DEVELOPMENT OF MICROCOMPUTER BASED FOUNDRY PRODUCTION CONTROL SYSTEM

By

SABAPATHY SABARATNAM

MTech CEng MIProdE

A thesis submitted for the degree of
Doctor of Philosophy

University of Aston in Birmingham

December 1982

The University of Aston in Birmingham

DEVELOPMENT OF MICROCOMPUTER BASED PRODUCTION CONTROL SYSTEMS FOR FOUNDRIES.

By
S. SABARATNAM.
Submitted for Ph.D December 1982

SYNOPSIS

This thesis deals with the problems associated with production planning and control in jobbing/batch foundries and the use of microprocessor technology to assist foundry management to overcome these problems. The research deals with three specific areas.

(1) Identification of features contributing to the problem.
(2) Defining the requirements for a production control system.
(3) Using microcomputers to assist production controllers in their task.

Since foundries provide a service, the objective of production control systems should be to achieve a reasonable balance between maximum on-time deliveries and efficient utilisation of resources. Information required for job selection is considered to be the root of the problem. Detailed scrutiny of the problem reveals that production planning in jobbing/batch foundries could be best achieved by combining the intuition of the production controller with the information processing power of the computer. Hence it is advocated that the establishment of an 'information system' and more informed procedures for job selection should constitute the basis for production control.

The computing complexity required for a foundry production information system is comparatively small compared with that required for other manufacturing industries and a wide range of low cost microcomputers have adequate capacity for such a system.

The proposed microcomputer based production control system is expected to cost about £8000 for a foundry handling up to 1000 live orders. Case studies conducted during the research indicate that microcomputer based systems can contribute significantly towards better production control, although it is too early to generalise on specific savings in production control staffing.

Limitations were evident, with respect to speed of execution and data storage capacity of low cost computer hardware. However this could be overcome by using the latest versions (16 bit) of microcomputers, 'winchester drives', and re-organisation of the data base.

Key-words:- Jobbing/Batch Foundries, Production Control, Microcomputer, Information System.

Acknowledgements

I wish to express my sincere gratitude to Mr. Trevor Law, my supervisor, for his continuous guidance and encouragement during this research.

I am also grateful to the management and staff of the foundries (Appendix 4) who provided essential information and opinion, which were essential for this work.

My thanks are also due to Science and Engineering Research Council for their financial support.

Finally, I would like to thank my wife for her encouragement and patience throughout this research.

Declaration

No part of the work described in this Thesis has been submitted in support of an application for another degree at this University or any other institute of learning.

No part of the work described in this Thesis has been done in collaboration with any other person.

S.Sabaratnam.

CONTENTS

		Page
Chapter 1		
1.0	Introduction	1
Chapter 2		
2.0	Production Control features of Sand Casting Process	10
2.1	Precasting Activities	12
2.1.1	Pattern Making and Storage	12
2.1.2	Core Making	13
2.1.3	Mould Making	13
2.1.4	Molten Metal Preparation	16
2.2	Casting	17
2.3	Post casting Activities	17
2.3.1	Casting and Mould Separation	19
2.3.2	Shot blast/ Hydro blast	19
2.3.3	Fettling	19
2.3.4	Heat Treatment	20
2.3.5	Inspection	21
2.4	Mechanisation and Automation	21
2.5	Manufacturing Strategy	22
2.6	Batch Size	23
2.7	Foundry Scheduling	25
2.7.1	Scheduling Theory	25
2.7.2	Individuality of Foundry Scheduling	26

2.7.3 Capacity loading versus Loading to Infinite Capacity 27

2.7.4 Integrated Plant Scheduling versus Individual Work Centre Scheduling 30

Chapter 3

3.0 Limitation of Manual Production Control Systems and the need for Computerisation 33

Chapter 4

4.0 Use of Computers in Foundry Production Planning and Control 45

4.1 Literature Survey 45

4.2 General Production Control Packages and its Relevence to Foundry Applications 53

4.3 Specialised Foundry Production Control Packages 55

4.4 Custom built Foundry Production Control Systems 60

Chapter 5

5.0 Requirement of a Foundry Production Control System 62

5.1 Objectives 63

5.2 Approaches to Production Control 65

5.3 Levels of Decision Making 67

5.4 Required System Functions 70

5.4.1 Order Acceptance and Overall Plant Loading 71

5.4.2 Detailed Plant Scheduling 72

5.4.2.1 Scheduling Pre-casting Activities 72

5.4.2.2 Scheduling Post-casting Activities 74
5.4.3 Issues of Shop Floor Instructions 75
5.4.4 Production Recording and Monitoring Progress 77
5.4.5 Generating Management Reports 78
5.4.5.1 Forward Load Reports 80
5.4.5.2 Work Centre Load Analysis 83
5.4.5.3 Foundry Performance Reports 83
5.4.5.4 Overdue Delivery Reports 83
5.4.5.5 Work in Progress Reports 83
5.4.5.6 Scrap Analysis 84
5.4.5.7 Production Performance 84

Chapter 6

6.0 Microcomputer Systems and their relevance to Foundry Production Control 85
6.1 The Role of Microcomputer Systems 87
6.2 Problems Associated with Microcomputer Systems 89
6.2.1 Standardisation 90
6.2.2 Hardware Combinations and System Maintenance 90
6.2.3 Software Development 91
6.2.4 Data Storage Devices 94
6.3 Scope of Microcomputers in Foundry Production Control 95

Chapter 7

7.0 Proposed Microcomputer Based Production Control System 99
7.1 Design Concepts 99

7.2	System Overview	100
7.2.1	Pattern Register	100
7.2.2	Order File	103
7.2.3	The Program	105
7.2.4	Computer Hardware	105
7.2.5	System Operation	107
7.3	System Functions	107
7.3.1	Order Entry and File Management	108
7.3.1.1	Insert New Order	108
7.3.1.2	Display Order Details	110
7.3.1.3	Amend Order Details	110
7.3.1.4	Delete Order	111
7.3.1.5	Print Order File	111
7.3.1.6	Pattern Register Management	111
7.3.2	Order Book Analysis	112
7.3.2.1	Load by Pattern Number	112
7.3.2.2	Load by Moulding Centre	112
7.3.2.3	Load by Metal Grade	116
7.3.2.4	Load by Box Size	116
7.3.2.5	Load by Inspection Code	116
7.3.2.6	Load by Order Group	120
7.3.2.7	Print Overdue Deliveries	120
7.3.2.8	Orders Requiring Samples	120
7.3.2.9	Orders Waiting for Pattern	124
7.3.3	Summary of Forward Loads	124
7.3.3.1	Summary of Moulding Forward Loads	124
7.3.3.2	Summary of Forward Metal Requirements	127
7.3.4	Daily Moulding Schedule	127

7.3.5 Issue of Shop Instructions 129

7.3.6 Production and Scrap Recording 132

7.3.7 Periodic Production Reports 134

7.3.8 Scrap Analysis 134

7.3.9 Financial Information 134

7.3.9.1 Value of Work-in-Progress 137

7.3.9.2 Order Book Value 137

Chapter 8

8.0 Practical Applications 140

Chapter 9

9.0 Discussion 150

Chapter 10

10.0 Conclusions 157

Appendices

Appendix 1.

Variations in Post-Casting processes in a typical Steel Foundry 161

Appendix 2.

Program Listing for the Proposed System 164

Appendix 3.

Program listing and printouts from Cronite Production Control System. 196

Appendix 4.

Foundries contacted during the research. 246

References 248

LIST OF FIGURES

1	Types of Production Systems	5
2	Foundry Production Flow	11
3	Core Production	14
4	Mould Production	15
5	Post-Knockout Production Flow	18
6	Batch Size Vs Number of Orders	24
7	Production Details Required for Planning	28
8	Demand on Clerical Resources	36
9	Quality of Decision Vs Time	40
10	Characteristics of Objective Function	64
11	Levels of Decision Making	68
12	Cost-Effectiveness of Computer Systems	97
13	Information Flow in Foundry Production Control System	101
14	Microcomputer Hardware for Production Control	106
15	Flowchart for Order Entry	109
16	Flowchart for Order book Analysis	113

List of Tables

1. Foundry sizes by number employed 5
2. Integrated Plant Scheduling vs Individual Work Centre Scheduling 32
3. Benefits of Computerised Production Control 42
4. Summary of Production Control Reports 81
5. Order and Progress Details 105
6. Load by Pattern Number 114
7. Load by Moulding Centre 115
8. Load by Metal Grade 117
9. Box Requirements 118
10. Load by Inspection Code 119
11. Load by Order Group 121
12. List of Overdue Deliveries 122
13. Orders Requiring Samples 123
14. Orders Waiting for Patterns 125
15. Summary of Moulding Forward Loads 126
16. Summary of Metal Requirements 128
17. Moulding Shop Instructions 131
18. Fettling Shop Instructions 133
19. Weekly Production Performance 135
20. Scrap analysis 136
21. Value of Work-in-Progress 138
22. Sales Value 139

Chapter 1

1.0 Introduction

If a manufacturing organisation is to function effectively and profitably, management must make effective and timely decisions. Production control is one of the important tasks of management where decisions have to be made frequently (or on a continous basis). This involves planning the production programs, publishing documents, recording performances, comparing with planned programs, reporting the variances and taking corrective action when necessary. Manual production control systems, although not different to computerised systems in principle, suffer from natural time lag. As observed by Drucker (16), time is a unique resource which has a totally inelastic supply and is totally irreplacable. The main purpose of using computers in production control applications is to compensate for these inherent limitations of time.

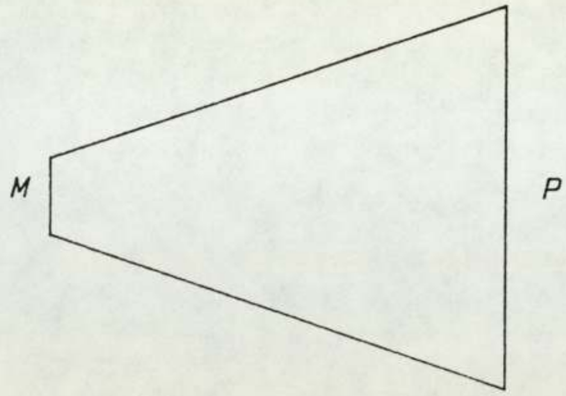
The role played by a computer in a production control system is seen by many as to act as an information depot and a calculating machine. Its function is to capture and process data relating to a large amount of transactions which continuously take place in a manufacturing environment. The processed data is usually presented to management in the form of reports on past events and plans for action. Computers do not make important decisions in the production control function but they could assist in providing timely and accurate information to assist decision making. Computer based production control systems can help to study bigger problems, evaluate more alternatives and aid in the search for an optimum solutions.

Most production control decisions can usually be best arrived at by combining the information storage capacity and processing power of the computer together with the human intuition of the production controller. The use of a computer makes it possible to plan production activities in detail, quickly and more easily, than it would be possible using manual methods. It could also provide an additional facility to management to evaluate the various production planning and control methods and improve current practices if possible.

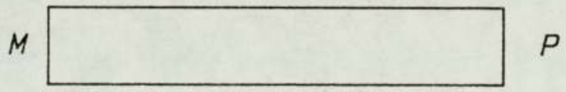
Burbidge (10) classifies production systems into three types (fig 1):-

(1) Implosive systems
(2) Process systems
(3) Explosive systems

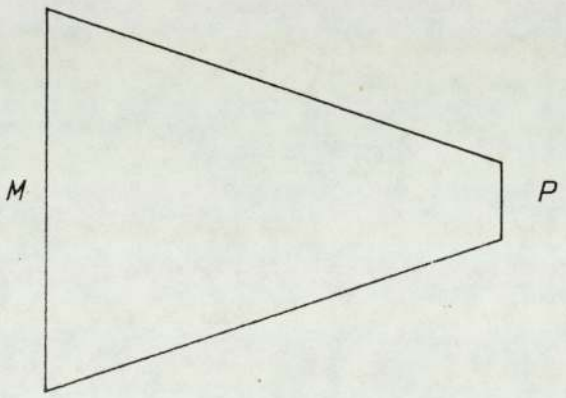
Foundry production could be categorised as an implosive system where one basic raw material (metal) is used to manufacture different products. As observed by Watts (58), the main features which distinguish production control in



(1) Implosive (eg. Foundry)



(2) Process (eg. Cement, Chemicals)



(3) Explosive (eg. Assembly)

M = Input of materials - No of varieties
P = Output of products - No of varieties

Fig 1 : Types of Production Systems

foundries from those of general engineering industries are:-

(a) The production line is unidirectional ie, operations are carried out in a fixed sequence through the various work centres.

(b) Considerable variation in the work content at various work centres due to casting shape, complexity, metal, inspection requirement and batch size.

(c) Uncertainty of yield due to rejects.

Due to the special nature of foundry production, the computer software needs to differ from the commonly available production control packages. During the last decade various attempts were made to devolop computer programs to suit foundry production control functions but had limited success. There are two major reasons for failure. Firstly the systems were based on expensive mainframe and mini computers. The majority of the foundries are small in size (table 1). Their turnover is small and the cost of implementing computerised production control systems cannot be justified. Secondly, these systems are sophisticated in design and inflexible in their function to cater for individual foundry requirements. These systems are usually more oriented towards commercial data processing activities (such as payroll, accounting and invoicing) than production control. Hence a very high proportion of the foundries still use manual systems. Most of

No of employees	No of foundries	% of total
1 - 25	764	60.5
26 - 50	171	13.5
51 - 100	130	10.3
101 - 200	97	7.7
201 - 500	85	6.7
501 - 1000	13	1.0
over 1000	4	0.3
Total	1264	100.0

Table 1. Foundry size by number employed.(1980/81)

Source:- Foundry Industry Training Committee.

the foundries who desire the use of computers for production control find that the major contribution it can make is in handling the volume of routine clerical work which has to be undertaken within short time periods. Many foundries have adopted some printing aids such as line selection duplicators or copiers to speed up some of the procedure. Further improvements in these procedures such as calculations and the presentation of reports etc. require the assistance of a computer.

Using computers for production control is not necessarily a matter of obtaining 'new' or 'different' data but simply a procedure of consolidating and interrogating the data already available. This will normally lead to the elimination of excessive clerical effort and clerical errors while providing timely information in a form that will be convenient to handle. Further, by storing detailed data in a computer, it would be possible to retrieve information in new combinations that could not be obtained by manual procedures on a systematic basis. The emergence of low cost microcomputers has provided an opportunity to bridge this gap between inadequate manual methods and expensive computer based systems.

The development of microprocessor technology and the shrinking of hardware cost have brought a wide range of business computers within the grasp of small foundries. Most noticable development is the availability of a wide range of microcomputer systems in various shapes and sizes. Certain makes of microcomputers available in the market possess most elements of a large computer. They can fit in to existing office space and are simple enough to be operated reliabily by existing production control staff. In contrast wages of clerical staff have risen both absolutely and relative to computer system prices.

Software development for microcomputers has not kept pace with the arrival of hardware. There are practical limitations in using these systems for production control application compared with mainframe or minicomputers in terms of memory, speed of operation and data storage capacity. Many microcomputers need specially developed application software. The nature of these microcomputers and associated low cost supporting peripherals request a different philosophy in system design and software development. One of the major sources of frustration in the development of software for foundry production in foundries has been the relatively unstructured and nonstereotyped nature of the foundry industry itself, another being the lack of knowledge of software developers in foundry operations.

This research is concerned with the investigation of the suitability of low cost micro computers to assist foundry management in production planning and control functions. If it has become cost effective to introduce computers in production control, it is essential to know precisely what role the computers should play. As a result it is necessary to identify what is to be controlled, how it is to be controlled and how the computers can assist in this process. This involves analysis of production control procedures and development of suitable systems for production control and computerisation.

Since most foundries are of a jobbing/batch nature and use sand casting technique, special attention is focussed on this type of situation. Most jobbing/batch foundries can be classified as small manufacturing systems and to have one or more of the following attributes:-

(a) Relatively small share of the market.

(b) Managed by the owner(s) in a personal way, without formalised management structure.

(c) Subsidiaries of large companies or tied suppliers of castings, which operates with relative independence on a day-to-day basis and have decision making capability 'on the site'.

In the second chapter, the features influencing production planning and control in sand casting process are examined and the problems of scheduling are analysed. Chapter three contains discussions on the limitations of manual production control systems and the need for computerisation.

A literature survey on the use of computers in foundry production planning and control is reviewed in chapter four. This includes a review of existing foundry production control systems, the type of computers used, it's effectiveness and costs. In chapter five a specification of the requirements for a production planning and control system for a jobbing/batch foundry is presented. The nature and the role of low-cost microcomputers is analysed and it's suitablity for foundry production control functions is discussed in chapter six. A description of a microcomputer based production control system developed during this research is presented in chapter seven. This demonstrates how a microcomputer can be programmed to plan and control production in jobbing/batch sand foundries. This research is conducted in collaboration with foundries some of whom have adopted the proposal. The impact of such practical applications were discussed in chapter eight. The results of the research is analysed and discussed in chapter nine. This includes an analysis of how the proposed system could be adapted to suit individual foundry requirements. Based on this analysis conclusions have been formed in the final chapter.

Chapter 2

2.0.0 Production Control features of Sand Casting Process in a jobbing/batch environment.

The basic function of a foundry is to convert metal into desired shapes and sizes. The casting process has not fundamentally changed for centuries although the individual techniques have evolved and the properties of materials have become increasingly sophisticated. In many cases, casting is the simplest, most economical and possibly the only technically feasible method of obtaining the required shape and size of a component. Most popular of the production techniques is 'Sand Casting'. The reason for its dominant position lies in it's versatility with respect to weight, shape, size and material composition of any particular casting.

Production in Sand casting begins with making or procurement of patterns and progresses through the process of mould and core making, casting, fettling, heat treatment, inspection etc until the finished castings are despatched. Figure 2 shows the foundry production flow in a sand casting environment. All these activities require varied degrees of co-ordination for the organisation of manufacture.

In the context of planning and control, production of casting could be divided into three distinct stages. They are:-

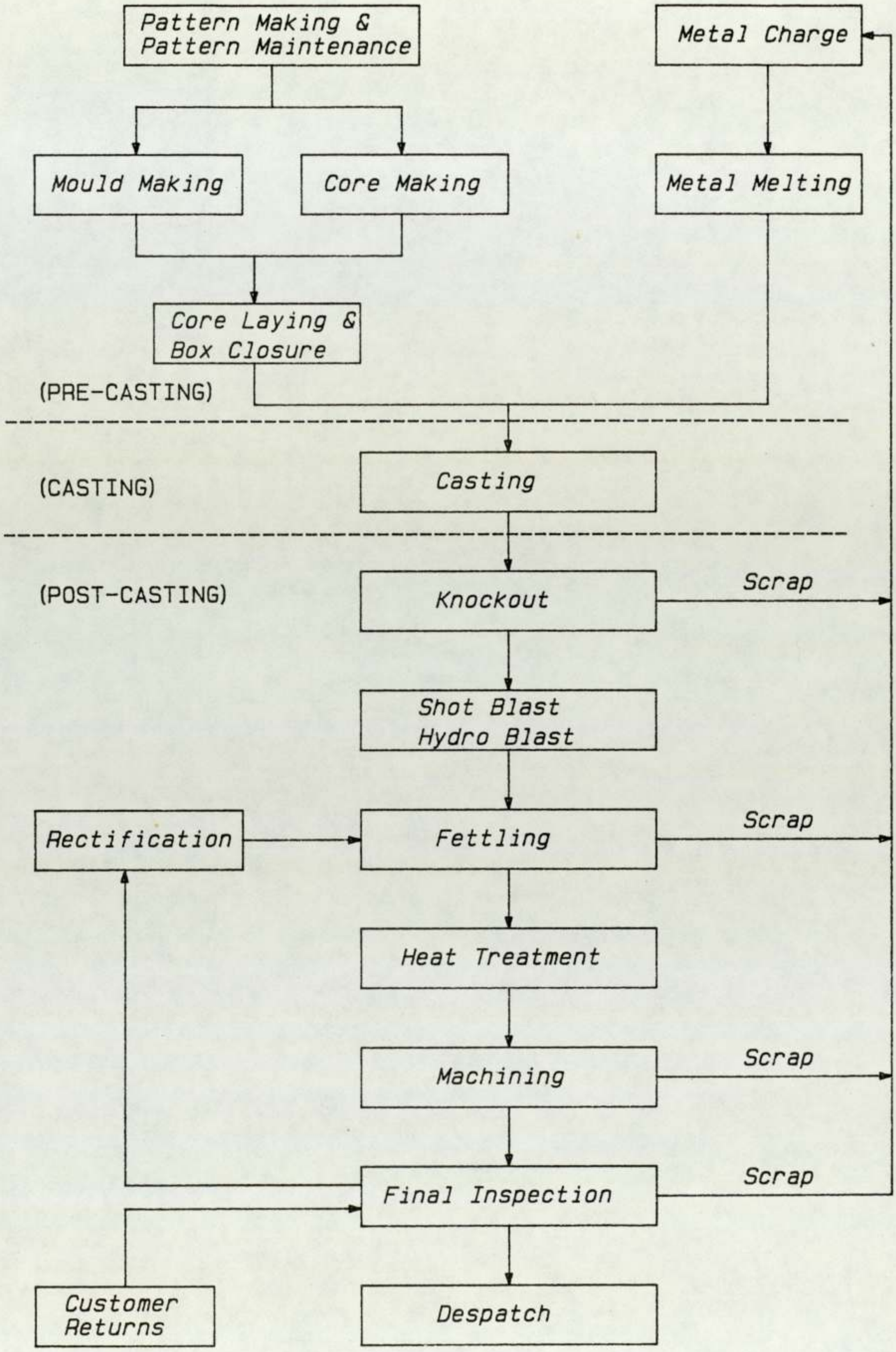


Fig 2 : Foundry Production Flow

(a) Pre-casting

(b) Casting

(c) Post-casting

2.1.0. Pre-casting activities.

The precasting activities consists of four main elements, namely pattern making, mould making, core making and molten metal preparation.

2.1.1. Pattern making and Storage

Pattern making is a highly skilled craft which usually involves the fabrication of a replica of the required component with due allowances for shrinkage in cooling. In a jobbing situation, patterns are made of wood and/or plaster. Not all foundries have pattern making facilities and in some cases patterns are supplied by the customer or this work may be subcontracted by the foundry.

On completion of the job the pattern is usually stored in the foundry. Foundries prefer to hold on to these patterns on the assumption that the customers will order more of these castings in the future. This leads to the build up of a massive pattern stores in jobbing environment. Some foundries have patterns in storage which were not used for about five years. With every pattern in store there is a need for the storage of technical and historic information.

2.1.2. Core making

Cores are used as inserts in moulds providing the desired component shape which would be difficult to obtain by direct moulding. They are usually made with sands and binders and hardened by baking or gassing (fig 3).

The core making program is normally dictated by the moulding schedule. Some castings have very simple or no core content while others have multiple or complex core content. Consideration should be given to core drying and transport time (if any) to the core assembly area. If the core making activity cannot cope with the corresponding moulding load, cores have to be made in advance. Cores made well in advance may deteriorate due to their shelf life or due to repeated handling. This could also cause storage problems and could be expensive.

2.1.3. Mould Making

Mould making (fig 4) can range from simple manual operations to highly automated production. The degree of automation depends to a great extent on the quantities of castings made out of a particular pattern at any one period. For manual operations, the sand is compacted by hand ramming or by sandslinger. With machine moulding the most effective results are obtained by jolting and sqeezing.

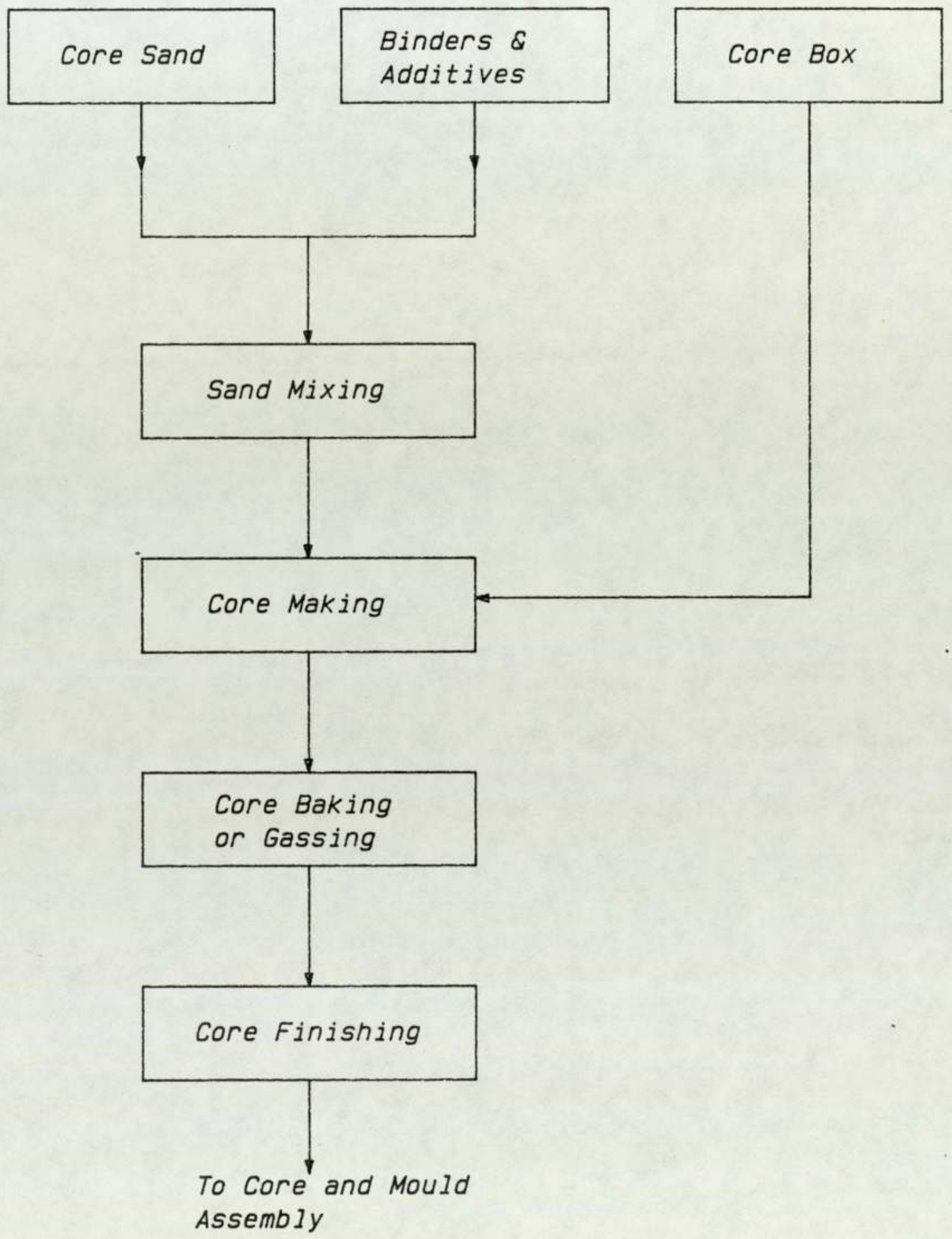


Fig 3 : Core Production

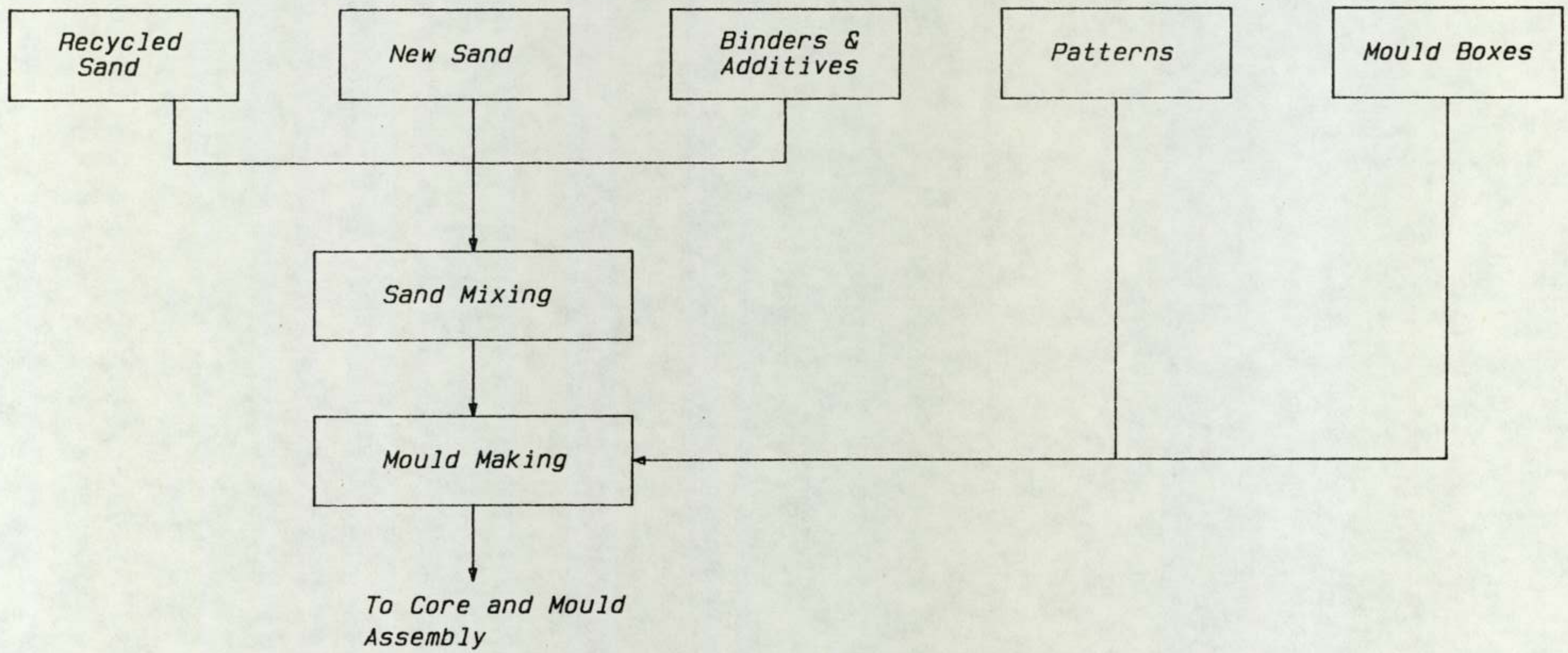


Fig 4 : Mould Production

Moulding is the focal point of production planning in most foundries. Foundries usually plan the moulding program for a particular period to maximise moulding resources subject to metal availability and core making capacity.

2.1.4 Molten metal preparation

The type of furnace used for melting depends on the metal to be used. The ingredients are either pure metal, purchased scrap, foundry scrap or often a combination of these three. Molten metal can be directly tranported to moulding area by ladles or temporarily stored in holding furnaces for later use. It is a usual practice to melt more than one metal in one furnace at different times of the same day.

Melting is a parallel activity to moulding. However it does not usually present problems of the same magnitude as core or mould making. The emphasis here is towards ensuring that the required metal is available at the specified time, and in the correct quantities. One other factor considered is the sequence of melting of different metals to prevent contamination.

2.2.0 Casting

In this context casting refers to the pouring of molten metal into the mould. All products of the foundry go through this stage. There are two important aspects in casting. Firstly the pouring temperature must be high enough to ensure metal flow, especially through thin sections in the mould, while preventing hot tearing due to excessive temperatures. Secondly there should be sufficient metal in the ladle to fill the mould cavity. Casting schedules are usually dictated by the availability of moulds.

2.3.0 Post-casting activities

After the casting process the component has to go through a series of processes to obtain the desired shape and quality. The number of processes required depends on the individual job. Various combinations of such processes for a steel foundry is given in Appendix 1. Post-casting operations can vary with the type of metal used for casting. Steel castings require comparatively more operations than iron or non-ferrous castings. The possible combinations of work flow through various work centres are illustrated by figure 5.

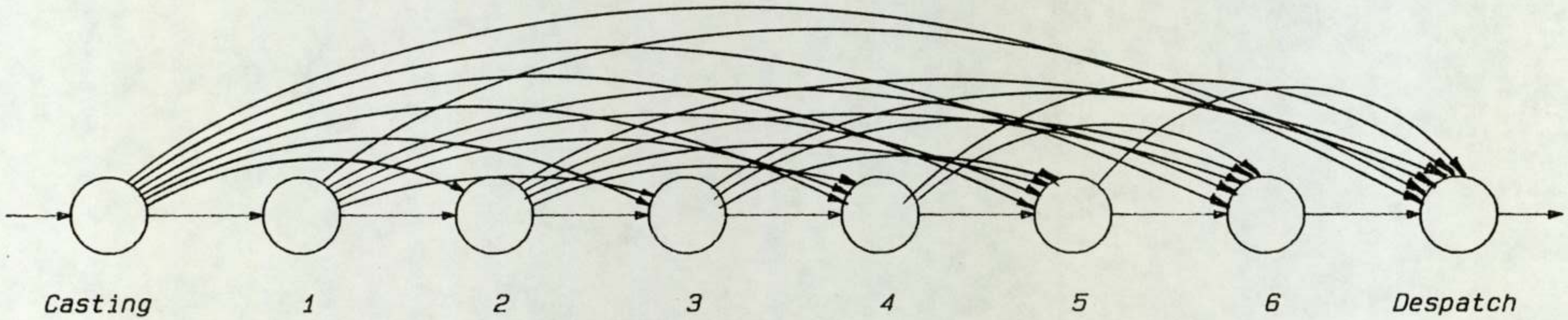


Fig 5 : Post-knockout Production Flow

2.3.1 Casting and mould separation

Having cast and allowed to cool for sufficient time, the castings are knocked out from the mould boxes. The boxes are returned to the moulding area and the components transfered for subsequent operations.

2.3.2 Shot blast/Hydro blast

Both processes are used for initial cleaning of the castings, especially to remove any sand adhering to them. This is important in components with sharp crevices and cavities where it is unlikely that the complete sand removal has occured at the knock-out stage. The 'blasting' treatment is sometimes repeated at a later stage of production to provide a better finish to the casting.

In this process castings belonging to different jobs may be mixed to obtain maximum throughput. This activity is not scheduled and job selection is therefore likely to be at random.

2.3.3 Fettling

This term refers to the activities involving the removal of exess metal from the casting to obtain the desired shape. This process may involve sawing, flame cutting, chipping, grinding etc.

Organising the fettling schedule is one of the main problems in production control. This is mainly because of the different types of jobs arriving in the fettling area. Some of the jobs may have a negligible amount of work content on certain operations but could hold up other operations because many of the jobs on that mix may require this operation. The renumeration of fettling operatives are usually based on the weight of castings processed and consequently their priorities may differ from those of production control. Batches of castings may not stay together after knockout and this could be further split due to some castings requiring rework (eg welding). These rectified items may require an additional fettling cycle.

2.3.4 Heat treatment

Not all castings require heat treatment which may be used in one or many forms such as annealing, normalising, stress relieving etc., to obtain the required metallurgical properties. This process may be repeated at various stages of production.

In the heat treatment stage castings may be mixed to get an economic load. The added problem is to identify the castings requiring a specific type of heat treatment process from available work load.

2.3.5 Inspection

Inspection may take place during any stage of post-casting process and the defective casting may be scrapped or sent for rectification. A final inspection is carried out before the castings are despatched.

Some castings require intensive test and inspection procedures. They may include X-ray radiography, pressure testing etc. for which most small foundries have to use outside contractors. Hence inspection department will require advanced notification of such jobs to meet delivery targets.

2.4.0 Mechanisation and Automation

Like other manufacturing industries foundries are moving towards mechanisation and automation wherever possible with a view of improving productivity and to relieve men from undesirable tasks. Development initially concentrated solely on the moulding function. However core making took a big stride forward with the advent of core binders which permitted abolition of the drying stores, and through the development of new types of core making machines. The improved types of furnaces permit foundries to melt a higher tonnage of metal per unit time than was possible before.

Mechanisation and automation present two problems to the production controller. Firstly, mechanisation is introduced at a cost and this demands a high plant utilisation to produce return on investment. Secondly, reduction in unit production time due to mechanisation, permits more jobs to be allocated to these plants in any one period.

2.5.0 Manufacturing Strategy

Foundries are in general independent or tied suppliers of components to engineering industries. The level of production depend on firm orders for castings from customers which in turn are dependent on the customers' sales performance. These customers may have accurate forecasts for their products but this information is not available to the foundries except in the case of foundries owned by the users of castings. Some purchasers of castings use more than one foundry for the same product to ensure reliable supply. In many cases, orders are placed at short notice and these may be subject to amendment at a later date.

These factors require most foundries to adopt a policy of manufacturing 'strictly' to order but some foundries tend to adopt the policy of 'manufacturing to order and some to inventory' when future demand is known. Manfacturing strictly to order tends to cause large fluctuations in production activities but eliminates the need to store inventories for which the demand is unpredictable. The policy of manufacturing to order and some to inventory could be adopted when the demand rate is relatively stable or predictable.

This leads to some stabilisation in production level and saves set up cost at the expense of building small inventories.

2.6 Batch Size

In a jobbing/batch foundry the batch size of orders are usually low while number of such orders are propo^r^tionally high. This leads to frequent pattern changes, core box changes and variation in metal requirement during a fixed production period. The set up time for moulding and core making are marginal compared with that of preparing different grades of metal. Fig 6 shows the relationship between the batch size and number of orders for ^a^ fixed capacity foundry.

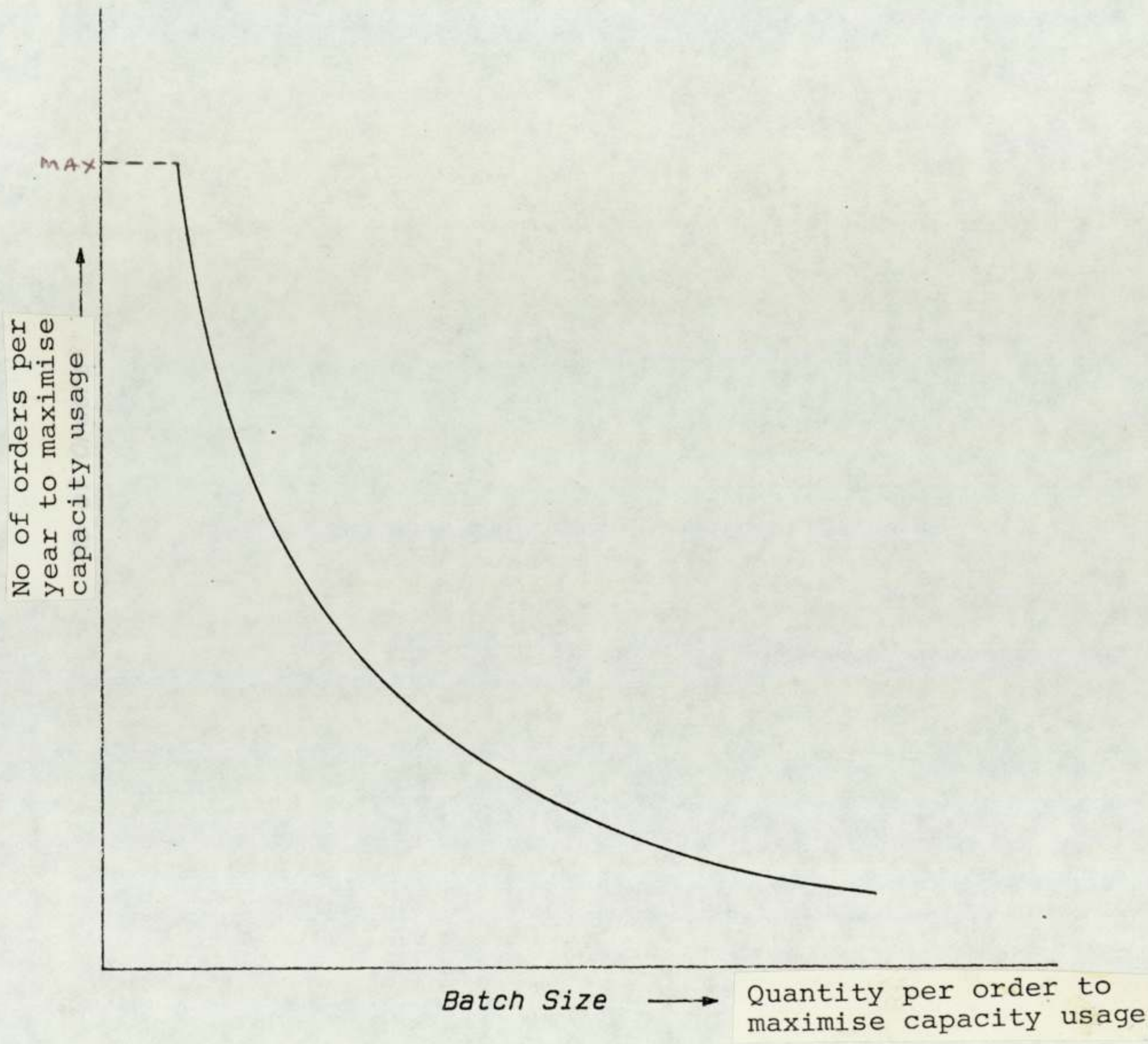


Fig 6 : Relationship between Number of Orders and Batch Size for a Fixed Capacity Foundry

2.7.0 Foundry Scheduling

In a jobbing/batch foundry products do not always follow the flow pattern as in flow production. Usually these foundries contain large numbers of different jobs, each having different routes and high variation in work content at different production stages. At any instant in time, at any facility or a department with a number of similar facilities, there will be jobs waiting to be processed. Scheduling is to assign priorities to each of these jobs in the queue so that the desired criterion or a set of criteria is optimised.

2.7.1 Scheduling Theory

Because of the inadequacy of scheduling theory to cope with the complexities in the foundry operations scheduling theory is ignored by foundry management. Considerable effort has been devoted in the past and present to the problems of Job Shop Scheduling. These studies are mainly concentrated on simple and straight forward problems. A scheduling problem can exist under several environments. The environment can be static, dynamic or probabilistic. In a static situation all jobs arrive in the shop before scheduling is performed. In a dynamic situation jobs arrive over time and compete for same facility. In some situations, where more than one machine group can perform an operation, the job can be assigned to any one in the specified group. The particular group that the job will end up depends on the status of these groups at that time. Thus a probability is assigned to each machine group that will perform a given operation. This situation is termed as probabilistic.

The size of the problem varies with the number of jobs and the number of facilities available. There are practical constraints on the problem. For example in foundries the size of castings demands the use of a particular moulding machine and this should take place at a specific time of the day when a particalur grade of metal is available. Some jobs demand specific completion dates. These constraints will reduce the number of feasible schedules but a mathematical solution to the problem is often extremely large, even for computer.

2.7.2 Individuality of foundry scheduling

A major part of a foundry's capital is invested in core making, moulding and melting facilities. A cost effective foundry operation requires optimum utilisation of these facilities while achieving delivery targets. The major problem is that the activities on each of these facilities has a direct impact on the other two as illustrated in section 2.1. The work content among the three facilities to produce a particular casting can vary widely. For example the production of a cylinder head for a motor vehicle needs a highly complex core compared with moulding time while no core will be required for the production of a water pump housing. The unpredictabilty of scrap rates calls for remakes of certain castings which sometimes takes priority over agreed shop schedules. The order book of a jobbing/batch foundry is highly dynamic. This is further complicated by the manufacturing strategy (section 2.5).i,e manufacturing strictly to order. The situation is complicated by the customers who alter their requirement at a very late stage. While foundries condemn this practice they condone in order to maintain customer goodwill. Furthermore the schedule is constrained by the availabilty of moulding boxes and the availability of space on roller tracks or on the floor for storing moulds. The limited availability of metal preparation facilities and the need to sequence melts to avoid contamination imposes additional constraints on the foundry scheduler.

2.7.3 Capacity Loading versus Loading to Infinite Capacity

Short term scheduling is an activity that is very much like preparing master schedule but it has a shorter time horizon (daily in most jobbing foundries) and involves considerably more and accurate details (fig 7). It is usually accomplished by one of the following basic approaches.

(a) Capacity Loading

(b) Loading to infinite capacity

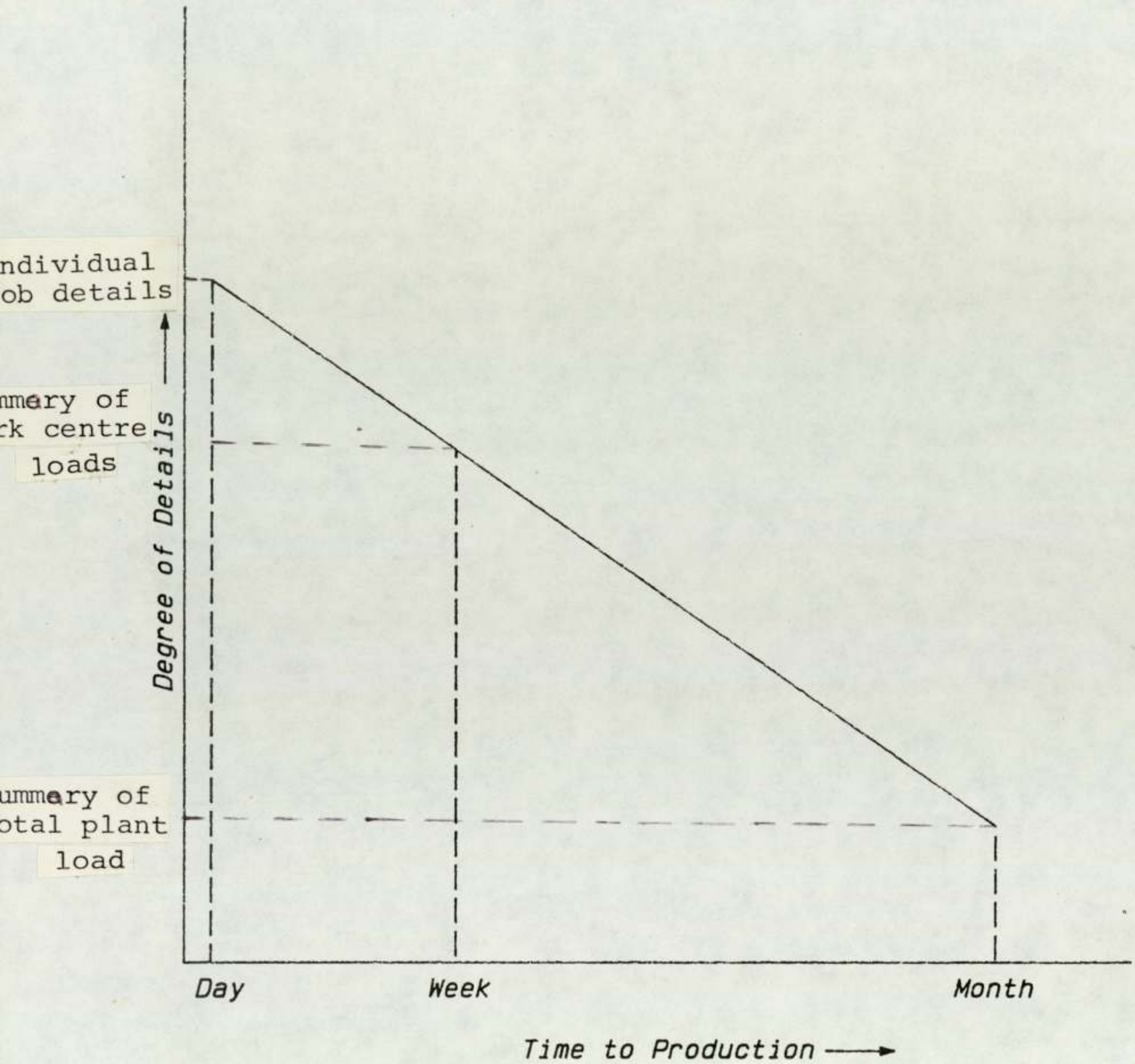


Fig 7 : Production Details Required for Planning

An effective schedule of precasting activities should reflect a good balance between mould making, core making and melting for each time period. Due to the possible high variation of job content between these sections for any particular product, it is necessary to match the total capacity requirement of jobs scheduled and the capacity available in all three sections. An overload in one section could disrupt the total casting program. Hence for pre-casting activities a capacity loading approach will be suitable.

For post-casting operations it is difficult to predict the load for each process in advance. This is mainly due to unpredictability of scrap and job arrival time. This leads to a situation where each section has to select jobs out of what is physically available for processing at any one time. Hence it is necessary to use the approach of loading to infinite capacity where each work centre is presented with a list of all jobs waiting for that process ranked according to the order of priorities. These priorities may be based on delivery dates and any further operations each jobs have to go through before delivery. This provides flexibilty for the supervision and leads to improved resource utilisation.

Capacity loading provides a balanced load for pre-casting activities and eliminates the need for continuous capacity adjustments. This could affect delivery performance but can be compensated by giving priority for late jobs in post-casting operations. Loading to infinite capacity is easier to program and implement and could increase work centre resource utilisation. It can focus on bottlenecks in the production line and force management to act when problems develop by capacity adjustment.

2.7.4 Integrated plant scheduling versus Individual work centre scheduling

Modern approaches to production scheduling problems tend to advocate the use of integrated plant scheduling method with a view of obtaining total plant optimisation. Schedules are usually obtained for a fixed period (eg month) in advance. Though this approach may be relevent to flow type foundry production, most jobbing/batch foundries find it impossible to model the works. The mathematics is too complex and the order book is too highly dynamic to give any consideration. This also requires large computing power which is beyond the means of most foundries.

The conventional foundry scheduling approach where each work centre is scheduled daily based on the jobs available for those work centres is still prefered by many foundry managers. This involves a simpler task of optimisation of each work centre resource with due consideration to delivery dates and other operations remaining. This method inevitably has the disadvantages from the collective point of view and can increase production lead time. But the problem usually of manageable size and each department can deal with local disturbances without causing much disruption to other work centres. The resource utilisation is comparatively higher. The merits of both approaches are compared in table 2.

	INTEGRATED PLANT SCHEDULING	INDIVIDUAL WORK CENTRE SCHEDULING
Objective	Optimisation of total plant	Optimisation of each work centre
Scheduling process	Total plant	Each work centre
Scheduling period	Week or month	One day
Scheduling cycle	Weekly or monthly	Daily
Inputs	Total order book. Total plant capacity. Work in progress.	Load available for that work centre. Work centre capacity.
Outputs	Integrated schedule for the period	Daily production instructions
Action for fluctuation	Reschedule	Adjust capacity
Nature of system	Complex	Relatively simple
Plant utilisation	Low	High
Degree of control	Low	High

Table 2. Integrated scheduling vs Individual work centre scheduling for a jobbing/batch foundry.

Chapter 3

3.0 Limitations of Manual Production Control Systems and the need for computerisation.

Inspite of various efforts made by computer system vendors and foundry trade organisations to promote computerised production control systems, manual production control systems are still seen to be predominant in the foundry industry. For some small foundries this may be the best overall solution.

In most jobbing/batch foundries, manufacturing a variety of castings and with a proportionately higher number of orders, the production control situation is often dynamic. This requires a large amount of timely data, frequently, to plan and control production. With manual systems such data is difficult to obtain, and when available, it is often too late, to be any use and may contain inaccuracies. When the required data does become available, it is difficult to carry out the necessary analysis for extracting the relevant information due to inadequate time and clerical resources.

Often clerical staff spend a considerable amount of time preparing production schedules for the subsequent production periods, only to find the requirements have changed and quick alterations have to be made to reflect the new circumstances. This becomes an impossibly lengthy task to undertake on a systematic basis. Hence informal paper work grows alongside the formal paper work, with priority lists and instructions to modify the formal plan to make what is 'really' required. This confused situation could lead to less control of shop floor activities and result in the phenomenon which is so characteristic in the foundry industry called the 'overdues'.

The initial forward planning and subsequent planning of daily production programs needs frequent analysis of load, capacity, priorities etc. Every day, when production has taken place and/or new orders have been received, these parameters will change, and all these analyses has to be repeated to obtain information on the latest situation. During post-casting of production there is a need to monitor the progress of individual jobs through the foundry. In addition to knowing the progress made by the jobs, the completed jobs from one work centre is required to be loaded to the subsequent work centre to ensure continuity in production. This transfer of jobs from one work centre to another may alter existing priorities and a new schedule may have to be issued to reflect the changes. The effectiveness of this monitoring process increases with the increase in monitoring stages upto an optimum level. This procedure of preparing new shedules daily for each work centre is time consuming and requires large clerical resources. Hence in foundries using manual systems, there is a tendency to limit the monitoring stages to less than the optimum required.

Preparation of periodic reports consumes a major part of clerical time of production control staff. Fig (8) shows the uneven demand on clerical resources required to prepare periodic reports in addition to the daily routines. To satisfy this demand additional staff have to be employed to avoid the risk of neglecting daily routines during peak load on clerical resources.

The ineffectiveness of manual production control systems may lead to high work-in-progress, poor plant utilisation and poor delivery performance. This could result in foundries quoting increased delivery lead times and can prompt some customers to place their orders well in advance of their requirements. These advance orders increases the delivery lead time for other customers further and the consequence can be either more customers placing orders in advance of their requirememnts or going to other foundries for their castings. In these situations the increase in delivery lead time is not caused by demand but purely by a self defeating spiral of advance orders placed by customers, chasing increased delivery lead time of the foundry.

Another frequently encountered problem with the manual system is the lack of communication between different departments. Each department with different objectives tend to maintain independent records in order to fulfil their functions. In a dynamic situation the records are subject to continuous change which has to be communicated to all other affected areas. Sometimes the department concerned may not be informed

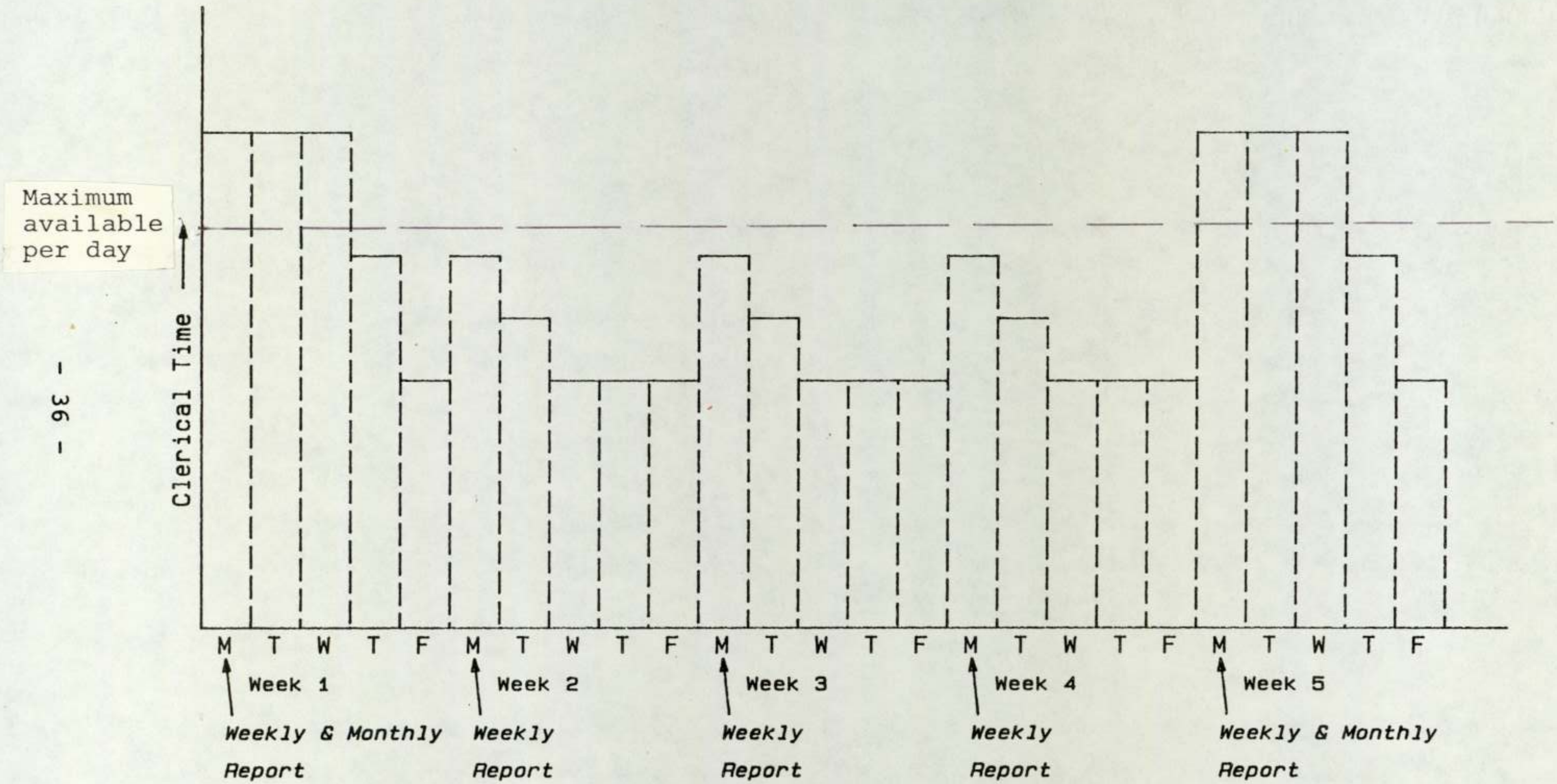


Fig 8 : Demand on Clerical Time

of these changes or there is a considerable delay in information reaching them. Any decisions made during this interim period could be based on obsolete data.

A report by the Institute of British Foundrymen (27) states that most manual systems for processing orders are riddled with minor errors due to copying of details from one piece of paper to another during the life of an order. The consequences are that:-

(a) Clerical effort is devoted to cross-checking with other sources of information to ensure that the data in general and product description in particular, are correct. This is only partly successful.

(b) An unreasonable proportion of errors in the form of incorrect products and/or documents reaches the customer.

The report further states that in small organisations with a small number of transactions it may be possible to keep the outstanding order file up-to date although it will contain the above errors. When the file has been analysed the errors will be disguised in the form of management information. Once the number of transactions has increased to critical point there is a gradual decline in the clerical performance.

In general, problems encountered due to manual production control systems could be summarised as follows:-

(a) Inability to offer realistic delivery dates due to lack of accurate and up to date committed capacity and resource reports.

(b) Inabilty to modify production schedules quickly when circumstances change.

(c) Customer enquiries are difficult to answer because of the information not centralised.

(d) Inadequate coordination within production centres specially in pre casting activities due to tedious and repetitive calculations which cannot be undertaken systematically.

(e) Delivery dates are missed because of lack of accurate and timely information regarding the progress of production.

(f) Unne cessary increase in work in progress.

(g) Errors in production records caused by clerical procedures.

(h) Uneven demand on clerical resources.

(i) Successful operation of the manual system depends on key personnel, which can cause production disruption through holidays, sickness, etc.

(j) The informal nature of the system makes it difficult to adopt to changes through expansion or alterations in production facilities.

Most of these limitations centre on the inability of the clerical staff to analyse the volume of data available, perform ne cessary calculations and produce the required information on time. Computers can assist production control in overcoming this weakness. The essential role of computers in production control is to perform these routine calculations and produce reports desired by management for decision making (fig 9). The ability of a computer system to store and process large volume of data can help the production controller, faced with constant changes, to plan production more confidently. It makes it possible to plan more comprehensively than it is possible with manual systems.

The implementation of a computer based production control system can prompt foundry managers to think, perhaps for the first time, about the planning and control methods currently used and make improvements where possible. It can provide more time for the production control staff to review the plans and revise them at frequent intervals, possibly on a continuous basis, as further facts emerge or changes take

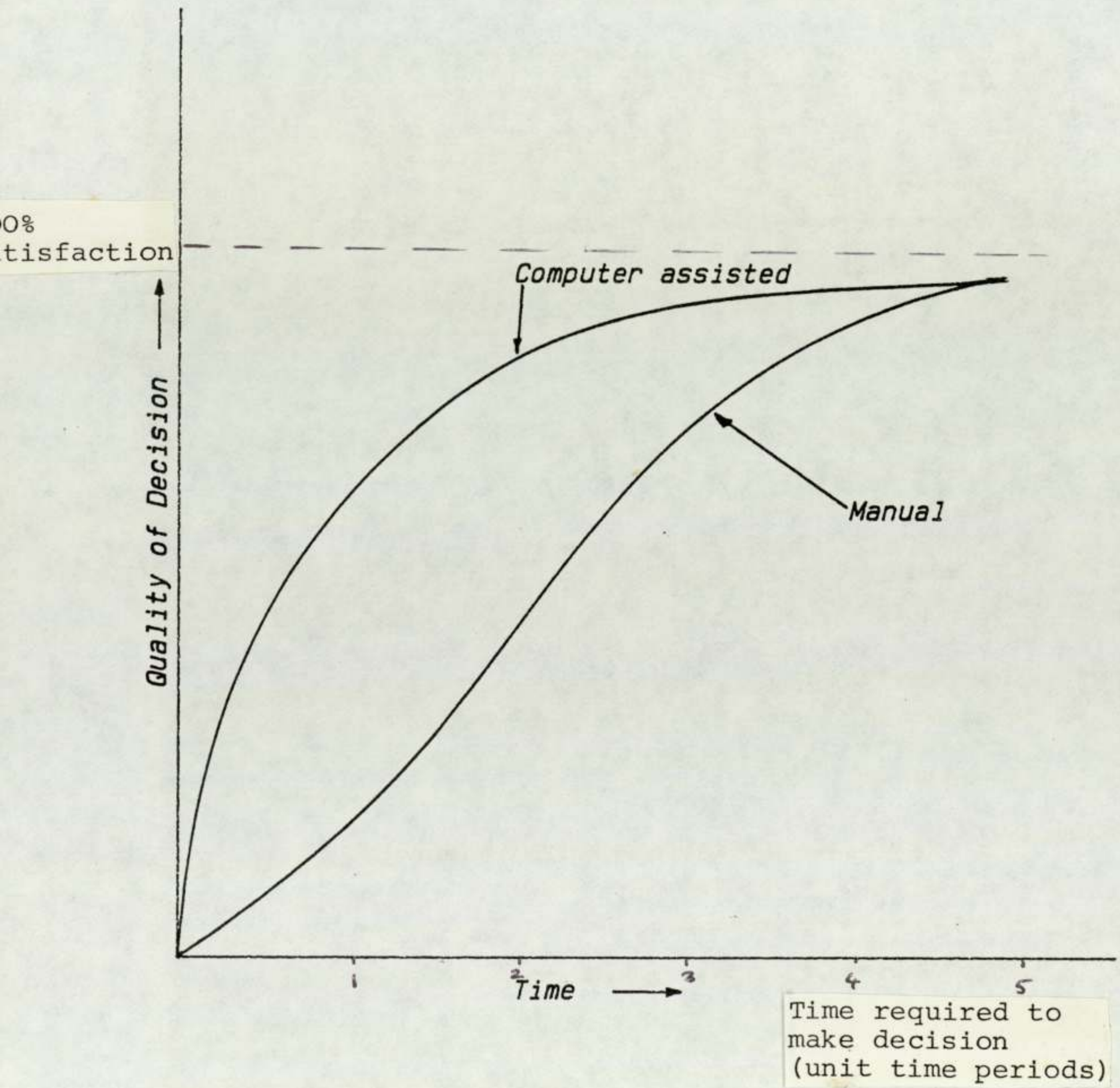


Fig 9 : Pictorial comparison of quality of decision VS time for Computer and Manual Control Procedures place. With manual systems such reviews and revisions are not often carried out due to the high cost of clerical resources required.

In a survey (22) conducted by 'The National Computing Centre' on the benefits of computer based production control, 80% of the users indicated that they could get speedier and more accurate information (table 3). The other benefits mentioned include reduction in stock, work-in-progress and delivery period. Three of the companies surveyed quoted an improvement in delivery performance of 40% and two companies quote an improvement of 80%. The report points out that savings of this magnitude could be taken to be a reflection on the deficiencies of the manual system as much as the excellence of the computer versions.

The main difficulty with a computer based production planning and control system is that it takes away the flexibility and the informality of the manual systems that is much needed in accomodating the disturbances in jobbing/batch foundries. Therefore in the control role, which is so vital, the computer system must be able to fulfil two basic requirements. Firstly, it must provide at least as adequate, a means of recovering information as a manual system does in terms of speed and presentation, and preferably improve it. Secondly, it must be possible to ask the computer varied questions for selecting information and doing manipulation which are not possible manually.

	Benefit	Companies with improvements (% of 134)
1.	Reduction in stocks	47
2.	Reduction in WIP	36
3.	Reduction in queing time	25
4.	Improved competitive position	29
5.	Reduction in labour turnover	3
6.	Reduction in staff	41
7.	Reduction in overtime	25
8.	Increased production	28
9.	Reduction in backorders	42
10.	Reduction in delivery period	35
11.	Reduction in idle time	
	(a) man	20
	(b) machine	19
12.	Reduction in capital expenditure	7
13.	Reduction in production lead time	35
14.	More accurate information	79
15.	Speedier availability of infomation	80

Table 3. Benefits of computerisation.
Sourse - National Computing Centre

It is often necessary to expedite the processing of some critical orders which are either late or are urgently required. In manual systems the expediting involves asking the supervisor to ensure that the particular job is worked upon next, usually by progress chasers. The system often fails because the management is unaware of the effect of this expediting on other orders. This is mainly due to the amount of clerical work involved in calculation of these effects. Also managers, shop supervision, progress chasers and operators have different priorities. In computerised production control systems, an order can be expedited by altering the priority associated the particular order. The higher the priority, the further up the job will appear in the shop instructions list. With such computer based systems it is no longer necessary to negotiate with a number of people in the affected department.

In manual systems, usually the edges between the three areas of information, decision and execution are blurred and indistinguishable. These are usually not capable of being programmed into a computer. Computer based systems will therefore require very clear definitions of the authority of each level of management and the assistance the computer is expected provide at each of these levels.

If the production controller using manual systems is making complex decisions, considering the inter-acting variables and exercising judgement based on intuition, then it is unlikely that the computer can do more than aid him to quantify his judgement. Alternatively, if the task of the manual system is performing repetitious simple calculations followed by very simple decisions, then the computer can perform these tasks leaving the production controller to devote more time on better decision making, rather than making hasty, snap decisions.

Chapter 4

4.0 Use of Computers in Production Planning and Control in Foundries.

4.1 Literature Survey

Two different basic approaches are adopted in using computers in foundry production control. One is to use the computers to make decisions on the behalf of management (decision system), the other being the use of computers to provide timely and better information to the manager to make decisions (information system).

Law and Humphrey(36) review the principles underlying the applications of computers in the foundry industry. They pointed out that the foundry industry, in comparison with other manfacturing industries, were unduly slow in applying computer technology. Several reasons were offered to account for this delay. These include the high cost of computer installation, low proportion of formally trained personnel employed by the foundries, the dispersion of the industry as a multitude of small firms and the failure of the technical press and trade organisations to promote the importance of computers to foundry management.

Waespi (56) advocating the use of computers as a management tool warns that, if the introduction of computers were not suported by correctly oriented organisational structure, it could undermine the very foundations of the firm. For many small foundries this could mean an entirely fresh approach. Hence, to consider that computerisation simply means switching manual routines to the machine after which more accurate results could be obtained at a greater speed, is a misconception.

Sargeaunt (48) outlining both the philosophy behind and the principles involved in scientific decision making, states that full-scale application quantitative methods would often prove impracticable without access to a computer.

Law and Green (37) examine the feasibility of using computers for production scheduling in foundries. They first reviewed in detail five scheduling techniques and explain how, a model developed for a malleable iron foundry, simulating the heuristic rules of the moulding department personnel. The model consists of fourteen sequentially linked programs, which essentially receive orders and base subsequent delivery promises on a four week production cycle plus estimated order backlog. Current schedules are produced every week, each order being adjusted for number in stock and anticipated yield. Job choice is based on management set priority rules which are formulated mainly to promote a high rate of on time delivery. A similar approach was advocated by Southall (52) in an attempt to solve balancing problems in foundry scheduling. He offers a mathematical optimisation routine to overcome balancing difficulties in a batch/flow type situation and presents a simulation model to deal with jobbing/batch problems. These two papers advocate the use of computers in decision making role. There is no evidence to show that the computer models presented represents the foundries in question and the practical value of the proposals are not substantiated.

Montgomery-Smith and Owen (42) emphasis the advantages of the use of simple computer systems to present intelligible and concise information to management as a basis for tighter control of factors affecting foundry profitability. They point out high plant utilisation and reliable delivery, as being the key to profitability rather than the quality of castings produced. Although this does not necessiate the use of computers, management control is considerably enhanced if they are included. Cost control and production control are two areas recomended for computerisation. They observe that in the areas concerned 90% of the problem, and the time taken to solve it, tends to lie in arranging the relevant information in such a way that it can be easily assimilated. The paper advocates in the development of simple computer systems for foundry management and complexity as the reason for failure.

In a follow up of this article by Fuller et al (19) it is emphasised that decision making must remain the prerogative of the management and therefore advise, a cheaper, information system to assist in production planning and control. The inability to perform large amounts of simple calculations, sorting the results and presenting the information are cited as the reason for poor production planning. While proposing a common package for all foundries they further recomend that

(a) Control of the use of the system should be vested in foundry personnel.

(b) Frequency of operation of the system should be determined by the foundry.

(c) The system should provide specialised reports where possible to suit individual foundries.

(d) The cost of using these systems should not, in total, incur expenditure of more than 1% of turnover.

Hollinshead (24) states that the philosophy behind the use of computers for production control as 'The computer is no more than a management tool for providing timely information to enable better decisions to be made'. The system described was based on a set computer files and schedules the jobs back from stated delivery dates. The computer is programmed to provide information on loading of moulding, core making and fettling departments. Flexibility is considered as an important feature of the system. This point is exemplified where new jobs or unscheduled jobs for which priorities have changed between computer listings, are added manually to the production program.

A similar control procedure is described by Dahlke (12). The computer produces production program for core shop three weeks in to the future and two weeks for moulding. A notification to the pattern storage department to assure that the required patterns will be readily available when needed. Although the computer details the weeks load by order item, it does not provide day to day details. It is left to the shop supervision to decide on the day to day production that can accomplish the weekly schedule. In contrast, a scheme described by Wakefield (57) shows the computer to be also responsible for day to day scheduling. It determines, for example, if there are enough orders to justify pouring a specific grade of iron on the day or to postpone the orders to a later day in the week to justify an economical heat. In addition if a job is behind schedule, the computer will incorporate it to the schedule so as to minimise interference with other orders already scheduled or the plant efficiency.

The importance of progress monitoring is emphasised by Malcomb (39) and Dahlke (12). At Hermit Investment Casting Co.(39), where at any one time 300 jobs can be in various stages of completion, it is imperative that the fullest information be available if over- or under-production is to be avoided. Daily labour distribution cards, completed by every operator and showing the type of operation, job number, number of pieces completed and the employee time record, are received at the end of each day by the data processing department. This data is fed into the computer to update the data base and to produce weekly control reports. One of these reports shows the number of components at each stage of production for any given job. A similar approach was adopted by Maynard Co (Dahlke 12) but with added sophistications. Each department was provided with a data entry terminal. At the end of each day, the operator transmits the details of production via this terminal. They have to identify themselves to the computer by inserting the identification cards before data is keyed in. On the following day the shop supervisor and management will receive detailed reports showing what was accomplished on the previous day and what was expected during the week. These daily reports are suplemented by weekly reports showing summaries on production, scrap and plant utilisation. At Flynn and Ermock (3) where computers are used for monitoring progress,there is an interesting additional feature. The computer also produces reports that gives dollar values to the production and scrap components.

According to Binmore (8), the basic difficulty of progressing work through a foundry producing batches of castings is that the castings produced as a batch in the foundry do not stay in that batch during subsequent process operations. This is due to either a percentage of castings requiring reworking, or to processes in which castings are mixed. For this reason, a production control system cannot be based on progressing a batch of castings through a number of work centres.

The ability to obtain additional information by using computers for foundry production control is pointed out by Varley and Daniels (55). While describing the importance of computers even for small foundries, they stress the value of 'spin-off' information that could be made available for the management and in some cases to the customer. eg:-

(a) Checks on pattern usage to minimise storage areas.

(b) Indication of trend in selected customer demands to predict potential requirements.

(c) Lists for customers showing outstanding orders giving details of quantities, values, delivery dates etc.

More discussion on the use of computers in foundry production control and it's impact are given by Benz(7), Drago(15), Maynard and Cooper(40) and Niehuas(45). Most of the systems reviewed are based on the philosophy of providing necessary information to assist the production control staff in planning and controling production.

The working group E2 set by the Institute of British Foundrymen concludes (27,28 and 29) that the use of computer in production planning control can improve the situation considerably. But the reports warn that:-

(a) No computerised system can possibly compensate for the previous lack of a sensible manual system.

(b) The more closely the computer system defines the organisation of production, the system becomes more inflexible and prone to failure.

The working group further states that production scheduling is best done by the experienced human scheduler for whom the computer can provide necessary information.

4.2 General Production Control Packages and their Relevence to Foundry Appplications.

A variety of production control packages have been developed by manufacturers of computers and other software developers. These packages are generally designed to run on large computers and oriented towards assembly-type manufacturing industries which are characterised by complex finished products involving assemblies of purchased parts or internally manufactured components, and by manufacture with variable process routes typically involving many operations. King (32), in a survey of computer based production control in general, found that 34% of the companies surveyed used standard packages and almost all of these (90%) had made modifications to meet their specific requirements. In an assessment of production control packages for foundry applications by Law and Thapar (38), only the BCIRA/Hoskins package was found to be suitable for foundry production control applications. Their analysis indicate that, if general production control packages are to be used in foundry operations, they require expensive modifications. This assessment was supported Trinder (54) based on studies by BNF Technology Centre. Out of 75 packages surveyed by 'Which Computer' (60) in 1980, only one package was indicated as suitable for foundry applications.

Most of the engineering packages offer comprehensive facilities such as:-

(a) Sales order processing

(b) Stock control

(c) Requirements planning

(d) Forecasting

(e) Shop loading/Capacity planning

(f) Progress monitoring

(g) Product costing

(h) Purchase order

(i) Simulation

Among these facilities offered (a),(e) and (f) have some relevance to foundry applications.

Foundries have special information processing requirements that are not found in assembly-type industries. Some of these reasons are:-

(a) Raw materials used to produce castings are normally not requisitioned or purchased for specific jobs.

(b) Scheduling pre-casting operations require special resource balancing routines to cater for the constraints imposed by one activity on the other two. As a result this balancing requirements, the system should allow for splitting the jobs in to two or batches whenever required.

(c) Unit labour costs required for melt, pour and knockout usually cannot be charged for specific job.

(d) In processes, such as shot blast and heat treatment, castings belonging to different jobs may be mixed. Hence costing and machine loading require special handling.

(e) Component yield presents problems not found in assemblies of purchased or internally manufactured components.

(f) The ability to report data from the shop floor require special recognition in a foundry. Many foundries have shop floor conditions not conduc ive to reporting information back to production control accurately.

4.3 Specialised foundry production control packages

Examples on the use of specialised foundry production control packages are described by Daily (11),Gamble (20), Weil (59), and Niehuas(45). These systems could be divided into two broad types.

(a) Packages using batch processing approach

- implemented on main frame computers.

(b) Packages using real time approach

- implemented on minicomputers.

These packages were usually developed by foundry trade organisations with a view of assisting members in sharing development cost or a by product of a system designed to satisfy the individual needs of a foundry.

One widely publicised batch processing type foundry production control package was the BCIRA/Hoskins system. It was the outcome of BCIRA research into foundries of various types and sizes of foundries and claimed to be used by a number of foundries since 1972. This package was designed to operate on ICL and some IBM main frame computers and mainly for bureau use. In terms of facilities provided it satisfies most of the foundry production control requirements. Foundries can implement the various facilities at their own pace and tailor the reports, (maximum of twelve) to suit their own requirements. The package does not provide computer scheduling facilities but the reports can help the human scheduler to prepare daily production programs. Daily (11) describing how Sheepbridge Engineering Ltd. use BCIRA/Hoskins package, points out the satisfaction of the system after six years of use. But it must be pointed out that this company has their own computer hardware costing approximately

£350,000 and have 37 data processing and operating staff in the computer department for the group. This package used about 7 hours of computer time a week. The annual cost of data preparation and processing was given at £17,000. Daily further estimates the purchase price of the package to be in the range of £8,500 to £12,000 and the cost of using the bureau computer could be about £3,500 at 1978 price levels. The main drawback in this package is that it requires an expensive computer to run or need to use a bureau service which can cause inconveniences.

With a view to eliminating the disadvantages of the BCIRA/Hoskins system, the British Non-ferrous Technology Centre developed a computer package for foundry production control during 1974 to 1977. The facilities offered by this package are similar to that of the BCIRA/Hoskins system except that it provides a real-time system. The package is designed to operate on DIGICO minicomputer located in the production control department. The total system cost, including three terminals and a printer, is about £35,000. There is no analysis available for system operating costs. Since it's emergence 5 years ago, the author's investigation found only two foundries, one of which participated in its development have installed this system. Gamble (20) describes the experiences of implemetating of this system and it's advantages. The system was specially designed for jobbing/batch foundries.

Weil (59) describes the use of a minicomputer for foundry administration in small a non-ferrous foundry employing a total of 35 employees. In addition to production control function, it has facilities for payroll and accounting. This program was specially developed for Gascoignes Foundry on the Wang minicomputer and later modified for general foundry use. This package named 'FO.COM 42' is being marketed for about £20,000.

The latest addition to foundry production control packages, FORUM, was anounced by Management Information Services Ltd. The package though expected to be released in the second half of 1982, no evidence is available to the author on any installation. The complete package including payroll and accounting expected to cost over £50,000. For production control applications alone the system is expected to cost about £35,000.

There is evidence on the availability of similar packages in the United States. Niehaus (45) provides an account of the facilities available on the foundry computer package developed by B & L Information systems Inc, but there are no indications available on it's costs.

All systems reviewed in this section provide satisfactory facilities for foundry production control applications. The BCIRA system is based on the batch processing approach whereas the others use the real-time approach. There are advantages and disadvantages in both types. Until recently, the cost of computing was so high that batch processing was the popular method for foundries contemplating computing for production control applications. With the emergence of minicomputers and lower hardware cost, there is an accelerating trend towards real-time computer systems for production control.

Batch processing is an arrangement whereby the production control transfers data related to it's activities to computer input sheets to an internal data processing department or to a computer bureau for processing and production of appropriate reports. The frequency of such processing is by prior arrangement and it is normally a weekly cycle. The output is strictly for the data submitted and if any change in the data has to be incorporated in the reports the entire program has to be re-run or the user must wait until the next run. A highly disciplined approach to data tabulation is required and any errors in the data submitted can result in a wasted run. On the other hand, the production control department need not purchase a computer and has the benefit of using a powerful computer at comparatively low cost. In well-organised and static production control situations, a weekly updating of records may be satisfactory. In jobbing/batch foundries where the problem is ill-structured and dynamic, batch processing approach is unsuitable.

The real-time approach is found to be more effective in solving production control problems of jobbing/batch foundries with a dynamic order book. All information in this type of system is constantly updated and the information produced will reflect the latest situation. The input errors can be quickly identified and corrected. The production controller, who is likely to have full control over the system, can review and revise his plans until a satisfactory solution is obtained. The major disadvantages of this approach have been that the production control department had to invest in computer hardware and the production control staff required some form of training in using computers. The advent of low-cost microcomputers and new approaches in software design are expected to overcome these disadvantages.

4.4 Custom built Production Control Systems.

Some foundries who were determined to use computer based systems to improve management functions and were not satisfied with the foundry packages available, took a 'bold' step by developing computer systems to match their particular needs. Dudley foundry's experience in such a venture was described by G.Jones (30) and N.Jones (31). The system was initially developed on a Datapoint 2200 computer system (hardware costing £25,000) and due to deficiencies of both hardware and software the foundry had to abandon the system after 2 years. In a latter attempt another computer (Honeywell 61/60S - hardware costing £70,000) was acquired and the software was re-written. Although the latter system was claimed to be fulfilling Dudley Foundry's requirements, the total cost of development seemed to be high for many foundries to embark on such a venture. This foundry recently ceased trading.

The general advantages of custom built production control systems are:-

(a) Systems can be designed and installed to specific requirements.

(b) Existing and proven manual methods can be used as ~ basis for system design.

(c) Production control staff at all levels can participate and contribute ideas on particular needs of the foundry.

(d) System may be more easily modified after installation to cater for unforseen problems.

(e) Better chance of integrating production control with other computing needs of the foundry.

The main disadvantages are higher development costs and time required for design and implementation.

Chapter 5

5.0 Requirements of a Production Planning and Control System for a foundry.

The term production control is often used to cover both planning and control activities although there is an obvious difference in the meaning of the two words. 'Production planning' deals with 'pre-production' activities such as determination of production program, aquisition of materials and arrangement of resources for future production. 'Production control' deals with the situation 'during-production' such as implementation of a predetermined production plan and control of all aspects of production according to such plan.

British Standards Institution defines production control as "Procedures and means by which manufacturing programs and plans are determined, information issued for their execution and data collected and recorded to control manufacture in accordance with the plans".

In most manufacturing organisations, planning and control of production are the responsibility of the same department and usually called production control. Such a situation is always justified since, although two identifiable aspects exist, they do not exist independently nor in isolation. Production planning and production control are very closely linked and entirely interdependent. Decisions during planning will determine the problems and often the nature of control, and experiences during control will influence future planning.

5.1 Objectives

Production of castings is essentially a service industry, whose prime objective is customer satisfaction, and hence production planning and control in foundries must attempt to maximise the number of on-time deliveries. But achievement of manufacturing reliability is not the only consideration. A business enterprise only remains an attractive proposition as long as the return justifies the investment. This implies cost control, which has relevance to production planning and control since cost minimisation implies maximum resource utilisation. However, as shown in fig. 10, these can become conflicting objectives. Often, the required job choice to optimise on-time deliveries is not the same as that to optimise resources. In jobbing/batch situations the job combination to suit one work centre is seldom the same as that required to suit another work centre. Hence the exercise of production planning should become a compromise between these two conflicting objectives.

The conception of production control signifies an acceptance that production plans are likely to be upset during the manufacturing process. Hence constant monitoring of plans and subsequent modifications to cater for the variations that arise must be accepted.

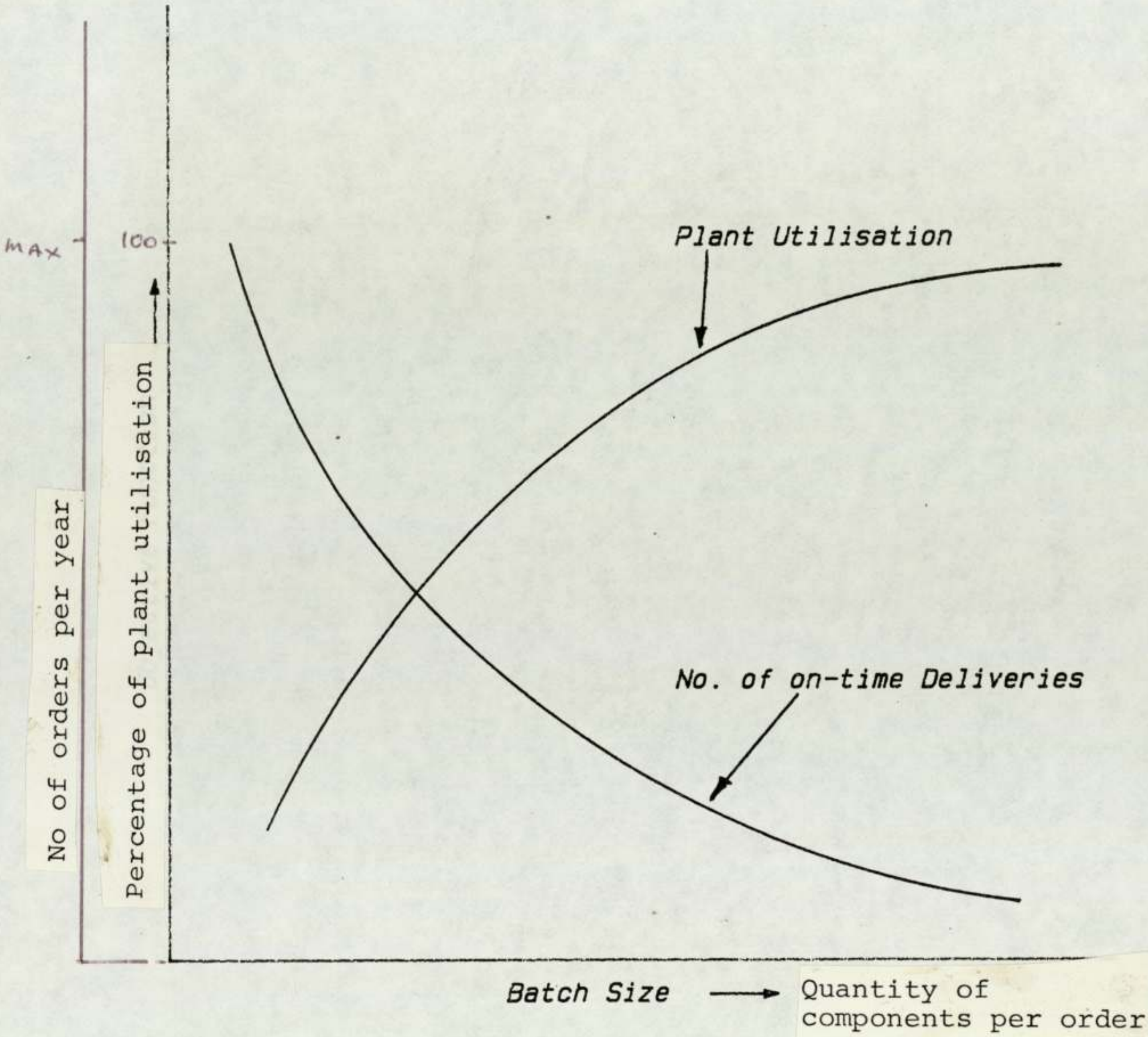


Fig 10 : Relationship between plant utilisation, delivery performance and batch size

5.2 Approaches to Production Control

As explained by Nicholson (44) the first decision to be made in designing a production control system is whether the production control system is to form a major initiative for determining and implementing company policies or is simply a fire-fighting service. Top management generally use accounting models to judge the control of the business. These models are often too simple to reflect the operating interactions which takes place at detailed shop floor level. This results in the production controller being forced to deviate from the intended delivery or stock positions in order to support the accuracy of the financial model (budget). The fire-fighting becomes necessary because the implications of accepting commitments in the form of new orders, changed customer orders and capacity changes have not been worked out in advance and in sufficient detail. The attraction of the fire-fighting approach is its flexibility. It may help to satisfy the management to be in-line with the budgets and to relieve presure on the production controller from formal plans. In this situation the production controller always promises 'to do his best as soon as possible' for whatever requests made. This approach requires less effort than establishing in detail, to a sufficient degree of accuracy, what can and what cannot be done. The main weakness of this approach is that it gives no proof that the manufacturing resources are utilised efficiently and/or cannot quote firm delivery dates. Although some form of fire-fighting is always nescessary in dynamic jobbing/batch foundry production control systems, adequate control cannot be execised without formulating a realistic plan.

Having established the need for production planning, it is ne cessary to decide how these plans should be formulated. Two views exist on the approach to planning when production control systems are discussed. The first approach is to present the data relating to production control to a computer which will produce a detailed production schedule for a period ahead. The problem is considered as one of optimisation and the output is dictated by a model of the works built in to the computer system. This is the view advocated by vendors of computer scheduling packages, and to some extent by consultants. The attraction of computerised scheduling is that it resolves complex problems. In this approach the responsibilities of the production control staff is reduced to ensuring system discipline and data accuracy. The danger is that there is no easy way of checking accuracy of the plans presented, due to the complexity of the scheduling techniques used. But, apart from the motivational problems of getting accurate data input to the system and the vagueness of any preliminary cost benefit analysis, there are two fundamental objections to this approach:

(a) It is practically impossible to model typical jobbing/batch foundry operations in sufficient detail to make predictions about where the jobs will be after a certain time period, during it's manufacture, because of data inaccuracy or other disturbances.

(b) It is undesirable to model for the production of detailed schedules as this removes flexibility, discretion, responsibility and adaptability of objectives from the production control function.

The second approach to the problem is to present the position to the supervision to make decisions on the details of day-to-day production. The role of the computer in this approach is to digest the volume of data available and present information in a predetermined manner which could be easily assimilated. Computers are not essential in this approach but can speed up the process of decision making. This approach, which is generally known as 'Production Information System', can provide the fexibility required in the jobbing/batch enviroment. The nature of information presented to various levels of management will depend on the tasks they are expected to perform.

5.3 Levels of decision making in production control

The planning and controlling of production in a foundry can be considered as comprising three levels of decision making (figure 11), combined to give an overall approach by which strategy and tactics can be planned and then used as a basis for control.

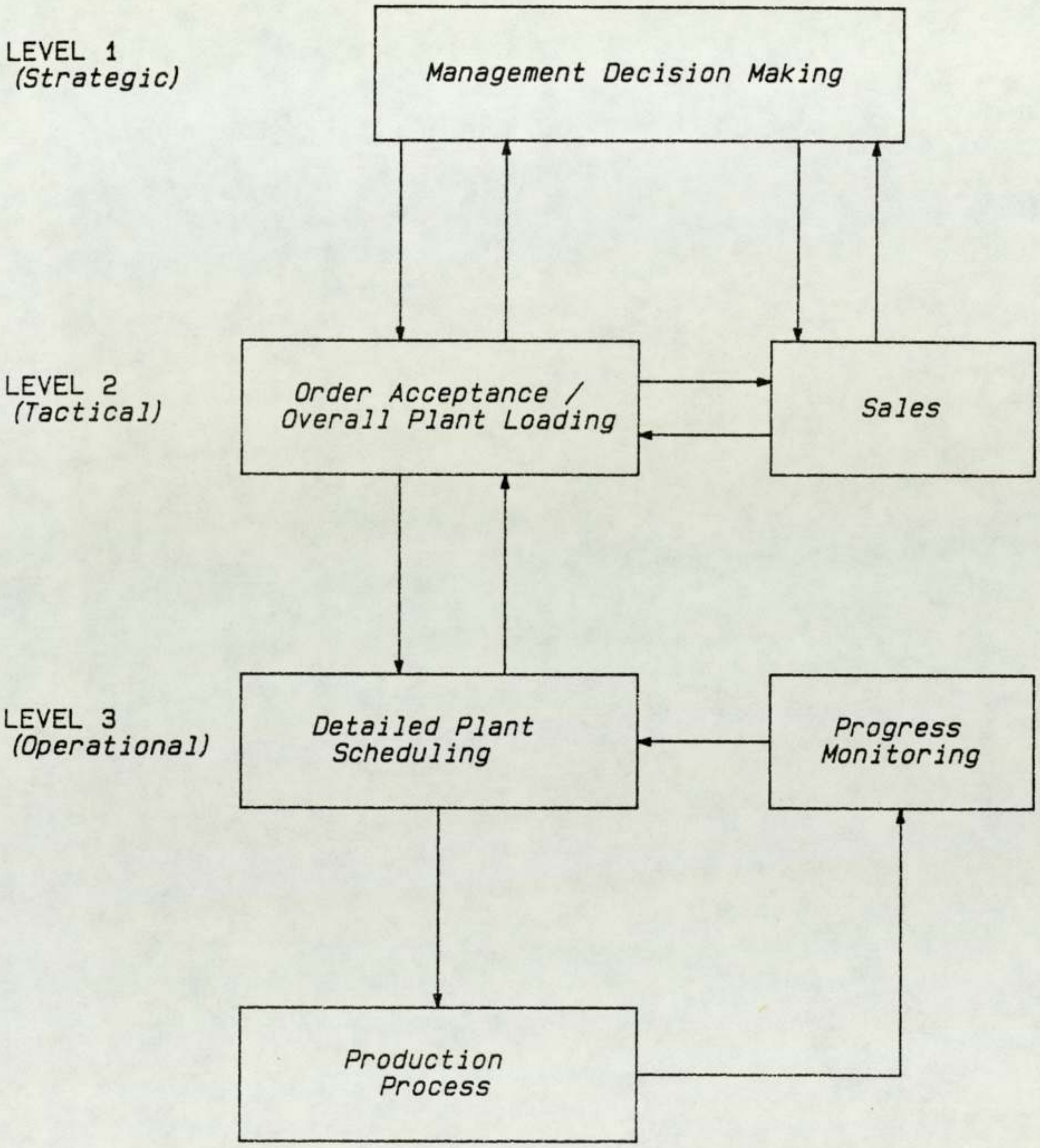


Fig 11: Levels of Decision Making in Production Control and Information Flow

At the top level of management decision making (level 1), the objectives might include profit maximisation, minimisation of production costs, increased sales, or product diversification. The criteria for decision making may relate to costs, sales, work in progress, inventory, production performance, historical profit performance and long-term market expectations. The consequence of such decisions at this level could affect areas such as plant replacement or capacity renewal, budgeting, manpower planning and marketing.

At the middle level (level 2), the decision making deals with more tangible variables. The objectives at this level should be based on providing a 'reasonable' balance between foundry capacity, work in progress, orders in hand, sales rate and plant utilisation. The outcome of the decision process should lead to a 'master' production schedule which ensures a 'relatively' smooth overall production program. A consequence of this 'master' planning should be the identification, well in advance, of areas in which additional orders should be sought so as to obtain efficient resource utilisation and satisfy customer demands.

The lowest level (level 3) of the decision making hierarchy dictates the detailed operation of the foundry. The main objective at this level is to transform the 'master' production schedule, drafted by level 2 procedures, into a day to day production program. The other factors which influence decision making at this level are resource availability, resource utilisation, production cost, levels of work in progress and required level of quality. The consequence of the activities should lead to a detailed production program for the immediate period ahead, for all work centres within the foundry.

Production Control in a foundry is normally concerned most visibly with level 3 decisions - ie the detailed tactics of day to day planning, monitoring, data feedback and reactive control. However, inherent in the Production Control System, should also be elements of both the level 1 decisions (concerned with strategic objectives) and level 2 (basically strategic policies). Regardless of the precise control mechanisms used and the production information systems involved, effective Production Control must encompass all of these decision-making levels in some way.

5.4 Required System Functions

In pursuing the objectives (set out earlier), a foundry production planning and control system should facilitate the following activities:-

(1) Order acceptance and forward plant loading

(2) Detailed plant scheduling

(3) Issue of shop floor Instructions

(4) Monitoring progress of work

(5) Preparation of management reports

These should be in accordance with the 'policy' set by level 2 decisions and be made via level 3 decisions.

5.4.1 Order acceptance and forward plant loading

When an order is received, there is a need to know whether production capacity is available in the foundry to manufacture the castings and whether requested delivery dates can be met.

The first step in making this decision is to assess the amount, and type, of manufacturing capacity required for the job at the moulding stage, and the lead time for the job. Having established the lead time, the production planner has to decide whether the job could be fitted into the moulding program without interrupting the work already scheduled.

To make this decision, the production controller needs to know the up-to-date forward load on the moulding facilities and how it compares with 'capacity'; this should be made available in the form of a load picture at each moulding centre for each time period.

If the job cannot be fitted in to achieve the requested delivery, the forward load summary should be able to assist the production controller to indicate an alternative delivery date. When the delivery requirements are agreed, the new job should be assigned a moulding period and should then be incorporated into the forward load summary before considering the next order.

Forward loading should be much more than an operation of allocating orders to various moulding weeks. It is an essential preliminary step towards the daily production schedule. The ease of scheduling daily production activities depends on the consideration given to core making, metal preparation and fettling capacities during the formulation of forward moulding load. It is also essential to consider the allowances for loss of production capacity due to plant breakdowns, absenteeism, remakes due to scrap and other similar factors rather the nominal capacity of the plant.

5.4.2 Detailed Plant Scheduling

As described in foundry scheduling (section 2.7), there is an obvious need to consider pre-casting and post-casting scheduling seperately.

5.4.2.1 Scheduling pre-casting activities

The focal point of scheduling pre-casting activities is moulding. Job selection should be based on:-

(1) Master schedule analysis

(2) Arrears from previous schedules

(3) Scrap re-makes requirements

(4) Availability of resources

The system should provide a facility to analyse in detail the program for a selected period. The required details are moulding centre, quantity required, pattern details, moulding time, core requirements, metal requirements and standard production time. From these details, each moulding centre could be loaded according to its capacity for each day. From the load for the moulding centres, the exact load for coremaking and melting should be obtained. If there is any imbalance between these three load centres, a rescheduling (adjustment) procedure should be adopted until a 'reasonable' balance is obtained.

When an acceptable production program for the day has been generated, the sequence in which the jobs are to be tackled will be decided, depending on the sequence and quantities at which different types of metal will be available, and subject to moulding box availability and space on roller tracks or on the floor for storing the moulds. The consequence of this detailed scheduling activity should be a 'make list' for different moulding centres for each production day and a corresponding list for coremaking. It should also lead to issuing of sets of instructions for metal preparation, giving weight quantities and the sequence in which metal should be made available.

5.4.2.2 Scheduling post-casting activities

Scheduling post-casting operations ahead of the actual completion of the casting process presents considerable difficulties. This is mainly due to the uncertainty of yield due to rejects, the high degree of variation in work content and prediction of job arrival time from the previous production stage. In jobbing/short series foundries the situation is highly dynamic. Job selection for any work centre cannot be based on a first in/first out principle. Criteria for job selection at these work centres should probably be 'maximisation of on-time deliveries'.

A sensible method of tackling this problem is to prepare a list of jobs available for processing at any work centre, ranked according to priorities and to allow the shop supervision to use this list as a guide for job selection. This provides flexibility for the shop supervision to deal with local difficulties, while still ensuring that work is not 'forgotten' either accidentally because it is hidden under piles of castings, or deliberately because the 'bonus' on it is too low (in the view of the fettling shop).

The foregoing is a 'tactical' (level 3) solution only, as a more strategically sound method of planning and loading post-casting processes requires 'decoupling' of foundry and fettling shop into two distinct planning entities - this would require at the very least some form of 'marshalling yard' for castings.

5.4.3 Issue of shop floor instructions.

Shop floor instructions (or production programs) to all departments should include all special technical instructions. Specific instructions should be issued to all departments for which the program is prepared while other departments should receive a copy of the program which could affect their activities. For the core making department, which are not specifically planned, the moulding program should be made available. These should indicate the corresponding load on the core centres so that, if required, cores could be produced in advance and thus prevent interruption to the moulding program. A copy of the moulding program could alert the fettling department on what they could expect to receive. The same information can assist the inspection department to prepare for special inspection requirements if necessary.

Shop floor instruction should have all necessary information for the production departments to carry out their tasks easily. Where possible, identification of castings should be in the combination of pattern number, description, and customer name. The confusion between the number of castings required and the number of boxes to be produced should be also avoided.

These shop floor instruction documents should form the basis for the return of information from the shop floor. This enables the production controller to assess exactly what proportion of their schedules were met and to record the production figures. The other advantage is that the production supervisors need not get involved in preparing additional paper work to report production and can indirectly persuade them to assess their own performance. Hence provision should be made on the shop floor instruction sheets issued to record production details such as quantity produced and quantity scraped.

5.4.4 Production Recording and Monitoring progress

For effective control the foundry planner constantly needs to know the exact status of each job. Each day a report should be sent by each work centre to the production controller, giving details of achievements. These work-returns should consist of:-

(a) Information on jobs tackled/completed

(b) Inspection records indicating good and scrap castings and casting diverted for rework against each job

The system should provide a facility to record this information and produce reports on the actual production achieved against plans which are currently being executed. In the light of this information, the production controller will be able to decide whether plans need further modifications. If, for example, quantities produced are falling below the planned level, he must either revise the planned production for subsequent periods or recommend allocation of additional resources to reach the target. In case of any excessive scrap, the production controller will be able to replan the production immediately to avoid excessive delays in delivery.

The other advantage of this recording process is that the castings completed in one production stage could be loaded accurately to the subsequent work centres. With an accurate monitoring system, it is possible to handle customer enquiries quickly and inform them of the current status of their orders.

During post-casting stages of production, batches of castings do not always stay within batches. This is mainly due to processes in which castings are mixed (eg shot blasting, heat treatment) for higher plant utilisation, or may be due to rectification and recycling of some castings. The batch quantity can 'decrease' at each centre due to castings rejected or diverted for rework, and can 'increase' when reworked castings join a batch at a later date. Hence it is difficult to use a system based on monitoring the progress of a 'batch' of castings. An effective foundry production control system must cater for a special monitoring procedure involving 'split' batches and 'variable' batches.

5.4.5 Management Reports

One of the most essential forms of output from any production control system is the reports. Reports are a most important means by which management is exercised and by which a planner can improve his performance. They usually reflect the past achievements compared targets, and can assist in decision making for the future. Reports may be in the form of private lists to assist the production controller, or may be summaries for debate within the organisation in management meetings.

The most common approach has been to produce lists and statements for individual staff in production control functions to enable them to perform their own particular jobs better. These reports may help individuals to understand their position, but they do not necessarily help them to manage any better. A better approach is to design the reports, so that they provide a collective position to all staff involved, to debate at regular meetings. It is only when individual staff actions are exposed to scrutiny by others, and their mutual inconsistancies debated, that promised actions are likely to be fulfilled.

Reports should have the following characteristics:-

(a) Necessary and meaningful information
(what is to be known and why?)

(b) Clear and well defined
(neither too much nor too little information)

(c) Accuracy
(that will improve user confidence)

(d) Promptness

(early as possible)

(e) Information must be presented in perspective

In general the following reports are required from a foundry production control system (Table 4).

5.4.5.1 Forward load reports

These reports should indicate the production capacity committed for orders already accepted. The critical planning area is moulding but schedules must also be prepared within the constraints of metal production. Two types of forward load reports are required:-

(a) Summary of moulding forward load

Moulding forward load should be available in the form of summaries of committed capacity against each moulding centre for each period of the planning horizon. This will be the

REPORT	USED BY	FREQUENCY
Forward load reports	Production Control Purchasing	Weekly or on demand
Work centre load analysis	Production Control Shop supervision	Daily or on demand
Foundry performance	Management	Monthly
Overdue deliveries	Production Control Management	Weekly or on demand
Work in progress	Production Control Management	Monthly
Scrap Analysis	Management	Monthly

Table 4. Summary of Management Reports.

main information the production controller will have on which delivery promises could be made for future orders.

(b) Summary of forward metal requirements

This is to be presented similarly to the moulding forward load, showing different grades of metal required, against specified production period. This information will act as an indication to the purchasing department on raw material requirements. It will also help the production controller to reorganise production schedules to avoid uneconomical 'heats' of material.

These two forward load reports should guide the production controller to answer quickly the following questions when confronted with a new order.

(a) Is there sufficient capacity to meet the delivery requirement of the new order?

(b) If the delivery date cannot be met without overloading, which moulding centre or metal preparation unit will have to be overloaded?

(c) If the delivery date cannot be met and no overloading is allowed, What is the next best date possible?

5.4.5.2 Work Centre load analysis

These reports should provide details of jobs making up the work load for the main production centres. These may be in the form of analyses of forward moulding load for a selected period, to assist detailed scheduling or of total work load for any post-knockout work centres.

5.4.5.3 Foundry performance reports

These should present analyses or summaries of output, scrap, plant utilisation and performance compared with expected performance for each work centre.

5.4.5.4 Overdue deliveries report

The report should provide lists of jobs on which deliveries are overdue, showing length of overdue, quantities and current position of each of these jobs.

5.4.5.5 Work in progress report

This analysis should provide information to the foundry management with summaries of weights, quantities and values of work in progress for all different sections of the foundry. The purpose of this report is two-fold. First, this would provide management with some useful general information and secondly, it could identify any bottlenecks occurring in the production line.

5.4.5.6 Scrap analysis

This should provide listings of castings on which scrap was detected showing quantities, percentages, causes, centre of origin, expected scrap rates and costs. This will allow the management to view the problem in perspective rather than fighting each problem in isolation as it occurs.

5.4.5.7 Production Performance

These reports can assist departmental supervision and foundry management to monitor the efficiency of each section. The reports should compare the actual output with planned production.

Chapter 6

6.0 Microcomputer systems and their relevence to foundry production control application

In general, computers available in the market for business applications could be classified into three catogories. These are mainframe computers, minicomputers and microcomputers. Mainframe computers were the first computers and they are able to carry out many tasks simultaneously for multiple users. Generally they are owned by large companies, universities or computer bureaux. These computers are usually remote from the user and are accessed via a terminal. Mainframe computers require specialist personnel to operate them and cost from £200,000 to several million pounds. The next generation of computers was named 'mini' because the computers occupied so much less space than the earlier mainframe computers. These can also perform multiple tasks and are normally accessed via terminals. In technical terms there is a rather arbitrary dividing line between mainframe and minicomputers. Initially minicomputer systems were slower and had less data storage capacity. Advances in computer technology means that minicomputers of today are more powerful and faster than larger computers of earlier years. The cost of minicomputers can start at about £15,000 and can go up to several hundred thousand pounds. Microcomputers are the recent addition to the computer family, although it is no longer considered to be 'new'. It is based on a single chip microprocessor and can only perform one task at a time. The cost of such computers can start from about £50 and go up to £5,000.

A microcomputer system in which the processor chip and memory chip are interfaced to input, output and storage with provision of elementary software is generally defined as one costing between £2,000 and £10,000. A typical system for business application will contain a visual display unit, keyboard, a floppy disk drive and a hard copy printing device. Originally these were based on 8 bit micro processor and could address up to 64K bytes memory. However at present there are microcomputers in the market which are based on 16 bit processors and can address up to 1 megabytes of memory. These have the speed and facilities of traditional medium size mini computers.

The fundamental difference between the micro system and any earlier type of system is that micros are user friendly to a degree which was not possible before. It is likely that a microcomputer system will be purchased, commissioned and used by the same individual, and the individual will be much more ready to declare that the system produces the service he wanted with more easiness than before. Moreover if the system is to be used by a specific user, then the system can be tailored to the special needs of the user.

6.1 Role of microcomputer systems

An often expressed view is that microcomputer systems are potentially so powerful that it will replace the conventional mainframe computers. Though this may happen in future, neither the awareness of the user nor the technological development at present, poses any threat to mainframe computers. But problems such as staff costs and the vulnerability to disruptive action may cause users to consider alternatives.

On the whole microcomputer systems can be considered currently to be relevant to a single department and associated with a process which is contained solely within that department, where the data content and processing requirements can be contained within the limited capability of the currently available systems. Existing technology can provide a linkage between these individual departmental microcomputers or to communicate with central mainframe computers. Another view is that the situations for the use of microcomputer systems are not different from those which have produced many sucessfully operated systems in the past. Although this is true in software terms, there are significant differences and important consequences. In distributed systems, the driving force behind their introduction has come from the centre (data processing department or senior management) while in the case of microcomputers the driving force for the introduction is coming from the periphery (user).

In a large organisation, which has existing data processing departments with centralised computer systems, microcomputers are seen as a tool for undertaking new or specific functions. This situation arises when small application areas within are frequently ignored by the system developers, often because the particular application does not integrate with the main role of system or which is difficult (and costly) to analyse. A project which is small or does not integrate with the main system without causing major disruption is likely to be postponed or ignored by high level management. To the manager responsible for this small non-integratable project, the task may be important and clerically time consuming. In such situations, micros can provide an alternative to using centralised facilities by allowing the user to develop his own microcomputer system. To the organisational management and the centralised data processing department, granting permission for independent small systems keeps the user 'off their backs' for a while until a suitable solution is found. For certain applications in a large organisation, locating a microcomputer system in the user department may be a useful and logical method of proceeding towards integration.

In small organisations which do not have computing facilities, microcomputers are seen as a cheap, and sometimes the only economically feasible, way of computerising specific functions. These functions may include accounts, payroll, stock control, production control etc. For some medium sized organisations, the facilities in currently available micros may not offer complete satisfaction but they may be forced to use them to ensure survival. In cases, where only one function need to be computerised, micros could be ideal.

In both cases microcomputers are seen as single system devices. It may do more than one function within a department (eg sales ledger and payroll) but it is more likely to be dedicated wholly to one task. There is no valid argument for the sharing of a micro system between departments. But there are multi-user ring based systems available at the higher end of the market which can share a common data base for different functions. With low cost systems a similar setup could be used by different departments for the same function.

6.2 Problems associated with microcomputer systems

The apparent barrier of computing power at dramatically low prices tends to blind the potential user to many problems that micro systems bring with them. Some such problems are discussed below.

6.2.1 Standardisation

With many choices available in micro systems and if a number of departments are contemplating the purchase of hardware then there is a reasonable chance, assuming no central control, that each will buy a system from a different manufacturer. In many cases software written for one type of computer cannot be used with the upgraded version of the same type of equipment without considerable software modification. With equipment supplied by different manufacturers the software compatibility is usually non-existent. The problem is the same with data storage devices. It is therefore essential that an organisation, intending to allow micro systems to be introduced, should adopt a policy of standardisation. The policy should standardise on a particular model and allow variations only if the intending user can demonstrate that the standard model cannot undertake the functions which are required. The problems are first to discover whether a rigid standardisation policy can be enforced and second to decide on what to standardise.

6.2.2 Hardware combination and System maintenance

One major advantage of microcomputer systems is the relative ease with which one can assemble different units into a single system and replace those units with new devices as they become available. The ability to study what is available, recognise its potential and incorporate it into the existing system is likely to be beyond the capability of most of the departmental managers. Similarly, when the system fails there will be the problem of identifying whether it is software or hardware, whether it is a simple system bug which has not been identified previously, or a major fault in which case it may be necessary to call an engineer. It is advisable to have an arrangement with the system supplier to provide maintenance.

5.2.3 Software Development

Most low cost micro systems other than those based on Z80 and CP/M, offer the user a simple single user operating system plus a subset of BASIC. Application software must either be purchased elsewhere or written inhouse. There are specialist system vendors who can supply a hardware and software combination for a particular application.

There are two important aspects in software developments which can optimise the system performance,

(a) The 'operational' efficiency of the program which attempts to maximise speed while minimising the memory required and data storage space.

(b) The 'production' efficiency where attempts are made to produce and implement software (packages) as cheaply and quickly as possible, and suitable for general commercial applications.

Consideration of these two types of efficiency resolve into two broad but sometimes conflicting objectives. Tailormade or bespoke computer software usually provides increased operational efficiency at increased costs. These systems are devoted to particular applications and cannot be used for any other purposes. A package based approach attempts to satisfy higher number of similar applications where development cost is shared by all users. For individual users this could mean redundant computer time and data storage space.

Main memory requirements of application software often exceeds the memory capacity of the low cost microcomputers, and the program cannot fit into the available space. This limitation could be overcome by using the overlay procedure. In this method the program is divided into modules and stored in the program disc, which could be read into memory as required and executed. Modules in different overlays cannot be simultaneously resident in the main memory. The program module continuously required could be made resident permanantly in a section of the memory and the rest of the memory could be used for temporary modules. The memory segments used for temporary modules should be large enough to contain the largest temporary module. The overlay technique is not new to microcomputer system and has been in use with larger computer systems. With the emergence of micros with increased memory capacity overlay technique may not be required.

In the case of microcomputer applications, due to the low cost of hardware, it has provided an opportunity to devote part of the saving to increase the operational efficiency of the program. In some cases, the capacity of small computers dictates the software developers to concentrate on the operational efficiency of the program in order to perform the required task.

6.2.4 Data storage devices

One of the essential features of microcomputer systems for business applications is the data storage devices. There are two types of storage devices available for use with low cost systems. They are (1) Floppy Discs and (2) 'Winchester Drives'

Most widely used storage device with micro systems are the floppy discs. A 5.25 inch floppy disc holds about half a megabyte of data on one side and there are 8 inch dual drive floppy disc system which would hold about three megabytes and at favourable prices. These are delicate plastic disks and improper handling or disk wear caused by repeated use, could result in the loss of data. At present considerable effort is being made by the manufacturers to solve this problem. According to Green (21) new material used in the manufacture, can extend the life of these disk to over 10,000 hours. At the higher end of the low cost data storage devices are the so called 'winchester' drives. These have access times of the order as hard disks, but smaller in physical size and lower in price. These devices have storage capacities starting about 5 megabytes and expanding up to 40 megabytes or even more. 'Winchester' drives are sealed units and the disks cannot be removed.

These two technologies provide adequate on line storage depending on the application but they all exhibit traditional disc drive problems. While discs provides permanent storage, there is always a necessity for security copying and for data interchange. This problem has been solved in the case of floppies by having two drives in the system. For larger storage requirements a 'winchester' drive could be used supported by a floppy disc or a high speed magnetic tape for security copying.

6.3 Scope of Microcomputer Systems in Foundry Production Control

As discussed in the previous chapter, a better approach to control production in jobbing/batch foundries, is to adopt a production information system. This means providing timely and accurate information relating to orders and its progress to aid management in decision making. Production control in a foundry is normally concerned with decisions at tactical and operational levels (section 5.3), and the task of producing the information, at the required level of accuracy and frequency, by manual methods is not satisfactory. This involves storing of data, sorting the data according to specified catogories, performing simple calculations and presenting information. Hence the main role of a computer in foundry production control is mainly information processing.

A wide gap exists between production control systems and computer based systems available in the market in terms of costs and operational sophistication. Foundries who desire the use of computers to perform routine clerical procedures often found the systems based on mini and mainframe computers too expensive to justify it's installation. Microcomputers can provide a cost effective method of filling this gap. Low cost microcomputers can be programed to assist production control in this limited task. Fig 12 shows the comparison of cost effectiveness of the three types of computers.

The scope and limitations of the microcomputer as a foundry production control tool is controlled by the random access memory of the system and the capacity to store adequate data. The amount of memory required for an information system is considerably less than it requires for a decision system, and microcomputers can meet this need. The software required to run the system is likely to take up most of the memory but programming techniques like 'program overlay' can overcome this problem.

Most jobbing/batch foundries usually have up to 1000 live orders at any time on file and the amount of data relating to production planning and control is small per job compared with assembly type manufacture. At the 'tactical' level of production control, the system is expected to present summaries on total order book, where as at the 'operational' level the system is expected present detailed information on selected jobs. This means that the on-line data storage requirements are comparatively smaller and capacities of floppy disc devices or small 'winchester' drives can meet

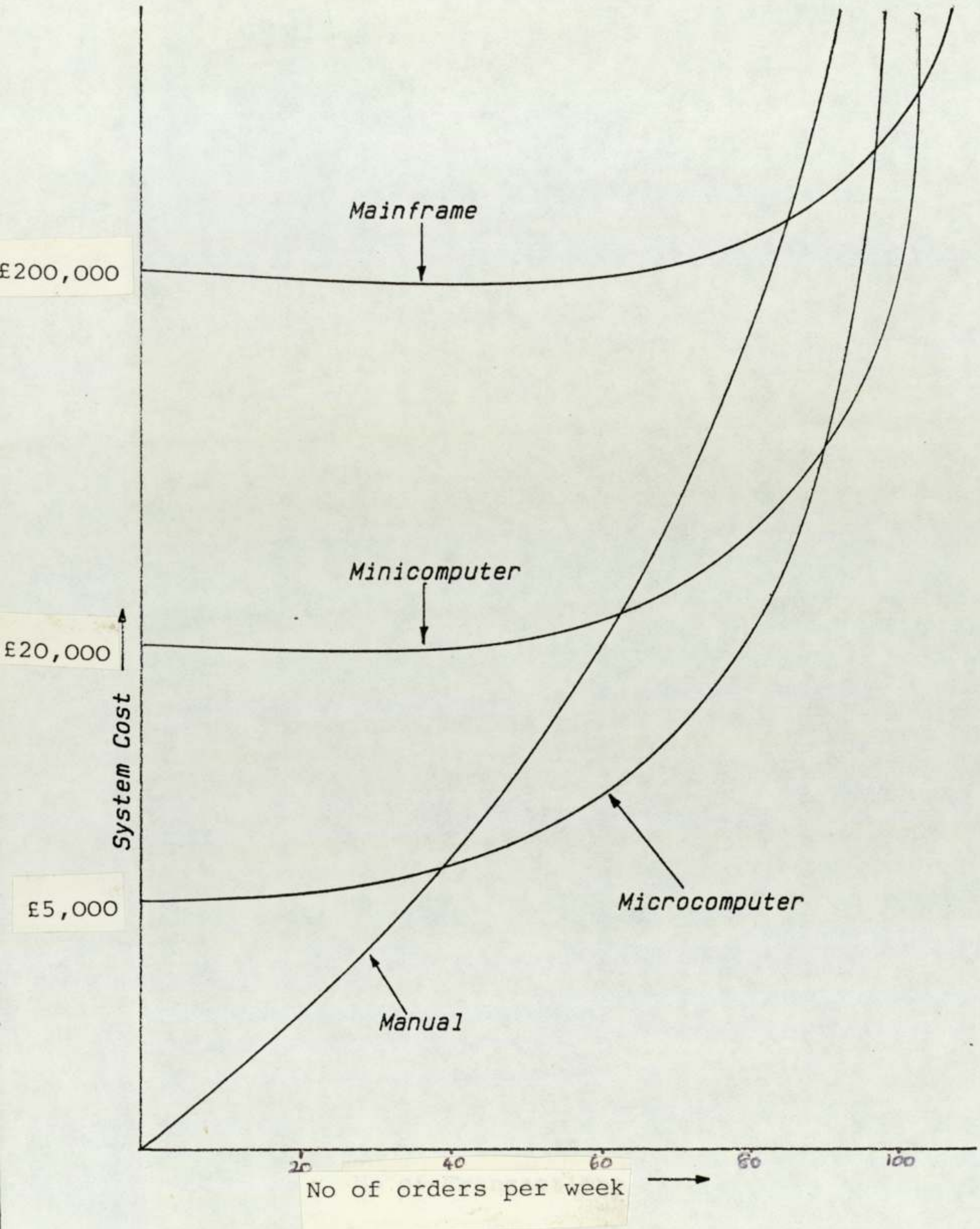


Fig 12 : Cost Effectiveness of Computer Systems this demand.

Foundries with computer installations for other commercial applications and unwilling to integrate production control functions, due to high cost of modifications or interruptions, can use microcomputer systems as an interim step. For other small foundries who desire to use computers only for production control applications, microcomputer systems can provide the means of achieving this at relatively small cost.

In summary, it could be said that the computing complexity of a foundry production control system is smaller in terms of processing power, complexity of software and volume of on-line data storage, than with many other manufacturing industries. The microcomputer systems currently available in the market provides satisfactory capacity to meet these requirements at low costs.

Chapter 7

7.0 Proposed Micro-Computer based Prodction Control System

The philosophy adopted in this proposal is that the microcomputer system should provide a means of obtaining speedy and accurate information, relating to orders and their progress, and to assist decision making in production planning and control.

7.1 Design Concepts

1. Decision making in foundry production control should remain the prerogative of the management and the role of the computer system should constitute an information centre.

2. The production control department should have their own low cost computer system which could be used by the staff who usually do not have specialist knowledge in computing.

3. The total cost of such a system should not exceed the cost of employing additional clerical staff necessary if no computer systems were used.

4. The system should operate on a 'real time' mode to provide up to date information to cope with the

dynamic jobbing/batch situation.

5. The proposed system should not require any special data other than that normally used in a manual production control system.

7.2 System Overview

In its simplest form the system consists of microcomputer hardware, a program and two basic files, the Patterns register and an Order file. The pattern register will contain non-perishable data and the order file will contain the perishable and semi-perishable data. The program will interrogate these files, select appropriate data, perform the required caculations and present specified information. Figure 13 indicates the information flow of the system. The illustrated outputs from the system shown in this chapter are examples only and the type of output can be decided by the user and will involve program modification.

7.2.1 Patterns Register

The patterns register is a collection of records of castings which are regularly (or previously) made. The information held in these records constitutes the identification of the products, technical information of how they should be produced and other necessary historical information. The purpose of this file is purely for storage of non-perishable

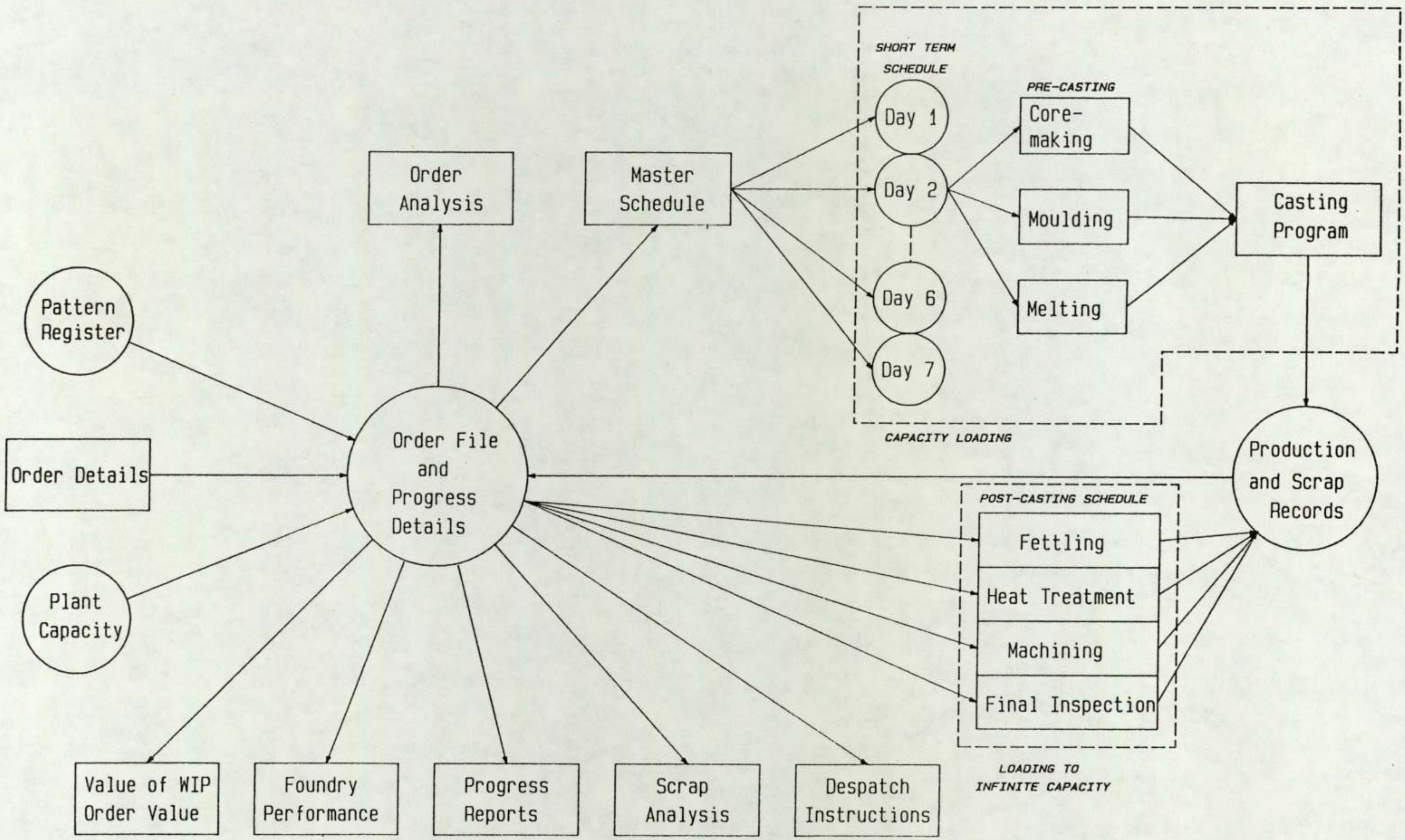


FIG 13 : Information Flow in Proposed Production Control System information which could be refered to, or could be transfered to the order file when required. Each record in the pattern register contains the following information.

(1) Pattern number

(2) Description

(3) Customer name

(4) Metal grade

(5) Finished weight

(6) Quantity per box

(7) Weight per mould

(8) Box size

(9) Moulding centre

(10) Time per mould

(11) Core box number

(12) Number of cores

(13) Time per core/set

(14) Post knockout route

(15) Fettling code

(16) Fettling time

(17) Heat treatment code

(18) Inspection code

(19) Pattern status

(20) Price per unit

(21) Data for WIP valuation

7.2.2 Order File

The order file contains data on all the products currently on order. This is the nucleus of the computer system. Most of the information used for production control is extracted from this file. Each record on this file contains all the data on the castings stored in the pattern register together with other perishable information related to planning and control of production (table 5).

The required additional information is:-

(1) Order number	
(2) Quantity on order	
(3) Quantity planned	
(4) Sample required	Planning Data
(5) Order date	
(6) Planned moulding date	
(7) Planned fettling date	
(8) Planned delivery date	
(9) Total cast	
(10) Quantity to mould	
(11) Quantity in fettling	
(12) Quantity in heat treatment	
(13) Quantity in machining	
(14) Quantity in inspection	Progress Data
(15) Quantity in despatch	
(16) Quantity delivered	

ABCD FOUNDRY User Name : Saba Date :14 Mar 82 Time : 13:00:41

	ORDER DETAILS				
(1)	Ord No.	: 100001	(22)	Sample Required	: N
(2)	Pattern Number	: XYZ403254/2	(23)	WIP data	: 45678
(3)	Description	: 5in Valve	(24)	Date of Order	: 05 Mar 82
(4)	Customer	: A.E.S Ltd.	(25)	Moulding Schld	: 12 Mar 82
(5)	Metal Grade	: MET12	(26)	Fettling Schld	: 19 Mar 82
(6)	Weight	: 25Kg	(27)	Delivery Schld	: 02 Apr 82
(7)	Qty per Box	: 1			
(8)	Weight per Mould	: 37.5Kg		PROGRESS DETAILS	
(9)	Box Code	: 36	(28)	Qty Ordered	: 75
(10)	Moulding Centre	: 22	(29)	Tot Planned	: 82
(11)	Time/Mould	: .25	(30)	Total Cast	: 50
(12)	Core Box No.	: 4371	(31)	Qty to Mould/Cast	: 45
(13)	No of Cores	: 1	(32)	Qty in Fettling	: 0
(14)	Core Centre	: 52	(33)	Qty in Heat Treatment	: 20
(15)	Time/Cores	: .4	(34)	Qty in Machining	: 0
(16)	P.K.O. Route	: 1101	(35)	Qty in Inspection	: 5
(17)	Fettling Code	: 135	(36)	Qty in Despatch	: 10
(18)	Fettling Time	: .15	(37)	Qty Delivered	: 0
(19)	Inspection Code	: I4	(38)	Qty in Rectification	: 2
(20)	Price/Casting	: 100	(39)	Qty Scrapped	: 13
(21)	Pattern Status	: Y	(40)	Tot Cust Return	: 0

Table 5. Order and Progress Details

(17) Quantity in rectification

(18) Quantity scrapped

(19) Total customer returns

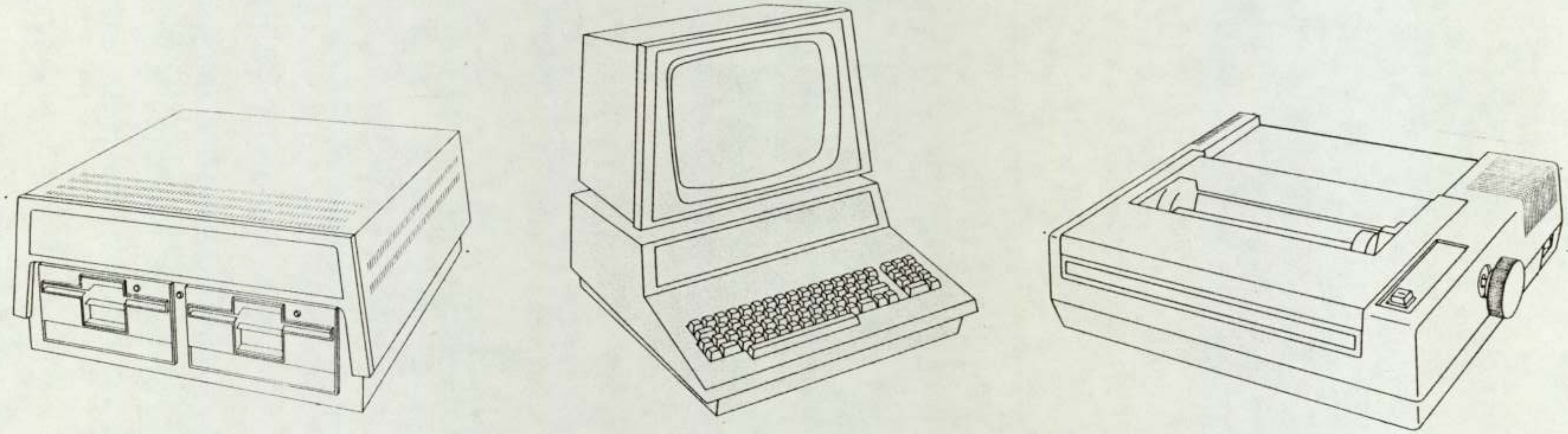
The user will be required to enter the planning data while the progress data will be generated by the computer as the transactions relating to that order takes place in the foundry.

7.2.3 The program

The basic function of the program is to interogate the files to provide the required information. In addition it also acts as a means of transfering information between files or within a record. The program provides a 'menu' which prompts the user to select the functions required. This is an interactive program where the user is requested to answer questions prompted by the computer. The program is written in BASIC and the listing is given in Appendix 2.

7.2.4 Computer hardware

The proposed system could be implemented using a 32K RAM desk top computer with 1 megabyte floppy disk drive and a dot matrix printer (fig. 14). The total hardware cost for this typical set up is about £2500 at 1982 prices. This hardware configuration is capable of handling up to 1000 live orders at any one time. If the system require to handle more than



Floppy Disc Drive

1 megabyte storage

Desk Top Computer

32K Ram

Printer

Fig 14: Low cost Computer Hardware

1000 live orders, the floppy disc system could be replaced by a hard disc drive with an additional cost of approximately £1,000, for a 5 megabytes storage capacity.

7.2.5 System operation

When the user starts-up the system it will display a 'menu' which indicates the facilities provided on the screen. The 'master menu' is made up of several sub-system menus that can be called. The production control staff can become familiar with these menus after spending only a few minutes at the computer.

7.3 System functions

The system is divided into sub-systems providing the following functions

(a) Order entry and file management

(b) Order book analysis

(c) Summary of forward load

(d) Preparation of daily moulding schedule

(e) Issue of shop floor instructions

(f) Recording production and generation of production reports

(g) Scrap analysis

(h) Financial information

7.3.1 Order entry and file management

This section of the program deals with the manipulation and maintenance of the two main files. The functions available for order file management are:-

(1) Insert new order

(2) Read order details

(3) Amend order details

(4) Delete order

(5) Print order file

7.3.1.1 Insert New Order

This facility enables the user to enter orders into the system. These orders may be for regularly or previously made castings (repeat orders) or for new jobs which are to be made for the first time in the foundry.

In the case of a repeat order, the details of the casting will be available in the pattern register. This data could be retrieved by the pattern or part number. The additional production planning information required is entered and the completed record is added to the order file (fig. 15).

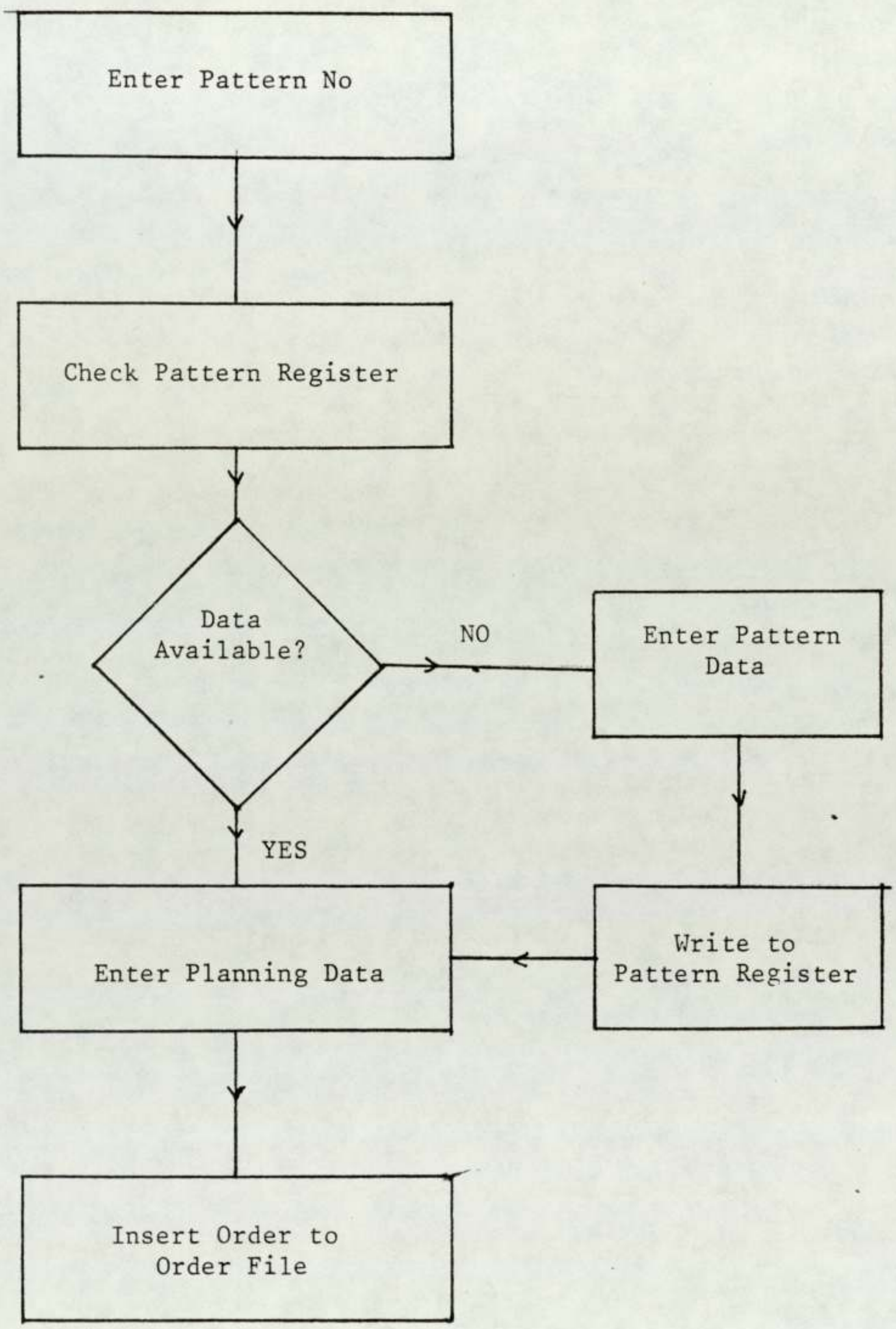


Fig 15: Flow chart for Order Entry

In the case of new jobs the system will request the user to enter all data before the order is entered into the order file. Then the system will automatically write the information required in the pattern register for future use.

7.3.1.2 Display Order Details

On selection of this option and by keying the job number, all details relating to that job will be displayed. The information includes all manufacturing and progress data of the job (table 5). This enables the production controller to monitor the progress of individual orders and to answer any customer inquiries related to that particular order. This facility can assist the production controller to assess the progress of the order and predict a probable delivery date.

7.3.1.3 Amend Order Details

This facility enables the production controller to amend any of the details in the order as and when required. These amendments may be alteration of quantities or manufacturing data.

7.3.1.4 Delete Order

When an order is completed this facility allows for the deletion of that order from the order file and to free the file space. This is important due to file size restrictions on the floppy disc drive in a low cost system.

7.3.1.5 Print Order File

This provides a facility to print the total order file when required for any checking.

7.3.1.6 Pattern register management

Similar to the order file management the following facilities are available to maintain the pattern register.

(a) Insert new pattern details

(b) Read pattern record

(c) Amend pattern record

(d) Delete pattern record

(e) Print pattern register

7.3.2 Order book analysis

This facility provides a means by which the production controller can segregate the total work load in the precasting stages by the appropriate categories, which will assist in producing the daily production programs (fig 16). This information could be obtained for any selected period. The following options are essential.

7.3.2.1 Load by a pattern number

On selection of this option and entering the pattern number the system will search through the complete order file, identify all orders utilising this pattern and produce a list in chronological sequence of planned moulding dates. Against each job the list will have details of numbers of moulds required and standard moulding time (table 6). This enables the production controller to avoid conflicting planned usage of patterns or to keep pattern changes to a minimum.

7.3.2.2 Load by moulding centre

This option will segregate all jobs assigned to any selected moulding centre and present them in their order of priority. For each job the details of pattern number, number of moulds required, total moulding time, required metal grade, weight of metal and pattern status will be available (table 7).

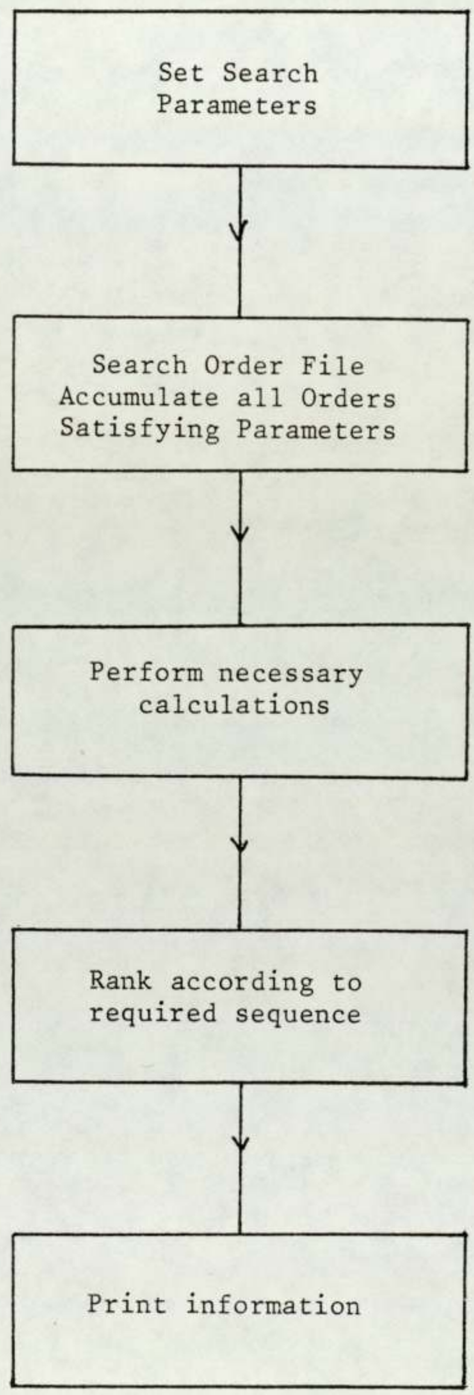


Fig 16: Flow chart for Order Book Analysis

ABCD FOUNDRY User Name : Saba Date :10 Feb 82 Time : 13:17:14 page 1/1

Load by Pattern Number :- XYZ8726/231

Order No	Moulds	Time	Metal	Weight	Mou/Schld
100002	27	2.70	MET04	1350	12 Feb 82
100181	55	5.55	MET04	2750	23 Feb 82
100142	110	10.10	MET04	5500	28 Feb 82
100167	219	20.20	MET04	10950	14 Mar 82
100136	50	5.00	MET04	2500	17 Mar 82
100035	30	3.00	MET05	1500	20 Mar 82
100053	10	1.00	MET04	500	03 Apr 82
100114	43	4.30	MET04	2150	10 Apr 82
100189	11	1.20	MET04	550	28 Apr 82

Table 6. Load by Pattern Number

ABCD FOUNDRY User Name : Saba Date :10 Feb 82 Time : 13:17:14 page 1/1

Load by Moulding Centre :- 21

Order No	Pattern No.	Moulds	Time	Metal	Weight	Mou/Schld
100002	XYZ400004024	27	12.15	MET04	6750	12 Feb 82
100181	XYZ400001956	55	24.75	MET08	12375	13 Feb 82
100142	XYZ400001462	110	27.50	MET02	27500	14 Feb 82
100167	XYZ400007267	219	65.70	MET07	19163	14 Feb 82*
100136	XYZ400007541	14	0.70	MET05	4200	15 Feb 82
100035	XYZ400000399	11	2.75	MET07	550	18 Feb 82
100053	XYZ400007340	10	1.00	MET03	625	23 Feb 82
100114	XYZ400008195	43	6.45	MET18	3225	28 Feb 82*
100189	XYZ400008273	11	2.75	MET15	2200	28 Feb 82
100030	XYZ400009187	18	5.40	MET03	2700	02 Mar 82
100066	XYZ400003862	110	11.00	MET05	27500	03 Mar 82
100022	XYZ400007880	14	3.50	MET10	4200	10 Mar 82
100132	XYZ400000789	164	32.80	MET03	10250	11 Mar 82*
100004	XYZ400000515	3	0.30	MET09	225	11 Mar 82*
100054	XYZ400006413	5	0.25	MET05	1000	11 Mar 82

Table 7. Load by Moulding Centre

*Pattern not available

7.3.2.3 Load by metal grade

Similar to the previous function, this enables the production controller to asses the load for selected metal grades. This list is useful to optimise the utilisation of melting facilities in the foundry. For each order, information will be available on weight per mould, total job weight and the planned casting date (table 8). In addition the total weight of any grade of metal required for each day will be provided.

7.3.2.4 Load by box size

The availability of numbers of molding boxes of any particular size is sometimes a constraint in scheduling production. This function enables the production controller to check box requirements against availability (table 9).

7.3.2.5 Load by Inspection Code

Some castings require special inspection and test procedures to ensure quality and these activities (eg. outside radiography) may have to be planned in advance to meet delivery targets. This function will print such orders requiring selected type of inspection, together with planned moulding, fettling and delivery dates (table 10).

ABCD FOUNDRY User Name : Saba Date :10 Feb 82 Time : 13:18:59 page 1/1

Load by Metal Grade : MET12 From: 12 Feb 82 To: 16 Feb 82

Order No.	Pattern No.	Wt/mould	Job Wt	Prod Date	Days Total
100194	XYZ400003023	87	7175	12 Feb 82	
100197	XYZ400004026	350	1750	12 Feb 82	
100013	XYZ400007386	125	4500	12 Feb 82	-----> 13425
100192	XYZ400005916	500	5500	13 Feb 82	
100101	XYZ400001356	225	3150	13 Feb 82	-----> 8650
100009	XYZ400005393	200	1000	14 Feb 82	-----> 1000
100172	XYZ400004685	25	275	15 Feb 82	
100067	XYZ400008431	225	8450	15 Feb 82	
100028	XYZ400009933	75	4050	15 Feb 82	
100104	XYZ400001984	50	250	15 Feb 82	-----> 13025
100126	XYZ400007209	500	500	16 Feb 82	-----> 500
				Total	36600

Table 8. Load by Metal Grade

ABCD FOUNDRY User Name : Saba Date :10 Feb 82 Time : 13:23:19 page 1/ 1

Load by Box Code : 36 From:- 12 Feb 82 To:- 16 Feb 82

Order No.	Pattern No.	Mou-Schld	No-Boxes		Days Total
100013	XYZ400007386	12 Feb 82	36		
100202	XYZ400006960	12 Feb 82	37		
100119	XYZ400006507	12 Feb 82	14	----->	87
100033	XYZ400006936	13 Feb 82	14		
100114	XYZ400008195	13 Feb 82	43	----->	57
100034	XYZ400002450	14 Feb 82	27		
100032	XYZ400000482	14 Feb 82	5	----->	32
100024	XYZ400001397	15 Feb 82	5		
100098	XYZ400001492	15 Feb 82	22		
100001	XYZ400008183	15 Feb 82	45		
100155	XYZ400004752	15 Feb 82	27	----->	99
100027	XYZ400008230	16 Feb 82	41		
100152	XYZ400006212	16 Feb 82	21		
100175	XYZ400007221	16 Feb 82	5		
100031	XYZ400006872	16 Feb 82	22	----->	89

Table 9. Box Requirements

ABCD FOUNDRY User Name : Saba Date :10 Feb 82 Time : 13:24:48 page 1/ 1

Load by Inspection Code : X2

Order No.	Pattern No.	Qty-Order	Mld-Schld	Fet-Schld	Del-Schld
100109	XYZ400000365	5	20 Feb 82	25 Feb 82	07 Mar 82
100053	XYZ400007340	10	18 Feb 82	23 Feb 82	16 Mar 82
100032	XYZ400000482	10	10 Feb 82	17 Feb 82	24 Mar 82
100163	XYZ400004702	5	23 Feb 82	01 Mar 82	27 Mar 82
100073	XYZ400005632	7	28 Feb 82	10 Mar 82	01 Apr 82
100132	XYZ400000789	15	28 Feb 82	03 Mar 82	08 Apr 82
100186	XYZ400004894	20	03 Mar 82	10 Mar 82	11 Apr 82
100125	XYZ400008434	50	04 Mar 82	18 Mar 82	14 Apr 82
100103	XYZ400005973	25	23 Feb 82	25 Mar 82	20 Apr 82
100040	XYZ400004820	8	12 Feb 82	28 Feb 82	20 Apr 82
100005	XYZ400004446	10	14 Mar 82	30 Mar 82	21 Apr 82
100036	XYZ400006305	5	28 Mar 82	15 Apr 82	26 Apr 82

Table 10. Load by Inspection requirements

7.3.2.6 Load by Order Groups

Some customer orders have more than one variety of casting and may have to be delivered according to a customer's schedule. Each of these batches have a separate job number and may have to be delivered according to a customer's schedule. This facility will provide a summary of these different jobs belonging to a specific customer order (table 11).

7.3.2.7 Print overdue deliveries

This function will provide the production controller or senior management with a comprehensive list of all jobs not completed according to plan. Each entry in the list contains job number, customer name, period overdue, order quantity and the quantities of castings in each progress stage in the foundry (table 12). This list could be used to expedite overdue orders and to identify bottlenecks in the production line.

7.3.2.8 Orders Requiring Samples

Some jobs require sample approval by the customer. This facility will produce a list of jobs where a sample has to be made and sent to the customer for approval before the rest of the batch can be planned (table 13).

ABCD FOUNDRY User Name : Saba Date :01 Mar 82 Time : 13:24:48 page 1/ 1

Load by Order Group : 100053 Date of Order :- 10 Jan 82

Order No.	Pattern No.	Qty-Order	Qty-Despd	Mld.Schld	Del-Schld
100053A1	XYZ400000365	25	20	10 Feb 82	28 Feb 82
100053B1	XYZ400007340	25	20	12 Feb 82	28 Feb 82
100053C1	XYZ400000482	25	20	10 Feb 82	28 Feb 82
100053D1	XYZ400004702	25	20	13 Feb 82	28 Feb 82
100053A2	XYZ400000365	50	0	10 Mar 82	30 Mar 82
100053B2	XYZ400007340	50	0	12 Mar 82	30 Mar 82
100053C2	XYZ400000482	50	0	10 Mar 82	30 Mar 82
100053D2	XYZ400004702	50	0	13 mar 82	30 Mar 82
100053A3	XYZ400000365	30	0	25 Mar 82	20 Apr 82
100053B3	XYZ400007340	30	0	25 Mar 82	20 Apr 82
100053C3	XYZ400000482	30	0	25 Mar 82	20 Apr 82
100053D3	XYZ400004702	30	0	25 Mar 82	20 Apr 82
100053A4	XYZ400000365	25	0	10 Apr 82	02 May 82
100053B4	XYZ400007340	25	0	12 Apr 82	02 May 82
100053C4	XYZ400000482	25	0	10 Apr 82	02 May 82
100053D4	XYZ400004702	25	0	13 Apr 82	02 May 82

Table 11. Load by Order Group

OVERDUE DELIVERIES Date:- 10 Mar 82 Time:- 12:05:23

Wks O/D	Customer	Description	Order No	Qty Order	Tot Cast	Q/in Fetl	Q/in H/t	Q/in M/c	Q/in Desp	Qty Deld	Q/in Rect	Qty Scrp	Delvy Schld
6	Customer 2	Casting A	100231	100	105	00	00	20	030	50	00	05	28 Jan 82
5	Customer 4	Casting G	100124	50	53	00	00	00	50	00	00	03	02 Feb 82
5	Customer 6	Casting h	100021	10	10	02	00	08	00	00	00	00	04 Feb 82
3	Customer 3	Casting B	100032	2	00	00	00	00	00	00	00	00	12 Feb 82
3	Customer 1	Casting C	100085	200	160	120	40	00	00	00	00	00	12 Feb 82
3	Customer 7	Casting K	100456	05	05	00	00	00	03	00	02	00	14 Feb 82
2	Customer 6	Casting L	100001	170	180	21	50	10	35	50	00	14	26 Feb 82
2	Customer 9	Casting J	100121	01	01	00	00	00	01	00	00	00	28 Feb 82
2	Customer 5	Casting D	100423	04	00	00	00	00	00	03	00	01	28 Feb 82
1	Customer 8	Casting R	100632	15	15	07	08	00	00	00	00	00	01 Mar 82
1	Customer 2	Casting X	100017	20	20	10	05	00	05	00	00	00	02 Mar 82
1	Customer 3	Casting N	100042	100	76	23	20	10	15	00	03	05	02 Mar 82
1	Customer 6	Casting M	100011	05	00	00	00	00	05	00	00	00	03 Mar 82
1	Customer 4	Casting F	100009	12	00	00	00	00	00	00	00	00	04 Mar 82
1	Customer 2	Casting E	100008	01	00	00	00	00	00	00	00	00	04 Mar 82
1	Customer 1	Casting S	100099	300	315	170	120	00	00	00	00	25	05 Mar 82
1	Customer 1	Casting B	100064	10	10	01	02	04	01	00	01	01	06 Mar 82

Table 12. List of Overdue Deliveries

ABCD FOUNDRY User Name : Saba Date :10 Feb 82 Time : 13:17:14 page 1/ 1

Orders Requiring Samples

Order No	Pattern No.	Customer	Description	Date/Order	Patt/Sta
100002	XYZ400004024	Customer 1	Casting h	11 Jan 82	Y
100142	XYZ400001462	Customer 4	Casting y	12 Feb 82	Y
100167	XYZ400007267	Customer 3	Casting x	12 Feb 82	R
100136	XYZ400007541	Customer 2	Casting z	13 Feb 82	N
100035	XYZ400000399	Customer 8	Casting a	25 Feb 82	Y
100053	XYZ400007340	Customer 7	Casting s	27 Feb 82	R
100189	XYZ400008273	Customer 6	Casting d	28 Feb 82	R
100030	XYZ400009187	Customer 1	Casting f	01 Mar 82	N
100066	XYZ400003862	Customer 9	Casting g	01 Mar 82	Y

Table 13. Orders Requiring Samples

7.3.2.9 Orders waiting for patterns

This option will produce a list with appropriate details for the orders for which the pattern is not ready for use. The information can assist the production controller to avoid planning for such patterns or to expedite those patterns from stores or from the customer (table 14).

7.3.3 Summary of forward loads

This sub system provides a means of assessing the moulding forward load and forward metal requirements quickly, by the production controller, for jobs already planned. These reports could be used as a guide to make future delivery promises to customers and purchase metal charges for the foundry. It can also provide a useful guide to senior management to indicate the future level of activity in the foundry.

7.3.3.1 Summary of the moulding forward load

A printout of the summary of moulding load for each moulding section of the foundry is provided by this facility. The printout shows the total of overdue jobs and weekly loads for a period of 12 weeks in advance (table 15). The number of moulds planned and standard production hours estimated are given for each moulding centre. All requirements beyond 12 weeks are grouped and given at the end of the table. This

ABCD FOUNDRY User Name : Saba Date :10 Feb 82 Time : 13:17:14 page 1/ 1

Orders Waitng for Patterns

Order No	Pattern No.	Customer	Description	Mould/Schd
100002	XYZ400004024	Customer 1	Casting h	11 Jan 82
100142	XYZ400001462	Customer 4	Casting y	12 Feb 82
100167	XYZ400007267	Customer 3	Casting x	12 Feb 82
100136	XYZ400007541	Customer 2	Casting z	13 Feb 82
100035	XYZ400000399	Customer 8	Casting a	25 Feb 82
100053	XYZ400007340	Customer 7	Casting s	27 Feb 82
100189	XYZ400008273	Customer 6	Casting d	28 Feb 82
100030	XYZ400009187	Customer 1	Casting f	01 Mar 82
100066	XYZ400003862	Customer 9	Casting g	01 Mar 82

Table 14. Orders Waiting for Patterns

Summary of Moulding Forward Load   Current Week No.:- 14/82   Date:- 15 Mar 82

	MOULDING CENTRES																	
	21		22		23		24		25		26		27		28		Totals	
Week No.	Mlds	Hrs	Mlds	Hrs	Mlds	Hrs	Mlds	Hrs	Mlds	Hrs	Mlds	Hrs	Mlds	Hrs	Mlds	Hrs	Mlds	Hrs
Overdues	25	5	0	0	40	3	5	1	50	4	0	0	90	10	20	2	230	25
14/82	140	30	50	15	160	30	180	45	30	10	5	45	300	30	40	10	905	215
15/82	100	25	0	0	200	40	0	0	50	30	8	32	400	55	20	5	778	187
16/82	95	20	40	12	115	25	127	30	20	15	10	49	200	25	0	0	607	176
17/82	200	50	22	10	85	20	80	35	50	30	0	0	185	30	0	0	622	175
18/82	0	0	80	40	0	0	0	0	10	5	12	35	0	0	0	0	102	80
19/82	50	5	120	45	35	12	200	50	0	0	8	20	90	15	0	0	503	147
20/82	40	4	0	0	180	35	0	0	32	12	20	45	0	0	55	31	327	127
21/82	0	0	0	0	10	2	90	30	40	30	0	0	0	0	0	0	140	62
22/82	20	8	52	15	0	0	125	40	0	0	21	30	300	42	0	0	518	138
23/82	10	2	0	0	0	0	0	0	0	0	0	0	120	20	0	0	130	22
24/82	0	0	0	0	70	15	0	0	0	0	0	0	200	30	0	0	270	45
25/82	10	2	0	0	50	7	23	5	0	0	0	0	100	15	0	0	183	29
>25/82	0	0	0	0	315	90	295	75	0	0	0	0	400	100	0	0	1010	265
Totals	690	151	364	137	1270	279	1125	311	282	136	282	136	2385	372	135	48	6325	1695

Table 15. Summary of Moulding Forward Loads.

information can be used by the production controller to reschedule production to optimise plant utilisation or to plan urgent jobs without causing much disruption to jobs already planned.

7.3.3.2 Summary of metal requirements

The information provided here is similar to the summary of the moulding forward load. The printout will show the amount of metal required to carry out the planned moulding program. This summary could be used by the production controller to reschedule the jobs inorder to optimise melting facilities. It could also be used to program the metal procurement (table 16).

7.3.4 Daily Moulding Schedule

Having obtained details of castings to be produced for each week using the order book analysis, the production controller has to prepare a list of castings to be produced at various centres each day. This section of the system allows the production controller to prepare such a schedule. For each day up to 8 days ahead of the current date, the user will be able to allocate jobs to each of the moulding section. Such daily allocations are stored in separate temporary files and shop floor instructions for each moulding, core making and melting centre are generated from that file.

Summary of Metal Requirements Current Week No.:- 14/82 Date:- 15 Mar 82

			METAL GRADE		Weight in Kgs.				
Week No.	MET01	MET02	MET03	MET04	MET05	MET06	MET07	MET08	Totals
Overdues	2315	395	1015	0	3010	0	100	0	6835
14/82	3200	1505	4312	0	2310	145	630	0	12102
15/82	2900	1835	4040	0	1930	232	555	0	11492
16/82	3150	1703	4225	0	0	149	425	0	9652
17/82	2600	510	3920	1235	0	0	230	0	8495
18/82	2952	1440	0	982	0	335	0	0	5709
19/82	2531	0	2812	750	2030	120	0	0	8243
20/82	2010	0	835	600	2212	45	0	90	5792
21/82	0	0	675	830	0	0	0	0	1505
22/82	0	1300	1520	640	1235	30	342	0	5067
23/82	1053	1235	3568	0	900	0	220	0	6976
24/82	2200	1005	3015	0	620	0	130	0	6970
25/82	0	0	787	1025	2154	0	0	0	3966
>25/82	6032	3564	0	2658	5230	0	100	125	17709
Totals	30943	14492	30724	8720	21631	1056	2732	215	110573

Table 16. Summary of Metal Requirements.

This facility allows the production controller to split any order into smaller batches to be manufactured on different days to satisfy core making, metal or other resource constraints. After selection of the order number of the job to be planned, the user simply has to answer two questions, namely the date of production and quantities to be made. The system will transfer all information from the main order file to the daily production file. After allocating a suitable number of jobs to a specified production date, the system could be used to obtain, for each moulding centre the jobs allocated and the percentage of loading. It will also provide the corresponding load for core making and metal requirements for the day in consideration. Using these outputs for the three sections, adjustments could be made to the moulding schedule until a reasonable balance is obtained. The latest schedule could be issued as shop floor instructions for each of the two departments as 'make list' for the day.

The system will create the necessary files automatically each day up to 8 days in advance and erase the file for days for which the work is completed.

7.3.5 Issue of Shop floor instructions

Shop floor instructions for precasting activities will be the result of the daily moulding schedule prepared. Moulding shop instruction will contain detailed information on what moulds have to be produced each day. Core shop will use the same instructions as the cores have to be produced according to the moulding program. The instructions specify for each job, the order number, pattern number, moulding section, moulding time, core centre, core time, metal grade and the weight of metal required. The sequence in which the jobs have to be selected has to be agreed by supervision of these two sections. The system will produce summaries of the weights of metal required to cast the items in the moulding schedule. The sequence in which the different grades of metal should be made available has to be agreed with the moulding department.

For post-casting activities a list will be produced for each work centre which will provide details of all the jobs awaiting processing. These jobs will be arranged in the order in which they should be produced. These lists will be available for each post-casting department such as:-

(a) Fettling

(b) Heat treatment

(c) Machining

(d) Final Inspection

(e) Despatch

All shop floor instructions will contain spaces in which the section supervisor can write the quantity of production, quantity scrapped, reason for scrap and quantity sent for rectification. Table 17 shows how this information could be presented to the moulding and core making sections.

MOULDING SCHEDULE

Moulding Centre 21 Date:- 10 Mar 82

Order No.	Pattern No.	Or/Q	Ba/Q	Mlds	M/t	C/cen	C/t	Metal	Wt	Qty Prd	Qty Scrp
100001	XYZ4302/A	50	26	13	1.3	C1	.8	MET01	575	--------	--------
100002	GEC78531	10	10	10	0.8	C2	.5	MET03	1000	--------	--------
100003	23178911	5	2	2	.1	C2	.1	MET03	224	--------	--------
-----	-------	---	---	---	---	--	---	----	----	--------	--------
-----	-------	---	---	---	---	--	---	----	----	--------	--------
-----	-------	---	---	---	---	--	---	----	----	--------	--------
-----	-------	---	---	---	---	--	---	----	----	--------	--------
-----	-------	---	---	---	---	--	---	----	----	--------	--------
100025	ZXT987896	100	56	14	1.5	--	--	MET05	600	--------	--------

Table 17. Daily Moulding Schedule

Table 18 shows a typical intruction for the fettling department.

7.3.6 Production and Scrap Recording

This section of the system will allow the production control department to register the quantities of production against each order. At the end of each day's production, the shop floor instruction sheets issued to each work centre will be returned to the production control department giving details of jobs produced. The section for which production is to be recorded could be selected by the appropriate key. Then all jobs carried out in the section should be recorded by entering the order number and the quantity produced. The system will unload the quantity produced from this section and load it to the next work centre in which the particular casting should be processed. The succeeding load centre will be automatically loaded by checking the route assigned to the casting. In addition, quantities scrapped and the quantities sent for rectification should be recorded. If any quantity is scrapped the system will request the user to enter the reasons for scrap. The system will record these details to a daily production file which is later used for producing reports.

The recording process is repeated for all work centres. These recordings could be carried out at any time.

FETTLING LOAD - Date:- 10 Mar 82 Time:- 15:22:35

Order No	Pattern No.	Qty Order	Qty Fetd	Q/in Shop	Time/ Unit	Total Time	Code	Fett Schld	Delvy Schld	Wt/ Unit	Total Wt	Qty Ftld	Qty Scpd	Q for Rectn
102351	XY93547/A	100	38	52	5	260	F1	09 Mar 82	16 Mar 82	13	676	----	----	----
125392	ABC987561	10	8	2	15	30	F3	09 Mar 82	15 Mar 82	28	56	----	----	----
100036	XYZ400034	12	0	13	18	104	F12	10 Mar 82	17 Mar 82	20	260	----	----	----
100072	1234567	2	0	2	25	50	F8	10 Mar 82	14 Mar 82	43	86	----	----	----
100001	A654/23	150	0	165	4	660	F2	10 Mar 82	20 Mar 82	3	495	----	----	----
100123	R53286A	1	0	1	60	60	F8	10 Mar 82	18 Mar 82	35	35	----	----	----
100011	X564541	28	15	15	10	150	F6	11 Mar 82	25 Mar 82	16	240	----	----	----
100345	3542876	50	48	2	11	22	F1	11 Mar 82	21 Mar 82	8	16	----	----	----
100058	ZXT987896	100	56	14	15	210	F3	14 Mar 82	28 Mar 82	12	168	----	----	----

Table 18. Fettling Shop Instructions

7.3.7 Periodic Production Reports

These reports could be produced for all work centres which give against each order the quantity, weight and value of the casting produced. It will also identify the quantity, weight and percentage of scrap. At the end of the list a summary will appear. These reports could be produced for each work centre and for any selected period. Table 19 shows a typical report for moulding Department.

7.3.8 Scrap Analysis

The system will produce analysis of scrap for any selected period. This information can be extracted by scrap cause, centre of origin and metal grade. Table 20 shows such an analysis.

7.3.9 Financial Information

This function in the system will produce a report on work in progress, value of castings and projected sales value of the total order book.

PRODUCTION REPORT

Department :- MOULDING   Production Period:- Week 10/82

Moulding Section	No of Units Produced	Weight of Castings	Std. Hrs Produced	Actual Hrs Worked	Section Performance	Sales Value of Castings
1	231	2354	141	160	88%	£8,425
2	78	3752	58	80	73%	£12010
3	482	2268	121	120	100%	£3,203
4	68	3682	185	240	77%	£9,612
5	756	2816	132	120	110%	£15,121
Totals	1,615	14,872	637	720	88%	£58,191

Table 19. Weekly Production Report

SUMMARY OF FOUNDRY SRAP -- Week 10/82.   Date:- 15 Mar 82   Time:- 15:24:50

	Reason	Qty Scrapped	% Vol	Weight Scrapped	% Wt
(1)	Drawn	53	1	429	2
(2)	Scabbed	00	0	0	0
(3)	Crushed	43	1	389	3
(4)	Strained	---	--	-----	--
(5)	Misrun	---	--	-----	--
(6)	Broken	---	--	-----	--
(7)	Sand Inclusion	---	--	-----	--
(8)	Broken-in	---	--	-----	--
(9)	Slag Inclusion	---	--	-----	--
(10)	Run-out	---	--	-----	--
(11)	Cast-short	---	--	-----	--
(12)	Mis-placed core	---	--	-----	--
(13)	Cracked (foundry)	---	--	-----	--
(14)	Cracked (h/t)	---	--	-----	--
(15)	Distorted	---	--	-----	--
(16)	Fused	---	--	-----	--
(17)	Ripped	---	--	-----	--
(18)	Cross-joint	---	--	-----	--
(19)	Blown	---	--	-----	--
(20)	Composition	---	--	-----	--
	TOTALS	320	12	1800	09

Table 20. Summary of Scrap Analysis

7.3.9.1 Value of Work in progress

The function requests the system to search through the order book and identify the component cast but not delivered, assigns values and produces a summary of the value of work-in-progress in each stage of production (table 21) as well as for the total foundry.

7.3.9.2 Sales Value of Order Book

This facility produces a summary of projected cash flow in the foundry assuming the delivery dates are met. These values could be produced on a weekly or monthly basis (table 22).

Summary of Work-in-Progress - Date:-15 Mar 82

	Section	Weight	Value
(1)	Fettling	12,350	£30,850
(2)	Heat treatment	2,375	£6,380
(3)	Machining	3,857	£10,823
(4)	Dispatch	1,625	£7,872
	Totals	20,207	£55,845

Table 21. Value of Work-in-Progress

SALES VALUE OF ORDER BOOK - Date:- 15 Mar 82

Sales Month	Sales Value
82 March	£278,235
82 April	£174,512
82 June	£141,654
82 July	£103,524
82 August	£95,258
82 September	£80,456
82 October	£70,213
82 November	£50,327
82 December	£41,825
83 January	£28,321
83 February	£9,789
83 March	£1,963
Total	£576,077

Table 22. Sales Value

Chapter 8

8.0 Practical Applications

During the course of this research the author examined the production control methods of several foundries, of varying sizes and types of product. The purpose of these visits were two-fold, firstly to establish foundry's requirements of production control systems and secondly to explore the feasibility of using microcomputer based systems for production control applications. Although each foundry had specific production control procedures, there were important common features.

Out of the foundries approached for collaboration in the research, five foundries showed interest in the use of microcomputers in production control, adopted the proposals and implemented microcomputer based systems. The systems used by these foundries are basically similar and were based on the proposals in chapter seven. However each foundry required some modifications to the computer program to suit their specific requirements. The systems are currently in use in the following foundries:-

1. Cronite Ltd.
2. Butterly foundry Co. Ltd.
3. Bryan Donkin Co. Ltd.
4. Wilsons Foundry and Engineering Co.

5. Hockley Foundry Co. Ltd.

Some other foundries which did not participate in the research, but who were impressed by the benefits of microcomputer based production control system in use, had contacted the author through a software specialist with a view of adopting such a system. Indications are that about six more foundries will shortly using microcomputer based production control systems similar to the proposals in chapter seven. These foundries are:

1. Firth Vickers Foundry Ltd.
2. Armalloy Ltd.
3. Wolverhampton Die Castings Ltd.
4. Wolverhampton Iron Foundries Ltd.
5. Bristol Die Casting Co(1981) Ltd.
6. Parker Foundry Ltd.

Cronite was the first foundry to implement the system and it has been in operation since June 1981. The system used in this foundry was simpler than that adopted by the other foundries. This is due to a combination of two factors. First, the company had a satisfactory manual system. Secondly, the foundry wanted to proceed cautiously towards computerisation, and was prepared therefore merely to computerise their manual procedures. One interesting aspect in which Cronite differs from the other four foundries is that they already have a minicomputer on-site for commercial data processing applications.

Cronite foundry is classed as one of Europe's leading specialists in nickel alloy castings manufacture. The products are usually of high unit value, small in batch size and produced under stringent quality control procedures. The aircraft industry is one major group of customers, others are furnace manufactures and chemical plant producers. Aproximately 30% of Cronite products are exported and over 70 different grades of alloys are used.

Before a microcomputer based system was installed, the foundry was operating a manual production control system. The system, which was in operation for three years, handled on average about 500 live orders but at peak load the production control department has had to deal with over 1000 orders. Although the system operated satisfactorily during low demand periods, the production control department found itself unable to cope with the volume of clerical work involved during high load periods.

The main functions which contributed to this problem were:-

(1) Analysis of Order book

(2) Preparation of reports.

The analysis of order book usually involves segregation of total orders into various catagories such as sorting by moulding centre, alloy grade or customer and arranging them in the order of priorities so that a detailed moulding program could be prepared. These analyses are performed weekly. The reports produced periodically are summaries of forward moulding loads, forward alloy requirements, machining schedules, fabrication schedules and delivery schedules. These schedules are effectively a list of jobs awaiting processing at each stage and ranked according to priorities.

The manual system consists of a slotted wall board with cards containing the details of orders. The board is split into seven production centres each of which were broken down in to planned production weeks (up to four weeks ahead), scrap replacements, jobs planned beyond four weeks, and orders suspended by customers for some reason. The planned production week is further divided in to stages of progress of production.

Foundry production is usually planned weekly and hence an analysis of the latest situation is required for effective planning. When such analysis is required production control staff have to check through many cards from the board (all cards in some cases) to find the precise information needed. This is a tedious and time consuming task. On average this task requires about 15 hours of clerical time per week and during peak production periods it was found to an impossible task. Although this problem could be solved by employing additional manpower, the time consumed is excessive and this information prepared did not always reflect the latest situation.

There were 3 specific reasons for using a dedicated low cost microcomputer system for production control rather than using the minicomputer already available.

1. The manual system previously employed was satisfactory except for speed of analysis and preparation of reports. The microcomputer system was seen as a cost effective means of overcoming the deficiencies of the manual system.

2. No satisfactory software was available for foundry production control applications which could use the existing minicomputer.

3. Other computer systems available for foundry production control were deemed too expensive.

A Specification, that required the use of a 32k RAM microcomputer, a 1 megabyte floppy disk drive and a dot matrix printer (total hardware cost of £2,500), was approved by the company and programming was completed in two months.

The system consisted of a program written in BASIC and an index sequential file which can accomodate details of 1750 orders. Whenever information is required the program scans through the complete file, picks up relevent data and presents on the screen or on paper the compiled information.

The system provides the following facilities:-

(a) Enter New Order

(b) Update Order Details

(c) Read Order details

(d) Delete Order

(e) Sort by Order Group

(f) Sort by Alloy Type

(g) Sort by Customer

(h) Sort by Process

(i) Sort by Progress Stage

(j) Print Summary of Forward Load

(k) Print Summary of Alloy Requirements

(l) Print Weekly Sales Value

(m) Print Delivery Schedules

(n) Print Fabrication Schedules

(o) Print Machining Schedule

The above functions of the system are similar to those of the specifications given in chapter seven, except for the use of a pattern register. The program listing and complete set of reports produced by the system is given in Appendix 3.

The system provides a comprehensive analysis of the order book and produces the reports on demand. The main contributions are:-

(a) Assists production control staff in detail production planning and progressing

(b) Produces reports and summaries for discussions in regular management meetings.

The system has been in operation for about eighteen months and the production control department has completely dispensed with the wall board arrangements and the facilities offered by the computer are fully utilised. During peak load, the system handled about 1500 orders. The foundry is now in the process of installing an improved version of the system.

Amongst the other four foundries, Bryan Donkin Co. and Wilsons Foundry have been using the system for about 5 months. Both foundries have transferred all related data completely into the computer system. Butterly Foundry has just started using the system and Hockley Foundry has equipment and programs on site and implementation is still in progress. The system installed for these four foundries were simillar to those presented in chapter seven. However, a detailed study was carried out by the author on the requirements of Butterly Foundry and the observations are presented here.

Butterly foundry is a jobbing/short series foundry producing iron castings and employs approximately 150 people. The foundry has two cupolas each having a capacity of 6tons/hour and castings are produced in 16 different grades of metal. The moulding section is divided into 9 sections and the weight of castings varies between 2.5Kg to 10tonnes. Approximately 50% of the production is repeat orders. About 25% of the castings are heat treated and about 10% are sub-contracted for machining. The majority of orders are for small batches. This foundry deals with about 400 live orders at any one time.

At the production planning stage the information requirements are similar to those of Cronite foundry. The additional problem at Butterly Foundry is monitoring the progress of the casting through the post knockout stages of production. After the knockout stage, castings from different batches become mixed and it is left to the fettling department to segregate the castings for further processing. Job selection at this stage is a difficult task due to the following factors.

(a) Castings in the shop are not arranged in meaningful order.

(b) No paper work is attached to the components.

(c) Job tickets available in the supervisors office do not indicate priorities.

(d) Production staff are paid on the basis of weight of castings fettled and hence tend to select the jobs that maximises their income.

(e) There is a natural tendency to pick the castings from the top of a given pile.

A facility (section 7.3.5) in the computer system helps to overcome this problem by providing lists of jobs and the priority associated with the jobs.

The requirements of Bryan Donkins Co. Ltd. are almost identical to those of Butterly Foundry Co. Ltd., except for the volume of Orders. This is not surprising as both are 'Meehanite' foundries. On average they have about 800 live orders and at peak the number of orders reached over 1000. This has created some overflow problems to the order file and it has been recomended that they replace the floppy disc drive with a 'winchester drive' of 5 megabytes storage capacity, which can cost about £2,500. This would require minor changes to the existing software (i,e at the file input/output segments).

None of the foundries which installed microcomputer based systems have reported any reduction in staff employed on production control. All foundries indicate that the information available from the computer system has provided a significant contribution towards planning and controlling production.

Chapter 9

9.0 Discussion

Experience gained in foundries which have used microcomputers for production control tasks based on the proposals in chapter 7, suggests that the research work was worthwhile. This has been suported by the interest shown by other foundries to install such systems. The facilities available in the proposed microcomputer based system, could satisfy a major part of foundry's requirements. Although the objective must be to use the computer to handle all routine production control functions, cost effectiveness of these systems must be the prime consideration.

As a service industry, foundries must be able to organise manufacture to comply with customer wishes, while ensuring financial viability of the enterprise. Jobbing/batch foundries require production planning and control systems which can be adapted for rapid re-orientation of manufacturing activities with consequent high plant utilisation. Manual production control systems, which are being extensively used, suffer from the inability to produce information quickly enough, and in the detail required for such a dynamic enviroment. Although, the need for computerised production control systems were recognised by the management, they were discouraged by what they believed would be excessive costs.

Computer based systems available in the past, for foundry production control applications, were found to be too expensive for the majority of foundries to consider its installation. Hence a majority of the foundries still use manual production control systems. The development of microprocessor technology and the subsequent reduction in cost of computers has provided an opportunity to overcome this problem. This research has attempted to show how foundries can utilise low cost microcomputer systems to be cost effective in planning and controlling of production.

Information required for job selection, to optimise the often conflicting objectives of customer satisfaction and efficient resource utilisation, is considered to be the root of the problem. Hence, the establishment of an information system and more informed procedures for job selection constitutes the platform on which production planning and control policies can be developed. This improved command of the information system will facilitate better decision making at all levels. Production control is normally concerned with decision making at tactical and operational levels. The decisions at these levels should be based on providing a reasonable balance between foundry capacity, resource utilisation, work in progress, production costs and delivery commitments.

The proposals put forward in this thesis advocate a cost effective means of providing the decision maker with information relating to orders and their current status in the foundry. It is based on the assumption that the production control decisions could be best arrived at by combining the data processing power of the computer with the unquantifiable job knowledge of the production controller. The system attempts to provide assistance to the production controller in three specific tasks namely production planning, production control and reports generation.

At the planning stage information is made available in detail on the jobs available in the queue for a specific resource together with their capacity requirements. These itemised requirements can be matched against capacity available to obtain a suitable job mix. For the purposes of production planning it is recommended that pre-casting and post-casting activities be treated as separate entities. In a jobbing/batch environment, obtaining a balanced load between moulding and core making always requires detailed analysis. The computer system is designed to facilitate this analysis at a speed which is usually not possible by manual methods. For post-casting operations the system will provide a list of jobs available for processing at any work centre indicating the order in which they should be tackled. There are two important advantages in this approach. Firstly, the production control staff do not have to prepare schedules everytime the priorities change. These will be generated by the computer system whenever required. Secondly, it provides a means by which the section supervisor can assess the total work load in his department with guidance on the sequence in which the work should be carried out. This list facilitates the supervisor in selecting jobs to satisfy the production controllers requirements, while providing him with the flexibility to deal with any local difficulties.

Monitoring the progress of individual jobs through various stages of production is an important feature in the proposed computer system. The use of this feature is two-fold. Firstly, it will be easier to handle customer enquiries regarding the progress of their orders. Secondly, in the planning stage, jobs completed in one work centre could be loaded to the subsequent work centre automatically. Although an attempt is made to specify the stages at which production recording should take place, it is the view of the author that the needs of the foundries differ and this decision should be made individually by each foundry in conjunction with a systems analyst. Fettling is considered as a specific control point in the proposals. However, during the fettling process, castings could undergo several operations. If each of these operations has to be recorded, it requires many entries. In certain foundries, components are despatched within 24 hours of being cast. In such a situation tighter monitoring will be an unnecessary exercise.

Any order in the system can be expedited by altering the priority (due date) associated with the particular order. The higher the priority, the further up the job will appear in the shop instructions list. With the proposed system it is no longer necessary to negotiate with a number of people in the affected department.

Recording of production at various stages is the basis for reports generated by the system. The types of reports generated depend on the degree of detail the user is prepared to record onto the system. The examples provided in chapter seven are purely a demonstration of the capability of a microcomputer in generating these reports. The computer outputs can be tailored to suit individual foundries.

The order file is the nucleus of the proposed system. The data stored is almost the same as that used by the 'Kardex system' in manual methods. When particular information is required by the computer system, it scans through the complete order file. This method is similar to the procedure adopted by manual systems where production controllers have to search through a set of cards to compile the required information. The main advantage of the computer in this task is the speed. The other interesting feature of the proposed computer system is that it is designed to operate with data normally used in most manual systems. When a specific job is scheduled for production at a particular work centre, the data in the file remains unaltered until the operation is completed and reported to the production control for recording. Such recording will initiate the amendment of relevent data. Some computer based systems unload the scheduled jobs from the file, a characteristic which is not suitable for foundry operations.

The systems installed during this research were designed to handle 1000 live orders at any one time. This was due to the storage capacity of the 'floppy disc' drives used. Although this was increased to handle about 2000 orders, the response time was found to be unsatisfactory. The use of 'Winchester' drives for data storage can overcome these difficulties. The pattern register has similar restrictions but this could be overcome by using several floppy discs to store data. With the use of multiple disc for pattern register there is no limit to the number of records that could be stored. This arrangement will allow the user to have different discs for groups of pattern data (eg. customer, metal grade etc).

One of the major advantages of the proposed system is that the user could implement it to cover only a part of the foundry's activities. The implementation will not cause any major disruption to ongoing activities. Each order entry in to the system will take approximately 5 minutes (including thinking/ discussion) and a foundry with about 500 live orders can change from a manual system to a computer based one within a week.

The value of any computer based production control depends on the information needs of individual foundries and the frequency of such information. This research has demonstrated that low cost microcomputer systems can be used to provide considerable assistance to production planning and control. The cost of a microcomputer based system is considerably lower than the systems available in the past and may well be within the limits of departmental budgets. The financial risk involved in implementing this type of system is small and this will encourage computer based systems.

Although the system proposed makes specific reference to the sand casting process, the system could be adapted to die casting also.

Chapter 10

10.0 Conclusions

1. Manual production control systems predominate in the foundry industry. This situation exists because foundry management have traditionally believed that computerisation would result in excessive costs and additional complication.

2. Nature of production organisation in foundries differs from most other manufacturing industries and the computer based production control systems generally available are not suitable for foundry operations.

3. Specially produced foundry production control packages based on traditional mainframe and mini computers and are too expensive for the majority of the jobbing/batch foundries to consider implementation.

4. Development of microprocessor technology, particularly in the form of microcomputers, has resulted in four important developments. They are:-

   (a) A fall in the cost of computer provision.

   (b) The possibility of creating new forms of information systems.

(c) The opportunity to decentralise computerisation (i.e, to use dedicated computers for production control) and to exercise greater control.

(d) An increased emphasis on customising computer systems to satisfy individual requirements.

5. Since the foundry is primarily a service industry, the manufacturing programs have to be orientated towards greater customer satisfaction while ensuring financial viability. The dynamic nature of jobbing/batch environments require production control systems which can facilitate rapid re-orientation of manufacturing activities. In most cases this would require computerisation.

6. Modelling the operations of a jobbing/batch foundry onto a computer to produce manufacturing schedules is difficult to achieve. Effective production planning requires the 'non-quantifiable' job knowledge of experienced foundry production controllers. Hence, the establishment of a 'Production information system' and more informed procedures for job selection should be the basis for improved production control.

7. Computing complexity required for a foundry production information system is smaller than would be required for other manufacturing industries. Low cost microcomputers and associated hardware currently available, provide adequate data processing power and data storage capacity to implement a satisfactory foundry production control system.

8. Due to the limited capacity of low cost desk top computers, and the unstructured and non-stereotyped nature of foundry operations, it is difficult to devolop a single production control program to satisfy the requirements of all types of foundries. Micro based systems could be tailored to suit individual foundry requirements.

9. Although the 'floppy disc' drives have proved to be useful media for data storage there problems in providing adequate capacity. 'Winchester' drives having many megabytes of capacity can eleminate data storage problems and can speed up the system response. This increase in data storage capacity can facilitate the use of a common data base for other computerised activities such as product cost estimating systems and payment systems.

10. Financial risks involved in using microcomputer based systems are relatively small. The total costs of implementation of systems similar to those referred to in chapter 8 can vary from £5000 to £9000.

11. The production control system proposed in the thesis could be implemented to cover any part of the foundry as desired by the foundry management.

12. The simplicity in the approach to the design of the system allows for quick implementation without causing much distruption to the ongoing production control activities. The data normally used in manual systems will be sufficient to develop an effective computer based system.

13. The cost-effectiveness ratio of micro based systems seems to be higher than other computer based systems available for foundry production control.

14. Microcomputer based systems may be the only economically feasible way in which most small foundries can improve production planning and control.

APPENDIX 1

Variations in Post-Casting processes in a typical Steel Foundry

STANDARD PROCESS ROUTES

PROCESS ROUTE 00 - Castings with special process procedures which do not fit in with any of the following standard routes.

Process Route	Process Route	Process Route	Process Route
01 Shot/Hydroblast Burn Cold Cut out Weld cold Normalise Shotblast Finish	02 Shot/Hydroblast Anneal Hot Burn Shotblast Cut out Weld Hot Harden & Temper Shotblast Finish	03 Shotblast Burn Cold Cut out Weld cold Harden & Temper Shotblast Finish	04 Shot/Hydroblast Normalise Hot burn Cut out Weld Cold or (Local Preheat) Temper Shotblast Finish
05 Shotblast Anneal Shotblast Burn cold Cut out Weld cold or (Local Preheat) Harden & Temper Shotblast Finish	06 Shotblast K.O. Heads Anneal Shotblast Burn cold Cut out Weld hot Temper Shotblast	07 Hydroblast Normalise Shotblast Burn cold Cut out Weld cold or (Local Preheat) Temper Shotblast Finish	08 Shot/Hydroblast K.O. Heads Water Quench Burn cold Cut out Weld cold Shotblast Finish
09 Shot/Hydroblast Normalise Burn cold Cut out Weld cold Normalise Shotblast Finish	10 Shot/Hydroblast Powdercut Cold Cut out Weld cold Water Quench Shotblast Finish	11 Hydroblast Burn cold Cut out Weld cold Temper Hydroblast Finish	12 Shotblast Burn cold Cut out Weld cold Anneal Shotblast Finish
13 Shot/Hydroblast Normalise Stress Relieve Hot burn Shotblast Cut out Weld hot Harden & Temper Shotblast Finish	14 Shot/Hydroblast Normalise Temper Powdercut Hot Shotblast Cut out Weld hot Normalise Temper Shotblast Finish	15 K.O. Heads Normalise Temper Manual Shotblast Burn cold Finish	16 Hydroblast K.O. Heads Anneal Shotblast Sawoff heads Cut out Weld hot Harden & Temper Shotblast Finish

Process Route	Process Route	Process Route	Process Route
17 Shotblast Anneal Shotblast Burn cold Cut out Weld cold Homogenise Spray Quench (Large balloon type-temper) Shotblast	18 Shotblast K.O. Heads Stress Relieve Hot burn Cut out Weld hot Shotblast Temper Finish	19 Hydroblast K.O. Heads Anneal Hot burn Normalise Stress Relieve Shotblast Rough machine NDT/Cut out Weld hot Stress relieve Shotblast Finish	20 Hydroblast Anneal Hot burn Shotblast Temper Rough Machine NDT/Cut out Weld hot Stress Relieve Shotblast Finish
21 Hydroblast Anneal Hot burn Shotblast Normalise or Harden & Temper Shotblast Rough machine Cut out Weld hot or (Local Pre-heat) Temper Shotblast	22 Hydroblast K.O. Heads Anneal Shotblast Saw off heads Cut out Weld hot Stress Relieve Shotblast Machine Harden & Temper Shotblast Finish	23 Shot/hydroblast Stress Relieve Powdercut hot or Machine heads Normalise Temper Shotblast Cut out Weld hot Temper Shotblast Finish	24 Hydroblast K.O. Heads Anneal Hot burn Shotblast N.D.T. Cut out Stress relieve Weld hot Normalise Temper Shotblast Rough machine NDT/Cut out Weld hot Stress Relieve Shotblast Finish
25 Anneal Shotblast Burn cold Cut out Weld hot Normalise Shotblast Machine Cut out Weld hot Temper Shotblast Finish	26 Special Procedure Armour (Turret)	27 Special Procedure Armour (Pannier)	28 Special Procedure Armour (Control Plates)

APPENDIX 2

Program Listing of Proposed

Production Control System

```
ifin=999then10000
deffnc(x)=(asc(s$)and127)-64
deffnw(dw)=d+int(30.6*(m+1-(m<3)*12)+r)+int(365.25*(y+(m<3))+r)
0000 rem update 21/04/82  proda
0010 poke224,0:print"":poke59468,14:sys9*4096
0030 print""tab(30)"INITIALISING"
0040 gosub50010:ifin=999then11000
0050 in=999:print"":s$="ABCD FOUNDRY":s%=0:sys9*4096+48
0060 printleft$(lp$,8)"User Name     ";:lo=2:hi=5:gosub10705:un$=s$
0080 s%=26:sys9*4096+48
0100 printleft$(lp$,8)tab(40)"Time Now    (eg 144510)";:lo=6:hi=6:gosub107
0110 ti$=s$
0140 printleft$(lp$,15)"Date  (DD.MM.YY)";:lo=8:hi=8:gosub10705:gosub18900
0160 cd=fnw(dw):dw=cd:gosub48520:z$=dd$:s%=40:sys9*4096+48
0180 printleft$(lp$,15)tab(17)s$
0190 goto11000
0405 c=abs(n)+5e-4:n$=right$("          "+str$(sgn(n)*int(c)),6)
0410 n$=n$+"."+mid$(str$(1+c-int(c))+"000000000",4,2):return
0505 getc$:ifc$<>""then10520
0510 print"*";:fornn=0to50:getc$:ifc$=""thennextnn
0515 ifc$=""thenprint"+";:fornn=0to50:getc$:ifc$=""thennextnn:goto10510
0520 ifc$=""thenreturn
0525 c=asc(c$)
0530 if(c$=")and(peek(152)=1)thensysrs
0535 ifc$<>"~"thenreturn
0540 ifpeek(152)=1thengosub49900:rem open255,4:print£255,chr$(12):close25
0545 c$=chr$(0):return
0605 ifs$=""thenreturn
0610 ifln=hithenprint""chr$(asc(u$))" ";:goto10620
0615 print""chr$(asc(u$))chr$(asc(u$))"";
0620 ln=ln-1:s$=left$(s$,ln):return
0705 print": ";
0710 s$="":ln=0:printleft$(u$,hi)left$(bs$,hi);
0715 gosub10505:ifc=13then10750
0720 ifc=20thengosub10605:goto10715
0725 ifln=hithen10715
0730 c=cand127:ifc<32orc>126then10715
0735 s$=s$+c$:ln=ln+1:printc$;chr$(27);
0745 goto10715
0750 ifln<lothen10715
0760 s$=left$(s$+b$,hi)
0765 printleft$(b$,hi-ln)" ";:return
1000 sys9*4096+3:dclose£5
2000 poke224,1:print""spc(25)"SYSTEM OPTIONS"
2060 print""spc(20)"(a)  Order Entry / File Management
2065 print""spc(20)"(b)  Production Information
2068 print""spc(20)"(c)  Forward Loads
2070 print""spc(20)"(d)  Plant Loading and Daily Production Program
2075 print""spc(20)"(e)  Production Recording and Reports
2080 print""spc(20)"(f)  Scrap Analysis
2090 print""spc(20)"(g)  Financial Information
2095 print""spc(20)"(h)  Shut Down System"
2100 printlp$tab(25)"Option";:lo=1:hi=1:gosub10705:op=fnc(0)
2110 ifop<1orop>8goto12100
2120 onopgoto13110,62000,62200,62300,62100,62100,29000,63900
3110 print""tab(25)"File Management":printleft$(lp$,7)tab(10)"ORDER FILE
3150 fori=1to5:printleft$(lp$,(i*2)+7)tab(5)"("chr$(i+64)")  "mm$(i):nexti
3155 printleft$(lp$,7)tab(50)"CASTINGS FILE
3160 fori=6to10:printleft$(lp$,(i*2)-3);tab(45)"("chr$(i+64)")  "mm$(i):ne
3170 printlp$tab(25)"Option";:lo=1:hi=1:gosub10705:op=fnc(0)
```

```
3175 ifop<1orop>10goto13170
3180 onopgoto13205,13820,14120,14420,49500,27020,27220,27420,27620,49700
3205 print"Do You Have the Casting Details in the Castings File  (Y/N) ";
3210 cs=0:lo=1:hi=1:gosub10705:ifs$<>"Y"ands$<>"N"thenprintbl$;:goto13205
3215 ifs$="N"thencs=1:goto13520
3220 print"Pattern No.";:lo=1:hi=16:gosub10705:pn$=left$(s$+b$,16)
3240 dopen£3,(f3$),d1:record£3,1:input£3,nc
3260 forrc=2tonc+1:record£3,(rc):input£3,pt$
3280 ifpt$=pn$thendclose£3:goto13400
3300 nextrc:dclose£3
3320 printleft$(lp$,10)tab(10)"Casting Details Not Available on File"
3330 printtab(10)"Please input All Details"
3340 cs=1:gosub49020:goto13520
3400 dopen£4,(f4$),d1:record£4,(rc):sysgr:dclose£4
3410 print"Casting Details":fori=2to19:gosub46220
3430 c$=right$("0"+str$(i-1),2):t1=0:t2=5:ifi>21thent1=42:t2=47
3440 printleft$(lp$,fw(i,4))tab(t1);
3450 print"("c$")"tab(t2)pa$(i)tab(fw(i,5));": ";s$:nexti
3460 printbl$lp$"Is This The Casting You Require";:lo=1:hi=1:gosub10705
3465 ifs$<>"Y"ands$<>"N"thenprintbl$:goto13460
3470 ifs$="Y"thengoto18020
3499 goto13220
3520 print"INPUT NEW ORDER":ma=28:fori=1to28:gosub45020
3550 ifi=1thengosub32420:ifv=1thengoto13520
3560 nexti:gosub45520
3562 cr%(5)=0:cr%(6)=cr%(4):forj=7to16:cr%(j)=0:nextj
3570 gosub32220:ifv=1goto13600
3580 gosub31020:goto13610
3600 gosub31220
3610 printbl$lp$;"Order Entered    Key SPACE to Continue"
3620 gosub49030:ifcs=1then13670
3630 goto13110
3670 cr$(1)="            ":cr$(12)=" ":cr$(13)=" ":cr$(14)=" "
3675 forj=7to10:cr(j)=0:nextj:forj=3to16:cr%(j)=0:nextj
3700 dopen£3,(f3$),d1:record£3,1:input£3,nc:nc=nc+1
3710 ifnc>1000then13900
3720 record£3,1:print£3,nc:record£3,(nc):print£3,cr$(2):dclose£3
3740 dopen£4,(f4$),d1:record£4,(nc):syswr:dclose£4
3760 printbl$lp$"Details Entered to Castings File    Key Space to continu
3770 gosub49030:goto13110
3820 print"Order Number ";:lo=1:hi=fw(1,3):gosub10705:cr$(1)=s$
3840 gosub31840:ifv=1goto13820
3860 gosub32020:gosub41105:gosub49020:goto13110
3900 dclose£3:printbl$lp$"Casting File Full  "
3920 gosub49030:goto13700
4120 ma=40:print"Order Number ";:lo=1:hi=fw(1,3):gosub10705:cr$(1)=s$
4140 gosub31840:ifv=1goto14120
4160 gosub32020:gosub41105:gosub45520
4180 gosub31220
4200 printbl$lp$;"Order Updated    Strike any Key to Continue"
4220 gosub49030:goto13110
4420 print"Job Number to be Deleted";:lo=1:hi=fw(1,3):gosub10705:cr$(1)=s
4440 gosub31840:ifv=1goto27620
4460 gosub32020:gosub41105
4480 printbl$lp$"Is This The Order to be Deleted ";:lo=1:hi=1:gosub10705
4500 ifs$<>"Y"ands$<>"N"thenprintbl$;:goto14480
4520 ifs$="Y"then14560
4540 goto13110
4560 gosub31420
4580 s$="This Order has been Deleted from the file"
4600 printlp$s$:syssd:s$=chr$(12):syscv:gosub49020:goto13110
5020 print"";:printtab(15)"Production information:goto11000
```

```
8020 print"INPUT NEW ORDER"
8040 print""tab(10)"Pattern No.          : "cr$(2)
8100 printleft$(lp$,5)tab(10)"(1) Order No"tab(33);
8105 lo=4:hi=8:gosub10705:cr$(1)=s$:a$=s$
8110 ifv=1thengosub49020:goto18020
8120 printleft$(lp$,7)tab(10)"(2) Order Qty"tab(33);
8125 lo=1:hi=4:gosub10705:cr%(3)=val(s$)
8130 printleft$(lp$,9)tab(10)"(3) Planned Qty"tab(33);
8135 lo=1:hi=4:gosub10705:cr%(4)=val(s$)
8140 printleft$(lp$,11)tab(10)"(4) Plan Moulding"tab(33);
8145 lo=8:hi=8:gosub10705
8160 gosub18900:cr(8)=fnw(dw):dw=cr(8):gosub48520:printleft$(bs$,9)s$
8180 printleft$(lp$,13)tab(10)"(5) Plan Fettling"tab(33);
8185 lo=8:hi=8:gosub10705
8200 gosub18900:cr(9)=fnw(dw):dw=cr(9):gosub48520:printleft$(bs$,9)s$
8220 printleft$(lp$,15)tab(10)"(6) Plan Delivery"tab(33);
8225 lo=8:hi=8:gosub10705
8230 gosub18900:cr(10)=fnw(dw):dw=cr(10):gosub48520:printleft$(bs$,9)s$
8235 printleft$(lp$,17)tab(10)"(7) Pattern Available"tab(33);
8240 lo=1:hi=1:gosub10705:ifs$<>"Y"ands$<>"N"ands$<>"R"then18235
8245 cr$(11)=s$
8250 printleft$(lp$,19)tab(10)"(8) Sample Reuired"tab(33);
8255 lo=1:hi=1:gosub10705:ifs$<>"Y"ands$<>"N"then18250
8260 printbl$lp$"Any Alterations Y/N ";:lo=1:hi=1:gosub10705
8280 ifs$<>"Y"ands$<>"N"then18260
8300 ifs$="Y"then18020
8320 cr%(6)=cr%(4):cr%(5)=0:forj=7to16:cr%(j)=0:nextj:cr(7)=cd
8340 gosub41105:ma=40:gosub45520:goto13570
8900 d=val(left$(s$,2)):m=val(mid$(s$,4,2)):y=val(right$(s$,2))+1900:retu
9000 rem financial information
9020 print""left$(lp$,5)tab(20)"Finacial Information"
9030 print""spc(20)"(a)  Sales Value of Work in Progress
9040 print""spc(20)"(b)  Total Sales Value of Order Book
9070 printlp$tab(25)"Option";:lo=1:hi=1:gosub10705:op=fnc(0)
9080 ifop<1orop>2goto29020
9090 onopgoto29100,29500
9100 print""left$(lp$,12)tab(20)"Processing Sales Value of Work in Progre
9120 fork=1to7:sv(k)=0:nextk
9140 gosub31620:forrc=2tono:record£2,(rc):sysgr
9160 forj=8to15:ifcr%(j)<=0thennextj:goto29300
9180 fork=1to5:sv(k)=sv(k)+cr%(k+7)*cr(6):nextk
9200 sv(6)=sv(6)+cr%(14)*cr(6)
9300 nextrc:fori=1to6:sv(7)=sv(7)+sv(i):nexti
9320 print""tab(20)"Sales Value of Work in Progress"
9330 print""tab(25)"Fettling               £ ";right$(b$+str$(sv(1)),8)
9340 print""tab(25)"Heat Treatment         £ ";right$(b$+str$(sv(2)),8)
9350 print""tab(25)"Machining              £ ";right$(b$+str$(sv(3)),8)
9360 print""tab(25)"Inspection             £ ";right$(b$+str$(sv(4)),8)
9370 print""tab(25)"Rectification          £ ";right$(b$+str$(sv(6)),8)
9380 print""tab(25)"Despatch               £ ";right$(b$+str$(sv(5)),8)
9390 print""tab(25)"        Total          £ ";right$(b$+str$(sv(7)),8)
9400 gosub49020:goto29000
9500 rem--order book value
9520 print""left$(lp$,12)tab(25)"Processing Total Order Value"
9540 sv=0:gosub31620:forrc=2tono:record£2,(rc):sysgr
9560 sv=sv+cr%(3)*cr(6)
9580 nextrc
9600 print""left$(lp$,12)tab(25)"Total Order Value   = £";
9620 printright$(b$+str$(sv),9)
9640 gosub49020:goto29000
9900 rem--scratch and create report file
9910 scratch"Prod Report",d0
```

d0,1106

```
9920 dopen£5,"Prod Report",
9930 record£5,1:print£5,0:
9940 dclose£5
9999 end
1020 record£1,1:input£1,no:no=no+1
1040 record£1,1:print£1,no:record£1,(no+1):print£1,cr$(1)
1060 record£2,(no+1):syswr:return
1220 record£1,(z):print£1,cr$(1)
1240 record£2,(z):syswr:return
1420 record£1,(z):print£1,"Deleted"
1440 fori=1to14:cr$(i)=left$(b$,fs(i)):nexti
1460 fori=1to9:cr(i)=0:nexti:fori=1to13:cr%(i)=0:nexti
1480 record£2,(z):syswr:return
1620 record£1,1:input£1,no:return
1840 v=0:record£1,1:input£1,no
1860 forrc=2tono+1:record£1,(rc):input£1,a$
1880 ifa$=cr$(1)thenz=(rc):return
1900 nextrc:printchr$(13)"Record not found"
1920 gosub49020:v=1:return
2020 record£2,(z):sysgr:return
2220 record£1,1:input£1,no:v=0
2240 forrc=2tono+1:record£1,(rc):input£1,a$
2260 ifa$="Deleted"thenz=(rc):v=v+1:return
2280 nextrc:return
2420 v=0:record£1,1:input£1,no
2430 forrc=2tono+1:record£1,(rc):input£1,a$
2440 ifa$=cr$(1)goto32480
2460 nextrc:return
2480 v=1:print:print"This Order No. Already in Use"
2500 printbl$lp$"Key SPACE to Continue"
2520 getc$:ifc$<>" "then32520
2540 return
3120 dopen£3,d1:record£3,1:input£1,nc:nc=nc+1
3140 record£3,1:print£3,nc:record£3,(nc+1):print£3,cr$(2):dclose£3
3160 dopen£4,d1:record£4,(nc+1):syswr:dclose£4:return
3220 dopen£3,(f3$),d1:record£3,(z):print£3,cr$(2):dclose£3
3240 dopen£4,(f4$),d1:record£4,(z):syswr:dclose£4:return
3420 dopen£3,(f3$),d1:record£3,(z):print£3,"Deleted             ":dclose£3
3440 fori=1to14:cr$(i)=left$(b$,fs(i)):nexti
3460 fori=1to9:cr(i)=0:nexti:fori=1to13:cr%(i)=0:nexti
3480 dopen£4,(f4$),d1:record£4,(z):syswr:dclose£4:return
3620 dopen£3,(f3$),d1:record£3,1:input£3,nc:dclose£3:return
3840 v=0:dopen£3,(f3$),d1:record£3,1:input£3,nc
3860 forrc=2tonc+1:record£3,(rc):input£3,a$
3880 ifa$=cr$(2)thenz=(rc):dclose£3:return
3900 nextrc:dclose£3:printchr$(13)"Record not found"
3920 gosub49020:v=1:return
4020 dopen£4,(f4$),d1:record£4,(z):sysgr:dclose£4:return
4220 dopen£3,d1:record£3,1:input£3,nc:v=0
4240 forrc=2tonc+1:record£3,(rc):input£3,a$
4260 ifa$="Deleted             "thenz=(rc):dclose£3:v=v+1:return
4280 nextrc:dclose£3:return
4420 v=0:dopen£3,(f3$),d1:record£3,1:input£3,nc
4430 forrc=2tonc+1:record£3,(rc):input£3,a$
4440 ifa$=cr$(2)thendclose£3:goto34480
4460 nextrc:dclose£3:return
4480 v=1:print:print"This Pattern No. Already in Use"
4500 printbl$lp$"Key SPACE to Continue"
4520 getc$:ifc$<>" "then34520
4540 return
6020 print""mm$(op)""
6040 print"          "mid$(mm$(op),9)" ";:lo=1:hi=fw(fr,3):gosub10705:ac$=s
```

```
6080 ifnwthenw1=wl:w2=wh:goto36240
6100 printleft$(lp$,1)tab(52)"From Date ";:lo=8:hi=8:gosub10705:gosub4404
6120 w1=w:ifw=0goto36100
6140 printleft$(lp$,1)tab(63)s$
6160 printleft$(lp$,2)tab(52)"To   Date ";:lo=8:hi=8:gosub10705:gosub4404
6180 w2=w:ifw=0goto36160
6200 printleft$(lp$,2)tab(63)s$
6240 print:sa=0
6260 forrc=2tono+1
6280 record£2,(rc):sysgr:w=cr(e)
6300 iffr=6then36360
6320 ifcr%(a)=0then36400
6340 goto36380
6360 ifcr%(4)<=0andcr%(5)<=0then36400
6380 ifw>=w1andw<=w2thenifcr$(ar)=ac$thensa=sa+1:rs$(sa)=str$(cr(e))+str$
6400 nextrc
6440 ifsa>0then36520
6460 printbl$lp$"No Records Satisfied. Key SPACE to Continue"
6480 getc$:ifc$<>" "then36480
6500 sysrs
6520 g=sa
6540 g=int(g/2):ifg=0thenreturn
6560 fori=1tosa-g:jj=i+g
6580 forj=ito1step-g
6600 ifrs$(jj)<rs$(j)thenc$=rs$(jj):rs$(jj)=rs$(j):rs$(j)=c$:jj=j:nextj
6620 nexti:goto36540
6640 return
9990 s$=uc$+"End of List":syscv
9995 open200,4:cmd200:print£200,chr$(12):close200:return
0110 printchr$(7);
0115 printlp$;"
0120 printlp$"Which data you want to alter;:lo=1:hi=1
0140 gosub10705:print""
0150 ifi<1ori>21goto40110
0162 c$=right$("0"+str$(i+1),2)
0165 print"("c$")"tab(7)pa$(i)tab(40);
0175 lo=1:hi=fw(i):gosub10705
0200 return
0320 n=20:printbl$lp$"Any Alterations(Y/N)";:lo=1:hi=1:gosub10705
0330 ifs$<>"Y"ands$<>"N"thenprintbl$;:goto40320
0340 return
1105 print"ORDER DETAILS"
1110 fori=1to40:ifi>22andi<27thengosub48510:goto41120
1115 gosub46220
1120 c$=right$("0"+str$(i),2):t1=0:t2=5:ifi>21thent1=42:t2=47
1130 ifi=26then gosub45600
1140 printleft$(lp$,fw(i,4))tab(t1);
1160 print"("c$")"tab(t2)pa$(i)tab(fw(i,5));": ";s$
1240 nexti:return
1500 iffr=2orfr=3orfr=16thenw1=val(left$(rs$(1),5)):w2=val(left$(rs$(sa),
1510 s$=mid$(mm$(op),9)+" : "+ac$+"            (From Week : "+str$(fny(w1))
1520 s$=s$+"        To Week : "+str$(fny(w2))+")":sys9*4096+18*3
1560 s$=left$(dh$,79):syscv
1580 s$=" ":syscv:return
2020 printleft$(lp$,3)tab(20)"Patt No:"cr$(2)tab(42)"Order Qty:"cr%(3)
2030 print""tab(61)"Tot Planned:";cr%(4)
2040 fori=29to40:gosub46220
2060 c$=right$("0"+str$(i-28),2):t1=0:t2=5:t3=24
2080 printleft$(lp$,fw(i,4)-6)tab(t1)"("c$")"tab(t2)pa$(i)tab(t3)": ";s$
2100 nexti:return
2300 t4=35:print:fori=29to40:gosub46220
2320 printleft$(lp$,fw(i,4)-6)tab(t4)": ";s$
```

```
340 nexti:return
500 qt=0:s1=1+5:s$="Qty (good) ":ifl=7orl=8thens$="Qty   "
510 printleft$(lp$,18)tab(10)s$;left$(tr$(1),12)tab(31);
520 lo=1:hi=5:gosub10705:qt=val(s$):ru$="1111111"+cr$(9)+"111"
525 ifl=8andqt>cr%(13)thenprintbl$:goto42500
530 ifl=8thencr%(16)=cr%(16)+qt:s1=3:goto42660
540 fors2=s1+1tolen(ru$):ifmid$(ru$,s2,1)="1"then42590
560 nexts2
590 ifcr%(s1)<qtthenprintbl$:goto42500
600 cr%(s1)=cr%(s1)-qt:cr%(s2)=cr%(s2)+qt
620 ifs1=7thencr%(5)=cr%(5)+qt
640 ifl=1orl=4orl=7thenqr=0:qs=0:sr$="                ":goto42820
660 qr=0:printleft$(lp$,19)tab(10)"Qty for Rectification"tab(31);:lo=1:hi
680 gosub10705:qr=val(s$):ifcr%(s1)<qrthenprintbl$:goto42660
690 ifl=8andqt<qrthenprintbl$:goto42660
700 cr%(s1)=cr%(s1)-qr:cr%(14)=cr%(14)+qr
720 ifs1=7thencr%(5)=cr%(5)+qr
740 qs=0:printleft$(lp$,20)tab(10)"Qty Scrapped"tab(31);:lo=1:hi=5
760 gosub10705:qs=val(s$):ifcr%(s1)<qsthenprintbl$:goto42740
770 ifl=8andqt<qr+qsthenprintbl$:goto42740
775 ifl=8andqt<>qr+qsthenprintbl$:goto25540
780 cr%(s1)=cr%(s1)-qs:cr%(15)=cr%(15)+qs:cr%(6)=cr%(6)+qs
800 ifs1=7thencr%(5)=cr%(5)+qs
810 ifqs>0thengoto42850
820 return
850 printleft$(lp$,20)tab(44)"Reason for Scrap";:lo=4:hi=16:gosub10705
860 sr$=s$:sr$=left$(sr$+b$,16)
880 return
020 nm=int(cr%(4)/cr%(1)+.5):nm$=right$(b$+str$(nm),5)
040 jw=int(nm*cr(2)+.5):jw$=right$(b$+str$(jw),6)
060 jt=int(nm*cr(5)+.5):jt$=right$(b$+str$(jt),5)
499 return
040 d=val(left$(s$,2)):m=val(mid$(s$,4,2)):y=val(right$(s$,2))+1900
080 w=fnw(dw):dw=w:gosub48520:return
999 return
020 ifxx=1thenx=i-1:goto45025
022 x=i
025 c$=right$("0"+str$(x),2):t1=0:t2=5:ifi>21thent1=42:t2=47
040 printleft$(lp$,fw(i,4))tab(t1);
055 print"("c$")"tab(t2)pa$(i)tab(fw(i,5));:lo=1:hi=fw(i,3):gosub10705
060 ifi=20goto45100
065 ifi=21ori=22goto45090
072 ifi>22andi<27thengosub48740:goto45080
075 gosub46020
080 return
090 ifs$<>"Y"ands$<>"N"thenprintbl$;:goto45025
095 goto45072
100 ifs$<>"Y"ands$<>"N"ands$<>"R"thenprintbl$;:goto45025
105 goto45072
520 printbl$lp$"Any Alterations(Y/N)";:lo=1:hi=1:gosub10705
540 ifs$<>"Y"ands$<>"N"thenprintbl$;:goto45520
560 ifs$="Y"thengoto45720
580 return
600 printleft$(lp$,8)tab(47)"PROGRESS DETAILS":return
720 printchr$(7);
740 printlp$;"
760 printlp$"Which data you want to alter";:lo=1:hi=2:gosub10705
800 i=val(s$):ifi<1ori>magoto45720
820 print"":gosub45020:goto45520
020 onfw(i,1)gosub46040,46060,46080:return
040 cr$(fw(i,2))=s$:return
060 cr(fw(i,2))=val(s$):return
```

```
80 cr%(fw(i,2))=val(s$):return
20 onfw(i,1)gosub46240,46260,46280:return
40 s$=cr$(fw(i,2)):return
60 s$=mid$(str$(cr(fw(i,2))),2):return
80 s$=mid$(str$(cr%(fw(i,2))),2):return
20 printbl$lp$"Any Alterations(Y/N)";:lo=1:hi=1:gosub10705
40 ifs$<>"Y"ands$<>"N"thenprintbl$;:goto47020
60 ifs$="Y"thengoto47120
80 return
20 printchr$(7);
40 printlp$;"
60 printlp$"Which data you want to alter";:lo=1:hi=2:gosub10705
80 i=val(s$):x=i:ifi<1ori>magoto47160
00 i=i+1
20 c$=right$("0"+str$(x),2):t1=0:t2=5:ifi>19thent1=42:t2=47
40 printleft$(lp$,fw(i,4))tab(t1);
55 print"("c$")"tab(t2)pa$(i)tab(fw(i,5));:lo=1:hi=fw(i,3):gosub10705
75 gosub46020:goto47020
10 dw=cr(fw(i,2))
20 y=int(dw/365.25+r)
30 y2=int(y*365.25+r):m=int((dw-y2)/30.6+r):ifm<4theny=y-1:goto48530
40 d=dw-int(r+m*30.6)-y2:ifd=0thenm=m-1:goto48540
45 d$=right$(str$(100+d),2):y=(y-(m>13)):y$=right$(str$(y),2)
60 m=(m-1+(m>13)*12):dd$=d$+m$(m)+y$:s$=dd$:return
40 d=val(left$(s$,2)):m=val(mid$(s$,4,2)):y=val(right$(s$,2))+1900
60 cr(fw(i,2))=fnw(dw):dw=cr(fw(i,2))
70 gosub48520:printleft$(lp$,fw(i,4));tab(fw(i,5));": ";s$:return
20 poke158,0:printbl$lp$"Key SPACE to Continue"
30 getc$:ifc$=""then49030
35 printlp$"
40 gosub10525
10 printlp$:ifc$=chr$(0)then49020
20 return
00 poke158,0:printleft$(lp$,18)"Key SPACE for next page"
20 getc$:ifc$=""then49220
30 printleft$(lp$,18)"
40 gosub10525
60 printleft$(lp$,18):ifc$=chr$(0)then49280
80 return
00 print""left$(lp$,10)tab(25)"Printing Order File"
20 gosub31620:forrc=2tono+1
40 record£1,(rc):input£1,a$:record£2,(rc):sysgr:s$=str$(rc-1)+"**"+a$:sy
60 s$="":fori=1to14:s$=s$+cr$(i)+":":nexti:syscv
80 s$="":fori=1to6:s$=s$+str$(cr(i))+":":nexti
00 da$="":fori=7to9:dw=cr(i):gosub48520:da$=da$+dd$+" :":nexti:s$=da$:sy
20 s$="":fori=1to13:s$=s$+str$(cr%(i))+" :":nexti:syscv:s$="":syscv
60 nextrc:goto13110
00 print""left$(lp$,10)tab(25)"Printing Casting File"
20 dclose:gosub33620
30 dopen£3,(f3$),d1:dopen£4,(f4$),d1:forrc=2tonc+1
40 record£3,(rc):input£3,a$:record£4,(rc):sysgr:s$=str$(rc-1)+"**"+a$:sy
60 s$="":fori=2to14:s$=s$+cr$(i)+":":nexti:syscv
80 s$="":fori=1to6:s$=s$+str$(cr(i))+":":nexti:syscv
00 nextrc:dclose:dopen£1,(f1$),d0:dopen£2,(f2$),d0:goto13110
00 qq=qq+1:open6,8,6,"1:dump"+mid$(str$(qq),2)+",s,w":sys37528:return
0 ifin=999thenreturn
0 bf$="":bf%=0:bl$=chr$(7)
0 wl=723626:wh=730562
0 r=1/256
0 cv=7*4096+15*256:sd=9*4096+15:gr=10*4096+24:wr=10*4096+27
0 rs=9*4096+6:gm=10*4096+12:wm=10*4096+15
0 cm$=chr$(15):uc$=chr$(18):en$=chr$(14):ue$=chr$(20):ff$=chr$(12)
```

```
20 dimcr%(16),cr(10),cr$(14),pa$(40),fw(40,5)
40 dimbf(9),sq(17):open6,8,6,"`1:print,s,w"
40 fori=1to40:readpa$(i):pa$(i)=pa$(i)+"":forj=1to5:readfw(i,j):nextj:ne
00 data"Ord No.         ",1, 1, 8, 2,22,"Pattern No.     ",1, 2,16, 3,22
10 data"Description     ",1, 3,12, 4,22,"Customer        ",1, 4,12, 5,22
20 data"Metal Grade     ",1, 5, 5, 6,22,"Weight          ",2, 1, 8, 7,22
30 data"Qty per Box     ",3, 1, 2, 8,22,"Wt per mould    ",2, 2, 8, 9,22
40 data"Box Code        ",1, 6, 2,10,22,"Moulding Centre",1, 7, 2,11,22
50 data"Time/Mould      ",2, 3, 5,12,22,"No of Cores     ",3, 2, 2,13,22
60 data"Core Centre     ",1, 8, 2,14,22,"Time/Cores      ",2, 4, 5,15,22
70 data"P.K.O. Route    ",1, 9, 4,16,22,"Fettling Code   ",1,10, 5,17,22
80 data"Fettling Time   ",2, 5, 5,18,22,"Inspection Code",1,11, 2,19,22
90 data"Price/Casting   ",2, 6, 8,20,22,"Pattern Status  ",1,12, 1,21,22
00 data"Sample Required",1,13, 1,22,22,"Sample Approved",1,14, 1, 2,64
10 data"Date of Order   ",2, 7, 8, 3,64,"Moulding Schld  ",2, 8, 8, 4,64
20 data"Fettling Schld  ",2, 9, 8, 5,64,"Delivery Schld  ",2,10, 8, 6,64
30 data"Qty Ordered     ",3, 3, 5, 9,64,"Tot Planned     ",3, 4, 5,10,64
40 data"Total Cast      ",3, 5, 5,11,64,"Qty to Mould    ",3, 6, 5,12,64
50 data"Qty to Cast     ",3, 7, 5,13,64,"Qty in Fettling",3, 8, 5,14,64
60 data"Qty in Heat T   ",3, 9, 5,15,64,"Qty in M/cing   ",3,10, 5,16,64
70 data"Qty in Inspec'n",3,11, 5,17,64,"Qty in Despatch",3,12, 5,18,64
80 data"Qty Delivered   ",3,13, 5,19,64,"Qty in Rectif'n",3,14, 5,20,64
90 data"Qty Scrapped    ",3,15, 5,21,64,"Tot Cust Return",3,16, 5,22,64
20 b$=" ":dh$="-":u$=chr$(164):bs$="":eq$="=":fori=1to6
25 b$=b$+b$:u$=u$+u$:bs$=bs$+bs$:dh$=dh$+dh$:eq$=eq$+eq$
30 nexti:dh$=left$(dh$+dh$+dh$,132):eq$=left$(eq$+eq$+eq$,132)
50 lp$="":fori=1to5:lp$=lp$+lp$:nexti:lp$=""+left$(lp$,22)+""
20 dimfs(14):fori=1to14:readfs(i):nexti
40 data8,16,12,12,5,2,2,2,4,5,2,1,1,1
60 fori=1to14:cr$(i)=left$(b$,fs(i)):nexti
20 dimmm$(30):fori=1to30:readmm$(i):mm$(i)=mm$(i)+"":nexti
40 data"Insert New Order","Read Order Details","Amend Order details"
60 data"Delete Order","Print Order File","Insert New Casting"
65 data"Read Casting Record","Amend Casting Record"
70 data"Delete Casting Record","Print Casting File"
80 data"Sort by Pattern No.","Sort by Metal Grade"
90 data"Sort by Moulding Centre","Sort by Core Centre"
200 data"Sort by Box Code","Sort by Inspection Code","Sort by Order Group
210 data"Overdue Deliveries"
215 data"Orders Require Samples","Orders Waiting for Pattern"
218 data"Summary of Moulding Forward Load"
219 data"Summary of Forward Metal Requirements"
220 data"Core Centre","Moulding Centre","Metal Requirements"
240 data"Fettling","Heat Treatment","Machining","Final Inspection"
250 data"Despatch"
20 dimfl(31,20),rs$(250),sv(7)
20 dimpr$(9):forl=1to9:readpr$(l):pr$(l)=pr$(l)+"":nextl
40 data"Moulding        ","Casting         ","Fettling        "
50 data"Heat Treatment  ","Machining       "
60 data"Inspection      ","Despatch        ","Customer Returns"
70 data"Total Foundry   "
00 dimm$(12):fori=1to12:readm$(i):m$(i)=m$(i)+"":nexti
20 data" Jan "," Feb "," Mar "," Apr "," May "," Jun "
40 data" Jul "," Aug "," Sep "," Oct "," Nov "," Dec "
00 f1$="TOrder Index"+"":f2$="TOrder File"+""
00 f3$="TCast Index"+"":f4$="TCast File"+"":f5$="Prod Scrap"+""
00 dopen£1,(f1$):dopen£2,(f2$)
00 dimmc$(9):fori=1to9:readmc$(i):mc$(i)=mc$(i)+"":nexti
20 data"20","21","22","23","24","25","26","27","UA"
00 dimmt$(15):fori=1to15:readmt$(i):mt$(i)=mt$(i)+"":nexti
20 data"MET01","MET02","MET03","MET04","MET05","MET06","MET07","MET08"
40 data"MET09","MET10","MET11","MET12","MET13","MET14","MET15"
```

```
5200 dimtr$(8):fori=1to8:readtr$(i):tr$(i)=tr$(i)+"":nexti
5220 data"Moulded","Cast","Fettled","Heat Treated","Machined","Passed"
5240 data"Despatched","Returned"
5300 dimsr$(16):fori=1to16:readsr$(i):sr$(i)=sr$(i)+"":nexti
5310 data"Shrinkage","Sand Inclusion","Slag Inclusion","Crushed"
5320 data"Broken Mld","Misplaced Core"
5330 data"Misrun","Run Out","Ripped","Blown","Broken-In"
5340 data"Cracked","Distorted"
5350 data"Dimentional","Machine Shop","Miscellaneous"
6999 return
2000 print""left$(lp$,12)tab(20)"Setting Production Information Module"
2040 poke144,85:poke145,228:dload"prodB"
2100 print""left$(lp$,12)tab(20)"Setting Production Recording Module"
2140 poke144,85:poke145,228:dload"prodD"
2200 print""left$(lp$,12)tab(20)"Setting Forward Load Module"
2240 poke144,85:poke145,228:dload"prodC"
2300 print""left$(lp$,12)tab(20)"Setting Plant Loading Module"
2340 poke144,85:poke145,228:dload"prodE"
3900 dclose£1:dclose£2:close128
3910 print""left$(lp$,10)"IF YOU HAVE MADE ANY ALTERATIONS BACK UP DISK"
3920 print"SWITCH OFF SYSTEM":end
3999 rem              scratch"prodA",d0:dsave"prodA",d0:verify"*",8
```

prodB

```
ifin=999then10000
deffnc(x)=(asc(s$)and127)-64
deffnw(dw)=d+int(30.6*(m+1-(m<3)*12)+r)+int(365.25*(y+(m<3))+r)
0000 rem--update21/04/82 prodpeek
0020 sys9*4096
0040 s$=z$:s%=40:sys9*4096+48
0050 s$=un$:s%=26:sys9*4096+48
0060 s$="ABCD FOUNDRY":s%=0:sys9*4096+48
0190 goto11000
0405 c=abs(n)+5e-4:n$=right$("          "+str$(sgn(n)*int(c)),6)
0410 n$=n$+"."+mid$(str$(1+c-int(c))+"000000000",4,2):return
0505 getc$:ifc$<>""then10520
0510 print"*";:fornn=0to50:getc$:ifc$=""thennextnn
0515 ifc$=""thenprint"+";:fornn=0to50:getc$:ifc$=""thennextnn:goto10510
0520 ifc$=""thenreturn
0525 c=asc(c$)
0530 if(c$=")and(peek(152)=1)thensysrs
0535 ifc$<>"~"thenreturn
0540 ifpeek(152)=1thengosub49900:rem open255,4:print£255,chr$(12):close25
0545 c$=chr$(0):return
0605 ifs$=""thenreturn
0610 ifln=hithenprint""chr$(asc(u$))" ";:goto10620
0615 print""chr$(asc(u$))chr$(asc(u$))"";
0620 ln=ln-1:s$=left$(s$,ln):return
0705 print": ";
0710 s$="":ln=0:printleft$(u$,hi)left$(bs$,hi);
0715 gosub10505:ifc=13then10750
0720 ifc=20thengosub10605:goto10715
0725 ifln=hithen10715
0730 c=cand127:ifc<32orc>126then10715
0735 s$=s$+c$:ln=ln+1:printc$;chr$(27);
0745 goto10715
0750 ifln<lothen10715
0760 s$=left$(s$+b$,hi)
0765 printleft$(b$,hi-ln)" ";:return
1000 sys9*4096+3
2000 poke224,1:print""tab(20)"PRODUCTION INFORMATION"
2060 print""tab(20)"(a) Order Book Analysis
2070 print""tab(20)"(b) Production Program (Selected Period)
2080 print""tab(20)"(c) Current Load at P.K.O. Centres
2090 print""tab(20)"(d) Return to the Main System
2095 print""tab(20)"(e) Shut Down System
2100 printlp$tab(25)"Option";:lo=1:hi=1:gosub10705:op=fnc(0)
2110 ifop<1orop>5goto12100
2120 onopgoto15000,26000,28000,62000,63900
5000 rem--order book analysis
5020 print"";:printtab(15)"Order Book Analysis
5040 fori=11to20
5060 printleft$(lp$,((i-11)*1)+7);tab(20)"("chr$(i+64-10)") "+mm$(i):next
5100 printlp$tab(25)"Option";:lo=1:hi=1:gosub10705:op=fnc(0)
5120 ifop<1orop>11goto15100
5140 onopgoto15310,15620,16510,17220,15910,17400,18000,24000,25000,25000
5310 op=op+10:e=8:fr=2:nw=-1:ar=2:a=6
5320 gosub31620:gosub19100:gosub15480:prints$:gosub15520:prints$:poke224,
5340 fori=1tosa
5360 s$="page"+str$(p1)+" /"+left$(str$(p2)+b$,3):s%=69:sys9*4096+48
380 gosub19200:gosub43020:dw=cr(8):gosub48520
400 s$=cr$(1)+"      "+cr$(7)+"      "+nm$+"   "+jt$+"        "+cr
420 s$=s$+"    "+ct$+"      "+dd$:prints$
440 ifi<>1and(int(i/15)=i/15)thengosub19110:gosub19120
```

```
5460 nexti:gosub19140:poke224,1:goto15020
5480 s$="Order No.   M-Centre    Moulds    M-Time    C-Centre    C-Time"
5500 s$=s$+"      Mou-Schld":return
5520 s$="---------   --------    ------    ------    --------    ------"
5540 s$=s$+"      ---------":return
5620 op=op+10:fr=5:nw=-1:e=8:ar=5
5740 gosub31620:gosub19100:gosub15880:prints$:gosub15890:prints$:poke224,
5775 tw=0:gt=0:fori=1tosa
5790 gosub19200:gosub43020:tw=tw+jw:gt=gt+jw:dw=cr(8):gosub48520
5800 s$=cr$(1)+"      "+cr$(2)+"    "+right$(b$+str$(int(cr(2))),5)+"
5803 s$=s$+jw$+"      "+dd$
5806 ifleft$(rs$(i),7)=left$(rs$(i+1),7)then15809
5807 s$=s$+"  "+left$(dh$,5)+">"+right$(b$+str$(tw),6):tw=0
5809 prints$
5810 ifi<>1and(int(i/15)=i/15)thengosub19110:gosub19120
5811 nexti
5815 s$="   "+left$(dh$,75):prints$
5818 s$=left$(b$,52)+"Total"+right$(b$+str$(gt),20):prints$
5830 gosub19140:goto15020
5880 s$="Order No.    Pat No.          Wt/mould     Job Wt     Prod Date
5885 s$=s$+"      Days Total":return
5890 s$="---------    ----------       --------     ------     ---------
5895 s$=s$+"      ----------":return
5910 op=op+10:fr=9:nw=-1:e=8:ar=6:a=6:dt=0
5930 gosub31620:gosub19100:gosub16140:prints$:gosub16160:prints$:poke224,
6000 fori=1tosa
6030 gosub19200:gosub43020:dw=cr(8):gosub48520:dt=dt+nm
6035 s$=cr$(1)+"     "+cr$(2)+"     "+dd$+"        "+nm$
6040 ifleft$(rs$(i),7)=left$(rs$(i+1),7)then16045
6042 s$=s$+"  "+left$(dh$,5)+">"+right$(b$+str$(dt),6):dt=0
6045 prints$
6050 ifi<>1and(int(i/15)=i/15)thengosub19110:gosub19120
6060 nexti:gosub19140:goto15020
6140 s$="Order No.    Patt. No.          Mou-Schld    No-Boxes"
6145 s$=s$+"        Days Total":return
6160 s$="---------    ----------         ---------    --------"
6170 s$=s$+"        ----------":return
6220 op=op+10:fr=17:nw=-1:ar=12:e=9:a=7
6230 gosub31620:gosub19100:gosub16440:prints$:gosub16460:prints$:poke224,
6330 fori=1tosa:gosub19200:dw=cr(9):gosub48520:gosub43020
6340 s$=cr$(1)+"          "+right$(b$+str$(cr%(2)),5)+"              "
6350 s$=s$+right$(b$+str$(cr%(7)),5)+"        "+right$(b$+str$(cr%(7)*cr(1)
6352 s$=s$+"            "+dd$:prints$
6355 ifi<>1and(int(i/15)=i/15)thengosub19110:gosub19120
6360 nexti:gosub19140:goto15020
6440 s$="Job No.        Qty Ord          Qty Avail      Weight    "
6450 s$=s$+"      Dlev Date":return
6460 s$="-------        -------          ---------      ------    "
6470 s$=s$+"      ---------":return
6510 op=op+10:fr=10:nw=-1:e=8:ar=7:a=6
6530 gosub31620:gosub19100:gosub16730:prints$:gosub16760:prints$:poke224,
6600 tm=0:tw=0:tt=0:fori=1tosa:gosub19200:gosub43020:dw=cr(8):gosub48520
6640 tm=tm+nm:tw=tw+jw:tt=tt+jt
6660 s$=cr$(1)+"   "+cr$(2)+"   "+nm$+jt$+"         "
6670 s$=s$+cr$(5)+"     "+jw$+"       "+dd$
6672 ifcr$(12)<>"Y"thens$=s$+"*"
6675 prints$
6680 ifi<>1and(int(i/15)=i/15)thengosub19110:gosub19120
6690 nexti:s$=left$(dh$,79):prints$
6691 n=tt:gosub10405
6692 s$="       Totals"+right$(b$+str$(tm),22)
6693 s$=s$+n$+right$(b$+str$(tw),21):prints$:gosub19140
```

```
6695 ifop=24goto26000
6700 goto15020
6730 s$="Order No   Patt No.               Moulds      Time      Metal      Weigh
6740 s$=s$+"   Mou/Schld":return
6760 s$="---------  ------------           ------      ----      -----      -----
6770 s$=s$+"   ----------":return
7220 op=op+10:fr=13:nw=-1:e=8:ar=8:a=6
7230 gosub31620:gosub19100:gosub17310:prints$:gosub17330:prints$:poke224,
7240 fori=1tosa
7250 s$="page"+str$(p1)+" /"+left$(str$(p2)+b$,3):s%=69:sys9*4096+48
7260 gosub19200:gosub43020:dw=cr(8):gosub48520
7270 s$=cr$(1)+"   "+cr$(2)+"   "+right$(b$+str$(cr%(6)),5)+"     "
7280 s$=s$+left$(str$(cr(4))+"000",4)+" "+ct$+"           "+cr$(7)
7285 s$=s$+"        "+dd$:prints$
7290 ifi<>1and(int(i/15)=i/15)thengosub19110:gosub19120
7300 nexti:gosub19140:poke224,1:ifop=23goto26000
7305 goto15020
7310 s$="Order No.   Pattern No.         C-Qty   T/set   C-Time    M-Centr
7320 s$=s$+"    Mou-Schld":return
7330 s$="---------   -----------         -----   -----   ------    -------
7340 s$=s$+"    ----------":return
7400 rem
7420 op=op+10:fr=18:nw=-1:e=10:ar=11:a=3
7430 gosub31620:gosub19100:gosub17520:prints$:gosub17540:prints$:poke224,
7440 fori=1tosa
7450 gosub19200:gosub43020:dw=cr(10):gosub48520
7460 s$=cr$(1)+"         "+cr$(2)+"          "+right$(b$+str$(cr%(3)),5)
7490 s$=s$+"             "+dd$:prints$
7500 ifi<>1and(int(i/15)=i/15)thengosub19110:gosub19120
7510 nexti:gosub19140:goto15020
7520 s$="Order No.     Pattern No.             Qty-Order           Del-Schlu
7530 return
7540 s$="----------    ------------            ---------           ---------
7550 return
8000 rem
8010 print"Sort by Order Group"
8020 print"          Order Group";:lo=6:hi=6:gosub10705:og$=s$
8030 print"":poke224,5:sa=0:gosub31620
8040 forrc=2tono:recordf1,(rc):inputf1,a$
8050 ifleft$(a$,6)<>og$then18100
8060 sa=sa+1
8070 rs$(sa)=mid$(a$,7,1)+left$(a$,6)+right$(a$,1)+str$(rc)
8100 nextrc
8110 gosub36440:gosub18170
8130 fori=1tosa:rc=val(mid$(rs$(i),9)):recordf2,(rc):sysgr
8135 dw=cr(10):gosub48520
8140 s$=cr$(1)+"       "+cr$(2)+"      "+right$(b$+str$(cr%(3)),5)
8145 s$=s$+"           "+dd$
8150 prints$:nexti
8160 dclose:poke224,1:gosub49020:goto15000
8170 s$="Order No.    Pattern No.        Order Qty          Del-Schld":pri
8175 s$="---------    -----------        ---------          ---------":pri
8185 return
8900 d=val(left$(s$,2)):m=val(mid$(s$,4,2)):y=val(right$(s$,2))+1900:retu
9100 gosub36020:p2=int(sa/15+.99):p1=1:gosub19120:return
9110 ifi=sathenreturn
9115 gosub49200:print"";:p1=p1+1:return
9120 s$="page"+str$(p1)+"/"+left$(str$(p2)+b$,4):s%=69:sys9*4096+48:retur
9140 poke224,1:gosub49020:s$=left$(b$,10):s%=69:sys9*4096+48:return
9200 rc=val(mid$(rs$(i),9)):recordf2,(rc):sysgr:return
000 rem
020 print"":printleft$(lp$,11)tab(20)"Printing Overdue Deliveries"
```

```
4040 sa=0:gosub31620:forrc=2tono+1:record£2,(rc):sysgr
4060 ifcr(10)>cdthen24200
4080 sa=sa+1:rs$(sa)=str$(cr(10))+str$(rc)
4200 nextrc:gosub36440:p1=1:p2=0:k=50
4220 fori=1tosa:gosub24800
4240 rc=val(mid$(rs$(i),9)):record£2,(rc):sysgr:dw=cr(10):gosub48520
4260 s$=left$(str$(cd-dw)+b$,5)+"       "+cr$(3)+"     "+cr$(4)+"    "+cr$(1)
4280 s$=s$+"    "+right$(b$+str$(cr%(3)),5)+"  "+right$(b$+str$(cr%(5)),5)
4290 s$=s$+"  "+right$(b$+str$(cr%(8)),5)+"  "+right$(b$+str$(cr%(9)),5)
4295 s$=s$+"  "+right$(b$+str$(cr%(10)),5)+"  "+right$(b$+str$(cr%(11)),5
4298 s$=s$+"  "+right$(b$+str$(cr%(12)),5)+"  "+right$(b$+str$(cr%(13)),5
4300 s$=s$+"  "+right$(b$+str$(cr%(14)),5)+"  "+right$(b$+str$(cr%(15)),5
4310 s$=s$+"  "+right$(b$+str$(cr%(16)),5)+"   "+dd$:syscv
4320 nexti:s$=uc$+"End of list":syscv:gosub39999:goto15020
4800 ifk<50then24890
4820 p1=p1+1:k=0
4830 s$=en$+cm$+"                    Overdue Deliveries       "+z$+"      "
4835 syscv:s$="":syscv
4840 s$="DaysO/D   Customer         Casting Desc   Order No.  "
4850 s$=s$+"Ord Q   Cast   Fetl   Ht/T    M/c   Insp   Desp   Delv   Rect
4860 s$=s$+"   Scrp   Cu.R   Del Schld":syscv
4870 s$="-------   --------         ------------   ---------  "
4875 s$=s$+"-----   ----   ----   ---    ---   ----   ----   ----   ----
4880 s$=s$+"   ----   ----   ----------":syscv
4890 k=k+1:return
5000 rem
5005 ifop=12goto25015
5010 print"":printleft$(lp$,12)tab(23)"Processing Sample Requirments"
5012 goto25020
5015 print"":printleft$(lp$,12)tab(22)"Processing Pattern Requirments"
5020 sa=0:gosub31620:forrc=2tono+1:record£2,(rc):sysgr
5030 ifop=12then25060
5040 ifcr$(13)<>"Y"then25100
5050 goto25080
5060 ifcr$(12)<>"N"then25100
5080 sa=sa+1:rs$(sa)=str$(cr(8))+str$(rc)
5100 nextrc:gosub36440:p1=1:p2=0:k=50:gosub25200
5120 fori=1tosa:gosub25200
5130 rc=val(mid$(rs$(i),9)):record£2,(rc):sysgr:dw=cr(8):gosub48520:d1$=d
5135 dw=cr(7):gosub48520
5140 s$="    "+cr$(1)+"        "+cr$(2)+"   "+cr$(3)+"     "+d1$
5150 s$=s$+"        "+dd$:syscv
5160 nexti:s$="End of list":syscv:gosub39999:goto15020
5200 ifk<50then25330
5210 p1=p1+1:k=0
5220 ifop=12then25238
5230 s$=en$+cm$+"            Orders Requiring Samples          "+z$:syscv
5235 goto25240
5238 s$=en$+cm$+"           Orders Waitting for Patterns       "+z$:syscv
5240 s$=uc$+"":syscv
5250 s$="   Order No.      Pattern No.        Description       Mou-Schld"
5260 s$=s$+"         Order Date":syscv
5270 s$="   ----------     -----------        -----------       ----------"
5275 s$=s$+"         -----------":syscv
5330 k=k+1:return
5499 stop
6000 rem--production program moulding
6020 print"";:printtab(15)"Production Program (Selected Period)"
6040 fori=23to25
6060 printleft$(lp$,((i-24)*3)+13);tab(20)"("chr$(i+64-22)") "+mm$(i):nex
6080 printlp$tab(25)"Option";:lo=1:hi=1:gosub10705:op=fnc(0)
6100 ifop<1orop>3goto26080
```

```
6120 onopgoto26200,26300,26400
6200 op=op+22:fr=13:nw=0:e=8:ar=8:a=6
6220 goto17230
6300 op=op+22:fr=10:nw=0:e=8:ar=7:a=6
6320 goto16530
6400 op=op+22:fr=5:nw=0:e=8:ar=5
6420 goto15740
8000 f1$=dd$:dw=cr(10):gosub48520
8020 print"";:printtab(15)"Current Load at Post-knockout Centres"
8040 fori=26to30
8060 printleft$(lp$,((i-26)*3)+6);tab(23)"("chr$(i+64-25)") "+mm$(i):next
8080 printlp$tab(25)"Option";:lo=1:hi=1:gosub10705:op=fnc(0)
8100 ifop<1orop>5goto28080
8120 onopgoto28200,28250,28350,28400,28450
8200 op=op+25:a=8:e=9:goto28500
8250 op=op+25:a=9:e=10:goto28500
8350 op=op+25:a=10:e=10:goto28500
8400 op=op+25:a=11:e=10:goto28500
8450 op=op+25:a=12:e=10:goto28500
8500 print""left$(lp$,12)tab(20)"Processing Load at ";mm$(op)
8510 sa=0:gosub31620:forrc=2tono+1:record£2,(rc):sysgr
8520 ifcr%(a)<=0then28560
8540 sa=sa+1:rs$(sa)=str$(cr(e))+str$(rc)
8560 nextrc:gosub36440:gosub28990:gosub28900:ifop=26thengosub28700:goto28
8570 gosub28750
8580 poke224,4:fori=1tosa:rc=val(mid$(rs$(i),9)):record£2,(rc):sysgr:dw=c
8600 gosub48520:ifop=26thengosub28800:goto28640
8620 gosub28850
8640 ifi<>1and(int(i/15)=i/15)thengosub28910:gosub28930
8680 nexti:poke224,1:gosub49020:goto28020
8700 s$="Order No Pattern No.       Description    Qty  Weight Route "
8710 s$=s$+"Fet-Schld  Del-Schld":prints$
8720 s$="-------- -----------       -----------    ---  ------ ----- "
8730 s$=s$+"----------  ----------":prints$:return
8750 s$="Order No   Pattern No.         Description        Qty   Weight  Rou
8760 s$=s$+"   Del-Schld":prints$
8770 s$="--------   -----------         -----------        ---   ------  ---
8780 s$=s$+"   ----------":prints$:return
8800 f$=dd$:dw=cr(10):gosub48520
8810 s$=cr$(1)+" "+cr$(2)+" "+cr$(3)+" "+right$(b$+str$(cr%(a)),5)
8820 s$=s$+"  "+right$(b$+str$(cr%(a)*cr(1)),6)+"  "+cr$(9)+" "
8830 s$=s$+f$+"  "+dd$:prints$:return
8850 s$=cr$(1)+"   "+cr$(2)+"   "+cr$(3)+"    "+right$(b$+str$(cr%(a)),5)
8860 s$=s$+"    "+right$(b$+str$(cr%(a)*cr(1)),6)+"    "+cr$(9)
8870 s$=s$+"    "+dd$:prints$:return
8900 p2=int(sa/15+.99):p1=1:gosub28930:return
8910 ifi=sathenreturn
8920 gosub49200:print"";:p1=p1+1:return
8930 s$="page"+str$(p1)+"/"+left$(str$(p2)+b$,4):s%=69:sys9*4096+48:retur
8940 poke224,1:gosub49020:s$=left$(b$,10):s%=69:sys9*4096+48:return
8990 print"Current Load in ";mm$(op):return
1020 record£1,1:input£1,no:no=no+1
040 record£1,1:print£1,no:record£1,(no+1):print£1,cr$(1)
060 record£2,(no+1):syswr:return
220 record£1,(z):print£1,cr$(1)
240 record£2,(z):syswr:return
420 record£1,(z):print£1,"Deleted"
440 fori=1to14:cr$(i)=left$(b$,fs(i)):nexti
460 fori=1to9:cr(i)=0:nexti:fori=1to13:cr%(i)=0:nexti
480 record£2,(z):syswr:return
620 record£1,1:input£1,no:return
840 v=0:record£1,1:input£1,no
```

```
1860 forrc=2tono+1:record£1,(rc):input£1,a$
1880 ifa$=cr$(1)thenz=(rc):return
1900 nextrc:printchr$(13)"Record not found"
1920 gosub49020:v=1:return
2020 record£2,(z):sysgr:return
2220 record£1,1:input£1,no:v=0
2240 forrc=2tono+1:record£1,(rc):input£1,a$
2260 ifa$="Deleted"thenz=(rc):v=v+1:return
2280 nextrc:return
2420 v=0:record£1,1:input£1,no
2430 forrc=2tono+1:record£1,(rc):input£1,a$
2440 ifa$=cr$(1)goto32480
2460 nextrc:return
2480 v=1:print:print"This Order No. Already in Use"
2500 printbl$lp$"Key SPACE to Continue"
2520 getc$:ifc$<>" "then32520
2540 return
6020 ifop=23orop=24orop=25thenprint"Production Program":goto36085
6030 print""mm$(op)""
6040 print"           "mid$(mm$(op),9)" ";:lo=1:hi=fw(fr,3):gosub10705:ac$=s
6080 ifnw=-1goto36240
6085 ifop=23goto36092
6087 ifop=24goto36094
6090 goto36096
6092 print"Core Centre ";:lo=1:hi=fw(fr,3):gosub10705:ac$=s$:goto36100
6094 print"Moulding Centre ";:lo=1:hi=fw(fr,3):gosub10705:ac$=s$:goto3610
6096 print"Metal Grade ";:lo=1:hi=fw(fr,3):gosub10705:ac$=s$
6100 printleft$(lp$,1)tab(52)"From Date ";:lo=8:hi=8:gosub10705:gosub4404
6120 w1=w:ifw=0goto36100
6140 printleft$(lp$,1)tab(63)s$
6160 printleft$(lp$,2)tab(52)"To   Date ";:lo=8:hi=8:gosub10705:gosub4404
6180 w2=w:ifw=0goto36160
6200 printleft$(lp$,2)tab(63)s$
6240 print:sa=0
6260 forrc=2tono+1
6280 record£2,(rc):sysgr:w=cr(e)
6300 iffr=5then36360
6310 iffr=18then36380
6320 ifcr%(a)=0then36400
6340 goto36380
6360 ifcr%(6)<=0andcr%(7)<=0then36400
6380 ifnw=0thengoto36385
6382 ifcr$(ar)=ac$thensa=sa+1:goto36390
6383 goto36400
6385 ifcr(8)>=w1andcr(8)<=w2thenifcr$(ar)=ac$thensa=sa+1:goto36390
6387 goto36400
6390 rs$(sa)=str$(cr(e))+str$(rc)
6400 nextrc
6440 ifsa>0then36520
6460 printbl$lp$"No Records Satisfied, Key SPACE to Continue"
6480 getc$:ifc$<>" "then36480
6500 sysrs
6520 g=sa
6540 g=int(g/2):ifg=0thenreturn
6560 fori=1tosa-g:jj=i+g
6580 forj=ito1step-g
6600 ifrs$(jj)<rs$(j)thenc$=rs$(jj):rs$(jj)=rs$(j):rs$(j)=c$:jj=j:nextj
6620 nexti:goto36540
6640 return
999 open200,4:cmd200:print£200,chr$(12):close200:return
500 iffr=2orfr=3orfr=16thenw1=val(left$(rs$(1),5)):w2=val(left$(rs$(sa),
510 s$=mid$(mm$(op),9)+" : "+ac$+"          (From Week : "+str$(fny(w1))
```

```
1520 s$=s$+"        To Week : "+str$(fny(w2))+")":sys9*4096+18*3
1560 s$=left$(dh$,79):syscv
1580 s$=" ":syscv:return
3020 nm=int(cr%(6)/cr%(1)+.5):nm$=right$(b$+str$(nm),5)
3040 jw=int(nm*cr(2)+.5):jw$=right$(b$+str$(jw),6)
3060 jt=nm*cr(3):n=jt:gosub10405:jt$=n$
3070 ct=cr%(6)*cr(4):n=ct:gosub10405:ct$=n$
3499 return
4040 d=val(left$(s$,2)):m=val(mid$(s$,4,2)):y=val(right$(s$,2))+1900
4080 w=fnw(dw):dw=w:gosub48520:return
6020 onfw(i,1)gosub46040,46060,46080:return
6040 cr$(fw(i,2))=s$:return
6060 cr(fw(i,2))=val(s$):return
6080 cr%(fw(i,2))=val(s$):return
6220 onfw(i,1)gosub46240,46260,46280:return
6240 s$=cr$(fw(i,2)):return
6260 s$=mid$(str$(cr(fw(i,2))),2):return
6280 s$=mid$(str$(cr%(fw(i,2))),2):return
8510 dw=cr(fw(i,2))
8520 y=int(dw/365.25+r)
8530 y2=int(y*365.25+r):m=int((dw-y2)/30.6+r):ifm<4theny=y-1:goto48530
8540 d=dw-int(r+m*30.6)-y2:ifd=0thenm=m-1:goto48540
8545 d$=right$(str$(100+d),2):y=(y-(m>13)):y$=right$(str$(y),2)
8560 m=(m-1+(m>13)*12):dd$=d$+m$(m)+y$:s$=dd$:return
8740 d=val(left$(s$,2)):m=val(mid$(s$,4,2)):y=val(right$(s$,2))+1900
8760 cr(fw(i,2))=fnw(dw):dw=cr(fw(i,2))
8770 gosub48520:printleft$(lp$,fw(i,4));tab(fw(i,5));": ";s$:return
9020 poke158,0:printbl$lp$"Key SPACE to Continue"
9030 getc$:ifc$=""then49030
9035 printlp$"
9040 gosub10525
9110 printlp$:ifc$=chr$(0)then49020
9120 return
9200 poke158,0:printleft$(lp$,18)"Key SPACE for next page"
9220 getc$:ifc$=""then49220
9230 printleft$(lp$,18)"
9240 gosub10525
9260 printleft$(lp$,18):ifc$=chr$(0)then49280
9280 return
9900 qq=qq+1:open6,8,6,"1:dump"+mid$(str$(qq),2)+",s,w":sys37528:return
2000 print""left$(lp$,12)tab(25)"Loading Main System"
2040 poke144,85:poke145,228:dload"prodA"
3900 dclose£1:dclose£2:close128
3910 print""left$(lp$,10)"IF YOU HAVE MADE ANY ALTERATIONS BACK UP DISK"
3920 print"SWITCH OFF SYSTEM":end
3999 rem                 scratch"prodB",d0:dsave"prodB",d0:verify"*",8
```

prodC

```
ifin=999then10000
deffnc(x)=(asc(s$)and127)-64
deffnw(dw)=d+int(30.6*(m+1-(m<3)*12)+r)+int(365.25*(y+(m<3))+r)
0000 rem--update21/04/82 prodlen
0020 sys9*4096
0040 s$=z$:s%=40:sys9*4096+48
0050 s$=un$:s%=26:sys9*4096+48
0060 s$="ABCD FOUNDRY":s%=0:sys9*4096+48
0190 goto11000
0405 c=abs(n)+5e-4:n$=right$("          "+str$(sgn(n)*int(c)),6)
0410 n$=n$+"."+mid$(str$(1+c-int(c))+"000000000",4,2):return
0505 getc$:ifc$<>""then10520
0510 print"*";:fornn=0to50:getc$:ifc$=""thennextnn
0515 ifc$=""thenprint"+";:fornn=0to50:getc$:ifc$=""thennextnn:goto10510
0520 ifc$=""thenreturn
0525 c=asc(c$)
0530 if(c$=")and(peek(152)=1)thensysrs
0535 ifc$<>"~"thenreturn
0540 ifpeek(152)=1thengosub49900:rem open255,4:print£255,chr$(12):close25
0545 c$=chr$(0):return
0605 ifs$=""thenreturn
0610 ifln=hithenprint""chr$(asc(u$))" ";:goto10620
0615 print""chr$(asc(u$))chr$(asc(u$))"";
0620 ln=ln-1:s$=left$(s$,ln):return
0705 print": ";
0710 s$="":ln=0:printleft$(u$,hi)left$(bs$,hi);
0715 gosub10505:ifc=13then10750
0720 ifc=20thengosub10605:goto10715
0725 ifln=hithen10715
0730 c=cand127:ifc<32orc>126then10715
0735 s$=s$+c$:ln=ln+1:printc$;chr$(27);
0745 goto10715
0750 ifln<lothen10715
0760 s$=left$(s$+b$,hi)
0765 printleft$(b$,hi-ln)" ";:return
1000 sys9*4096+3
2000 poke224,1:print""tab(20)"Forward Loads"
2060 print""tab(20)"(a) Summary of Moulding Load"
2070 print""tab(20)"(b) Summary of Metal Requirements"
2090 print""tab(20)"(c) Return to the Main System
2095 print""tab(20)"(d) Shut Down System
2100 printlp$tab(25)"Option";:lo=1:hi=1:gosub10705:op=fnc(0)
2110 ifop<1orop>4goto12100
2120 onopgoto21000,23000,62000,63900
1000 rem--moulding forward load
1010 print"":printleft$(lp$,12)spc(22)"Processing Moulding Forward Load"
1020 dn=0:gosub31620
030 p1=1:p2=0:fori=0to30:forj=1to20:fl(i,j)=0:nextj,i
080 forrc=2tono+1:record£2,(rc):sysgr
090 ifcr%(6)=0then21300
100 forj=1to9:ifcr$(7)<>mc$(j)thennextj:goto21300
110 dn=cr(8)-cd+1:ifdn<1thendn=0
120 nm=int(cr%(6)/cr%(1)+.5):jt=int(nm*cr(3)+.5)
130 ifdn>28thendn=29
140 fl(dn,j)=fl(dn,j)+nm:fl(dn,19)=fl(dn,19)+nm
150 fl(dn,j+9)=fl(dn,j+9)+jt:fl(dn,20)=fl(dn,20)+jt
300 nextrc
320 forj=1to20:fori=0to29:fl(30,j)=fl(30,j)+fl(i,j):nexti:nextj
520 s$=en$+cm$+"Summary of Forward Load":syscv:s$="":syscv
540 s$=left$(b$,57)+en$+cm$+"Moulding Centre":syscv:s$=eq$:syscv
```

```
1600 s$=" Date      !    20    !    21    !    22    !    23    !"
1620 s$=s$+"    24    !    25    !    26    !    27    !    UA    !"
1630 s$=cm$+s$+"    Total  !":syscv
1642 s$="            ! Mlds  Hrs ! Mlds  Hrs ! Mlds  Hrs ! Mlds  Hrs !"
1644 s$=s$+" Mlds  Hrs ! Mlds  Hrs ! Mlds  Hrs ! Mlds  Hrs ! Mlds  Hrs !"
1646 s$=s$+" Mlds  Hrs !":syscv:s$=eq$:syscv
1675 fori=0to30:dw=cd+i-1:gosub48520:s$="":forj=1to9
1690 s$=s$+" !"+right$(b$+str$(fl(i,j)),5)+right$(b$+str$(fl(i,j+9)),5):n
1695 s$=s$+" !"+right$(b$+str$(fl(i,19)),5)+right$(b$+str$(fl(i,20)),5)+"
1697 ifi=0thendd$="Overdues "
1698 ifi=29thendd$="Others   "
1699 ifi=30thendd$="Totals   "
1700 s$=dd$+" "+s$:syscv
1701 goto 21740
1720 s$="":d1$=left$(dh$,11)+"+":fork=1to11:s$=s$+d1$:nextk
1730 ifi=29ori=30thens$=eq$
1735 syscv
1740 nexti:s$=uc$:syscv:goto12000
3000 rem--metal forward load
3020 print"":printleft$(lp$,12)spc(20)"Processing Metal Requirements"
3030 dn=0:gosub31620
3040 p1=1:p2=0:fori=0to30:forj=1to16:fl(i,j)=0:nextj,i
3060 forrc=2tono+1:record£2,(rc):sysgr
3080 ifcr%(6)=0andcr%(7)=0then23220
3100 forj=1to15:ifcr$(5)<>mt$(j)thennextj:goto23220
3120 dn=cr(8)-cd+1:ifdn<1thendn=0
3140 jw=int(((cr%(6)+cr%(7))/cr%(1)+.5)*cr(2))
3160 ifdn>28thendn=29
3180 fl(dn,j)=fl(dn,j)+jw:fl(dn,16)=fl(dn,16)+jw
3220 nextrc
3240 forj=1to16:fori=0to29:fl(30,j)=fl(30,j)+fl(i,j):nexti:nextj
3540 s$=chr$(14)+chr$(15)+"Summary of Metal Requirements":syscv:s$="":sys
3560 s$=left$(b$,40)+chr$(14)+chr$(15)+"Metal Grade *** Weights in Kgs":s
3580 s$=chr$(15)+left$(eq$,125):syscv
3600 s$=" Date       ! MET01! MET02! MET03! MET04! MET05! MET06! MET07!"
3620 s$=s$+" MET08! MET09! MET10! MET11! MET12! MET13! MET14! N/Std!"
3640 s$=chr$(15)+s$+"  Total!":syscv:s$=left$(eq$,125):syscv
3700 fori=0to30:dw=cd+i-1:gosub48520:s$="":forj=1to15
3720 forj=1to15:s$=s$+"!"+right$(b$+str$(fl(i,j)),6):nextj
3740 s$=s$+"!"+right$(b$+str$(fl(i,16)),7)+"!"
3760 ifi=0thendd$="Overdues "
3780 ifi=29thendd$="Others   "
3800 ifi=30thendd$="Totals   "
3820 s$=dd$+"  "+s$:syscv
3821 goto23900
3840 s$="-----------+":d1$=left$(dh$,6)+"+":fork=1to15:s$=s$+d1$:nextk
3850 s$=s$+"-------+"
3860 ifi=29ori=30thens$=left$(eq$,125)
3880 syscv
3900 nexti:s$=chr$(18):syscv:goto12000
1020 record£1,1:input£1,no:no=no+1
1040 record£1,1:print£1,no:record£1,(no+1):print£1,cr$(1)
1060 record£2,(no+1):syswr:return
220 record£1,(z):print£1,cr$(1)
240 record£2,(z):syswr:return
420 record£1,(z):print£1,"Deleted"
440 fori=1to14:cr$(i)=left$(b$,fs(i)):nexti
460 fori=1to9:cr(i)=0:nexti:fori=1to13:cr%(i)=0:nexti
480 record£2,(z):syswr:return
620 record£1,1:input£1,no:return
840 v=0:record£1,1:input£1,no
860 forrc=2tono+1:record£1,(rc):input£1,a$
```

```
1880 ifa$=cr$(1)thenz=(rc):return
1900 nextrc:printchr$(13)"Record not found"
1920 gosub49020:v=1:return
2020 record£2,(z):sysgr:return
2220 record£1,1:input£1,no:v=0
2240 forrc=2tono+1:record£1,(rc):input£1,a$
2260 ifa$="Deleted"thenz=(rc):v=v+1:return
2280 nextrc:return
2420 v=0:record£1,1:input£1,no
2430 forrc=2tono+1:record£1,(rc):input£1,a$
2440 ifa$=cr$(1)goto32480
2460 nextrc:return
2480 v=1:print:print"This Order No. Already in Use"
2500 printbl$lp$"Key SPACE to Continue"
2520 getc$:ifc$<>" "then32520
2540 return
6020 ifop=23orop=24orop=25thenprint"Production Program":goto36085
6030 print""mm$(op)""
6040 print"          "mid$(mm$(op),9)" ";:lo=1:hi=fw(fr,3):gosub10705:ac$=s
6080 ifnw=-1goto36240
6085 ifop=23goto36092
6087 ifop=24goto36094
6090 goto36096
6092 print"Core Centre ";:lo=1:hi=fw(fr,3):gosub10705:ac$=s$:goto36100
6094 print"Moulding Centre ";:lo=1:hi=fw(fr,3):gosub10705:ac$=s$:goto3610
6096 print"Metal Grade ";:lo=1:hi=fw(fr,3):gosub10705:ac$=s$
6100 printleft$(lp$,1)tab(52)"From Date ";:lo=8:hi=8:gosub10705:gosub4404
6120 w1=w:ifw=0goto36100
6140 printleft$(lp$,1)tab(63)s$
6160 printleft$(lp$,2)tab(52)"To   Date ";:lo=8:hi=8:gosub10705:gosub4404
6180 w2=w:ifw=0goto36160
6200 printleft$(lp$,2)tab(63)s$
6240 print:sa=0
6260 forrc=2tono+1
6280 record£2,(rc):sysgr:w=cr(e)
6300 iffr=5then36360
6310 iffr=18then36380
6320 ifcr%(a)=0then36400
6340 goto36380
6360 ifcr%(6)<=0andcr%(7)<=0then36400
6380 ifnw=0thengoto36385
6382 ifcr$(ar)=ac$thensa=sa+1:goto36390
6383 goto36400
6385 ifcr(8)>=w1andcr(8)<=w2thenifcr$(ar)=ac$thensa=sa+1:goto36390
6387 goto36400
6390 rs$(sa)=str$(cr(e))+str$(rc)
6400 nextrc
6440 ifsa>0then36520
6460 printbl$lp$"No Records Satisfied, Key SPACE to Continue"
6480 getc$:ifc$<>" "then36480
6500 sysrs
6520 g=sa
6540 g=int(g/2):ifg=0thenreturn
6560 fori=1tosa-g:jj=i+g
6580 forj=ito1step-g
6600 ifrs$(jj)<rs$(j)thenc$=rs$(jj):rs$(jj)=rs$(j):rs$(j)=c$:jj=j:nextj
6620 nexti:goto36540
6640 return
999 open200,4:cmd200:print£200,chr$(12):close200:return
500 iffr=2orfr=3orfr=16thenw1=val(left$(rs$(1),5)):w2=val(left$(rs$(sa),
510 s$=mid$(mm$(op),9)+" : "+ac$+"             (From Week : "+str$(fny(w1))
520 s$=s$+"          To Week : "+str$(fny(w2))+")":sys9*4096+18*3
```

```
1560 s$=left$(dh$,79):syscv
1580 s$=" ":syscv:return
3020 nm=int(cr%(6)/cr%(1)+.5):nm$=right$(b$+str$(nm),5)
3040 jw=int(nm*cr(2)+.5):jw$=right$(b$+str$(jw),6)
3060 jt=nm*cr(3):n=jt:gosub10405:jt$=n$
3070 ct=cr%(6)*cr(4):n=ct:gosub10405:ct$=n$
3499 return
4040 d=val(left$(s$,2)):m=val(mid$(s$,4,2)):y=val(right$(s$,2))+1900
4080 w=fnw(dw):dw=w:gosub48520:return
6020 onfw(i,1)gosub46040,46060,46080:return
6040 cr$(fw(i,2))=s$:return
6060 cr(fw(i,2))=val(s$):return
6080 cr%(fw(i,2))=val(s$):return
6220 onfw(i,1)gosub46240,46260,46280:return
6240 s$=cr$(fw(i,2)):return
6260 s$=mid$(str$(cr(fw(i,2))),2):return
6280 s$=mid$(str$(cr%(fw(i,2))),2):return
8510 dw=cr(fw(i,2))
8520 y=int(dw/365.25+r)
8530 y2=int(y*365.25+r):m=int((dw-y2)/30.6+r):ifm<4theny=y-1:goto48530
8540 d=dw-int(r+m*30.6)-y2:ifd=0thenm=m-1:goto48540
8545 d$=right$(str$(100+d),2):y=(y-(m>13)):y$=right$(str$(y),2)
8560 m=(m-1+(m>13)*12):dd$=d$+m$(m)+y$:s$=dd$:return
8740 d=val(left$(s$,2)):m=val(mid$(s$,4,2)):y=val(right$(s$,2))+1900
8760 cr(fw(i,2))=fnw(dw):dw=cr(fw(i,2))
8770 gosub48520:printleft$(lp$,fw(i,4));tab(fw(i,5));": ";s$:return
9020 poke158,0:printbl$lp$"Key SPACE to Continue"
9030 getc$:ifc$=""then49030
9035 printlp$"
9040 gosub10525
9110 printlp$:ifc$=chr$(0)then49020
9120 return
9200 poke158,0:printleft$(lp$,18)"Key SPACE for next page"
9220 getc$:ifc$=""then49220
9230 printleft$(lp$,18)"
9240 gosub10525
9260 printleft$(lp$,18):ifc$=chr$(0)then49280
9280 return
9900 qq=qq+1:open6,8,6,"'1:dump"+mid$(str$(qq),2)+",s,w":sys37528:return
2000 print""left$(lp$,12)tab(25)"Loading Main System"
2040 poke144,85:poke145,228:dload"prodA"
3900 dclose£1:dclose£2:close128
3910 print""left$(lp$,10)"IF YOU HAVE MADE ANY ALTERATIONS BACK UP DISK"
3920 print"SWITCH OFF SYSTEM":end
3999 rem                  scratch"prodC",d0:dsave"prodC",d0:verify"*",8
ady.
```

prodD

```
 ifin=999then10000
 deffnc(x)=(asc(s$)and127)-64
 deffnw(dw)=d+int(30.6*(m+1-(m<3)*12)+r)+int(365.25*(y+(m<3))+r)
0000 rem--update21/02/82 prodstr$
0020 sys9*4096
0040 s$=z$:s%=40:sys9*4096+48
0050 s$=un$:s%=26:sys9*4096+48
0060 s$="ABCD FOUNDRY":s%=0:sys9*4096+48
0190 goto11000
0405 c=abs(n)+5e-4:n$=right$("              "+str$(sgn(n)*int(c)),6)
0410 n$=n$+"."+mid$(str$(1+c-int(c))+"000000000",4,2):return
0505 getc$:ifc$<>""then10520
0510 print"*";:fornn=0to50:getc$:ifc$=""thennextnn
0515 ifc$=""thenprint"+";:fornn=0to50:getc$:ifc$=""thennextnn:goto10510
0520 ifc$=""thenreturn
0525 c=asc(c$)
0530 if(c$=")and(peek(152)=1)thensysrs
0535 ifc$<>"~"thenreturn
0540 ifpeek(152)=1thengosub49900:rem open255,4:print£255,chr$(12):close25
0545 c$=chr$(0):return
0605 ifs$=""thenreturn
0610 ifln=hithenprint""chr$(asc(u$))" ";:goto10620
0615 print""chr$(asc(u$))chr$(asc(u$))"";
0620 ln=ln-1:s$=left$(s$,ln):return
0705 print": ";
0710 s$="":ln=0:printleft$(u$,hi)left$(bs$,hi);
0715 gosub10505:ifc=13then10750
0720 ifc=20thengosub10605:goto10715
0725 ifln=hithen10715
0730 c=cand127:ifc<32orc>126then10715
0735 s$=s$+c$:ln=ln+1:printc$;chr$(27);
0745 goto10715
0750 ifln<lothen10715
0760 s$=left$(s$+b$,hi)
0765 printleft$(b$,hi-ln)" ";:return
1000 sys9*4096+3:dclose£5
2000 poke224,1:print""spc(15)"PRODUCTION RECORDING AND ANALYSIS"
2070 print""spc(20)"(a)  Production and Scrap Recording
2080 print""spc(20)"(b)  Production and Scrap Reports
2090 print""spc(20)"(c)  Scrap Analysis
2092 print""spc(20)"(d)  Return to the Main System
2095 print""spc(20)"(e)  Shut Down System"
2100 printlp$tab(25)"Option";:lo=1:hi=1:gosub10705:op=fnc(0)
2110 ifop<1orop>5goto12100
2120 onopgoto25100,28020,12000,62000,63900
3900 d=val(left$(s$,2)):m=val(mid$(s$,4,2)):y=val(right$(s$,2))+1900:retu
5100 print""spc(17)"Production Recording":print
5120 forl=1to8:print""tab(20)"("chr$(l+64)")"tab(25)pr$(l):nextl
5140 printlp$tab(25)"Option";:lo=1:hi=1:gosub10705:op=fnc(0):l=op
5150 ifop<1orop>8thenprintbl$:goto25140
5160 dopen£5,(f5$),d1:nr=0
5200 print""tab(10)"Production Recording"tab(40)pr$(l)
5500 print"Order No";:lo=1:hi=fw(1,3):gosub10705:cr$(1)=s$
5520 gosub31840:ifv=1goto25200
540 gosub32020:gosub42020:gosub42500:gosub42300
560 printbl$lp$"Any Alterations(Y/N)";:lo=1:hi=1:gosub10705
580 ifs$<>"Y"ands$<>"N"thenprintbl$;:goto25560
600 ifs$="Y"then25200
620 if(qt+qr+qs)=0then25960
900 gosub31220:gosub26040
```

```
5920 printbl$lp$;"Production Recorded      Key SPACE to Continue"
5940 gosub49030:goto25200
5960 printbl$lp$;" NOT RECORDED      KEY SPACE TO CONTINUE"
5980 gosub49030:goto25200
6040 cr$(10)=cn$:cr(2)=l:cr(3)=qt:cr(4)=qr:cr(5)=qs:cr(10)=cd
6045 cr(7)=qt+qr+qs:fori=1to16:cr%(i)=sq(i):nexti
6050 record£5,1:input£5,nr:nr=nr+1:record£5,1:print£5,nr
6120 record£5,(nr+1):syswr
6200 return
3020 print""spc(17)"Production Reports"
3040 forl=1to9:print""tab(20)"("chr$(l+64)")"tab(25)pr$(l):nextl
3060 printlp$tab(25)"Option";:lo=1:hi=1:gosub10705:op=fnc(0):l=op
3080 ifop<1orop>9thenprintbl$:goto28060
3100 print""left$(lp$,5)tab(20)"Production Report       :"pr$(l)
3120 printleft$(lp$,10)tab(20)"From Date                 ";:lo=8:hi=8:gosub107
3140 gosub18900:d1=fnw(dw):dw=d1:gosub48520
3150 printleft$(lp$,10)tab(20)"From Date                :";dd$
3160 printleft$(lp$,15)tab(20)"To Date                   ";:lo=8:hi=8:gosub107
3180 gosub18900:d2=fnw(dw):dw=d2:gosub48520
3190 printleft$(lp$,15)tab(20)"To Date                  :";dd$
3222 ifl=9thengoto28227
3225 ce$=pr$(l):k=l:gosub28230:gosub39990:goto28020
3227 fork=1to8:ce$=pr$(k):gosub28230:gosub39990:nextk:goto28020
3230 gosub28800
3232 nr=0:dopen£5,(f5$),d1:record£5,1:input£5,nr
3235 forj=2tonr+1:record£5,(j):sysgr
3250 ifk<>cr(2)thengoto28400
3260 ifcr(10)<d1orcr(10)>d2thengoto28400
3300 dw=cr(10):gosub48520
3320 gosub28600
3400 nextj:dclose£5:return
3600 qp$=right$(b$+str$(cr(7)),5)
3610 pw$=right$(b$+str$(cr(7)*cr(1)),8)
3620 qs$=right$(b$+str$(cr(5)),5)
3630 sw$=right$(b$+str$(cr(5)*cr(1)),8)
3640 ps$=right$(left$(str$(int((cr(5)/cr(7))*100+.5)),3),2)
3700 s$=cr$(1)+"   "+cr$(2)+"   "+cr$(3)+"   "
3720 s$=s$+qp$+"    "+pw$+"    "+qs$+"    "+sw$+"      "+ps$+"      "+dd$+"
3725 s$=s$+cr$(10)
3730 ifk=2ork=7ork=8thens$=s$+"       "+right$(b$+str$(cr(7)*cr(6)),8)
3770 s$=cm$+s$:syscv:return
3800 s$=cm$+en$+"Production Report"+"           "+ce$+"         "+z$:syscv
3810 s$="":syscv
3820 s$="Order No   Pattern No          Description      Tot.Qty"
3840 s$=s$+"   Total-Wt   Q-Scr   Scrap-Wt   %Scr   Prod Date    Cl.No
3850 ifk=2ork=7ork=8thens$=s$+"     "+"Sales Value"
3860 s$=cm$+s$:syscv
3870 s$="--------   ----------       ----------     ------"
3880 s$=s$+"   -------   -----   -------   ---   --------    ----"
3885 ifk=2ork=7ork=8thens$=s$+"   "+"-----------"
3890 s$=cm$+s$:syscv:return
9020 rem-scrap analysis
9040 goto12000
9900 rem--scratch and create report file
9910 scratch"Prod Scrap",d1
9920 dopen£5,"Prod Scrap",d1,l175
9930 record£5,1:print£5,0:
9940 dclose£5:end
020 record£1,1:input£1,no:no=no+1
040 record£1,1:print£1,no:record£1,(no+1):print£1,cr$(1)
060 record£2,(no+1):syswr:return
220 record£1,(z):print£1,cr$(1)
```

```
1240 record£2,(z):syswr:return
1420 record£1,(z):print£1,"Deleted"
1440 fori=1to14:cr$(i)=left$(b$,fs(i)):nexti
1460 fori=1to9:cr(i)=0:nexti:fori=1to13:cr%(i)=0:nexti
1480 record£2,(z):syswr:return
1620 record£1,1:input£1,no:return
1840 v=0:record£1,1:input£1,no
1860 forrc=2tono+1:record£1,(rc):input£1,a$
1880 ifa$=cr$(1)thenz=(rc):return
1900 nextrc:printchr$(13)"Record not found"
1920 gosub49020:v=1:return
2020 record£2,(z):sysgr:return
2220 record£1,1:input£1,no:v=0
2240 forrc=2tono+1:record£1,(rc):input£1,a$
2260 ifa$="Deleted"thenz=(rc):v=v+1:return
2280 nextrc:return
2420 v=0:record£1,1:input£1,no
2430 forrc=2tono+1:record£1,(rc):input£1,a$
2440 ifa$=cr$(1)goto32480
2460 nextrc:return
2480 v=1:print:print"This Order No. Already in Use"
2500 printbl$lp$"Key SPACE to Continue"
2520 getc$:ifc$<>" "then32520
2540 return
3120 dopen£3,d1:record£3,1:input£1,nc:nc=nc+1
3140 record£3,1:print£3,nc:record£3,(nc+1):print£3,cr$(2):dclose£3
3160 dopen£4,d1:record£4,(nc+1):syswr:dclose£4:return
3220 dopen£3,(f3$),d1:record£3,(z):print£3,cr$(2):dclose£3
3240 dopen£4,(f4$),d1:record£4,(z):syswr:dclose£4:return
3420 dopen£3,(f3$),d1:record£3,(z):print£3,"Deleted            ":dclose£3
3440 fori=1to14:cr$(i)=left$(b$,fs(i)):nexti
3460 fori=1to9:cr(i)=0:nexti:fori=1to13:cr%(i)=0:nexti
3480 dopen£4,(f4$),d1:record£4,(z):syswr:dclose£4:return
3620 dopen£3,(f3$),d1:record£3,1:input£3,nc:dclose£3:return
3840 v=0:dopen£3,(f3$),d1:record£3,1:input£3,nc
3860 forrc=2tonc+1:record£3,(rc):input£3,a$
3880 ifa$=cr$(2)thenz=(rc):dclose£3:return
3900 nextrc:dclose£3:printchr$(13)"Record not found"
3920 gosub49020:v=1:return
4020 dopen£4,(f4$),d1:record£4,(z):sysgr:dclose£4:return
4220 dopen£3,d1:record£3,1:input£3,nc:v=0
4240 forrc=2tonc+1:record£3,(rc):input£3,a$
4260 ifa$="Deleted            "thenz=(rc):dclose£3:v=v+1:return
4280 nextrc:dclose£3:return
4420 v=0:dopen£3,(f3$),d1:record£3,1:input£3,nc
4430 forrc=2tonc+1:record£3,(rc):input£3,a$
4440 ifa$=cr$(2)thendclose£3:goto34480
4460 nextrc:dclose£3:return
4480 v=1:print:print"This Pattern No. Already in Use"
4500 printbl$lp$"Key SPACE to Continue"
4520 getc$:ifc$<>" "then34520
4540 return
6020 print""mm$(op)""
6040 print"           "mid$(mm$(op),9)" ";:lo=1:hi=fw(fr,3):gosub10705:ac$=s
6080 ifnwthenw1=wl:w2=wh:goto36240
100 printleft$(lp$,1)tab(52)"From Date ";:lo=8:hi=8:gosub10705:gosub4404
120 w1=w:ifw=0goto36100
140 printleft$(lp$,1)tab(63)s$
160 printleft$(lp$,2)tab(52)"To   Date ";:lo=8:hi=8:gosub10705:gosub4404
180 w2=w:ifw=0goto36160
200 printleft$(lp$,2)tab(63)s$
240 print:sa=0
```

```
6260 forrc=2tono+1
6280 record£2,(rc):sysgr:w=cr(e)
6300 iffr=6then36360
6320 ifcr%(a)=0then36400
6340 goto36380
6360 ifcr%(4)<=0andcr%(5)<=0then36400
6380 ifw>=w1andw<=w2thenifcr$(ar)=ac$thensa=sa+1:rs$(sa)=str$(cr(e))+str$
6400 nextrc
6440 ifsa>0then36520
6460 printbl$lp$"No Records Satisfied, Key SPACE to Continue"
6480 getc$:ifc$<>" "then36480
6500 sysrs
6520 g=sa
6540 g=int(g/2):ifg=0thenreturn
6560 fori=1tosa-g:jj=i+g
6580 forj=ito1step-g
6600 ifrs$(jj)<rs$(j)thenc$=rs$(jj):rs$(jj)=rs$(j):rs$(j)=c$:jj=j:nextj
6620 nexti:goto36540
6640 return
9990 s$=uc$+"End of List"+ff$:syscv
9995 open200,4:cmd200:print£200,chr$(12):close200:return
1500 iffr=2orfr=3orfr=16thenw1=val(left$(rs$(1),5)):w2=val(left$(rs$(sa),
1510 s$=mid$(mm$(op),9)+" : "+ac$+"                    (From Week : "+str$(fny(w1))
1520 s$=s$+"        To Week : "+str$(fny(w2))+")":sys9*4096+18*3
1560 s$=left$(dh$,79):syscv
1580 s$=" ":syscv:return
2020 printleft$(lp$,3)tab(20)"Patt No:"cr$(2)tab(42)"Order Qty:"cr%(3)
2030 print""tab(61)"Tot Planned:";cr%(4)
2040 fori=29to40:gosub46220
2060 c$=right$("0"+str$(i-28),2):t1=0:t2=5:t3=24
2080 printleft$(lp$,fw(i,4)-6)tab(t1)"("c$")"tab(t2)pa$(i)tab(t3)": ";s$
2100 nexti:return
2300 t4=35:print:fori=29to40:gosub46220
2320 printleft$(lp$,fw(i,4)-6)tab(t4)": ";s$
2340 nexti:return
2500 qt=0:s1=l+5:s$="Qty (good) ":ifl=7orl=8thens$="Qty  "
2510 printleft$(lp$,18)tab(10)s$;left$(tr$(l),12)tab(31);
2520 lo=1:hi=5:gosub10705:qt=val(s$):ru$="111111"+cr$(9)+"111"
2525 ifl=8andqt>cr%(13)thenprintbl$:goto42500
2530 ifl=8thencr%(16)=cr%(16)+qt:s1=3:goto42660
2540 fors2=s1+1tolen(ru$):ifmid$(ru$,s2,1)="1"then42590
2560 nexts2
2590 ifcr%(s1)<qtthenprintbl$:goto42500
2600 cr%(s1)=cr%(s1)-qt:cr%(s2)=cr%(s2)+qt
2620 ifs1=7thencr%(5)=cr%(5)+qt
2640 ifl=1orl=4orl=7thenqr=0:qs=0:goto42820
2660 qr=0:printleft$(lp$,19)tab(10)"Qty for Rectification"tab(31);:lo=1:h
2680 gosub10705:qr=val(s$):ifcr%(s1)<qrthenprintbl$:goto42660
2690 ifl=8andqt<qrthenprintbl$:goto42660
2700 cr%(s1)=cr%(s1)-qr:cr%(14)=cr%(14)+qr
2720 ifs1=7thencr%(5)=cr%(5)+qr
2740 qs=0:printleft$(lp$,20)tab(10)"Qty Scrapped"tab(31);:lo=1:hi=5
2760 gosub10705:qs=val(s$):ifcr%(s1)<qsthenprintbl$:goto42740
2770 ifl=8andqt<qr+qsthenprintbl$:goto42740
2775 ifl=8andqt<>qr+qsthenprintbl$:goto25540
2780 cr%(s1)=cr%(s1)-qs:cr%(15)=cr%(15)+qs:cr%(6)=cr%(6)+qs
2800 ifs1=7thencr%(5)=cr%(5)+qs
2805 printleft$(lp$,21)tab(10)"Clock Number";:lo=1:hi=5:gosub10705:cn$=s$
2810 ifqs>0thengoto42850
2820 printleft$(lp$,21)tab(10)"Clock Number";:lo=1:hi=5:gosub10705:cn$=s$
2830 return
2850 k=1:forsr=1to17:sq(sr)=0:nextsr
```

```
2855 printleft$(lp$,5)tab(44)"    Reason for Scrap";:lo=1:hi=1:gosub10705
2858 sr=fnc(0):ifsr=26then42950
2859 ifsr<1orsr>16goto42855
2870 printleft$(lp$,(5+k))tab(46);sr$(sr);tab(63);:lo=1:hi=4:gosub10705
2880 sq(sr)=sq(sr)+val(s$):sq(17)=sq(17)+sq(sr)
2900 k=k+1:goto42855
2950 ifsq(17)<>qsthen42970
2960 return
2970 printlp$"Descrepencies in Quantities              Hit Space for Re-ent
2980 gosub49030:forb=6to23:printleft$(lp$,b)tab(46);
2990 print"                    ":nextb:goto42850
4040 d=val(left$(s$,2)):m=val(mid$(s$,4,2)):y=val(right$(s$,2))+1900
4080 w=fnw(dw):dw=w:gosub48520:return
4999 return
5020 ifxx=1thenx=i-1:goto45025
5022 x=i
5025 c$=right$("0"+str$(x),2):t1=0:t2=5:ifi>21thent1=42:t2=47
5040 printleft$(lp$,fw(i,4))tab(t1);
5055 print"("c$")"tab(t2)pa$(i)tab(fw(i,5));:lo=1:hi=fw(i,3):gosub10705
5060 ifi=20goto45100
5065 ifi=21ori=22goto45090
5072 ifi>22andi<27thengosub48740:goto45080
5075 gosub46020
5080 return
5090 ifs$<>"Y"ands$<>"N"thenprintbl$;:goto45025
5095 goto45072
5100 ifs$<>"Y"ands$<>"N"ands$<>"R"thenprintbl$;:goto45025
5105 goto45072
5520 printbl$lp$"Any Alterations(Y/N)";:lo=1:hi=1:gosub10705
5540 ifs$<>"Y"ands$<>"N"thenprintbl$;:goto45520
5560 ifs$="Y"thengoto45720
5580 return
5600 printleft$(lp$,8)tab(47)"PROGRESS DETAILS":return
5720 printchr$(7);
5740 printlp$;"
5760 printlp$"Which data you want to alter";:lo=1:hi=2:gosub10705
5800 i=val(s$):ifi<1ori>magoto45720
5820 print"":gosub45020:goto45520
6020 onfw(i,1)gosub46040,46060,46080:return
6040 cr$(fw(i,2))=s$:return
6060 cr(fw(i,2))=val(s$):return
6080 cr%(fw(i,2))=val(s$):return
6220 onfw(i,1)gosub46240,46260,46280:return
6240 s$=cr$(fw(i,2)):return
6260 s$=mid$(str$(cr(fw(i,2))),2):return
6280 s$=mid$(str$(cr%(fw(i,2))),2):return
7020 printbl$lp$"Any Alterations(Y/N)";:lo=1:hi=1:gosub10705
7040 ifs$<>"Y"ands$<>"N"thenprintbl$;:goto47020
7060 ifs$="Y"thengoto47120
7080 return
7120 printchr$(7);
7140 printlp$;"
7160 printlp$"Which data you want to alter";:lo=1:hi=2:gosub10705
7180 i=val(s$):x=i:ifi<1ori>magoto47160
7200 i=i+1
420 c$=right$("0"+str$(x),2):t1=0:t2=5:ifi>19thent1=42:t2=47
440 printleft$(lp$,fw(i,4))tab(t1);
455 print"("c$")"tab(t2)pa$(i)tab(fw(i,5));:lo=1:hi=fw(i,3):gosub10705
475 gosub46020:goto47020
510 dw=cr(fw(i,2))
520 y=int(dw/365.25+r)
530 y2=int(y*365.25+r):m=int((dw-y2)/30.6+r):ifm<4theny=y-1:goto48530
```

```
8540 d=dw-int(r+m*30.6)-y2:ifd=0thenm=m-1:goto48540
8545 d$=right$(str$(100+d),2):y=(y-(m>13)):y$=right$(str$(y),2)
8560 m=(m-1+(m>13)*12):dd$=d$+m$(m)+y$:s$=dd$:return
8740 d=val(left$(s$,2)):m=val(mid$(s$,4,2)):y=val(right$(s$,2))+1900
8760 cr(fw(i,2))=fnw(dw):dw=cr(fw(i,2))
8770 gosub48520:printleft$(lp$,fw(i,4));tab(fw(i,5));": ";s$:return
9020 poke158,0:printbl$lp$"Key SPACE to Continue"
9030 getc$:ifc$=""then49030
9035 printlp$"
9040 gosub10525
9110 printlp$:ifc$=chr$(0)then49020
9120 return
9200 poke158,0:printleft$(lp$,18)"Key SPACE for next page"
9220 getc$:ifc$=""then49220
9230 printleft$(lp$,18)"
9240 gosub10525
9260 printleft$(lp$,18):ifc$=chr$(0)then49280
9280 return
9900 qq=qq+1:open6,8,6,"'1:dump"+mid$(str$(qq),2)+",s,w":sys37528:return
2000 print""left$(lp$,12)tab(25)"Loading Main System"
2040 poke144,85:poke145,228:dload"prodA"
3900 dclose£1:dclose£2:close128
3910 print""left$(lp$,10)"IF YOU HAVE MADE ANY ALTERATIONS BACK UP DISK"
3920 print"SWITCH OFF SYSTEM":end
3999 rem             scratch"prodD",d0:dsave"prodD",d0:verify"*",8

ady.
```

prodE

```
ifin=999then10000
deffnc(x)=(asc(s$)and127)-64
deffnw(dw)=d+int(30.6*(m+1-(m<3)*12)+r)+int(365.25*(y+(m<3))+r)
0000 rem--update21/04/82 prodpeek
0020 sys9*4096
0040 s$=z$:s%=40:sys9*4096+48
0050 s$=un$:s%=26:sys9*4096+48
0060 s$="ABCD FOUNDRY":s%=0:sys9*4096+48
0190 goto11000
0405 c=abs(n)+5e-4:n$=right$("          "+str$(sgn(n)*int(c)),6)
0410 n$=n$+"."+mid$(str$(1+c-int(c))+"000000000",4,2):return
0505 getc$:ifc$<>""then10520
0510 print"*";:fornn=0to50:getc$:ifc$=""thennextnn
0515 ifc$=""thenprint"+";:fornn=0to50:getc$:ifc$=""thennextnn:goto10510
0520 ifc$=""thenreturn
0525 c=asc(c$)
0530 if(c$=")and(peek(152)=1)thensysrs
0535 ifc$<>"~"thenreturn
0540 ifpeek(152)=1thengosub49900:rem open255,4:print£255,chr$(12):close25
0545 c$=chr$(0):return
0605 ifs$=""thenreturn
0610 ifln=hithenprint""chr$(asc(u$))" ";:goto10620
0615 print""chr$(asc(u$))chr$(asc(u$))"";
0620 ln=ln-1:s$=left$(s$,ln):return
0705 print": ";
0710 s$="":ln=0:printleft$(u$,hi)left$(bs$,hi);
0715 gosub10505:ifc=13then10750
0720 ifc=20thengosub10605:goto10715
0725 ifln=hithen10715
0730 c=cand127:ifc<32orc>126then10715
0735 s$=s$+c$:ln=ln+1:printc$;chr$(27);
0745 goto10715
0750 ifln<lothen10715
0760 s$=left$(s$+b$,hi)
0765 printleft$(b$,hi-ln)" ";:return
1000 sys9*4096+3
2000 rem menu
2020 dclose£6
2040 poke224,1:print""spc(15)"PLANT LOADING AND PRODUCTION PROGRAM"
2070 print""spc(20)"(a)  Loading Moulding Section
2080 print""spc(20)"(b)  Production Program - Moulding
2090 print""spc(20)"(c)  Production Program - Core
2091 print""spc(20)"(d)  Production Program - Melting
2092 print""spc(20)"(e)  Return to Main System
2095 print""spc(20)"(f)  Shut Down System"
2100 printlp$tab(25)"Option";:lo=1:hi=1:gosub10705:op=fnc(0)
2110 ifop<1orop>6goto12100
2120 onopgoto15000,20000,21000,22000,62000,63900
5000 rem==load moulding
5020 print""left$(lp$,1)"Loading Moulding Section"
5040 printleft$(lp$,1)tab(50)"Date of Production";:lo=8:hi=8:gosub10705
5050 gosub40000
060 pd=fnw(dw):ifpd>cd+7 or pd<cdthengosub40100:goto12000
080 dw=pd:gosub48520:printleft$(lp$,1)tab(70)s$
100 f6$=str$(pd):gosub25000
200 poke224,2:print""left$(lp$,3)"Order No  ";:lo=6:hi=8:gosub10705
220 cr$(1)=left$(s$+b$,8):gosub31840:ifv=1goto15200
240 gosub32020:gosub41105:goto15420
420 printleft$(lp$,23)bl$"Is this the Order You Want ? (Y/N)";
430 lo=1:hi=1:gosub10705:ifs$<>"Y"ands$<>"N"goto15420
```

```
5440 ifs$="N"goto15200
5460 printleft$(lp$,23)bl$" How many do you want to Mould  ?";:lo=1:hi=5
5480 gosub10705:x=val(s$):ifx>cr%(6)orx<1then15520
5500 goto15560
5520 printleft$(lp$,23)bl$"Illegal Qty Requested - Key Space to continue"
5540 wait158,15,0:goto15460
5560 cr%(6)=x:nc=nc+1:record£6,1:print£6,nc:record£6,(nc+1):syswr
5580 gosub40300:goto15200
5900 dclose:stop
0000 rem-moulding
0020 print""left$(lp$,2)"Production Program - Moulding";:ar=7:rp=8
0025 cn=0:gosub27000:ifcn=1goto20020
0030 printleft$(lp$,3)tab(10)"Moulding Centre";:lo=2:h=2:gosub10705
0035 ac$=left$(s$+b$,2):gosub27100:print
0040 gosub29100:gosub20400:prints$:gosub20500:prints$:poke224,5
0060 tm=0:tw=0:tt=0:fori=1tosa:gosub29200:gosub43020:dw=cr(8):gosub48520
0080 tm=tm+nm:tw=tw+jw:tt=tt+jt
0100 s$=cr$(1)+"    "+cr$(2)+"  "+nm$+" "+jt$+"     "+cr$(8)+"  "+ct$+"
0120 s$=s$+cr$(5)+"     "+jw$
0140 ifcr$(12)<>"Y"thens$=s$+"*"
0160 prints$
0180 ifi<>1and(int(i/15)=i/15)thengosub29110:gosub29120
0200 nexti:s$=left$(dh$,79):prints$
0220 n=tt:gosub10405:tt$=right$(n$,8)
0240 s$="          Totals"+right$(b$+str$(tm),21)
0260 s$=s$+tt$+right$(b$+str$(tw),34):prints$:gosub29140
0300 goto12000
0400 s$="Order No   Patt No.            Moulds     Time   C/C   C/time    Met
0420 s$=s$+"   M/Weght":return
0500 s$="---------  ---------           ------     ----   ---   -------   ---
0520 s$=s$+"   --------":return
1000 rem core centre
1010 print""left$(lp$,2)"Production Program - Core Making";:ar=8:rp=8
1020 cn=0:gosub27000:ifcn=1goto21010
1030 printleft$(lp$,3)tab(10)"Core Centre";:lo=2:h=2:gosub10705
1035 ac$=left$(s$+b$,2):gosub27100:print
1040 gosub29100:gosub21400:prints$:gosub21500:prints$:poke224,5
1060 tm=0:tw=0:tt=0:fori=1tosa:gosub29200:gosub43020
1080 tm=tm+cr%(6):tw=tw+jw:tt=tt+ct
1100 gosub29200:gosub43020
1120 s$=cr$(1)+"    "+cr$(2)+"    "+right$(b$+str$(cr%(6)),5)+"       "
1140 s$=s$+str$(cr%(2))+"      "+left$(str$(cr(4))+"000",4)+"    "+ct$+"    "
1160 s$=s$+"      "+cr$(7)+"      "+cr$(5):prints$
1180 ifi<>1and(int(i/15)=i/15)thengosub29110:gosub29120
1200 nexti:s$=left$(dh$,79):prints$
1220 n=tt:gosub10405:tt$=right$(n$,8)
1240 s$="            Totals"+right$(b$+str$(tm),21)
1260 s$=s$+right$(b$+tt$,26):prints$:gosub29140
1300 goto12000
1400 s$="Order No.   Pattern No.          C-Qty  No/set  T/Set   Std.Time"
1420 s$=s$+"   Mou/Cen  Metal":return
1500 s$="----------  -----------          -----  ------  -----   --------"
1520 s$=s$+"   --------  -----":return
000 rem metal requirements
020 print""left$(lp$,2)"Metal Requirements"
025 cn=0:gosub27000:ifcn=1goto22020
060 forj=1to16:fl(0,j)=0:nextj
200 dopen£6,(f6$),d0:record£6,1:input£6,nc
220 forrc=2tonc+1:record£6,(rc):sysgr
240 fori=1to15:ifcr$(5)<>mt$(i)thennexti:goto22400
260 jw=int((cr%(6)/cr%(1))*cr(2))
280 fl(0,i)=fl(0,i)+jw:fl(0,16)=fl(0,16)+jw
```

```
2400 nextrc:dclose£6
2500 printleft$(lp$,8)"Furnace No  1"
2520 printleft$(lp$,9)"Sequence   Weight(Kg)"
2525 printleft$(lp$,10)"*********************"
2530 printleft$(lp$,11)tab(2)"MET03"tab(10)right$(b$+str$(fl(0,3)),7)
2540 printleft$(lp$,12)tab(2)"MET02"tab(10)right$(b$+str$(fl(0,2)),7)
2550 printleft$(lp$,13)tab(2)"MET04"tab(10)right$(b$+str$(fl(0,4)),7)
2560 printleft$(lp$,14)tab(2)"MET01"tab(10)right$(b$+str$(fl(0,1)),7)
2570 printleft$(lp$,15)tab(2)"MET08"tab(10)right$(b$+str$(fl(0,8)),7)
2600 printleft$(lp$,8)tab(25)"Furnace No  2"
2620 printleft$(lp$,9)tab(25)"Sequence   Weight(Kg)"
2625 printleft$(lp$,10)tab(25)"*********************"
2630 printleft$(lp$,11)tab(27)"MET09"tab(35)right$(b$+str$(fl(0,9)),7)
2640 printleft$(lp$,12)tab(27)"MET10"tab(35)right$(b$+str$(fl(0,10)),7)
2650 printleft$(lp$,13)tab(27)"MET05"tab(35)right$(b$+str$(fl(0,5)),7)
2660 printleft$(lp$,14)tab(27)"MET12"tab(35)right$(b$+str$(fl(0,12)),7)
2670 printleft$(lp$,15)tab(27)"MET15"tab(35)right$(b$+str$(fl(0,15)),7)
2700 printleft$(lp$.8)tab(55)"Furnace No  3"
2720 printleft$(lp$,10)tab(55)"*********************"
2730 printleft$(lp$,11)tab(57)"MET11"tab(65)right$(b$+str$(fl(0,11)),7)
2740 printleft$(lp$,12)tab(57)"MET14"tab(65)right$(b$+str$(fl(0,14)),7)
2750 printleft$(lp$,13)tab(57)"MET07"tab(65)right$(b$+str$(fl(0,7)),7)
2760 printleft$(lp$,14)tab(57)"MET13"tab(65)right$(b$+str$(fl(0,13)),7)
2770 printleft$(lp$,15)tab(57)"MET06"tab(65)right$(b$+str$(fl(0,6)),7)
2800 printleft$(lp$,18)tab(30)"Total Weight"tab(50)fl(0,16)
2900 gosub49020:goto22000
3000 stop
5000 dopen£6,(f6$),d0:ifds<>62theninput£6,nc:return
5010 dclose£6:dopen£6,"Diary",d0
5015 forrc=1to8:record£6,(rc):input£6,rs$(rc):next
5020 scratch(" "+rs$(1)),d0
5040 rs$(1)=mid$(f6$,2)
5041 sa=8:g=sa
5042 g=int(g/2):ifg=0then25060
5043 fori=1tosa-g:jj=i+g
5044 forj=ito1step-g
5045 ifrs$(jj)<rs$(j)thenc$=rs$(jj):rs$(jj)=rs$(j):rs$(j)=c$:jj=j:nextj
5046 nexti:goto25042
5060 forrc=1to8:record£6,(rc):print£6,rs$(rc):next:dclose£6
5100 dopen£6,(f6$),d0,l175:record£6,1:nc=0:print£6,nc:return
7000 printleft$(lp$,2)tab(50)"Date of Production";:lo=8:hi=8:gosub10705
7020 gosub40000:pd=fnw(dw)
7040 dw=pd:gosub48520:printleft$(lp$,2)tab(69)s$
7060 ifpd>cd+7 or pd<cdthengosub40200:cn=1:return
7080 f6$=str$(pd):return
7100 dopen£6,(f6$),d0:ifds<>62theninput£6,nc:goto27200
7120 gosub40200:cn=1:return
7200 sa=0:forrc=2tonc+1:record£6,(rc):sysgr
7210 rem    printcr$(ar);"~";ac$;"~"
7220 ifcr$(ar)=ac$thensa=sa+1:goto27260
7240 goto27300
7260 rs$(sa)=cr$(ar)+cr$(5)+str$(rc)
7300 nextrc
7440 ifsa>0then27520
7460 printbl$lp$"No Records Satisfied, Key SPACE to Continue"
7480 getc$:ifc$<>" "then27480
7500 dclose£6:sysrs
7520 g=sa
7540 g=int(g/2):ifg=0thenreturn
7560 fori=1tosa-g:jj=i+g
7580 forj=ito1step-g
7600 ifrs$(jj)<rs$(j)thenc$=rs$(jj):rs$(jj)=rs$(j):rs$(j)=c$:jj=j:nextj
```

```
7620 nexti:goto27540
7640 return
9100 p2=int(sa/15+.99):p1=1:gosub29120:return
9110 ifi=sathenreturn
9115 gosub49200:print"";:p1=p1+1:return
9120 s$="page"+str$(p1)+"/"+left$(str$(p2)+b$,4):s%=69:sys9*4096+48:retur
9140 poke224,1:gosub49020:s$=left$(b$,10):s%=69:sys9*4096+48:return
9200 rc=val(mid$(rs$(i),rp)):record£6,(rc):sysgr:return
1020 record£1,1:input£1,no:no=no+1
1040 record£1,1:print£1,no:record£1,(no+1):print£1,cr$(1)
1060 record£2,(no+1):syswr:return
1220 record£1,(z):print£1,cr$(1)
1240 record£2,(z):syswr:return
1420 record£1,(z):print£1,"Deleted"
1440 fori=1to14:cr$(i)=left$(b$,fs(i)):nexti
1460 fori=1to9:cr(i)=0:nexti:fori=1to13:cr%(i)=0:nexti
1480 record£2,(z):syswr:return
1620 record£1,1:input£1,no:return
1840 v=0:record£1,1:input£1,no
1860 forrc=2tono+1:record£1,(rc):input£1,a$
1880 ifa$=cr$(1)thenz=(rc):return
1900 nextrc:printchr$(13)"Record not found"
1920 gosub49020:v=1:return
2020 record£2,(z):sysgr:return
2220 record£1,1:input£1,no:v=0
2240 forrc=2tono+1:record£1,(rc):input£1,a$
2260 ifa$="Deleted"thenz=(rc):v=v+1:return
2280 nextrc:return
2420 v=0:record£1,1:input£1,no
2430 forrc=2tono+1:record£1,(rc):input£1,a$
2440 ifa$=cr$(1)goto32480
2460 nextrc:return
2480 v=1:print:print"This Order No. Already in Use"
2500 printbl$lp$"Key SPACE to Continue"
2520 getc$:ifc$<>" "then32520
0000 d=val(left$(s$,2)):m=val(mid$(s$,4,2)):y=val(right$(s$,2))+1900:retu
0100 printlp$"Loading Accepted Only Up 7 days Ahead - Hit Space To Contin
0120 getc$:ifc$<>" "then40120
0130 return
0200 printlp$"No Loading Available for "dd$" Hit Space To Continue      "
0220 getc$:ifc$<>" "then40120
0230 return
0300 printleft$(lp$,23)"Loading Accepted                  Hit Space To Continu
0320 getc$:ifc$<>" "then40320
0330 return
1105 print"ORDER DETAILS"
1110 fori=1to40:ifi>22andi<27thengosub48510:goto41120
1115 gosub46220
1120 c$=right$("0"+str$(i),2):t1=0:t2=5:ifi>21thent1=42:t2=47
1130 ifi=26then gosub45600
1140 printleft$(lp$,fw(i,4))tab(t1);
1160 print"("c$")"tab(t2)pa$(i)tab(fw(i,5));": ";s$
1240 nexti:return
020 nm=int(cr%(6)/cr%(1)+.5):nm$=right$(b$+str$(nm),5)
040 jw=int(nm*cr(2)+.5):jw$=right$(b$+str$(jw),6)
060 jt=nm*cr(3):n=jt:gosub10405:jt$=right$(n$,7)
070 ct=cr%(6)*cr(4):n=ct:gosub10405:ct$=right$(n$,7)
090 return
600 printleft$(lp$,8)tab(47)"PROGRESS DETAILS":return
220 onfw(i,1)gosub46240,46260,46280:return
240 s$=cr$(fw(i,2)):return
260 s$=mid$(str$(cr(fw(i,2))),2):return
```

```
6280 s$=mid$(str$(cr%(fw(i,2))),2):return
8510 dw=cr(fw(i,2))
8520 y=int(dw/365.25+r)
8530 y2=int(y*365.25+r):m=int((dw-y2)/30.6+r):ifm<4theny=y-1:goto48530
8540 d=dw-int(r+m*30.6)-y2:ifd=0thenm=m-1:goto48540
8545 d$=right$(str$(100+d),2):y=(y-(m>13)):y$=right$(str$(y),2)
8560 m=(m-1+(m>13)*12):dd$=d$+m$(m)+y$:s$=dd$:return
9020 poke158,0:printbl$lp$"Key SPACE to Continue"
9030 getc$:ifc$=""then49030
9035 printlp$"
9040 gosub10525
9110 printlp$:ifc$=chr$(0)then49020
9120 return
9200 poke158,0:printleft$(lp$,18)"Key SPACE for next page"
9220 getc$:ifc$=""then49220
9230 printleft$(lp$,18)"
9240 gosub10525
9260 printleft$(lp$,18):ifc$=chr$(0)then49280
9280 return
9900 qq=qq+1:open6.8.6."'1:dump"+mid$(str$(qq).2)+".s.w":sys37528:return
2000 print""left$(lp$.12)tab(25)"Loading Main System"
2040 poke144,85:poke145,228:dload"prodA"
3900 dclose£1:dclose£2:close128
3910 print""left$(lp$,10)"IF YOU HAVE MADE ANY ALTERATIONS BACK UP DISK"
3920 print"SWITCH OFF SYSTEM":end
3999 rem                  scratch"prodE",d0:dsave"prodE",d0:verify"*",8
```

APPENDIX 3

Program Listing and Printouts from

Cronite Production Control Systems

```
224,0:print"":poke59468,14:clr:ti$="000000
-4096
b438
tleft$(lp$,8)"User Name     ";:lo=2:hi=5:gosub26:un$=s$
6:sys9*4096+48:gosub480
tleft$(lp$,8)tab(40)"Time Now    (eg 144510)";:lo=6:hi=6:gosub26
s$:s$="Cronite Ltd ":s%=0:sys9*4096+48
tleft$(lp$,15)"Date (DD/MM/YY)";:lo=8:hi=8:gosub26:z$=s$
1:sys9*4096+48
tleft$(lp$,15)tab(40)"Current Week No. ";:lo=5:hi=5:gosub26
al(s$):w=cw:gosub423:ifw=0then8
=str$(cw):goto37
bs(n)+5e-4:n$=right$("          "+str$(sgn(n)*int(c)),6)
n$+"."+mid$(str$(1+c-int(c))+"000000000",4,2):return
c$:ifc$<>""then16
nt"*";:fornn=0to50:getc$:ifc$=""thennextnn
$=""thenprint"+";:fornn=0to50:getc$:ifc$=""thennextnn:goto14
$=""thenreturn
sc(c$)
c$=")and(peek(152)=1)thendclose:sysrs
$<>"~"thenreturn
eek(152)=1thenopen255,4:print£(255),chr$(12):close255:syssd
chr$(0):return
$=""thenreturn
n=hithenprint""chr$(asc(u$))" ";:goto25
nt""chr$(asc(u$))chr$(asc(u$))"";
ln-1:s$=left$(s$,ln):return
nt": ";
"":ln=0:printleft$(u$,hi)left$(bs$,hi);
ub13:ifc=13then34
=20thengosub22:goto28
n=hithen28
and127:ifc<32orc>126then28
s$+c$:ln=ln+1:printc$;chr$(27);
o28
n<lothen28
left$(s$+b$,hi)
ntleft$(b$,hi-ln)" ";:return
9*4096+3
e224,1:print""spc(15)"Which section do you require?"
nt""spc(20)"(a)  Production Information"
nt""spc(20)"(b)  Monthly Schedule"
nt""spc(20)"(c)  Dump Files"
nt""spc(20)"(d)  Shut Down System"
ntlp$tab(25)"Option";:lo=1:hi=1:gosub26:op=fnc(0)
<1orop>4goto43
goto46,276,485,495
nt""spc(23)"Production Information"
ntspc(23)"----------------------"
):fori=0to13
)-n:printleft$(lp$,int(i/2)*2+8);tab(n)"("chr$(i+65)")  "mm$(i+1)
i
tlp$tab(25)"Option";:lo=1:hi=1:gosub26:op=fnc(0)
<1orop>14goto51
goto55,65,67,74,85,102,118,129,141,156
-10goto168,208,244,38
t"INPUT OF NEW ORDER"
=1to21:gosub391
1thengosub353
i
401:ifs$="Y"thengosub386:goto59
```

```
sub349:i+v=1goto62
sub323:gosub326:goto63
sub330:gosub333
intbl$lp$;"Order Entered    Strike any Key to Continue"
sub427:goto46
int"Order Number ";:lo=1:hi=fw(1):gosub26:cr$(1)=s$
sub339:gosub345:gosub404:gosub426:goto46
int"Order Number ";:lo=1:hi=fw(1):gosub26:cr$(1)=s$
sub339:gosub345
sub404
sub401:ifs$="Y"thengosub386:goto70
sub330:gosub333:gosub430
intbl$lp$;"Order Updated    Strike any Key to Continue"
sub427:goto46
int"Order Number to be Deleted ";:lo=1:hi=fw(1):gosub26:cr$(1)=s$
sub339:gosub345:gosub404
intbl$lp$"Is This The Order to be Deleted ";:lo=1:hi=1:gosub26
s$<>"Y"ands$<>"N"thenprintbl$;:goto76
s$="Y"then80
to46
sub337
rj=1to21:cr$(j)=left$(b$,fw(j)):nextj:gosub333
="This Order has been Deleted from the file"
intlp$s$
=chr$(12):syscv:syssd:goto46
int"Order Group ";:lo=5:hi=5:gosub26:og$=s$
=0:dopen£1,"tom.index",d0:record£1,1:input£1,nr
rrc=1tonr:record£1,(rc+1):input£1,a$
left$(a$,5)<>og$thengoto92
=sa+1:ifmid$(a$,6,1)<>"A"then91
$(sa)=right$(a$,1)+left$(a$,5)+"0"+a$:goto92
$(sa)=right$(a$,1)+left$(a$,6)+a$
xtrc:dclose
sub375
int:print"Order Numbers"
int"-------------":print:poke224,5
ri=1tosa
left$(rs$(i),1)<>left$(rs$(i-1),1)thenprint:print
intmid$(rs$(i),8)" ";
xti
close:poke224,1
rint:gosub426:goto46
r=5:nw=0:gosub202:gosub114:prints$:gosub116:prints$:poke224,5
w=0:tw=0:fori=1tosa
osub207:n=fnm(x):ww=ww+n:tw=tw+n:gosub11
$="    "+cr$(1)+left$(b$,8)+cr$(2)+left$(b$,10)+n$+left$(b$,9)+cr$(7)
fleft$(rs$(i),5)=left$(rs$(i+1),5)then108
=ww:gosub11:s$=s$+"  "+left$(dh$,7)+">"+n$:ww=0
ints$
i<>1and(int(i/15)=i/15)thengosub203:gosub205
xti
="    "+left$(dh$,75):prints$
tw:gosub11:s$=left$(b$,45)+"Grand Total"+left$(b$,9)+n$:prints$
to206
="   W/O No.        CK No.         Wt to Cast         Prod Wk         "
=s$+"Weekly Total Wt":return
="   --------       ------         ----------         -------         "
=s$+"---------------":return
=3:nw=-1:gosub202:gosub125:prints$:gosub127:prints$:poke224,5
i=1tosa
ub207:s$=" "+cr$(1)+"        "+cr$(9)+"         "+cr$(2)+"         "
=s$+right$(b$+str$(val(cr$(4))),5)+"          "
=s$+right$(b$+str$(val(cr$(14))),5)+"          "+cr$(8):prints$
<>1and(int(i/15)=i/15)thengosub203:gosub205
ti:goto206
" W/O No.      Description       CK No.       Qty Ord       Qty to Cast"
```

```
s=s$+"    Dely Wk":return
s=" -------     -----------     ------     -------     -----------"
s=s$+"    -------":return
r=2:nw=-1:gosub202:gosub137:prints$:gosub139:prints$:poke224,5
ori=1tosa
s="page"+str$(p1)+" /"+left$(str$(p2)+b$,3):s%=69:sys9*4096+48
osub207:n=val(cr$(14))*val(cr$(11)):gosub11
s="  "+cr$(1)+"       "+right$(b$+str$(val(cr$(14))),5)+"       "
s=s$+cr$(7)+"     "+cr$(5)+"      "+cr$(6)+"       "+n$:prints$
fi<>1and(int(i/15)=i/15)thengosub203:gosub205
exti:goto206
s="  W/O No.     No to Cast     Prod Wk     Alloy     Process"
s=s$+"    Total Time":return
s="  -------     ----------     -------     -----     --------"
s=s$+"    ----------":return
r=6:nw=0:gosub202:gosub152:prints$:gosub154:prints$:poke224,5
w=0:gt=0:fori=1tosa
osub207:nm=val(cr$(14))/val(cr$(10)):n=int(nm+.999999999)
m$=str$(n):nm$=right$(b$+nm$,5):ww=ww+val(nm$)
=n*val(cr$(13)):gosub11:gt=gt+n
$=cr$(1)+"   "+cr$(9)+"   "+nm$+"      "+cr$(7)+"     "
$=s$+cr$(5)+"    "+cr$(2)+"    "+n$:prints$
fi<>1and(int(i/15)=i/15)thengosub203:gosub205
exti:s$=left$(dh$,79):prints$
=gt:gosub11:s$="      Totals"+left$(b$,8)+right$(b$+str$(ww),12)
$=s$+left$(b$,36)+n$:prints$:goto206
$="W/O No     Description     Moulds   Prod Wk    Alloy   "
$=s$+"Ck No    Total Wt":return
$="------     -----------     ------   -------    -----   "
$=s$+"-----    --------":return
r=16:nw=-1:gosub202:gosub164:prints$:gosub166:prints$:poke224,5
ori=1tosa
osub207:n=fnm(x):gosub11
$=cr$(1)+"   "+cr$(9)+"   "+cr$(2)+"    "
$=s$+right$(b$+str$(val(cr$(14))),5)+"    "+n$+"     "+cr$(6)
$=s$+"      "+cr$(7):prints$
fi<>1and(int(i/15)=i/15)thengosub203:gosub205
exti:goto206
$="W/O No.    Description     CK No.     Q/Cast     Tot Wt"
$=s$+"    Process     Prod Wk":return
$="-------    -----------     ------     ------     ------"
$=s$+"    -------     -------":return
rint""left$(lp$,15)tab(25)"Processing Alloy Requirements"
ori=0to9:bf(i)=0:nexti
osub338:bf$=left$(b$,3):bf%=10
open£1,"tom",d0:scratch"scratch",d0:dopen£2,"scratch",d0,170:na=0
2=fnw(cw):w8=w2+8:forrc=2tonr
ecord£1,(rc)
sgr:w1=val(cr$(7))
val(cr$(14))=0orw1>w8then181
sub195:ifw1<w2thenbf(0)=bf(0)+fnm(x):goto180
(w1-w2+1)=bf(w1-w2+1)+fnm(x)
cord£2,(i):bf$=cr$(5):syswm
xtrc:dclose£1
sub189
%=10:forrc=1tona:ifrc/50=int(rc/50)thengosub189
cord£2,(rc):sysgm:s$=""
i=0to9:n=bf(i):gosub11
=s$+"     "+left$(n$,6)+"  ":nexti:c$=left$(str$(rc)+")"+b$,7)
=c$+bf$+" "+s$:syscv:s$="      "+left$(dh$,125):syscv
trc:dclose:scratch"scratch",d0:sysrs
=0:gosub409:s$=en$+cm$+"Forward Alloy Requirements"
cv:s$="":syscv
i=0to8:s$=s$+"        "+str$(fny(cw+i-1)):nexti
="     Alloy    Overdue"+s$:syscv:s$="=========="
i=0to9:s$=s$+"===========":nexti
```

```
yscv:return
f%=0:ifna=0then199
ori=1tona:record£2,(i)
ysgm:ifbf$=cr$(5)then200
exti
a=na+1:i=na:forj=0to9:bf(j)=0:nextj:bf%=10:return
ecord£2,(i):bf%=10:sysgm
eturn
osub361:p2=int(sa/15+.99):p1=1:gosub205:return
fi=sathenreturn
osub432:print"";:p1=p1+1:return
$="page"+str$(p1)+"/"+left$(str$(p2)+b$,4):s%=69:sys9*4096+48:return
close:poke224,1:gosub426:s$=left$(b$,10):s%=69:sys9*4096+48:goto46
c=val(mid$(rs$(i),7)):record£1,(rc):sysgr:gosub347:return
rint"":p1=1:p2=0:fori=0to8:forj=0to14:fl(i,j)=0:nextj,i
rintleft$(lp$,12)spc(35)"Processing":wn=0:gosub338
open£1,"tom",d0:forrc=1tonr:record£1,(rc+1):sysgr
fval(cr$(14))=0then221
orj=0to7:ifcr$(6)<>mc$(j)thennextj:goto221
n=val(cr$(7))-fnw(cw)+1:ifwn<1thenwn=0
=val(cr$(14))/val(cr$(10)):c=n*val(cr$(13))
fj>3thenn=val(cr$(14))*val(cr$(11))
fwn>3thenwn=4
fcr$(16)="hc"thenwn=5
fval(cr$(7))=fnw(52.99)thenwn=6
l(j,wn)=fl(j,wn)+n:fl(j,wn+7)=fl(j,wn+7)+c
l(8,wn+7)=fl(8,wn+7)+c
extrc
orj=0to8:fori=7to13:fl(j,14)=fl(j,14)+fl(j,i):nexti:nextj:dclose
osub409:s$=cm$+en$+"Summary of Forward Load"+ue$:syscv
$="":syscv:n=fnw(cw)
$="                Overdues       Week "+right$("0"+mid$(str$(fny(n)),2),5)
$=s$+"      Week "+right$("0"+mid$(str$(fny(n+1)),2),5)
$=s$+"      Week "+right$("0"+mid$(str$(fny(n+2)),2),5)
$=s$+"     >Week "+right$("0"+mid$(str$(fny(n+2)),2),5)
$=s$+"     Held by Cust.  Unplanned"+"          Totals":syscv
$="Process         Qty       Wt       Qty       Wt       Qty       Wt       Qty      "
$=s$+"Wt       Qty       Wt       Qty       Wt       Qty       Wt              Wt":syscv
$=left$(dh$,125)+"+":syscv
ori=0to8:s$="":qq$=""
orj=0to6:n=fl(i,j):ifn=0andi=8thenn$=b$:goto236
osub11
$=s$+left$(n$,6)+" ":qq$=qq$+left$(dh$,7)
=fl(i,j+7):gosub11:s$=s$+left$(n$,6)+" !"
q$=qq$+left$(dh$,6)+"-+"
extj:s$=ms$(i)+" !"+s$:qq$=left$(dh$,9)+"+"+qq$
=fl(i,14):gosub11:s$=s$+"    "+left$(n$,6)+" !":qq$=qq$+left$(dh$,6)
$=qq$+"-----+":syscv:s$=qq$:syscv
xti
=uc$:syscv:goto46
int"":s$="Sales":gosub480
int""left$(lp$,5)tab(30)"SALES VALUE"
intleft$(lp$,7)tab(30)"-----------"
intleft$(lp$,12)tab(5)"Starting Week No ";:lo=5:hi=5
sub26:w=val(s$):gosub423:w1=w:ifw=0goto247
intleft$(lp$,12)tab(43)"To Week No ";
sub26:w=val(s$):gosub423:w2=w:ifw=0goto249
ntleft$(lp$,20)tab(30)"Processing"
=w2-w1+2
i=1tonw:sv(i,0)=w1+i-1:sv(i,1)=0:nexti
ub338
en£1,"tom",d0:forrc=1tonr:record£1,(rc+1):sysgr
al(cr$(8))<w1orval(cr$(8))>w2goto259
j=1to(nw-1):ifval(cr$(8))<>sv(j,0)thennextj
j,1)=sv(j,1)+val(cr$(15)):sv(nw,1)=sv(nw,1)+val(cr$(15))
trc:dclose
```

```
rint"":printleft$(b$,30);"SALES VALUE
osub274:prints$:gosub275:prints$:print:poke224,7
osub270:fori=1tonw-1:if(int(i/50)=i/50)thengosub270
s=left$(b$,10)+mid$(str$(100+fny(sv(i,0))),3,5)+left$(b$,35)
s=s$+right$(b$+str$(sv(i,1)),8)
rints$:syscv:nexti:s$=" ":prints$:syscv
s=left$(b$,8)+left$(dh$,60):prints$:syscv
s=left$(b$,30)+"Total"+left$(b$,13)+right$(b$+str$(sv(nw,1)),10)
rints$:syscv
rint:print:poke224,1:gosub426:goto46
osub409:gosub273:syscv:s$="":syscv
osub274:syscv:gosub275:syscv:s$=" ":syscv
eturn
s=left$(b$,25)+cm$+en$+"SALES VALUE"+ue$+uc$:return
s=left$(b$,10)+"Week No"+left$(b$,33)+"Sales Value":return
s=left$(b$,10)+"-------"+left$(b$,33)+"-----------":return
rint""
rintleft$(lp$,4)tab(10)"Do you require to:-"
rintleft$(lp$,8)tab(20)"(a)    Obtain Monthly Delivery Schedule"
rintleft$(lp$,11)tab(20)"(b)    Obtain Fabrication Schedule"
rintleft$(lp$,14)tab(20)"(c)    Obtain Machining Schedule"
rintleft$(lp$,17)tab(20)"(d)    Return to main Menu"
rintlp$tab(27)"Option";:lo=1:hi=1:gosub26:op=fnc(0)
fop<1orop>4then276
fop=4then38
rint""
rintleft$(lp$,11)"From Week ";:lo=1:hi=5:gosub26
=val(s$):gosub423:w1=w:ifw=0then286
rintleft$(lp$,12)"To   Week ";:lo=1:hi=5:gosub26
=val(s$):gosub423:w2=w:ifw=0then288
rint"":s$="                  Processing  "
s=s$+mid$("Delivery   FabricationMachining  ",op*11-10,11)
s=s$+" Schedule":prints$
r=8:gosub338:sa=0:dopen£1,"tom",d0
orrc=2tonr+1
ecord£1,(rc):sysgr:w=val(cr$(8))
fop=2andcr$(19)="n"then302
fop=3andcr$(20)="n"then302
fw<w1orw>w2then302
r$(1)=right$(cr$(1),1)+left$(cr$(1),6)
fright$(cr$(1),1)="A"thencr$(1)=left$(cr$(1),6)+"0"
a=sa+1:rs$(sa)=cr$(8)+cr$(1)+str$(rc)
extrc:gosub375:p1=1:p2=0:k=50
ori=1tosa:gosub313
=val(mid$(rs$(i),14)):record£1,(rc):sysgr:gosub347
mid$(rs$(i),7,5)<>mid$(rs$(i-1),7,5)thens$="":syscv:gosub313
=right$(b$+str$(fnw(cw)-fnw(val(cr$(8)))),4)+"  ":ifi=1thenow$=s$
ow$<>s$thenow$=s$:s$=dh$:syscv:gosub313:s$="":syscv:gosub313:s$=ow$
=s$+"    "+cr$(3)+"   "+cr$(1)+"    "+cr$(4)+"    "+cr$(9)+"    "
=s$+cr$(8)+"     "+cr$(16)+"      "+cr$(17)+"      "+cr$(18)+"     "
=s$+cr$(5)+"    "+cr$(6)+"     "+cr$(14)+"      "+cr$(20)+"     "+cr$(19)
=s$+"     "+cr$(21):syscv
xti:s$=uc$:syscv:dclose:poke224,1:print:print:gosub426:goto276
k<50then322
sub409:p1=p1+1:k=0
=mid$("Delivery   FabricationMachining  ",op*11-10,11)
=cm$+en$+s$+" Schedule"+ue$:syscv:s$="":syscv
="Wks O/D   Customer        W/O No.   Q Ord   Description     D1 Wk    "
s$+"P St    Pat    Sam    Aly    Pros    Q/Cast   M/c   Ass   Spe":syscv
"--------   ---------        --------   -----   -----------     -----    "
s$+"-----    ---    ---    ---    ----    ------   ---   ---   ---":syscv
"":syscv
+1:return
en£1,"tom.index",d0:record£1,1:input£1,nr:nr=nr+1
ord£1,1:print£1,nr:record£1,(nr+1):print£1,cr$(1):dclose£1
urn
```

```
osub421
open£1,"tom",d0:record£1,(nr+1)
ysswr:dclose£1
eturn
open£1,"tom.index",d0:record£1,(z)
rint£1,cr$(1):dclose£1
eturn
osub421
open£1,"tom",d0:record£1,(z)
ysswr:dclose£1
eturn
open£1,"tom.index",d0:record£1,(z):print£1,"Deleted":dclose:return
open£1,"tom.index",d0:record£1,1:input£1,nr:dclose:return
r$(1)=left$(cr$(1)+"        ",7)
open£1,"tom.index",d0:record£1,1:input£1,nr
orrc=1tonr+1:record£1,(rc+1):input£1,a$
fa$=cr$(1)thenz=(rc+1):dclose£1:return
extrc:dclose£1:print:print"Record not found":gosub426
oto46
open£1,"tom",d0:record£1,(z)
ysgr:dclose£1
orj=7to8:cr$(j)=mid$(str$(100+fny(val(cr$(j))))+"    ",3,fw(j)):nextj
eturn
open£1,"tom.index",d0:record£1,1:input£1,nr:v=0
orrc=1tonr+1:record£1,(rc+1):input£1,a$
fa$="Deleted"thenz=(rc+1):v=v+1:dclose£1:return
extrc:dclose£1:return
open£1,"tom.index",d0:record£1,1:input£1,nr
orrc=1tonr+1:record£1,(rc+1):input£1,a$
fa$=cr$(i)goto357
extrc:dclose£1:return
close£1:print:print"This Order No. Already in Use"
rintbl$lp$"Strike any key to Continue"
etc$:ifc$=""then359
ysrs
rint""mm$(op)""
rint"           "mid$(mm$(op),9)" ";:lo=1:hi=fw(fr):gosub26:ac$=s$
fnwthenw1=wl:w2=wh:goto368
o=5:hi=5:printleft$(lp$,1)tab(52)"From Week ";:gosub26:w=val(s$)
osub423:w1=w:ifw=0goto364
rintleft$(lp$,2)tab(52)"To   Week ";:gosub26:w=val(s$)
osub423:w2=w:ifw=0goto366
rint:gosub338:sa=0:dopen£1,"tom",d0:c=7:iffr=3thenc=8
orrc=2tonr+1
ecord£1,(rc):sysgr:w=val(cr$(7))
fr=3orfr=2then373
val(cr$(14))=0then374
w>=w1andw<=w2thenifcr$(fr)=ac$thensa=sa+1:rs$(sa)=cr$(c)+str$(rc)
xtrc
sa>0then379
intbl$lp$"No Records Satisfied, Hit any Key to Continue"
tc$:ifc$=""then377
lose:sysrs
sa
int(g/2):ifg=0thenreturn
i=1tosa-g:jj=i+g
j=ito1step-g
s$(jj)<rs$(j)thenc$=rs$(jj):rs$(jj)=rs$(j):rs$(j)=c$:jj=j:nextj
ti:goto380
urn
ntchr$(7);
ntlp$;"                                                              ";
ntlp$"Which data you want to alter (Letter only)";:lo=1:hi=1
ub26:print"":i=(asc(s$)and127)-64
<1ori>21goto386
chr$(i+64)
```

```
intleft$(lp$,i+1)"("c$")"tab(7)pa$(i)tab(40);
n=20thenprinttab(60);cr$(i)left$(lp$,i+1)tab(40);
=1:hi=fw(i)
sub26:ifi=7ori=8thenw=val(s$):gosub423:ifw=0goto391
i=7andfnw(val(s$))<fnw(cw)then391
i=8and(fnw(val(s$))<fnw(val(cr$(7))))then391
i>16thenifs$<>"y"ands$<>"n"then391
$(i)=s$
turn
20:printbl$lp$"Any Alterations(Y/N)";:lo=1:hi=1:gosub26
s$<>"Y"ands$<>"N"thenprintbl$;:goto401
turn
int"Order Details"
ri=1to21
intleft$(lp$,i+1)"("chr$(i+64)")"tab(7)pa$(i)tab(40)": "cr$(i);
xti
turn
=left$(ti$,2)+":"+mid$(ti$,3,2)+":"+right$(ti$,2)
=uc$+chr$(12)+"Cronite Ltd  Date:"+z$+"  "
=s$+"Time:"+c$+"  Week No:"+cw$+"  "
=s$+"User:"+un$+" page"+str$(p1):ifp2thens$=s$+"/"+str$(p2)
scv:s$="":syscv
turn
fr=2orfr=3orfr=16thenw1=val(left$(rs$(1),5)):w2=val(left$(rs$(sa),5))
=mid$(mm$(op),9)+" : "+ac$+"            (From Week : "+str$(fny(w1))
=s$+"       To Week : "+str$(fny(w2))+")":sys9*4096+18*3
=left$(dh$,79):syscv
=" ":syscv:return
=" ":prints$:syscv
ri=7to8:cr$(i)=mid$(str$(1e5+fnw(val(cr$(i))))+"       ",3,fw(i)):nexti
eturn
w<1.80orw>53.99thenprintbl$;:w=0:return
=fnw(w):ifw<wlorw>whthenprintbl$;:w=0
eturn
rintbl$lp$"Strike any key to Continue"
etc$:ifc$=""then427
rintlp$"                                                                   "
osub17
rintlp$:ifc$=chr$(0)then426
eturn
rintleft$(lp$,18)"Strike any key for next page"
etc$:ifc$=""then433
rintleft$(lp$,18)"                                                                 "
osub17
rintleft$(lp$,18):ifc$=chr$(0)then437
eturn
$="":bf%=0:bl$=chr$(7)
ffnm(x)=val(cr$(14))/val(cr$(10))*val(cr$(13))
ffnc(x)=(asc(s$)and127)-64
ffnw(w)=int((w-int(w))*5300+int(w)-.99609375)
=fnw(1.80):wh=fnw(53.99)
ffny(w)=(w-int(w/53)*53)+int(w/53)/100+1
=9*4096+18*3:sd=9*4096+15:gr=10*4096+24:wr=10*4096+27
=9*4096+6:gm=10*4096+12:wm=10*4096+15
$=chr$(15):uc$=chr$(18):en$=chr$(14)
$=chr$(20)
mbf(9),fl(8,14)
mpa$(21):fori=1to21:readpa$(i):nexti
ta"W/O Number","CK Number","Customer Code","Order Quantity"
ta"Alloy Code","Production Process","Plan Prod WK","Plan Delry WK"
ta"Product Desc","No Castings/Box","Time per Casting(hrs)"
ta"Finish Wt/Casting(kg)","Wt of Castings/Mould(Kg)"
ta"Number to Cast","Sales Value","Progress State","Pattern Required"
ta"Sample Required","Assembly Required","Machining Required"
ta"Special"
="":fori=1to5:lp$=lp$+lp$:nexti:lp$=""+left$(lp$,22)+""
```

```
mfw(21):fori=1to21:readfw(i):nexti
ta7,4,12,5,3,3,5,5,12,4,4,4,4,5,5,2,1,1,1,1,1
=" ":dh$="-":u$=chr$(164):bs$="":fori=1to6
=b$+b$:u$=u$+u$:bs$=bs$+bs$:dh$=dh$+dh$
xti:dh$=left$(dh$+dh$+dh$,132)
mcr%(0),cr(0),cr$(21)
mmm$(14):fori=1to14:readmm$(i):nexti
ta"Enter a New Order","Read Order Details"
ta"Update Order Data","Delete Order","Sort by Order Group"
ta"Sort by Alloy Type","Sort by Customer","Sort by CK Number"
ta"Sort by Process","Sort by Progress Stage","Alloy Requirements"
ta"Summary of Forward Load","Weekly Sales Value"
ta"Return to Main Menu"
mrs$(525)
msv(55,1)
mms$(9):fori=0to8:readms$(i):nexti
ta"CWW(Box)","BMM(Box)","BT5(Box)","SHL(Mld)","FLR(Hrs)"
ta"P/S(Hrs)","S/T(Hrs)","S/B     "," Totals "
mmc$(9):fori=0to8:readmc$(i):nexti
ta"cww","bmm","bt5","shl","flr","p/s","s/t","s/b","totals"
ri=1to21:cr$(i)=left$(b$,fw(i)):next
turn
intleft$(lp$,8)tab(40)"Password : ";
=255:fori=1to5:gosub13:n=asc(mid$(s$,i,1)):n=(norc)andnot(nandc)
c<>13thenop=(((norop)andnot(opandn))*i)and255:print"-";:nexti
op=121orop=61orop=192orop=221orop=131thenreturn
to480
sub338:p1=1:p2=int(nr/50+.99):gosub493:s$=cm$:syscv
int""left$(lp$,15)tab(30)"Files Being Dumped"
open£1,"tom.index",d0:dopen£2,"tom",d0
rrc=2tonr+1:ifrc/50=int(rc/50)thengosub493:s$=cm$:syscv
ecord£1,(rc):input£1,a$:ifa$="Deleted"then492
ecord£2,(rc):sysgr:gosub347
s="":fori=1to21:s$=s$+cr$(i)+" ":nexti:s$=a$+" -- "+s$:syscv
extrc:dclose:s$=uc$:syscv:sysrs
sub409:p1=p1+1:s$="Index       Main File":syscv
="-----       ----------":syscv:s$="":syscv:return
int""left$(lp$,10)"IF YOU HAVE MADE ANY ALTERATIONS BACK UP DISK"
int"SWITCH OFF SYSTEM":fori=1to2500:nexti:sys64790
m update 23rd march 1982
m               scratch"CRPC1",d0:dsave"CRPC1",d0:verify"*",8
```

```
Cronite Ltd   User Name : Saba    Date : 09.02.82   Time : 11:23:45
Order Details
(a)    W/O Number                         : H50921
(b)    CK Number                          : 7953
(c)    Customer Code                      : ABR Food M/C
(d)    Order Quantity                     : 2
(e)    Alloy Code                         : 84
(f)    Production Process                 : flr
(g)    Plan Prod WK                       : 11.82
(h)    Plan Delry WK                      : 14.82
(i)    Product Desc                       : MeatPlatform
(j)    No Castings/Box                    : 1
(k)    Time per Casting(hrs)              : 3
(l)    Finish Wt/Casting(kg)              : 60
(m)    Wt of Castings/Mould(Kg)           : 150
(n)    Number to Cast                     : 0
(o)    Sales Value                        : 570
(p)    Progress State                     : si
(q)    Pattern Required                   : n
(r)    Sample Required                    : y
(s)    Assembly Required                  : n
(t)    Machining Required                 : n
(u)    Special                            : y
```

Cronite Ltd   User Name : Saba   Date : 09.02.82   Time : 11:56:43   page 1/2
Sort by Process   From Week : 10.82
Process : flr   To Week : 11.82

W/O No	Description	Moulds	Prod Wk	Alloy	Ck No	Total Wt
G54241a	Base Tray	1	10.82	5	1622	14.50
H55431	Support Beam	2	10.82	6A	7948	1000.00
G53251	Base Spider	3	10.82	8	7849	900.00
G53252	Inter Spider	3	10.82	8	7850	354.00
H53962	Plug	2	10.82	6	7877	5.40
G54771	Inter Spider	4	10.82	4	7930	140.00
H55981	Die Block 1	1	10.82	4	7978	365.00
H55982	Die Block 2	1	10.82	4	7979	365.00
E52812	Lug100*25*15	2	10.82	6A	7814	32.00
G54671	Basket	1	10.82	4	7926	183.00
E52922	Lug100*25*15	1	10.82	36	7814	16.00
E55201	Clamp	6	10.82	4	5973	72.00
E55202	Tube Support	10	10.82	4	7952	100.00
E55741	Tube Support	4	10.82	5	7454	40.00
G55311	Dog T11	10	10.82	4	3313	40.00
H55351	Bath	1	10.82	4	3327	171.00
H55402	Rim	32	10.82	3	4621	547.20
E53201	Grid	20	10.82	5	1127	1120.00
E53202	Clip	10	10.82	5	3121	32.00
H55491a	Tube 1 3/8od	67	10.82	4	2802	351.75
H53981	Basket Sect.	8	10.82	5	7955	760.00
H53991	Basket Sect	8	10.82	5	7957	800.00
H54001	Grid	4	10.82	5	1630	608.00
H53961	Roller	2	10.82	6	7876	76.00
H54121	150mm Cage	15	11.82	82	7932	397.50
G55751	Pot9*16	1	11.82	5	3010	65.00
G53891	Crucible	4	11.82	4	7913	52.00
E55731	Base w/oRing	10	11.82	5	2851	350.00
E55761	Muffle Sect	3	11.82	4	6889	456.00
H55661	Lock Nut	50	11.82	4	5335	100.00

Cronite Ltd User Name : Saba Date : 09.02.82 Time : 11:58:26 page 3/2

Sort by Process From Week : 10.82

Process : flr To Week : 11.82

W/O No	Description	Moulds	Prod Wk	Alloy	Ck No	Total Wt
H55331	Tube 1.25od	24	11.82	4	2655	252.00
E54151c	Grid	33	11.82	5	1134	2871.00
H55771	Exp Door	18	11.82	4	4433	1008.00
H55773	Washer 2 1/8	18	11.82	4	4431	54.00
H55782	Lug RH	18	11.82	4	5415	40.50
H55783	Lug LH	18	11.82	4	7495	40.50
H55341	Deflector	5	11.82	4	3358	17.50
G53902	Long SideY=5	7	11.82	4	7882	42.00
G53903	ShortSideY=5	7	11.82	4	7883	28.00
H55501	Jet	5	11.82	4	3340	46.50
H53631	Cassette	3	11.82	86	7933	219.00
G52621	Base	1	11.82	4	7923	65.00
G52622	Inter Spider	2	11.82	4	7924	22.00
Totals		445				14219.35

Cronite Ltd User Name : Saba Date : 09.02.82 Time : 11:36:47 page 1/2
Sort by Alloy Type From Week : 10.82
Alloy Type : 5 To Week : 14.82

W/O No.	CK No.	Wt to Cast	Prod Wk		Weekly Total Wt
G54241a	1622	1.45	10.82		
S00033	8506	888.00	10.82		
H55813	4230	0.00	10.82		
H55814	4231	0.01	10.82		
H53782	7896	0.00	10.82		
H54382	6347	0.00	10.82		
E55741	7454	40.00	10.82		
E55222	7951	0.07	10.82		
E56041	8022	720.00	10.82		
E53201	1127	1120.00	10.82		
E53202	3121	32.00	10.82		
H53981	7955	760.00	10.82		
H53991	7957	800.00	10.82		
H54001	1630	608.00	10.82		
H53783	7897	0.00	10.82	------->	4969.55
G55751	3010	65.00	11.82		
E55731	2851	350.00	11.82		
E54151c	1134	2871.00	11.82		
E56071	1191	266.50	11.82		
E56072	1192	495.00	11.82	------->	4047.50
H54711a	7914	357.00	12.82		
H55582	8485	88.00	12.82		
H55583	8486	105.00	12.82		
H55584	8487	69.00	12.82		
H55585	7981	3.00	12.82		
H55594	8488	69.00	12.82		
H55595	7981	3.00	12.82		
H55602	8485	88.00	12.82		
H55604	8489	69.00	12.82		
H55605	7981	3.00	12.82		

Cronite Ltd User Name : Saba Date : 09.02.82 Time : 11:38:14 page 2/2
Sort by Alloy Type From Week : 10.82
Alloy Type : 5 To Week : 14.82

W/O No.	CK No.	Wt to Cast	Prod Wk		Weekly Total Wt
H55772	4434	0.01	12.82		
H55774	4435	0.03	12.82		
H55614	8490	69.00	12.82		
H55615	7981	3.00	12.82		
H55231a	7934	247.00	12.82		
H55624	8493	82.00	12.82		
H55625	7981	3.00	12.82		
H55634	8494	41.00	12.82		
H55635	7981	3.00	12.82		
H55401	7963	448.00	12.82		
E56101	4981	75.00	12.82		
E56102	4982	18.00	12.82		
E56103	1426	90.00	12.82		
G56121	4556	183.00	12.82		
G54241b	1622	130.50	12.82	------->	2246.55
H55942		168.00	13.82		
H55943	8163	138.00	13.82		
H55892		168.00	13.82		
H55893	8163	138.00	13.82	------->	612.00
E53171	1623	276.00	14.82		
E53172	1624	276.00	14.82		
H56131	7992	287.50	14.82		
H55622	7989	0.00	14.82		
H55623	7990	0.00	14.82		
H55632	7989	0.00	14.82		
H55633	7990	0.00	14.82		
H54711b	7914	1725.50	14.82	------->	2565.00
			Grand Total		14440.61

Cronite Ltd   User Name : Saba   Date : 09.02.82   Time : 11:41:52   page 1/1

Sort by Customer

Customer : Babcock

W/O No.	Description	CK No.	Qty Ord	Qty to Cast	Dely Wk
H49661	Coathook	7628	2289	0	08.82
H54303	Web	3441	8	10	13.82
H54304	Bar 1.25dia	4220	4	0	13.82
H54311	CapNut 13UNC	4197	200	0	13.82
H55561	Venturi End	3559	1	0	13.82
H54301	Cone	3438	4	4	13.82
H54302	Blade	3440	4	0	13.82
H5430A	Spindle	4219	4	0	13.82
H54901	Venturi	3559	4	0	13.82
H54801	ConeImpeller	7915	5	5	14.82
H55341	Deflector	3358	5	5	15.82
H55651	Washer1.5od	5119	50	60	17.82
H55661	Lock Nut	5335	50	50	17.82
H55461	T Hanger Lug	7959	40	48	17.82
H5616A	Gas Baffle	5275	8	0	17.82
H56161	Channel	5276	8	8	17.82
H56162	End Plate	2051	16	16	17.82
H5617A	Gas Baffle	5277	8	0	17.82
H56171	Channel	5278	8	8	17.82
H56172	End Plate	2051	16	16	17.82
H56181	Ret Strip	2736	32	32	17.82

Cronite Ltd Date:09.02.82 Time:12:16:16 Week No: 10.82 User:Saba page 1/1

Summary of Forward Load

	Overdues		Week 10.82		Week 11.82		Week 12.82		>Week 12.82		Held by Cust.		Unplanned		Totals
Process	Qty	Wt	Qty	Wt	Qty	Wt	Qty	Wt	Qty	Wt	Qty	Wt	Qty	Wt	Wt
CWW(Box)	54	371	21	279	17	178	30	445	1109	23826	0	0	19	287	25387
BMM(Box)	38	744	77	1572	75	820	24	295	111	1351	0	0	42	1083	5867
BT5(Box)	14	651	0	0	20	761	6	300	8	488	0	0	0	0	2201
SHL(Mld)	341	4566	131	775	112	1349	42	534	305	2560	771	10797	227	2122	22706
FLR(Hrs)	70	1134	297	8079	255	6126	156	3520	182	5137	4	162	123	4268	28429
P/S(Hrs)	176	14254	147	11350	129	6627	27	1323	52	9800	38	7700	5	310	51365
S/T(Hrs)	1	282	27	3473	3	412	10	680	26	2040	0	0	0	0	6887
S/B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals		22004		25530		16275		7099		45204		18659		8071	142844

ıard Alloy Requirements

loy	Overdue	10.82	11.82	12.82	13.82	14.82	15.82	16.82	17.82	18.82
4	4153	3874	4697	3819	1572	244	67	0	0	317
18	0	0	0	0	0	400	0	0	0	0
3	0	3807	0	48	800	0	0	0	0	0
6A	14007	9358	0	0	0	0	0	0	0	0
5	2167	4969	4047	2246	612	2565	0	548	0	247
40	0	304	0	0	0	0	0	0	0	0
34	24	0	381	214	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
6	35	81	31	11	978	0	0	0	0	0
17	231	0	0	0	0	0	0	0	0	0
23	282	0	0	0	0	0	0	0	0	0
36	0	1881	0	0	246	0	0	0	0	0
51	0	0	0	0	0	84	0	0	0	0
lk	0	0	0	0	0	0	0	0	0	0
32	0	0	397	0	1825	0	0	0	0	0
510	0	0	0	0	0	0	0	0	0	0
3	520	1254	0	0	0	0	0	0	0	0
B	297	0	0	0	0	0	0	0	0	0
	275	0	3938	760	70	684	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3635	8320	0	0	0	0
	0	0	248	0	30	96	0	0	0	0
	11	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	492	48	0	0	0	0
	0	0	1000	0	0	3084	7748	0	0	0
	0	0	165	0	0	0	0	0	0	0
	0	0	1000	0	0	0	0	0	0	0
	0	0	150	0	0	0	0	0	0	0
	0	0	219	0	0	0	0	0	0	0

SALES VALUE

Week No	Sales Value
01.82	0
02.82	0
03.82	0
04.82	1638
05.82	0
06.82	4000
07.82	2258
08.82	18457
09.82	6787
10.82	18279
11.82	4726
12.82	26816
13.82	111965
14.82	19992
15.82	108692
16.82	11752
17.82	58561
18.82	5445
19.82	3125
20.82	645
21.82	765
22.82	0
23.82	2243
24.82	0
25.82	1418
26.82	3343
27.82	0
28.82	0
29.82	81377
30.82	0
31.82	0
32.82	1229
33.82	0
34.82	765
35.82	0
36.82	0
37.82	0
38.82	765
39.82	563
40.82	0
41.82	0
42.82	0
43.82	0
44.82	0
45.82	0
46.82	0
47.82	0
48.82	0
49.82	0
50.82	0
51.82	0
52.82	0
Total	495606

onite Ltd Date:15.02.82 Time:15:02:30 Week No: 11.82 User:Saba page 1/13

elivery Schedule

O/D	Customer	W/O No.	Q Ord	Description	Dl Wk	P St	Pat	Sam	Aly	Pros	Q/Cast	M/c	Ass	Spe
2	Normalair	H49961	59	Butterfly	52.81	si	n	y	16	flr	0	n	n	y
7	CES Holland	E50981	135	Coathanger	04.82	ok	n	n	4	shl	0	n	n	n
7	Cessna	H50451	20	Roller	04.82	ok	n	n	6	flr	0	y	n	n
5	Piftin	G51401	11	Frame	06.82	ok	n	n	4	bmm	0	n	n	n
5	CE	G5242A	1	Pot 24*30	06.82	ok	n	n	5	A	0	n	y	n
5	VF Eng	H51621a	1	Support	06.82	si	n	y	59	shl	0	n	n	y
5	VF Eng	H51622a	1	Screw M12	06.82	ok	n	n	15	bop	0	n	n	n
5	VF Eng	H51623a	1	Nut M12	06.82	ok	n	n	15	bop	0	n	n	n
4	CES Belgium	E5323A	2	Rad.Tube	07.82	ok	n	n	4	A	0	n	y	n
4	CES Belgium	E53231	2	Tube 5 1/4od	07.82	ok	n	n	4	s/t	0	y	y	n
4	CES Belgium	E53232	2	Tube 4 3/4od	07.82	ok	n	n	4	s/t	0	y	y	n
4	CES Belgium	E53233	2	U Bend	07.82	ok	n	n	4	cpc	0	n	y	n
4	CES Belgium	E5324A	1	Rad.Tube	07.82	ok	n	n	4	A	0	n	y	n
4	CES Belgium	E53241	2	Tube 121od	07.82	ok	n	n	4	s/t	0	n	y	n
4	CES Belgium	E53242	1	Tube 121 od	07.82	ok	n	n	4	s/t	0	n	y	n
4	CES Belgium	E53243	2	Flange	07.82	bo	n	n	40	bop	0	n	y	n
4	CES Belgium	E53244	4	Angle	07.82	ok	n	n	4	flr	0	n	y	n
	CES Belgium	E53245	1	Tube	07.82	ok	n	n	4	flr	0	n	y	n
	CES Belgium	E53246	6	Lug	07.82	ok	n	n	5	bop	0	n	y	n
	CES NAC	E54331	8	Tube 88.9od	07.82	ok	n	n	4	s/t	0	n	n	n
	CES France	E52121	40	Basket	08.82	ok	n	n	7B	flr	11	n	n	n
	CES Sweden	E54061	40	Guide Grid	08.82	ok	n	n	5	bmm	8	n	n	n
	CES NAC	E5416A	12	Grid 56*30	08.82	ok	n	n	7	A	0	n	y	n
	CES NAC	E54161	24	Grid 28*30	08.82	ok	n	n	7	bt5	5	n	y	n
	Piftin	G51432	4	Inter Grid	08.82	ok	n	n	8	flr	2	n	n	n
	Piftin	G54431	3	Tube 4.25od	08.82	ok	n	n	8	s/t	0	n	n	n
	Piftin	G54432	15	Tube 4.25od	08.82	ok	n	n	8	s/t	0	n	n	n

onite Ltd Date:15.02.82 Time:15:04:25 Week No: 11.82 User:Saba page 2/13

livery Schedule

O/D	Customer	W/O No.	Q Ord	Description	Dl Wk	P St	Pat	Sam	Aly	Pros	Q/Cast	M/c	Ass	Spe
	Babcock	H49661	2289	Coathook	08.82	ok	n	n	66F	shl	0	n	n	y
	WildBarfield	H52381	2	Liner 5inch	08.82	bo	n	n	5	bop	2	n	n	n
	WildBarfield	H52382	2	Liner 8inch	08.82	bo	n	n	5	bop	2	n	n	n
	Leyland	H5244A	1	Retort	08.82	ok	n	n	5	A	0	n	y	n
	Leyland	H52441	1	Tube10*9	08.82	bo	n	n	5	bop	0	y	y	n
	Leyland	H52442	1	Flange	08.82	ok	n	n	40	bop	0	y	y	n
	Hunslet	H53211	2	Basket	08.82	bo	n	n	5	bop	2	n	n	n
2	CES Belgium	E53112	32	Plate	09.82	ok	n	n	3	cww	0	n	n	n
2	CES Belgium	E53116	156	Plate	09.82	ok	n	n	3	cww	0	n	n	n
2	CES Belgium	E53117	156	Plate	09.82	ok	n	n	3	cww	0	n	n	n
2	CES Belgium	E53118	76	Plate	09.82	ok	n	n	3	cww	0	n	n	n
2	CES Italy	E53391	8	Tray	09.82	si	n	y	5	bt5	6	n	n	n
2	CES NAC	E53831	1	Fanhead 25	09.82	ok	n	n	4	flr	0	n	n	n
2	Piftin	G5569A	2	BasketT4*207	09.82	ok	n	n	5	A	0	n	y	n
2	SSEB	H52971	20	Support Lug	09.82	ok	n	n	4	flr	2	n	n	n
2	NEI	H53401	10	Air Swirler	09.82	ok	n	n	3	p/s	0	y	n	n
2	Land Pyros	H5342A	2	Sheath 60in	09.82	ok	n	n	4	A	0	n	y	n
	Land Pyros	H53421	7	Tube 1 1/4	09.82	ok	n	n	4	flr	0	n	y	n
	Land Pyros	H53422	2	Blank	09.82	ok	n	n	4	p/s	0	n	y	n
	Plibrico	H53732	117	HTBH 1 1/2	09.82	ok	n	n	6	cww	0	n	n	n
	Plibrico	H53734	50	HTB 1	09.82	ok	n	n	6	p/s	12	n	n	n
	Plibrico	H53861	6	HTAH 9 1/2	09.82	ok	n	n	6	cww	0	n	n	n
	DiamondPower	H5418A	2	Tube 6 ft	09.82	ok	n	n	4	A	0	n	y	n
	DiamondPower	H54181	8	Tube 2 3/8od	09.82	ok	n	n	4	flr	4	n	y	n
	Lindsey Oil	H55441	60	Bolt/Nut	09.82	bo	n	n	6	bop	60	n	n	n
	Stock	IP1/2	10	LongSide LH	09.82	ok	n	n	5	bmm	0	n	n	n
	Stock	IP1/3	10	LongSide RH	09.82	ok	n	n	5	bmm	2	n	n	n
	Stores	S00106	10	Small Ladle	09.82	ok	n	n	4	flr	10	n	n	n
	Stores	S00107	10	Large Ladle	09.82	ok	n	n	4	flr	10	n	n	n

livery Schedule

O/D	Customer	W/O No.	Q Ord	Description	Dl Wk	P St	Pat	Sam	Aly	Pros	Q/Cast	M/c	Ass	Spe
1	CES Sweden	E53161	300	Spacer	10.82	sf	n	y	4	cww	300	n	n	n
1	CES Holland	E53611	500	Coathanger	10.82	ok	n	n	4	shl	244	n	n	n
1	CES Sweden	E54051	8	Fanhead 17	10.82	ok	n	n	5	flr	6	n	n	n
1	CES NAC	E54621	3	Tray	10.82	ok	n	n	8	bt5	0	n	n	n
1	CES Italy	E56041	20	Tube88.9od	10.82	ok	n	n	5	s/t	20	n	n	n
1	Piftin	G53911	2	AdaptorPlate	10.82	ok	n	n	4	flr	0	y	n	n
1	Piftin	G53912	6	Support Rack	10.82	dr	n	n	4	flr	4	n	n	n
1	Piftin	G54401	60	Central Stem	10.82	n	n	n	4	flr	56	n	n	n
1	Piftin	G5532A	2	Frame	10.82	ok	n	n	310	A	0	n	y	n
1	Piftin	G55321	4	Ring	10.82	bo	n	n	310	bop	4	n	y	n
1	Piftin	G55322	2	Long Strip	10.82	bo	n	n	310	bop	2	y	y	n
1	Piftin	G55323	2	Short Strip	10.82	bo	n	n	310	bop	2	n	y	n
1	Piftin	G55324	4	Plate	10.82	bo	n	n	310	bop	4	y	y	n
1	Normalair	H53461	8	Ring	10.82	si	n	y	57	flr	0	n	n	n
1	BL Cars	H5402A	1	ChainGuideRH	10.82	ok	n	n	4	A	0	y	y	n
1	BL Cars	H54021	1	GuideRailRH	10.82	ok	n	n	4	flr	0	n	y	n
1	BL Cars	H54022	1	Extension	10.82	ok	n	n	4	flr	0	n	y	n
1	BL Cars	H5403A	1	ChainGuideLH	10.82	ok	n	n	4	A	0	y	y	n
1	BL Cars	H54031	1	GuideRail LH	10.82	ok	n	n	4	flr	0	n	y	n
1	BL Cars	H54032	1	Extension	10.82	ok	n	n	4	flr	0	n	y	n
	Wellworthy	H54691	10	Insert Grid	10.82	ok	n	n	8	bmm	10	n	n	n
	Wellworthy	H54692	10	Base Grid	10.82	ok	n	n	8	bmm	2	y	n	n
	Stock	S00012	10	Flange10.5	10.82	ok	n	n	40	bmm	10	n	n	n
	Stock	S00021	10	PotBase15.75	10.82	ok	n	n	4	s/b	0	n	n	n
	Stock	S00022	10	Flange15.75	10.82	ok	n	n	40	bmm	10	n	n	n
	Stock	S00023	16	Tube16.75od	10.82	ok	n	n	5	s/t	0	y	n	n
	Stock	S00031	10	BasePot 18.5	10.82	ok	n	n	4	s/b	0	n	n	n
	Stock	S00033	9	Tube19 1/8od	10.82	ok	n	n	5	s/t	9	y	n	n
	Stores	S00104	10	FormerBase5	10.82	ok	n	n	4	p/s	10	n	n	n
	CES Sweden	E54451a	50	Grid	10.82	ok	n	n	4	shl	23	n	n	n
	CES France	E56111a	30	Dog T4	10.82	ok	n	n	6	shl	0	y	n	n

livery Schedule

O/D	Customer	W/O No.	Q Ord	Description	Dl Wk	P St	Pat	Sam	Aly	Pros	Q/Cast	M/c	Ass	Spe
	Vauxhall	H54221a	2	TSM Grid	10.82	ok	n	n	5	bmm	0	y	n	n
	Piftin	G53931	48	Support Bar	11.82	ok	n	n	4	cww	36	n	n	n
	Piftin	G53941	72	Loading Bar7	11.82	ok	n	n	4	cww	64	n	n	n
	Piftin	G54781	4	Crucible	11.82	sf	n	y	5	flr	4	n	n	n
	Piftin	G54782	4	Top Ring	11.82	dr	n	n	5	flr	0	n	n	n
	Normalair	H52611	10	Body	11.82	si	n	y	16	flr	0	n	n	y
	Glossop	H56271	1 ht	Stick	11.82	ok	n	n	69	shl	1 ht	n	n	n
	Ingot	H56281	1 ht	Ingot	11.82	ok	n	n	57	p/s	1 ht	n	n	n
	Glossop	H56291	1 ht	Stick	11.82	ok	n	n	76	shl	1 ht	n	n	n
	Piftin	G54241a	1	Base Tray	11.82	sf	n	y	5	flr	1	n	n	n

onite Ltd Date:15.02.82 Time:15:13:00 Week No: 11.82 User:Saba page 5/13

livery Schedule

O/D	Customer	W/O No.	Q Ord	Description	Dl Wk	P St	Pat	Sam	Aly	Pros	Q/Cast	M/c	Ass	Spe
1	CES Canada	E5428A	1	Belt	12.82	ok	n	n	5	A	0	n	y	n
1	CES Canada	E54281	2349	Centre Link	12.82	ok	n	n	5	shl	680	n	y	n
1	CES Canada	E54282	81	Side Link	12.82	ok	n	n	5	shl	0	n	y	n
1	CES Canada	E54283	81	Side Link	12.82	ok	n	n	5	shl	2	n	y	n
1	CES Canada	E54284	81	Side Link	12.82	ok	n	n	5	shl	0	n	y	n
1	CES Canada	E54285	81	Side Link	12.82	ok	n	n	5	shl	0	n	y	n
1	CES Canada	E54286	162	Step Washer	12.82	es	n	n	5	cpc	0	n	y	n
1	CES Canada	E54287	162	Plain Washer	12.82	es	n	n	5	cpc	0	n	y	n
1	CES Canada	E54288	162	Rod	12.82	bo	n	n	5	bop	0	n	y	n
1	CES France	E54741	2	Tube 143od	12.82	ok	n	n	5	s/t	0	n	n	n
1	CES France	E54742	1	U Bend	12.82	es	n	n	5	cpc	0	n	n	n
1	CES Italy	E54811	20	Half Base	12.82	ok	n	n	4	bt5	0	n	n	n
1	CES Italy	E55181	5	Tube 143od	12.82	ok	n	n	5	s/t	0	n	n	n
1	Piftin	G53902	8	Long SideY=5	12.82	ok	n	n	4	flr	7	n	n	n
1	Piftin	G53903	8	ShortSideY=5	12.82	ok	n	n	4	flr	7	n	n	n
1	Piftin	G5467A	2	Work Basket	12.82	ok	n	n	4	A	0	n	y	n
1	Piftin	G54671	2	Basket	12.82	dr	n	n	4	flr	1	n	y	n
1	Piftin	G54672	8	Lug	12.82	ok	n	n	4	flr	0	n	y	n
1	Piftin	G54681	1	Sand Seal	12.82	ok	n	n	4	flr	0	n	n	n
1	Lucas CAV	H5378A	4	Radiant Tube	12.82	ok	n	n	5	A	0	n	y	n
1	Lucas CAV	H53781	4	U Bend	12.82	ok	n	n	5	cpc	0	n	y	n
1	Lucas CAV	H53782	4	Tube 3.5od	12.82	bo	n	n	5	bop	4	n	y	n
	Lucas CAV	H53783	4	Tube 4.5od	12.82	bo	n	n	5	bop	4	n	y	n
	Lucas CAV	H53784	4	Tube3.5od	12.82	ok	n	n	5	s/t	0	y	y	n
	Lucas CAV	H53785	4	Strap	12.82	ok	n	n	5	flr	0	n	y	n
	FHD	H5453A	1	Tube 12ft lg	12.82	ok	n	n	4	A	0	n	y	n
	FHD	H54531	6	Tube 1.5od	12.82	ok	n	n	4	p/s	6	n	y	n
	NEI	H54601	2	Impellor	12.82	ok	n	n	84	flr	1	n	n	y
	WildBarfield	H54611	1	Hearthplate	12.82	ok	n	n	4	flr	0	n	n	n
	CEGB	H54891	2	T Beam	12.82	ok	n	n	6	flr	0	n	n	n
	CEGB	H54892	2	Lug	12.82	ok	n	n	6	flr	2	n	n	n
	Morganite	H55361	30	Socket	12.82	ok	n	n	4	flr	32	y	n	n
	Lindsey Oil	H55431	4	Support Beam	12.82	si	n	y	6A	flr	2	n	n	y
	Lindsey Oil	H55432	10	Wall Support	12.82	si	n	y	6A	p/s	4	n	n	n
	J.Moncrieff	H55921	6metr	Bar38mm dia	12.82	bo	n	n	6	bop	6metr	n	n	n

elivery Schedule

s O/D	Customer	W/O No.	Q Ord	Description	Dl Wk	P St	Pat	Sam	Aly	Pros	Q/Cast	M/c	Ass	Spe
-2	CES NAC	E52431	120	Grid	13.82	ok	n	n	17	bmm	7	y	n	n
-2	CES Belgium	E5320A	10	Grid Assy	13.82	ok	n	n	5	A	0	n	y	n
-2	CES Belgium	E53201	20	Grid	13.82	np	y	y	5	flr	20	y	y	n
-2	CES Belgium	E53202	40	Clip	13.82	np	y	y	5	flr	40	n	y	n
-2	CES Belgium	E53203	40	Bolt1/2*2.5	13.82	ok	n	n	5	cpc	0	y	y	n
-2	CES Belgium	E53204	40	Nut 1/2 bsw	13.82	es	n	n	5	cpc	0	n	y	n
-2	CES Sweden	E53671	55	Guide Grid	13.82	sf	n	y	4	bmm	55	n	n	n
-2	CES Finland	E53841	200	Pin B23	13.82	sf	n	y	1	cww	204	n	n	n
-2	CES Finland	E53842	50	Pin B34	13.82	sf	n	y	1	p/s	50	n	n	n
-2	CES Sweden	E54071	5	Base Grid	13.82	dr	n	n	4	bmm	3	n	n	n
-2	CES Sweden	E54072	10	Support Ring	13.82	dr	n	n	4	bmm	8	y	n	n
-2	CES Holland	E54171	2	Jaws	13.82	ok	n	n	14	flr	2	n	n	n
-2	CES Holland	E54172	2	Jaws	13.82	op	y	n	14	flr	2	n	n	n
2	CES NAC	E54641	10	Base Grid	13.82	ok	n	n	31	bt5	0	n	n	n
-2	CES NAC	E54642	20	Short Side	13.82	ok	n	n	31	bmm	0	n	n	n
2	CES NAC	E54643	20	Long Side LH	13.82	ok	n	n	31	bmm	0	n	n	n
-2	CES NAC	E54644	20	Long Side RH	13.82	ok	n	n	31	bmm	0	n	n	n
2	CES Sweden	E54751	50	Support Grid	13.82	ok	n	n	4	bmm	2	n	n	n
2	CES Italy	E55171	30	Tray	13.82	ok	n	n	4	bt5	3	n	n	n
	CES Holland	E55191	300	Coathanger	13.82	ok	n	n	4	shl	192	n	n	n
	CES NAC	E55571	20	Grid	13.82	ok	n	n	5	bmm	0	n	n	n
	CES NAC	E55741	4	Tube Support	13.82	ok	n	n	5	flr	4	n	n	n
	Piftin	G52621	2	Base	13.82	si	n	y	4	flr	1	n	n	n
	Piftin	G52622	2	Inter Spider	13.82	sp	n	y	4	flr	2	n	n	n
	Piftin	G53251	3	Base Spider	13.82	np	y	y	8	flr	3	n	n	n
	Piftin	G53252	3	Inter Spider	13.82	np	y	y	8	flr	3	n	n	n
	Piftin	G53891	4	Crucible	13.82	sp	n	y	4	flr	4	n	n	n
	Piftin	G54771	4	Inter Spider	13.82	sf	n	y	4	flr	4	n	n	n
	CPC	G55311	20	Dog T11	13.82	ok	n	n	4	flr	20	n	n	n
	CE	G5553A	5	Pot15.75*18	13.82	ok	n	n	5	A	0	n	y	n

elivery Schedule

O/D	Customer	W/O No.	Q Ord	Description	Dl Wk	P St	Pat	Sam	Aly	Pros	Q/Cast	M/c	Ass	Spe
2	CE	G5554A	1	Pot18*24	13.82	ok	n	n	5	A	0	n	y	n
2	VF Eng	H51861	50	Grate Rod	13.82	bo	n	n	Wk	bop	50	n	n	n
2	BP Llandarcy	H51941	10	Tube Hanger	13.82	si	n	y	7	p/s	0	n	n	y
2	FHD	H5371A	1	Muffle Assy	13.82	ok	n	n	4	A	0	y	y	n
2	FHD	H53711	2	Muffle	13.82	ok	n	n	4	p/s	0	n	y	n
2	FHD	H53712	9	Tube 7/8od	13.82	ok	n	n	4	flr	12	n	y	n
2	FHD	H53713	4	Tube 1 3/8od	13.82	ok	n	n	4	flr	30	n	y	n
2	FHD	H53714	2	Flange	13.82	bo	n	n	40	bop	2	y	y	n
2	FHD	H53715	4	Gas Pipe	13.82	bo	n	n	15	bop	4	n	y	n
2	FHD	H53716	2	Outlet Pipe	13.82	bo	n	n	15	bop	2	n	y	n
2	J.Woodhead	H5396A	2	Roller Assy	13.82	ok	n	n	6	A	0	n	y	n
2	J.Woodhead	H53961	2	Roller	13.82	sp	n	y	6	flr	2	y	y	n
2	J.Woodhead	H53962	2	Plug	13.82	sp	n	y	6	flr	2	n	y	n
2	Caterpillar	H5398A	2	Basket Assy	13.82	ok	n	n	5	A	0	n	y	n
2	Caterpillar	H53981	8	Basket Sect.	13.82	sf	n	y	5	flr	8	n	y	n
2	Caterpillar	H5399A	2	Basket Assy	13.82	ok	n	n	5	A	0	n	y	n
2	Caterpillar	H53991	8	Basket Sect	13.82	sf	n	y	5	flr	8	n	y	n
2	Caterpillar	H54001	4	Grid	13.82	sf	n	y	5	flr	4	n	n	n
	Babcock	H5430A	4	Spindle	13.82	ok	n	n	6	A	0	n	y	n
	Babcock	H54301	4	Cone	13.82	ok	n	n	6	flr	4	y	y	n
	Babcock	H54302	4	Blade	13.82	ok	n	n	6	p/s	0	y	y	n
	Babcock	H54303	8	Web	13.82	ok	n	n	6	flr	10	n	y	n
	Babcock	H54304	4	Bar 1.25dia	13.82	bo	n	n	5	bop	0	y	y	n
	Babcock	H54311	200	CapNut 13UNC	13.82	cp	n	n	6	cpc	0	y	n	n
	GKN Screws	H5434A	2	Retort Plug	13.82	ok	n	n	4	A	0	n	y	n
	GKN Screws	H54341	2	Bung	13.82	ok	n	n	4	flr	0	y	y	n
	GKN Screws	H54342	2	Ring	13.82	ok	n	n	40	bop	0	y	y	n
	GKN Screws	H54343	12	Nut 3/8BSW	13.82	es	n	n	5	bop	0	n	y	n
	GKN Screws	H54344	4	Tube	13.82	ok	n	n	4	flr	0	y	y	n
	Automotive	H5436A	4	Side Plate	13.82	ok	n	n	4	A	0	n	y	n
	Automotive	H54361	4	Long Side	13.82	ok	n	n	4	flr	0	n	y	n
	Automotive	H54362	16	Bush	13.82	ok	n	n	4	flr	0	n	y	n
	Automotive	H5437A	4	End Plate	13.82	ok	n	n	4	A	0	n	y	n
	Automotive	H54371	4	Short Side	13.82	ok	n	n	4	flr	0	n	y	n
	Automotive	H54372	8	Bush	13.82	ok	n	n	4	flr	0	n	y	n
	Automotive	H5438A	8	Pin	13.82	ok	n	n	5	A	0	n	y	n

elivery Schedule

O/D	Customer	W/O No.	Q Ord	Description	Dl Wk	P St	Pat	Sam	Aly	Pros	Q/Cast	M/c	Ass	Spe
2	Automotive	H54381	8	Rod	13.82	ok	n	n	5	bop	0	y	y	n
2	Automotive	H54382	8	Head	13.82	bo	n	n	5	bop	8	y	y	n
2	Masterfil	H54421	18	Tube143od	13.82	ok	n	n	84	s/t	18	n	n	y
2	Masterfil	H54422	8	Tube 6 3/4od	13.82	ok	n	n	84	s/t	8	n	n	y
2	SmithClayton	H5452A	5	Hinged Tray	13.82	ok	n	n	4	A	0	n	y	n
2	SmithClayton	H54521	10	Tray	13.82	ok	n	n	4	bmm	4	n	y	n
2	SmithClayton	H54522	5	Hinge	13.82	ok	n	n	4	cww	0	n	y	n
2	SmithClayton	H54523	5	Pin	13.82	bo	n	n	5	bop	5	y	y	n
2	SmithClayton	H54524	10	Wire	13.82	ok	n	n	5	bop	0	n	y	n
2	BL Cars	H5456A	2	Guide Rail	13.82	ok	n	n	4	A	0	n	y	n
2	BL Cars	H54561	2	Rail	13.82	ok	n	n	4	flr	0	y	y	n
2	BL Cars	H54562	2	Extension	13.82	ok	n	n	4	flr	0	n	y	n
2	BL Cars	H54563	6	Webs	13.82	ty	n	n	4	flr	0	n	y	n
2	Ferro GB	H54701	260	Coathanger	13.82	ok	n	n	5	bmm	72	n	n	n
2	Babcock	H54901	4	Venturi	13.82	ok	n	n	3	p/s	0	y	n	n
2	Land Pyros	H5503A	4	Sheath 838mm	13.82	ok	n	n	4	A	0	n	y	n
2	Land Pyros	H55031	4	Tube 1.25od	13.82	ok	n	n	4	flr	4	n	y	n
2	Land Pyros	H55032	4	Tube 1.25od	13.82	ok	n	n	4	flr	4	n	y	n
2	Land Pyros	H55033	4	Blank 7/8od	13.82	ok	n	n	4	flr	0	n	y	n
2	Land Pyros	H5504A	3	Sheath 762mm	13.82	ok	n	n	4	A	0	n	y	n
2	Land Pyros	H55041	3	Tube 1.25od	13.82	ok	n	n	4	flr	4	n	y	n
2	Land Pyros	H55042	3	Tube 1.25od	13.82	ok	n	n	4	flr	4	n	y	n
2	Land Pyros	H55043	3	Blank 7/8	13.82	ok	n	n	4	flr	0	n	y	n
2	SpearJackson	H55351	1	Bath	13.82	ok	n	n	4	flr	1	n	n	n
	Steel Gauges	H55511	50	Nose 7/8	13.82	ok	n	n	4	p/s	0	n	n	n
	Steel Gauges	H55512	100	Nose 1 1/4	13.82	ok	n	n	4	p/s	0	n	n	n
	Babcock	H55561	1	Venturi End	13.82	ok	n	n	3	p/s	0	y	n	n
	SmithClayton	H5581A	5	Hinged Tray	13.82	ok	n	n	4	A	0	n	y	n
	SmithClayton	H55811	10	Tray	13.82	ok	n	n	4	bmm	10	n	y	n
	SmithClayton	H55812	5	Hinge	13.82	ok	n	n	4	cww	6	n	y	n
	SmithClayton	H55813	5	Pin	13.82	bo	n	n	5	bop	5	y	y	n
	SmithClayton	H55814	10	Locking Wire	13.82	bo	n	n	5	bop	10	n	y	n
	CEGB	H55881	50	Bar2.5*.5*72	13.82	ok	n	n	3	p/s	45	n	n	n
	CEGB	H55882	50	Bar2.5*.5*68	13.82	ok	n	n	3	p/s	45	n	n	n
	CEGB	H55883	50	Bar2.5*.5*39	13.82	ok	n	n	3	p/s	0	n	n	n
	CEGB	H55884	194	Bar2.5*.5*35	13.82	ok	n	n	3	p/s	118	n	n	n
	CEGB	H55885	72	Bar3*.75*36	13.82	ok	n	n	3	p/s	12	n	n	n
	CEGB	H55886	2000	Bar4.5*.75di	13.82	ok	n	n	3	p/s	936	n	n	n

elivery   Schedule

s O/D	Customer	W/O No.	Q Ord	Description	Dl Wk	P St	Pat	Sam	Aly	Pros	Q/Cast	M/c	Ass	Spe
-2	Belmont	H55981	1	Die Block 1	13.82	sf	n	y	4	flr	1	n	n	n
-2	Belmont	H55982	1	Die Block 2	13.82	sf	n	y	4	flr	1	n	n	n
-2	Ferro GB	H54711a	60	Susp.Bar	13.82	np	y	y	5	shl	60	n	n	n
-2	Steel Cords	H5549Aa	20	TubeAssy10ft	13.82	ok	n	n	4	A	0	n	y	n
-2	Steel Cords	H55491a	134	Tube 1 3/8od	13.82	ok	n	n	4	flr	134	n	y	n
-2	CES Sweden	E54151b	33	Grid	13.82	ok	n	n	5	flr	0	n	n	n
-2	CES Sweden	E54451b	25	Grid	13.82	ok	n	n	4	shl	25	n	n	n
-2	CES Sweden	E54151c	50	Grid	13.82	ok	n	n	5	flr	33	n	n	n

s O/D	Customer	W/O No.	Q Ord	Description	Dl Wk	P St	Pat	Sam	Aly	Pros	Q/Cast	M/c	Ass	Spe
-3	CES Swiss	E56071	5	Base Grid	14.82	ok	n	n	5	bt5	5	n	n	n
-3	CES Swiss	E56072	15	Inter Grid	14.82	ok	n	n	5	bt5	15	n	n	n
-3	Piftin	G54251	6	Support Grid	14.82	sf	n	y	4	bt5	6	n	n	n
-3	CE	G5575A	1	Pot 9*16	14.82	ok	n	n	5	A	0	n	y	n
-3	CE	G55751	1	Pot9*16	14.82	ok	n	n	5	flr	1	n	y	n
-3	CE	G55752	1	Rim	14.82	bo	n	n	40	bop	1	n	y	n
-3	ABR Food M/C	H50921	2	MeatPlatform	14.82	si	n	y	84	flr	0	n	n	y
3	Serck Glocon	H53451	10	100mm Cage	14.82	sf	n	y	91	p/s	10	n	n	y
3	MH Detrick	H53821	6	Tube Sheet	14.82	sf	n	y	7	p/s	6	n	n	n
3	MH Detrick	H53822	54	Support19606	14.82	si	n	y	7	p/s	51	n	n	n
3	MH Detrick	H53823	12	Support19607	14.82	ok	n	n	7	p/s	10	n	n	n
3	MH Detrick	H53824	200	Bolt/Nut 3/4	14.82	bo	n	n	B	bop	200	n	n	n
	MH Detrick	H53825	120	Bolt/Nut 7/8	14.82	bo	n	n	B	bop	120	n	n	n
	MH Detrick	H53826	200	Bolt/Nut 7/8	14.82	bo	n	n	B	bop	200	n	n	n
	Serck Glocon	H54121	15	150mm Cage	14.82	sf	n	y	82	flr	15	n	n	y
	Babcock	H54801	5	ConeImpeller	14.82	sp	n	y	7	flr	5	n	n	n
	Plibrico	H55481	120	HTAH Bell	14.82	ok	n	n	6	cww	0	n	n	n
	BL Cars	H5552A	1	Base Plate	14.82	ok	n	n	4	A	0	n	y	n
	BL Cars	H55521	1	Plate	14.82	ok	n	n	4	flr	0	n	y	n
	BL Cars	H55522	1	Extension12	14.82	ok	n	n	4	flr	0	n	y	n
	Vauxhall	H55641	20	Grid	14.82	ok	n	n	4	bmm	20	n	n	n
	Lewis&Towers	H55821	3	Plate	14.82	ok	n	n	4	p/s	3	n	n	n

elivery Schedule

O/D	Customer	W/O No.	Q Ord	Description	Dl Wk	P St	Pat	Sam	Aly	Pros	Q/Cast	M/c	Ass	Spe
3	Barltrop	H56191	1	Tube3in*2.75	14.82	ok	n	n	6	s/t	1	n	n	n
3	CES Denmark	E55801a	350	Guide	14.82	ok	n	n	7	shl	352	n	n	n
3	CES Denmark	E55802a	88	Alignment	14.82	ok	n	n	7	shl	95	n	n	n
3	CES Denmark	E55803a	875	Spacer	14.82	ok	n	n	7	shl	876	n	n	n
3	CES France	E56111b	70	Dog T4	14.82	ok	n	n	6	shl	0	y	n	n
3	Piftin	G54241b	9	Base Tray	14.82	np	y	y	5	bmm	9	n	n	n
3	Vauxhall	H54221b	2	TSM Grid	14.82	ok	n	n	5	bmm	0	y	n	n
4	CES GKN	E52756	24	TubeGuide984	15.82	si	n	y	6A	p/s	22	y	n	n
4	CES GKN	E52757	24	Ret.Plate	15.82	sf	n	y	6A	cww	24	n	n	n
4	CES GKN	E52758	24	KeeperPin628	15.82	sm	n	y	6A	cww	24	n	n	n
4	CES GKN	E52759	32	TubeGuide985	15.82	si	n	y	6A	p/s	28	y	n	n
4	CES GKN	E52761	32	Ret.Plate	15.82	si	n	y	6A	p/s	30	n	n	n
4	CES GKN	E52762	32	KeeperPin628	15.82	sm	n	y	6A	cww	48	n	n	n
4	CES GKN	E52763	36	TubeGuide986	15.82	si	n	y	6A	p/s	34	y	n	n
4	CES GKN	E52764	36	Ret.Plate	15.82	si	n	y	6A	p/s	36	n	n	n
4	CES GKN	E52765	36	KeeperPin628	15.82	sm	n	y	6A	cww	48	n	n	n
4	CES GKN	E52766	30	Support 999	15.82	ok	n	n	6A	p/s	11	n	n	n
4	CES GKN	E52767	24	Support1002	15.82	si	n	y	6A	p/s	22	n	n	n
4	CES GKN	E52768	48	Bolt 1001	15.82	si	n	y	6A	p/s	44	y	n	n
4	CES GKN	E52769	24	Support 1003	15.82	si	n	y	6A	p/s	22	n	n	n
4	CES GKN	E52771	32	Bolt 1001	15.82	si	n	y	6A	p/s	32	y	n	n
	CES GKN	E52772	16	Bolt 1010	15.82	si	n	y	6A	p/s	12	y	n	n
	CES GKN	E52773	1	TubeSheet994	15.82	sp	n	y	6A	p/s	1	n	n	y
	CES GKN	E52774	1	TubeSheet995	15.82	sp	n	y	6A	p/s	1	n	n	y
	CES GKN	E52775	6	Bracket 428	15.82	ok	n	n	6A	p/s	0	n	n	y
	CES GKN	E52776	4	Guide 436	15.82	ok	n	n	6A	p/s	0	n	n	n
	CES GKN	E52777	40	Guide 1000	15.82	si	n	y	6A	p/s	36	y	n	n
	CES GKN	E52778	40	Ret.Plate	15.82	sp	n	y	6A	cww	40	n	n	n
	CES GKN	E52779	40	KeeperPin628	15.82	sm	n	y	6A	cww	48	n	n	n
	CES GKN	E52781	20	TubeGuide985	15.82	si	n	y	6A	p/s	20	y	n	n
	CES GKN	E52782	20	Ret.Plate	15.82	si	n	y	6A	p/s	21	n	n	n
	CES GKN	E52783	20	KeeperPin628	15.82	sm	n	y	6A	cww	24	n	n	n
	CES GKN	E52784	31	Support1003	15.82	si	n	y	6A	p/s	31	n	n	n
	CES GKN	E52785	61	Bolt 1001	15.82	si	n	y	6A	p/s	64	y	n	n
	CES GKN	E52786	9	Bolt 1010	15.82	si	n	y	6A	p/s	12	y	n	n
	CES GKN	E52787	4	Support1006	15.82	ok	n	n	6A	p/s	0	n	n	n
	CES GKN	E52788	44	Support1004	15.82	si	n	y	6A	p/s	42	n	n	n
	CES GKN	E52789	80	Bolt 1001	15.82	si	n	y	6A	p/s	80	y	n	n

ronite Ltd Date:15.02.82 Time:15:24:19 Week No: 11.82 User:Saba page 11/13

elivery Schedule

O/D	Customer	W/O No.	Q Ord	Description	Dl Wk	P St	Pat	Sam	Aly	Pros	Q/Cast	M/c	Ass	Spe
-4	CES GKN	E52791	8	Bolt 1010	15.82	si	n	y	6A	p/s	8	y	n	n
-4	CES GKN	E52792	12	Guide 985	15.82	si	n	y	6A	p/s	12	y	n	n
-4	CES GKN	E52793	12	Ret.Plate	15.82	si	n	y	6A	p/s	12	n	n	n
-4	CES GKN	E52794	12	KeeperPin628	15.82	sm	n	y	6A	cww	24	n	n	n
-4	CES GKN	E52795	10	Support 998	15.82	ok	n	n	6A	p/s	0	n	n	n
-4	CES GKN	E52796	1	TubeSheet996	15.82	sf	n	y	6A	p/s	1	n	n	y
4	CES GKN	E52797	1	TubeSheet997	15.82	sf	n	y	6A	p/s	1	n	n	y
-4	CES GKN	E52798	4	Bracket 428	15.82	ok	n	n	6A	p/s	0	n	n	y
4	CES GKN	E52799	4	Guide 436	15.82	ok	n	n	6A	p/s	0	n	n	n
-4	CES GKN	E52801	24	Support1005	15.82	si	n	y	6A	p/s	22	n	n	n
4	CES GKN	E52802	32	Bolt 1001	15.82	si	n	y	6A	p/s	32	y	n	n
-4	CES GKN	E52803	16	Bolt 1010	15.82	si	n	y	6A	p/s	16	y	n	n
4	CES GKN	E52804	1	TubeSheet990	15.82	sf	n	y	6A	p/s	1	n	n	y
-4	CES GKN	E52805	8	Bracket1007	15.82	sf	n	y	6A	p/s	8	n	n	y
4	CES GKN	E52806	4	Bracket1007	15.82	sp	n	y	6A	p/s	4	n	n	y
-4	CES GKN	E5281A	4	Beam 1008	15.82	ty	n	n	36	A	0	n	y	y
4	CES GKN	E52811	4	Tube 150 od	15.82	ok	n	n	36	s/t	4	y	y	y
4	CES GKN	E52812	16	Lug100*25*15	15.82	sf	n	y	6A	flr	16	n	y	n
4	CES GKN	E5292A	2	Beam 1009	15.82	ty	n	n	36	A	0	n	y	y
4	CES GKN	E52921	2	Tube 150 od	15.82	ok	n	n	36	s/t	2	y	y	y
4	CES GKN	E52922	8	Lug100*25*15	15.82	sf	n	y	36	flr	8	n	y	n
4	CES NAC	E54761	20	Fanhead	15.82	np	y	y	4	flr	20	n	n	n
4	CES NAC	E54762	20	Shaft3.25*21	15.82	ok	n	n	4	p/s	20	n	n	n
4	CES Italy	E54821	40	Box	15.82	np	y	y	4	cww	40	n	n	n
	CES Sweden	E54961	10	Support Grid	15.82	np	y	y	4	cww	10	n	n	n
	CES France	E55201	12	Clamp	15.82	ok	n	n	4	flr	12	y	n	n
	CES France	E55202	20	Tube Support	15.82	ok	n	n	4	flr	20	n	n	n
	CES Holland	E5521A	28	RoofRod 850	15.82	ok	n	n	4	A	0	n	y	n
	CES Holland	E55211	28	RoofRod 600	15.82	ok	n	n	4	shl	28	n	y	n
	CES Holland	E55212	28	Rod Ext 250	15.82	ok	n	n	4	shl	30	y	y	n
	CES Holland	E5522A	70	RoofRod 870	15.82	ok	n	n	4	A	0	n	y	n
	CES Holland	E55221	70	RoofRod 600	15.82	ok	n	n	4	shl	72	n	y	n
	CES Holland	E55222	70	Rod Ext 270	15.82	bo	n	n	5	bop	70	y	y	n
	CES Italy	E55731	10	Base w/oRing	15.82	ok	n	n	5	flr	10	y	n	n
	Piftin	G55101	4	Top Grid	15.82	np	y	y	4	flr	4	n	n	n
	Piftin	G55111	4	Loading Grid	15.82	np	y	y	4	flr	4	n	n	n
	CE	G55391	2	Salt Pot	15.82	ok	n	n	4	flr	0	n	n	n

onite Ltd Date:15.02.82 Time:15:26:12 Week No: 11.82 User:Saba page

elivery Schedule 12/13

O/D	Customer	W/O No.	Q Ord	Description	Dl Wk	P St	Pat	Sam	Aly	Pros	Q/Cast	M/c	Ass	Spe
4	CE	G56121	2	Lead Pot	15.82	ok	n	n	5	flr	2	n	n	n
4	Lucas	H28881	8	Tube 5 5/16	15.82	ok	n	n	57	s/t	0	y	n	y
4	Lucas	H33941	100	Tube 5 5/16	15.82	ok	n	n	57	s/t	0	y	n	y
4	Lucas	H53011	9	Tube 5 5/16	15.82	ok	n	n	57	s/t	0	y	n	y
4	Ford	H5507A	1	BaseGridAssy	15.82	ok	n	n	4	A	0	n	y	n
4	Ford	H55071	1	Base Grid	15.82	ok	n	n	4	flr	0	y	y	n
4	Ford	H55072	1	Handle	15.82	ok	n	n	4	flr	0	n	y	n
4	Hall&Pickles	H55141	30	Exp Panel	15.82	bo	n	n	17	bop	30	n	n	n
4	Commonwealth	H5533A	20	Sheath 421g	15.82	ok	n	n	4	A	0	n	y	n
4	Commonwealth	H55331	47	Tube 1.25od	15.82	ok	n	n	4	flr	48	n	y	n
4	Commonwealth	H55332	20	Blank 7/8od	15.82	ok	n	n	4	flr	0	n	y	n
4	Babcock	H55341	5	Deflector	15.82	ok	n	n	4	flr	5	y	n	n
4	NEI	H55401	32	Stabiliser	15.82	sf	n	y	5	flr	32	y	n	n
4	NEI	H55402	32	Rim	15.82	ok	n	n	3	flr	32	y	n	n
4	VanDerVleit	H55471	20	Male Lug	15.82	np	y	y	1	flr	20	n	n	n
4	VanDerVleit	H55472	20	Female Lug	15.82	np	y	y	1	flr	20	n	n	n
	DiamondPower	H55501	10	Jet	15.82	ok	n	n	4	flr	10	n	n	n
	DiamondPower	H55551	128	Plate	15.82	np	y	y	4	cww	140	y	n	n
	ME Boilers	H5577A	18	ExpDoorAssy	15.82	ok	n	n	4	A	0	n	y	n
	ME Boilers	H55771	18	Exp Door	15.82	ok	n	n	4	flr	18	n	y	n
	ME Boilers	H55772	18	Hinge Pin	15.82	ty	n	n	5	bop	18	y	y	n
	ME Boilers	H55773	36	Washer 2 1/8	15.82	ok	n	n	4	flr	36	n	y	n
	ME Boilers	H55774	36	Split Pin	15.82	ty	n	n	5	bop	36	n	y	n
	ME Boilers	H5578A	18	Gas SealAssy	15.82	ok	n	n	4	A	0	n	y	n
	ME Boilers	H55781	18	Gas Seal	15.82	ok	n	n	4	p/s	18	n	y	n
	ME Boilers	H55782	18	Lug RH	15.82	ok	n	n	4	flr	18	n	y	n
	ME Boilers	H55783	18	Lug LH	15.82	ok	n	n	4	flr	18	n	y	n
	John Littler	H5584A	10	Grid36*24	15.82	ok	n	n	4	A	0	n	y	n
	John Littler	H55841	20	Grid	15.82	ok	n	n	4	bmm	20	n	y	n
	John Littler	H55842	20	Bolt1/2*1.75	15.82	cp	n	n	4	cpc	20	y	y	n
	John Littler	H55843	20	Nut 1/2 BSW	15.82	cp	n	n	4	cpc	20	y	y	n
	Land Pyros	H5595A	32	Sheath60inlg	15.82	ok	n	n	4	A	0	n	y	n
	Land Pyros	H55951	107	Tube1.25*18	15.82	ok	n	n	4	flr	108	n	y	n
	Land Pyros	H55952	32	Blank7/8*1/4	15.82	ok	n	n	4	flr	72	n	y	n

elivery Schedule

s O/D	Customer	W/O No.	Q Ord	Description	Dl Wk	P St	Pat	Sam	Aly	Pros	Q/Cast	M/c	Ass	Spe
-4	NEI	H56001	10	OrificePlate	15.82	ok	n	n	3	p/s	10	n	n	n
-4	Moore&Wright	H56051	2	Lead Pot	15.82	ok	n	n	4	flr	2	n	n	n
-4	BL Albion	H55231a	50	Corner Post	15.82	np	y	y	5	cww	52	y	n	n
-5	CES France	E54721	5	Grid	16.82	np	y	y	4	cww	5	y	n	n
-5	CES NAC	E54991	2	Plate	16.82	np	y	y	31	flr	2	n	n	n
-5	CES NAC	E55001	2	Grid	16.82	ok	n	n	4	flr	2	n	n	n
-5	CES Holland	E5576A	2	Muffle	16.82	ok	n	n	4	A	2	y	y	n
-5	CES Holland	E55761	3	Muffle Sect	16.82	ok	n	n	4	flr	3	n	y	n
-5	CES Holland	E55762	4	Flange	16.82	bo	n	n	40	bop	4	y	y	n
-5	CES Holland	E55763	8	Nipples	16.82	bo	n	n	40	bop	8	y	y	n
-5	CES Sweden	E56101	30	Corner Post	16.82	ok	n	n	5	bmm	30	n	n	n
-5	CES Sweden	E56102	10	Centre Post	16.82	ok	n	n	5	cww	12	n	n	n
-5	CES Sweden	E56103	10	Top Grid	16.82	ok	n	n	5	bmm	10	n	n	n
-5	Piftin	G55051	4	Base Tray	16.82	np	y	y	4	bt5	4	y	n	n
-5	Piftin	G55451	4	Base Tray	16.82	np	y	y	4	bt5	4	y	n	n
5	BSC	H53631	3	Cassette	16.82	sf	n	y	86	flr	3	y	n	y
5	Cam Gears	H53851	12	Support Grid	16.82	ok	n	n	4	bmm	12	y	n	n
5	Rolls Royce	H55851	4	Grid	16.82	pr	n	n	4	flr	4	n	n	n
	Oxymetal	H55971	2	Fan 17in	16.82	ok	n	n	6	flr	2	n	n	n
	Steel Cords	H5549Ab	20	TubeAssy10ft	16.82	ok	n	n	4	A	0	n	y	n
	Steel Cords	H55491b	134	Tube 1 3/8od	16.82	ok	n	n	4	flr	134	n	y	n

Machining Schedule

Wks O/D	Customer	W/O No.	Q Ord	Description	Dl Wk	P St	Pat	Sam	Aly	Pros	Q/Cast	M/c	Ass	Spe
7	Cessna	H50451	20	Roller	04.82	ok	n	n	6	flr	0	y	n	n
4	CES Belgium	E53231	2	Tube 5 1/4od	07.82	ok	n	n	4	s/t	0	y	y	n
4	CES Belgium	E53232	2	Tube 4 3/4od	07.82	ok	n	n	4	s/t	0	y	y	n
3	Leyland	H52441	1	Tube10*9	08.82	bo	n	n	5	bop	0	y	y	n
3	Leyland	H52442	1	Flange	08.82	ok	n	n	40	bop	0	y	y	n
2	NEI	H53401	10	Air Swirler	09.82	ok	n	n	3	p/s	0	y	n	n
1	Piftin	G53911	2	AdaptorPlate	10.82	ok	n	n	4	flr	0	y	n	n
1	Piftin	G55322	2	Long Strip	10.82	bo	n	n	310	bop	2	y	y	n
1	Piftin	G55324	4	Plate	10.82	bo	n	n	310	bop	4	y	y	n
1	BL Cars	H5402A	1	ChainGuideRH	10.82	ok	n	n	4	A	0	y	y	n
1	BL Cars	H5403A	1	ChainGuideLH	10.82	ok	n	n	4	A	0	y	y	n
1	Wellworthy	H54692	10	Base Grid	10.82	ok	n	n	8	bmm	2	y	n	n
1	Stock	S00023	16	Tube16.75od	10.82	ok	n	n	5	s/t	0	y	n	n
1	Stock	S00033	9	Tube19 1/8od	10.82	ok	n	n	5	s/t	9	y	n	n
1	CES France	E56111a	30	Dog T4	10.82	ok	n	n	6	shl	0	y	n	n
1	Vauxhall	H54221a	2	TSM Grid	10.82	ok	n	n	5	bmm	0	y	n	n
-1	Lucas CAV	H53784	4	Tube3.5od	12.82	ok	n	n	5	s/t	0	y	y	n
-1	Morganite	H55361	30	Socket	12.82	ok	n	n	4	flr	32	y	n	n
-2	CES NAC	E52431	120	Grid	13.82	ok	n	n	17	bmm	7	y	n	n
-2	CES Belgium	E53201	20	Grid	13.82	np	y	y	5	flr	20	y	y	n
-2	CES Belgium	E53203	40	Bolt1/2*2.5	13.82	ok	n	n	5	cpc	0	y	y	n

Cronite Ltd Date:15.02.82 Time:15:42:22 Week No: 11.82 User:Saba pag
2/2

Machining Schedule

Wks O/D	Customer	W/O No.	Q Ord	Description	Dl Wk	P St	Pat	Sam	Aly	Pros	Q/Cast	M/c	Ass	Spe
-2	CES Sweden	E54072	10	Support Ring	13.82	dr	n	n	4	bmm	8	y	n	n
-2	FHD	H5371A	1	Muffle Assy	13.82	ok	n	n	4	A	0	y	y	n
-2	FHD	H53714	2	Flange	13.82	bo	n	n	40	bop	2	y	y	n
-2	J.Woodhead	H53961	2	Roller	13.82	sp	n	y	6	flr	2	y	y	n
-2	Babcock	H54301	4	Cone	13.82	ok	n	n	6	flr	4	y	y	n
-2	Babcock	H54302	4	Blade	13.82	ok	n	n	6	p/s	0	y	y	n
-2	Babcock	H54304	4	Bar 1.25dia	13.82	bo	n	n	5	bop	0	y	y	n
-2	Babcock	H54311	200	CapNut 13UNC	13.82	cp	n	n	6	cpc	0	y	n	n
-2	GKN Screws	H54341	2	Bung	13.82	ok	n	n	4	flr	0	y	y	n
-2	GKN Screws	H54342	2	Ring	13.82	ok	n	n	40	bop	0	y	y	n
-2	GKN Screws	H54344	4	Tube	13.82	ok	n	n	4	flr	0	y	y	n
-2	Automotive	H54381	8	Rod	13.82	ok	n	n	5	bop	0	y	y	n
-2	Automotive	H54382	8	Head	13.82	bo	n	n	5	bop	8	y	y	n
-2	SmithClayton	H54523	5	Pin	13.82	bo	n	n	5	bop	5	y	y	n
-2	BL Cars	H54561	2	Rail	13.82	ok	n	n	4	flr	0	y	y	n
-2	Babcock	H54901	4	Venturi	13.82	ok	n	n	3	p/s	0	y	n	n
-2	Babcock	H55561	1	Venturi End	13.82	ok	n	n	3	p/s	0	y	n	n
-2	SmithClayton	H55813	5	Pin	13.82	bo	n	n	5	bop	5	y	y	n

Fabrication Schedule

Wks O/D	Customer	W/O No.	Q Ord	Description	Dl Wk	P St	Pat	Sam	Aly	Pros	Q/Cast	M/c	Ass	Spe
5	CE	G5242A	1	Pot 24*30	06.82	ok	n	n	5	A	0	n	y	n
4	CES Belgium	E5323A	2	Rad.Tube	07.82	ok	n	n	4	A	0	n	y	n
4	CES Belgium	E53231	2	Tube 5 1/4od	07.82	ok	n	n	4	s/t	0	y	y	n
4	CES Belgium	E53232	2	Tube 4 3/4od	07.82	ok	n	n	4	s/t	0	y	y	n
4	CES Belgium	E53233	2	U Bend	07.82	ok	n	n	4	cpc	0	n	y	n
4	CES Belgium	E5324A	1	Rad.Tube	07.82	ok	n	n	4	A	0	n	y	n
4	CES Belgium	E53241	2	Tube 121od	07.82	ok	n	n	4	s/t	0	n	y	n
4	CES Belgium	E53242	1	Tube 121 od	07.82	ok	n	n	4	s/t	0	n	y	n
4	CES Belgium	E53243	2	Flange	07.82	bo	n	n	40	bop	0	n	y	n
4	CES Belgium	E53244	4	Angle	07.82	ok	n	n	4	flr	0	n	y	n
4	CES Belgium	E53245	1	Tube	07.82	ok	n	n	4	flr	0	n	y	n
4	CES Belgium	E53246	6	Lug	07.82	ok	n	n	5	bop	0	n	y	n
3	CES NAC	E5416A	12	Grid 56*30	08.82	ok	n	n	7	A	0	n	y	n
3	CES NAC	E54161	24	Grid 28*30	08.82	ok	n	n	7	bt5	5	n	y	n
3	Leyland	H5244A	1	Retort	08.82	ok	n	n	5	A	0	n	y	n
3	Leyland	H52441	1	Tube10*9	08.82	bo	n	n	5	bop	0	y	y	n
3	Leyland	H52442	1	Flange	08.82	ok	n	n	40	bop	0	y	y	n
2	Piftin	G5569A	2	BasketT4*207	09.82	ok	n	n	5	A	0	n	y	n
2	Land Pyros	H5342A	2	Sheath 60in	09.82	ok	n	n	4	A	0	n	y	n
2	Land Pyros	H53421	7	Tube 1 1/4	09.82	ok	n	n	4	flr	0	n	y	n
2	Land Pyros	H53422	2	Blank	09.82	ok	n	n	4	p/s	0	n	y	n
2	DiamondPower	H5418A	2	Tube 6 ft	09.82	ok	n	n	4	A	0	n	y	n
2	DiamondPower	H54181	8	Tube 2 3/8od	09.82	ok	n	n	4	flr	4	n	y	n
1	Piftin	G5532A	2	Frame	10.82	ok	n	n	310	A	0	n	y	n
1	Piftin	G55321	4	Ring	10.82	bo	n	n	310	bop	4	n	y	n
1	Piftin	G55322	2	Long Strip	10.82	bo	n	n	310	bop	2	y	y	n
1	Piftin	G55323	2	Short Strip	10.82	bo	n	n	310	bop	2	n	y	n
1	Piftin	G55324	4	Plate	10.82	bo	n	n	310	bop	4	y	y	n
1	BL Cars	H5402A	1	ChainGuideRH	10.82	ok	n	n	4	A	0	y	y	n
1	BL Cars	H54021	1	GuideRailRH	10.82	ok	n	n	4	flr	0	n	y	n
1	BL Cars	H54022	1	Extension	10.82	ok	n	n	4	flr	0	n	y	n

Fabrication Schedule

Wks O/D	Customer	W/O No.	Q Ord	Description	Dl Wk	P St	Pat	Sam	Aly	Pros	Q/Cast	M/c	Ass	Spe
1	BL Cars	H5403A	1	ChainGuideLH	10.82	ok	n	n	4	A	0	y	y	n
1	BL Cars	H54031	1	GuideRail LH	10.82	ok	n	n	4	flr	0	n	y	n
1	BL Cars	H54032	1	Extension	10.82	ok	n	n	4	flr	0	n	y	n
-1	CES Canada	E5428A	1	Belt	12.82	ok	n	n	5	A	0	n	y	n
-1	CES Canada	E54281	2349	Centre Link	12.82	ok	n	n	5	shl	680	n	y	n
-1	CES Canada	E54282	81	Side Link	12.82	ok	n	n	5	shl	0	n	y	n
-1	CES Canada	E54283	81	Side Link	12.82	ok	n	n	5	shl	2	n	y	n
-1	CES Canada	E54284	81	Side Link	12.82	ok	n	n	5	shl	0	n	y	n
-1	CES Canada	E54285	81	Side Link	12.82	ok	n	n	5	shl	0	n	y	n
-1	CES Canada	E54286	162	Step Washer	12.82	es	n	n	5	cpc	0	n	y	n
-1	CES Canada	E54287	162	Plain Washer	12.82	es	n	n	5	cpc	0	n	y	n
-1	CES Canada	E54288	162	Rod	12.82	bo	n	n	5	bop	0	n	y	n
-1	Piftin	65467A	2	Work Basket	12.82	ok	n	n	4	A	0	n	y	n
-1	Piftin	654671	2	Basket	12.82	dr	n	n	4	flr	1	n	y	n
-1	Piftin	654672	8	Lug	12.82	ok	n	n	4	flr	0	n	y	n
-1	Lucas CAV	H5378A	4	Radiant Tube	12.82	ok	n	n	5	A	0	n	y	n
-1	Lucas CAV	H53781	4	U Bend	12.82	ok	n	n	5	cpc	0	n	y	n
-1	Lucas CAV	H53782	4	Tube 3.5od	12.82	bo	n	n	5	bop	4	n	y	n
-1	Lucas CAV	H53783	4	Tube 4.5od	12.82	bo	n	n	5	bop	4	n	y	n
-1	Lucas CAV	H53784	4	Tube3.5od	12.82	ok	n	n	5	s/t	0	y	y	n
-1	Lucas CAV	H53785	4	Strap	12.82	ok	n	n	5	flr	0	n	y	n
-1	FHD	H5453A	1	Tube 12ft lg	12.82	ok	n	n	4	A	0	n	y	n
-1	FHD	H54531	6	Tube 1.5od	12.82	ok	n	n	4	p/s	6	n	y	n
-2	CES Belgium	E5320A	10	Grid Assy	13.82	ok	n	n	5	A	0	n	y	n
-2	CES Belgium	E53201	20	Grid	13.82	np	y	y	5	flr	20	y	y	n
-2	CES Belgium	E53202	40	Clip	13.82	np	y	y	5	flr	40	n	y	n
-2	CES Belgium	E53203	40	Bolt1/2*2.5	13.82	ok	n	n	5	cpc	0	y	y	n
-2	CES Belgium	E53204	40	Nut 1/2 bsw	13.82	es	n	n	5	cpc	0	n	y	n
-2	CE	65553A	5	Pot15.75*18	13.82	ok	n	n	5	A	0	n	y	n
-2	CE	65554A	1	Pot18*24	13.82	ok	n	n	5	A	0	n	y	n
-2	FHD	H5371A	1	Muffle Assy	13.82	ok	n	n	4	A	0	y	y	n
-2	FHD	H53711	2	Muffle	13.82	ok	n	n	4	p/s	0	n	y	n
-2	FHD	H53712	9	Tube 7/8od	13.82	ok	n	n	4	flr	12	n	y	n
-2	FHD	H53713	4	Tube 1 3/8od	13.82	ok	n	n	4	flr	30	n	y	n
-2	FHD	H53714	2	Flange	13.82	bo	n	n	40	bop	2	y	y	n
-2	FHD	H53715	4	Gas Pipe	13.82	bo	n	n	15	bop	4	n	y	n
-2	FHD	H53716	2	Outlet Pipe	13.82	bo	n	n	15	bop	2	n	y	n

Fabrication Schedule

Wks O/D	Customer	W/O No.	Q Ord	Description	Dl Wk	P St	Pat	Sam	Aly	Pros	Q/Cast	M/c	Ass	Spe
-2	J.Woodhead	H5396A	2	Roller Assy	13.82	ok	n	n	6	A	0	n	y	n
-2	J.Woodhead	H53961	2	Roller	13.82	sp	n	y	6	flr	2	y	y	n
-2	J.Woodhead	H53962	2	Plug	13.82	sp	n	y	6	flr	2	n	y	n
-2	Caterpillar	H5398A	2	Basket Assy	13.82	ok	n	n	5	A	0	n	y	n
-2	Caterpillar	H53981	8	Basket Sect.	13.82	sf	n	y	5	flr	8	n	y	n
-2	Caterpillar	H5399A	2	Basket Assy	13.82	ok	n	n	5	A	0	n	y	n
-2	Caterpillar	H53991	8	Basket Sect	13.82	sf	n	y	5	flr	8	n	y	n
-2	Babcock	H5430A	4	Spindle	13.82	ok	n	n	6	A	0	n	y	n
-2	Babcock	H54301	4	Cone	13.82	ok	n	n	6	flr	4	y	y	n
-2	Babcock	H54302	4	Blade	13.82	ok	n	n	6	p/s	0	y	y	n
-2	Babcock	H54303	8	Web	13.82	ok	n	n	6	flr	10	n	y	n
-2	Babcock	H54304	4	Bar 1.25dia	13.82	bo	n	n	5	bop	0	y	y	n
-2	GKN Screws	H5434A	2	Retort Plug	13.82	ok	n	n	4	A	0	n	y	n
-2	GKN Screws	H54341	2	Bung	13.82	ok	n	n	4	flr	0	y	y	n
-2	GKN Screws	H54342	2	Ring	13.82	ok	n	n	40	bop	0	y	y	n
-2	GKN Screws	H54343	12	Nut 3/8BSW	13.82	es	n	n	5	bop	0	n	y	n
-2	GKN Screws	H54344	4	Tube	13.82	ok	n	n	4	flr	0	y	y	n
-2	Automotive	H5436A	4	Side Plate	13.82	ok	n	n	4	A	0	n	y	n
-2	Automotive	H54361	4	Long Side	13.82	ok	n	n	4	flr	0	n	y	n
-2	Automotive	H54362	16	Bush	13.82	ok	n	n	4	flr	0	n	y	n
-2	Automotive	H5437A	4	End Plate	13.82	ok	n	n	4	A	0	n	y	n
-2	Automotive	H54371	4	Short Side	13.82	ok	n	n	4	flr	0	n	y	n
-2	Automotive	H54372	8	Bush	13.82	ok	n	n	4	flr	0	n	y	n
-2	Automotive	H5438A	8	Pin	13.82	ok	n	n	5	A	0	n	y	n
-2	Automotive	H54381	8	Rod	13.82	ok	n	n	5	bop	0	y	y	n
-2	Automotive	H54382	8	Head	13.82	bo	n	n	5	bop	8	y	y	n
-2	SmithClayton	H5452A	5	Hinged Tray	13.82	ok	n	n	4	A	0	n	y	n
-2	SmithClayton	H54521	10	Tray	13.82	ok	n	n	4	bmm	4	n	y	n
-2	SmithClayton	H54522	5	Hinge	13.82	ok	n	n	4	cww	0	n	y	n
-2	SmithClayton	H54523	5	Pin	13.82	bo	n	n	5	bop	5	y	y	n
-2	SmithClayton	H54524	10	Wire	13.82	ok	n	n	5	bop	0	n	y	n
-2	BL Cars	H5456A	2	Guide Rail	13.82	ok	n	n	4	A	0	n	y	n
-2	BL Cars	H54561	2	Rail	13.82	ok	n	n	4	flr	0	y	y	n
-2	BL Cars	H54562	2	Extension	13.82	ok	n	n	4	flr	0	n	y	n
-2	BL Cars	H54563	6	Webs	13.82	ty	n	n	4	flr	0	n	y	n
-2	Land Pyros	H5503A	4	Sheath 838mm	13.82	ok	n	n	4	A	0	n	y	n
-2	Land Pyros	H55031	4	Tube 1.25od	13.82	ok	n	n	4	flr	4	n	y	n
-2	Land Pyros	H55032	4	Tube 1.25od	13.82	ok	n	n	4	flr	4	n	y	n
-2	Land Pyros	H55033	4	Blank 7/8od	13.82	ok	n	n	4	flr	0	n	y	n

Fabrication Schedule

Wks O/D	Customer	W/O No.	Q Ord	Description	Dl Wk	P St	Pat	Sam	Aly	Pros	Q/Cast	M/c	Ass	Spe
-2	Land Pyros	H5504A	3	Sheath 762mm	13.82	ok	n	n	4	A	0	n	y	n
-2	Land Pyros	H55041	3	Tube 1.25od	13.82	ok	n	n	4	flr	4	n	y	n
-2	Land Pyros	H55042	3	Tube 1.25od	13.82	ok	n	n	4	flr	4	n	y	n
-2	Land Pyros	H55043	3	Blank 7/8	13.82	ok	n	n	4	flr	0	n	y	n
-2	SmithClayton	H5581A	5	Hinged Tray	13.82	ok	n	n	4	A	0	n	y	n
-2	SmithClayton	H55811	10	Tray	13.82	ok	n	n	4	bmm	10	n	y	n
-2	SmithClayton	H55812	5	Hinge	13.82	ok	n	n	4	cww	6	n	y	n
-2	SmithClayton	H55813	5	Pin	13.82	bo	n	n	5	bop	5	y	y	n
-2	SmithClayton	H55814	10	Locking Wire	13.82	bo	n	n	5	bop	10	n	y	n
-2	Steel Cords	H5549Aa	20	TubeAssy10ft	13.82	ok	n	n	4	A	0	n	y	n
-2	Steel Cords	H55491a	134	Tube 1 3/8od	13.82	ok	n	n	4	flr	134	n	y	n

Cronite Ltd   Date:15.02.82   Time:15:44:37   Week No: 11.82   User:Saba   pag
1/13

Index   Main File

E55001	--	E55001	1466	CES NAC	2	4	flr	12.82	16.82	Grid	1	12	220	243	2	2306	ok	n n n n n
H52611	--	H52611	7817	Normalair	10	16	flr	07.82	11.82	Body	1	.75	1.75	7	0	1185	si	n y n n y
H5378A	--	H5378A	7895	Lucas CAV	4	5	A	11.82	12.82	Radiant Tube	5	3	40	40	0	1680	ok	n n y n n
E54981	--	E54981	7968	CES NAC	8	18	flr	14.82	18.82	Support	1	2.5	33	50	8	2226	np	y y n y y
H55881	--	H55881	7970	CEGB	50	3	p/s	10.82	13.82	Bar2.5*.5*72	3	.333	12	53	45	3233	ok	n n n n n
E55181	--	E55181	8202	CES Italy	5	5	s/t	10.82	12.82	Tube 143od	1	1	59.9	62	0	920	ok	n n n n n
E52771	--	E52771	7798	CES GKN	32	6A	p/s	10.82	15.82	Bolt 1001	4	.12	8	64	32	769	si	n y n y n
H5430A	--	H5430A	4219	Babcock	4	6	A	12.82	13.82	Spindle	5	.5	4	4	0	825	ok	n n y n n
S00031	--	S00031	8502	Stock	10	4	s/b	10.82	10.82	BasePot 18.5	1	1	33.5	50	0	0	ok	n n n n n
H50921	--	H50921	7953	ABR Food M/C	2	84	flr	11.82	14.82	MeatPlatform	1	3	60	150	0	570	si	n y n n y
H55431	--	H55431	7948	Lindsey Oil	4	6A	flr	10.82	12.82	Support Beam	1	12	300	500	2	5360	si	n y n n y
H5587Aa	--	H5587Aa	7483	BL	10	5	A	24.82	26.82	Load Fixture	10	.75	15	15	0	2780	ok	n n y n n
H53732	--	H53732	2081	Plibrico	117	6	cww	06.82	09.82	HTBH 1 1/2	12	.02	.27	8	0	280	ok	n n n n n
IP1/2	--	IP1/2	5067	Stock	10	5	bmm	08.82	09.82	LongSide LH	2	.25	.75	5.5	0	0	ok	n n n n n
H53781	--	H53781	2503	Lucas CAV	4	5	cpc	08.82	12.82	U Bend	1	.001	.001	.001	0	0	ok	n n y n n
H54711a	--	H54711a	7914	Ferro GB	60	5	shl	12.82	13.82	Susp.Bar	2	.117	3.85	11.9	60	2452	np	y y n n n
H5270A	--	H5270A		Torrington	1	4	A	52.99	52.99	ShakerMuffle	10	16	240	240	0	2200	op	n n y n n
H53782	--	H53782	7896	Lucas CAV	4	5	bop	10.82	12.82	Tube 3.5od	1	.001	.001	.001	4	0	bo	n n y n n
E52772	--	E52772	7800	CES GKN	16	6A	p/s	10.82	15.82	Bolt 1010	4	.12	8.5	64	12	452	si	n y n y n
H55882	--	H55882	7971	CEGB	50	3	p/s	10.82	13.82	Bar2.5*.5*68	3	.333	11.4	51	45	3106	ok	n n n n n
S00022	--	S00022	5557	Stock	10	40	bmm	10.82	10.82	Flange15.75	1	.75	11	17.7	10	0	ok	n n n n n
G54771	--	G54771	7930	Piftin	4	4	flr	10.82	13.82	Inter Spider	1	2	22	35	4	484	sf	n y n n n
H50451	--	H50451	7672	Cessna	20	6	flr	52.81	04.82	Roller	2	.125	2.75	9.75	0	666	ok	n n n y n
H55871a	--	H55871a	7484	BL	20	5	bmm	16.82	26.82	End Plate	2	.167	12	19.2	20	0	pr	n n y n n
H54601	--	H54601	5228	NEI	2	84	flr	08.82	12.82	Impellor	1	2	15	24.1	1	307	ok	n n n n y
E52773	--	E52773	7801	CES GKN	1	6A	p/s	08.82	15.82	TubeSheet994	1	10.6	448	690	1	1969	sp	n y n n y
H55872a	--	H55872a	7485	BL	40	5	bop	20.82	26.82	Pin 1in lg	1	.001	.001	.001	40	0	bo	n n y n n
E52774	--	E52774	7802	CES GKN	1	6A	p/s	08.82	15.82	TubeSheet995	1	10.6	445	685	1	1878	sp	n y n n y
E52775	--	E52775	7788	CES GKN	6	6A	p/s	10.82	15.82	Bracket 428	1	.833	32.7	47.7	0	492	ok	n n n n y
H55873a	--	H55873a	7486	BL	40	5	bmm	16.82	26.82	Cross Bar	4	.167	2	6.4	40	0	ok	n n y n n
E52776	--	E52776	7789	CES GKN	4	6A	p/s	10.82	15.82	Guide 436	2	.413	11	45	0	186	ok	n n n n n
H53824	--	H53824	7892	MH Detrick	200	8	bop	10.82	14.82	Bolt/Nut 3/4	1	.001	.001	.001	200	274	bo	n n n n n
H5371A	--	H5371A	7904	FHD	1	4	A	12.82	13.82	Muffle Assy	23	4	220	220	0	2250	ok	n n y y n
H55011	--	H55011	6830	NEI	12	6	flr	13.82	29.82	AirInletCone	1	6	227	340	2	18858	ok	n n n y n
H5503A	--	H5503A	6986	Land Pyros	4	4	A	12.82	13.82	Sheath 838mm	3	.25	2.77	2.77	0	290	ok	n n y n n
52777	--	E52777	7803	CES GKN	40	6A	p/s	09.82	15.82	Guide 1000	2	.4	16	64	36	2154	si	n y n y n
5581A	--	H5581A	1360	SmithClayton	5	4	A	13.82	13.82	Hinged Tray	6	0.5	30	30	0	1728	ok	n n y n n
55741	--	E55741	7454	CES NAC	4	5	flr	10.82	13.82	Tube Support	1	1	5.0	10.0	4	120	ok	n n n n n
5575A	--	G5575A	7965	CE	1	5	A	13.82	14.82	Pot 9*16	2	.5	50	50	0	272	ok	n n y n n
52778	--	E52778	7791	CES GKN	40	6A	cww	10.82	15.82	Ret.Plate	4	.08	2.25	18	40	296	sp	n y n n n
52431	--	E52431	1612	CES NAC	120	17	bmm	09.82	13.82	Grid	1	.5	28.5	33	7	9006	ok	n n n y n
5595A	--	H5595A	5726	Land Pyros	32	4	A	14.82	15.82	Sheath60inlg	5	.833	6	6	0	3119	ok	n n y n n
53825	--	H53825	7893	MH Detrick	120	8	bop	10.82	14.82	Bolt/Nut 7/8	1	.001	.001	.001	120	205	bo	n n n n n
55391	--	G55391	3066	CE	2	4	flr	11.82	15.82	Salt Pot	1	2	23.2	34	0	404	ok	n n n n n
2779	--	E52779	7792	CES GKN	40	6A	cww	10.82	15.82	KeeperPin628	24	.02	.1	7	48	63	sm	n y n n n
2781	--	E52781	7793	CES GKN	20	6A	p/s	10.82	15.82	TubeGuide985	2	.44	23	92	20	1090	si	n y n y n
462A	--	G4462A	7455	CE	3	23	A	17.82	29.82	Muffle	50	32	1730	1730	0	25245	ok	n n y n y
4621	--	G44621	8434	CE	19	23	s/t	09.82	29.82	Tube 641mmod	1	1	272	282	1	0	ok	n n y y n

Index Main File

G44622	--	G44622	7456	CE	24	inc	bop	45.81	29.82	Baffle Item2	1	1	.001	.001	0	0	ok	n n y n y
G44623	--	G44623	7457	CE	24	inc	bop	45.81	29.82	Baffle Item3	1	1	.001	.001	0	0	ok	n n y n n
G44624	--	G44624	7458	CE	6	23	cww	50.81	29.82	Guide Item4	2	.05	.3	3	0	0	ok	n n y n n
G44625	--	G44625	7459	CE	6	23	cww	50.81	29.82	Guide Item5	2	.05	.3	3	0	0	ok	n n y n n
G44626	--	G44626	7460	CE	6	23	cww	50.81	29.82	Guide Item6	2	.05	.55	3.6	0	0	ok	n n y n n
G44627	--	G44627	7461	CE	6	23	cww	50.81	29.82	Guide Item7	2	.05	.55	3.6	0	0	ok	n n y n n
G44628	--	G44628	7462	CE	12	23	cww	06.82	29.82	Support It8	2	.05	.75	3.5	0	0	ok	n n y n n
H53711	--	H53711	7905	FHD	2	4	p/s	07.82	13.82	Muffle	1	5.33	100	170	0	0	ok	n n y n n
G44629	--	G44629	7463	CE	12	23	cww	06.82	29.82	Support It9	2	.05	.75	3.5	0	0	ok	n n y n n
H53783	--	H53783	7897	Lucas CAV	4	5	bop	10.82	12.82	Tube 4.5od	1	.001	.001	.001	4	0	bo	n n y n n
H53712	--	H53712	7906	FHD	9	4	flr	07.82	13.82	Tube 7/8od	4	.125	1	10	12	0	ok	n n y n n
H49661	--	H49661	7628	Babcock	2289	66F	shl	03.82	08.82	Coathook	12	.01	.6	16	0	7950	ok	n n n n y
S00023	--	S00023	8505	Stock	16	5	s/t	10.82	10.82	Tube16.75od	4	.25	48	239	0	0	ok	n n n y n
H54301	--	H54301	3438	Babcock	4	6	flr	07.82	13.82	Cone	2	.191	2	6.3	4	0	ok	n n y y n
H55031	--	H55031	2655	Land Pyros	4	4	flr	09.82	13.82	Tube 1.25od	2	.167	1.5	10.5	4	0	ok	n n y n n
G5532A	--	G5532A	7935	Piftin	2	310	A	09.82	10.82	Frame	6	1.5	.001	.001	0	74	ok	n n y n n
E52782	--	E52782	7794	CES GKN	20	6A	p/s	10.82	15.82	Ret.Plate	3	.1	3.5	26.3	21	247	si	n y n n n
H5396A	--	H5396A	7875	J.Woodhead	2	6	A	12.82	13.82	Roller Assy	2	.25	23.8	23.8	0	500	ok	n n y n n
H50311	--	H50311	7249	HepworthPipe	497	23	shl	52.99	52.99	Pusher Prong	2	.05	3.17	9.33	455	11431	sf	n y n y n
G44631	--	G44631	7464	CE	6	23	cww	50.81	29.82	Support It10	6	.05	.35	6	0	0	ok	n n y n n
H53784	--	H53784	8017	Lucas CAV	4	5	s/t	08.82	12.82	Tube3.5od	4	.25	1.4	45	0	0	ok	n n y y n
H55883	--	H55883	7972	CEGB	50	3	p/s	10.82	13.82	Bar2.5*.5*39	6	.25	6.5	60	0	1965	ok	n n n n n
G44632	--	G44632	7465	CE	6	inc	bop	45.81	29.82	Spindle It11	1	1	.001	.001	0	0	ok	n n y y n
S00021	--	S00021	8501	Stock	10	4	s/b	10.82	10.82	PotBase15.75	1	1	25	37.8	0	0	ok	n n n n n
G52621	--	G52621	7923	Piftin	2	4	flr	11.82	13.82	Base	1	3	44	65	1	454	si	n y n n n
H53734	--	H53734	2078	Plibrico	50	6	p/s	07.82	09.82	HTB 1	4	.09	.6	4	12	268	ok	n n n n n
G52622	--	G52622	7924	Piftin	2	4	flr	11.82	13.82	Inter Spider	1	1	7	11	2	116	sp	n y n n n
G44633	--	G44633	7466	CE	18	inc	bop	45.81	29.82	Spacer It12	1	1	.001	.001	0	0	ok	n n y n n
G44634	--	G44634	7467	CE	6	40	bop	45.81	29.82	Flange It13	1	1	.001	.001	0	0	ok	n n y n n
H53785	--	H53785	6463	Lucas CAV	4	5	flr	08.82	12.82	Strap	4	.04	.13	2.5	0	0	ok	n n y n n
G4628A	--	G4628A	7455	CE	2	23s	A	18.82	29.82	Muffle	50	32	1730	1730	0	17066	ok	n n y n y
G46281	--	G46281	8434	CE	13	23s	s/t	07.82	29.82	Tube 641mmod	1	1	272	282	0	0	ok	n n y y n
H54302	--	H54302	3440	Babcock	4	6	p/s	07.82	13.82	Blade	4	.167	1.4	5.3	0	0	ok	n n y y n
G54781	--	G54781	7928	Piftin	4	5	flr	09.82	11.82	Crucible	1	.5	05	3	4	10	sf	n y n n n
G54782	--	G54782	7929	Piftin	4	5	flr	09.82	11.82	Top Ring	1	.333	.5	3.5	0	7	dr	n n n n n
H55151	--	H55151	8392	Wask	6	36	s/t	13.82	17.82	Tube 95mmod	1	1	36.3	41	6	1440	ok	n n n n n
E54761	--	E54761	3032	CES NAC	20	4	flr	12.82	15.82	Fanhead	1	2	34	60	20	6300	np	y y n n n
H53826	--	H53826	7894	MH Detrick	200	B	bop	10.82	14.82	Bolt/Nut 7/8	200	.001	.001	.001	200	374	bo	n n n n n
E52783	--	E52783	7792	CES GKN	20	6A	cww	10.82	15.82	KeeperPin628	24	.02	.1	7	24	32	sm	n y n n n
H53961	--	H53961	7876	J.Woodhead	2	6	flr	10.82	13.82	Roller	1	1.25	23	38	2	0	sp	n y y y n
E54762	--	E54762	4093	CES NAC	20	4	p/s	12.82	15.82	Shaft3.25*21	2	.167	22.7	87	20	0	ok	n n n n n
H55884	--	H55884	7973	CEGB	194	3	p/s	10.82	13.82	Bar2.5*.5*35	6	.25	5.9	55	118	6253	ok	n n n n n
E55171	--	E55171	1535	CES Italy	30	4	bt5	09.82	13.82	Tray	1	.75	43.7	72.5	3	5100	ok	n n n n n
46282	--	G46282	7456	CE	16	inc	bop	45.81	29.82	Baffle Item2	1	1	.001	.001	0	0	ok	n n y n y
5569A	--	G5569A	7370	Piftin	2	5	A	09.82	09.82	BasketT4*207	7	2	21.6	21.6	0	360	ok	n n y n n
46283	--	G46283	7457	CE	16	inc	bop	45.81	29.82	Baffle Item3	1	1	.001	.001	0	0	ok	n n y n n
46284	--	G46284	7458	CE	4	23s	cww	06.82	29.82	Guide Item4	4	.05	.3	3	0	0	ok	n n y n n
54901	--	H54901	3559	Babcock	4	3	p/s	09.82	13.82	Venturi	1	1	25	34.2	0	920	ok	n n n y n
54711b	--	H54711b	7914	Ferro GB	290	5	shl	14.82	17.82	Susp.Bar	2	.117	3.85	11.9	290	6293	np	y y n n n
55021	--	H55021	6567	NEI	8	3	p/s	13.82	29.82	NozzleTip AD	1	1.83	179	200	0	12772	ok	n n n y n

Index Main File

G46285	--	G46285	7459	CE	4	23s	cww	06.82	29.82	Guide Item5	4	.05	.3	3	0	0	ok	n n y n n
G46286	--	G46286	7460	CE	4	23s	cww	06.82	29.82	Guide Item6	4	.05	.55	3.6	0	0	ok	n n y n n
H54303	--	H54303	3441	Babcock	8	6	flr	07.82	13.82	Web	10	.025	.15	3	10	0	ok	n n y n n
S00012	--	S00012	5555	Stock	10	40	bmm	10.82	10.82	Flange10.5	1	0.75	6	12.7	10	0	ok	n n n n n
E54991	--	E54991	7969	CES NAC	2	31	flr	14.82	16.82	Plate	1	2.83	29	42	2	415	np	y y n n n
H55721a	--	H55721a	2538	MurrayWilson	50	4	shl	18.82	23.82	Nozzle 2059	2	.058	4	12.7	50	1229	ok	n n n n n
G46287	--	G46287	7461	CE	4	23s	cww	06.82	29.82	Guide Item7	4	.05	.55	3.6	0	0	ok	n n y n n
G46288	--	G46288	7462	CE	8	23s	cww	06.82	29.82	Support It8	2	.05	.75	3.5	0	0	ok	n n y n n
G46289	--	G46289	7463	CE	8	23s	cww	06.82	29.82	Support It9	2	.05	.75	3.5	0	0	ok	n n y n n
H52401	--	H52401	3079	Glossop	6 ht	42	p/s	53.99	53.99	Ingot	1 ht	5	750	1000	6 ht	1890	hc	n n n n n
G5242A	--	G5242A	6925	CE	1	5	A	05.82	06.82	Pot 24*30	3	6	198	198	0	860	ok	n n y n n
H51861	--	H51861	7749	VF Eng	50	Wk	bop	13.82	13.82	Grate Rod	1	.001	.001	.001	50	3260	bo	n n n n n
E52784	--	E52784	7799	CES GKN	31	6A	p/s	10.82	15.82	Support1003	1	.33	30	50	31	2080	si	n y n n n
G54241a	--	G54241a	1622	Piftin	1	5	flr	10.82	11.82	Base Tray	10	.5	7	14.5	1	131	sf	n y n n n
G44635	--	G44635	7533	CE	24	23	bmm	06.82	29.82	Baffle Supp	6	.1	1.65	19	0	0	ok	n n y n n
H54121	--	H54121	7932	Serck Glocon	15	82	flr	11.82	14.82	150mm Cage	1	1	16	26.5	15	1350	sf	n y n n y
H55811	--	H55811	1361	SmithClayton	10	4	bmm	10.82	13.82	Tray	1	1	25.2	34	10	0	ok	n n y n n
S00033	--	S00033	8506	Stock	9	5	s/t	10.82	10.82	Tube19 1/8od	3	0.33	88	296	9	0	ok	n n n y n
H54304	--	H54304	4220	Babcock	4	5	bop	07.82	13.82	Bar 1.25dia	1	.001	.001	.001	0	0	bo	n n y y n
H54891	--	H54891	2911	CEGB	2	6	flr	09.82	12.82	T Beam	1	2	38.3	42.3	0	520	ok	n n n n n
G44636	--	G44636	7534	CE	24	23	bmm	06.82	29.82	Baffle Supp	6	.1	1.75	19	0	0	ok	n n y n n
S00106	--	S00106		Stores	10	4	flr	07.82	09.82	Small Ladle	1	.5	1.5	3	10	0	ok	n n n n n
H55812	--	H55812	4229	SmithClayton	5	4	cww	10.82	13.82	Hinge	2	.133	4.9	14.5	6	0	ok	n n y n n
S00107	--	S00107		Stores	10	4	flr	07.82	09.82	Large Ladle	1	.5	2.5	5	10	0	ok	n n n n n
E52785	--	E52785	7798	CES GKN	61	6A	p/s	10.82	15.82	Bolt 1001	4	.12	8	64	64	1469	si	n y n y n
H55032	--	H55032	6987	Land Pyros	4	4	flr	09.82	13.82	Tube 1.25od	2	.167	1.25	10.5	4	0	ok	n n y n n
G44637	--	G44637	7535	CE	6	inc	bop	45.81	29.82	Channel	1	.001	.001	.001	0	0	ok	n n y n n
G55751	--	G55751	3010	CE	1	5	flr	11.82	14.82	Pot9*16	1	3	48	65	1	0	ok	n n y n n
H55813	--	H55813	4230	SmithClayton	5	5	bop	10.82	13.82	Pin	1	.001	.001	.001	5	0	bo	n n y y n
H53713	--	H53713	7907	FHD	4	4	flr	07.82	13.82	Tube 1 3/8od	30	.01	.05	5.25	30	0	ok	n n y n n
H55721b	--	H55721b	2538	MurrayWilson	50	4	shl	26.82	32.82	Nozzle 2059	2	.058	4	12.7	50	1229	ok	n n n n n
H54651	--	H54651	4088	MurrayWilson	50	4	p/s	12.82	18.82	Coupling	2	.167	1.1	4.89	0	733	ok	n n n n n
G44638	--	G44638	7536	CE	6	inc	bop	45.81	29.82	Plate	1	.001	.001	.001	0	0	ok	n n y n n
H55814	--	H55814	4231	SmithClayton	10	5	bop	10.82	13.82	Locking Wire	1	.001	.001	.001	10	0	bo	n n y n n
H55821	--	H55821	6636	Lewis&Towers	3	4	p/s	11.82	14.82	Plate	1	.233	5.4	11	3	115	ok	n n n n n
H51621a	--	H51621a	7737	VF Eng	1	59	shl	04.82	06.82	Support	16	.05	.35	14	0	2752	si	n y n n y
E54621	--	E54621	1172	CES NAC	3	8	bt5	07.82	10.82	Tray	1	.75	34.5	53	0	1303	ok	n n n n n
H55551	--	H55551	7967	DiamondPower	128	4	cww	13.82	15.82	Plate	20	.017	.13	8	140	438	np	y y n y n
G46295	--	G46295	7533	CE	16	23	bmm	06.82	29.82	Baffle Supp	6	.1	1.65	19	0	0	ok	n n y n n
G55321	--	G55321	7936	Piftin	4	310	bop	09.82	10.82	Ring	1	.001	.001	.001	4	0	bo	n n y n n
55831	--	H55831	7636	John Littler	2	4	flr	52.99	52.99	Hearth Tray	1	7	130	165	2	4842	ok	n n n y n
51622a	--	H51622a	7738	VF Eng	1	15	bop	05.82	06.82	Screw M12	1	.001	.001	.001	0	0	ok	n n n n n
51623a	--	H51623a	7739	VF Eng	1	15	bop	05.82	06.82	Nut M12	1	.001	.001	.001	0	0	ok	n n n n n
53411	--	H53411	2909	MurrayWilson	24	4	shl	12.82	18.82	Nozzle	2	.05	3.8	14.8	24	686	ok	n n n n n
46296	--	G46296	7534	CE	16	23	bmm	06.82	29.82	Baffle Supp	6	.1	1.75	19	0	0	ok	n n y n n
52786	--	E52786	7800	CES GKN	9	6A	p/s	10.82	15.82	Bolt 1010	4	.12	8.5	64	12	254	si	n y n y n
5584A	--	H5584A	1514	John Littler	10	4	A	14.82	15.82	Grid36*24	1	.25	18.8	18.8	0	0	ok	n n y n n
53851	--	H53851	1239	Cam Gears	12	4	bmm	10.82	16.82	Support Grid	1	.5	9	15.5	12	915	ok	n n n y n
2787	--	E52787	7804	CES GKN	4	6A	p/s	09.82	15.82	Support1006	1	.75	34.5	49.5	0	890	ok	n n n n n

Cronite Ltd Date:15.02.82 Time:15:51:36 Week No: 11.82 User:Saba pa

4/13

Index Main File

H55033	--	H55033	5725	Land Pyros	4	4	flr	09.82	13.82	Blank 7/8od	72	.008	0.02	7.0	0	0	ok	n	n	y	n	n
G55752	--	G55752	7966	CE	1	40	bop	11.82	14.82	Rim	1	.001	.001	.001	1	0	bo	n	n	y	n	n
G55322	--	G55322	7937	Piftin	2	310	bop	09.82	10.82	Long Strip	1	.001	.001	.001	2	0	bo	n	n	y	y	n
H55841	--	H55841	1006	John Littler	20	4	bmm	11.82	15.82	Grid	1	.5	18.8	24.5	20	0	ok	n	n	y	n	n
G46297	--	G46297	7535	CE	4	inc	bop	45.81	29.82	Channel	1	.001	.001	.001	0	0	ok	n	n	y	n	n
H55885	--	H55885	7974	CEGB	72	3	p/s	10.82	13.82	Bar3*.75*36	4	.25	10.7	64	12	4098	ok	n	n	n	n	n
E52788	--	E52788	7805	CES GKN	44	6A	p/s	09.82	15.82	Support1004	1	.67	25	40	42	2948	si	n	y	n	n	n
G46298	--	G46298	7536	CE	4	inc	bop	45.81	29.82	Plate	1	.001	.001	.001	0	0	ok	n	n	y	n	n
H53714	--	H53714	7908	FHD	2	40	bop	11.82	13.82	Flange	1	.001	.001	.001	2	0	bo	n	n	y	y	n
E54641	--	E54641	1402	CES NAC	10	31	bt5	07.82	13.82	Base Grid	1	.75	15.5	29.3	0	965	ok	n	n	n	n	n
G53251	--	G53251	7849	Piftin	3	8	flr	10.82	13.82	Base Spider	1	11.3	180	300	3	3550	np	y	y	n	n	n
E54642	--	E54642	5069	CES NAC	20	31	bmm	07.82	13.82	Short Side	2	.25	1.25	6.25	0	0	ok	n	n	n	n	n
E54811	--	E54811	1168	CES Italy	20	4	bt5	08.82	12.82	Half Base	1	.75	11.5	20.5	0	1040	ok	n	n	n	n	n
H55842	--	H55842	2543	John Littler	20	4	cpc	12.82	15.82	Bolt1/2*1.75	1	.001	.001	.001	20	0	cp	n	n	y	y	n
E52789	--	E52789	7798	CES GKN	80	6A	p/s	10.82	15.82	Bolt 1001	4	.12	8	64	80	1922	si	n	y	n	y	n
H55843	--	H55843	4938	John Littler	20	4	cpc	12.82	15.82	Nut 1/2 BSW	1	.001	.001	.001	20	0	cp	n	n	y	y	n
E52121	--	E52121	7782	CES France	40	7B	flr	06.82	08.82	Basket	1	2	17.3	27	11	2651	ok	n	n	n	n	n
E55801b	--	E55801b	7976	CES Denmark	350	7	shl	13.82	18.82	Guide	11	.01	.07	2.2	352	1748	ok	n	n	n	n	n
H5452A	--	H5452A	1360	SmithClayton	5	4	A	13.82	13.82	Hinged Tray	6	1	55.5	55.5	0	1728	ok	n	n	y	n	n
H55851	--	H55851	1310	Rolls Royce	4	4	flr	12.82	16.82	Grid	1	7	30	42.5	4	1158	pr	n	n	n	n	n
G55323	--	G55323	7938	Piftin	2	310	bop	09.82	10.82	Short Strip	1	.001	.001	.001	2	0	bo	n	n	y	n	n
H54521	--	H54521	1361	SmithClayton	10	4	bmm	10.82	13.82	Tray	1	.5	25.2	34	4	0	ok	n	n	y	n	n
E54741	--	E54741	8481	CES France	2	5	s/t	08.82	12.82	Tube 143od	2	.5	45.5	101	0	350	ok	n	n	n	n	n
G53891	--	G53891	7913	Piftin	4	4	flr	11.82	13.82	Crucible	1	.5	5.3	13	4	220	sp	n	y	n	n	n
E52791	--	E52791	7800	CES GKN	8	6A	p/s	10.82	15.82	Bolt 1010	4	.12	8.5	64	8	226	si	n	y	n	y	n
E54742	--	E54742	2516	CES France	1	5	cpc	11.82	12.82	U Bend	1	.001	.001	.001	0	0	es	n	n	n	n	n
H53715	--	H53715	7909	FHD	4	15	bop	11.82	13.82	Gas Pipe	1	.001	.001	.001	4	0	bo	n	n	y	n	n
H54522	--	H54522	4229	SmithClayton	5	4	cww	09.82	13.82	Hinge	2	.125	4.9	14.5	0	0	ok	n	n	y	n	n
E54751	--	E54751	1261	CES Sweden	50	4	bmm	09.82	13.82	Support Grid	2	.25	2.35	16	2	1040	ok	n	n	n	n	n
H5586Aa	--	H5586Aa	7489	BL	14	5	A	24.82	26.82	Tray Side	5	.25	8.2	8.2	0	563	ok	n	n	y	n	n
G55324	--	G55324	7939	Piftin	4	310	bop	09.82	10.82	Plate	1	.001	.001	.001	4	0	bo	n	n	y	y	n
G53252	--	G53252	7850	Piftin	3	8	flr	10.82	13.82	Inter Spider	1	5	71	118	3	1260	np	y	y	n	n	n
E52792	--	E52792	7793	CES GKN	12	6A	p/s	10.82	15.82	Guide 985	2	.44	23	92	12	656	si	n	y	n	y	n
H5504A	--	H5504A	5688	Land Pyros	3	4	A	12.82	13.82	Sheath 762mm	3	0.25	2.52	2.52	0	0	ok	n	n	y	n	n
H53716	--	H53716	7910	FHD	2	15	bop	11.82	13.82	Outlet Pipe	1	.001	.001	.001	2	0	bo	n	n	y	n	n
G5467A	--	G5467A	7925	Piftin	2	4	A	11.82	12.82	Work Basket	5	.5	172	172	0	1890	ok	n	n	y	n	n
E53671	--	E53671	1617	CES Sweden	55	4	bmm	11.82	13.82	Guide Grid	1	.5	1.7	6	55	2169	sf	n	y	n	n	n
H55861a	--	H55861a	7490	BL	14	5	flr	16.82	26.82	Tray Side	1	.5	7.2	18	14	0	ok	n	n	y	n	n
E55802b	--	E55802b	7977	CES Denmark	87	7	shl	14.82	18.82	Alignment	19	.005	.08	4	95	0	ok	n	n	n	n	n
H54311	--	H54311	4197	Babcock	200	6	cpc	08.82	13.82	CapNut 13UNC	1	.001	.001	.001	0	0	cp	n	n	n	y	n
53011	--	H53011	8450	Lucas	9	57	s/t	08.82	15.82	Tube 5 5/16	17	.058	4.5	92	0	192	ok	n	n	n	y	y
5586Ab	--	H5586Ab	7489	BL	14	5	A	37.82	39.82	Tray Side	5	.25	8.2	8.2	0	563	ok	n	n	y	n	n
55041	--	H55041	2655	Land Pyros	3	4	flr	09.82	13.82	Tube 1.25od	2	.167	1.5	10.5	4	0	ok	n	n	y	n	n
55042	--	H55042	6887	Land Pyros	3	4	flr	09.82	13.82	Tube 1.25od	2	.167	1.0	10.5	4	0	ok	n	n	y	n	n
55803b	--	E55803b	5947	CES Denmark	875	7	shl	14.82	18.82	Spacer	12	.01	.06	1.5	876	0	ok	n	n	n	n	n
54331	--	E54331	8022	CES NAC	8	4	s/t	06.82	07.82	Tube 88.9od	1	1	33	37	0	988	ok	n	n	n	n	n
5861b	--	H55861b	7490	BL	14	5	flr	26.82	39.82	Tray Side	1	.5	7.2	18	14	0	ok	n	n	y	n	n
5043	--	H55043	5725	Land Pyros	3	4	flr	09.82	13.82	Blank 7/8	72	0.08	0.02	7.0	0	0	ok	n	n	y	n	n
4401	--	G54401	7903	Piftin	60	4	flr	08.82	10.82	Central Stem	2	.25	.62	5	56	206	n	n	n	n	n	n

Cronite Ltd Date:15.02.82 Time:15:53:50 Week No: 11.82 User:Saba pa
5/

Index Main File

E52793	--	E52793	7794	CES GKN	12	6A	p/s	10.82	15.82	Ret.Plate	3	.11	3.5	26.3	12	148	si	n	y	n	n	n
H55886	--	H55886	7975	CEGB	2000	3	p/s	10.82	13.82	Bar4.5*.75di	72	.017	.26	32.8	936	4400	ok	n	n	n	n	n
H53791	--	H53791	7140	NEI	13	7	flr	12.82	19.82	Hanger SCH34	2	.25	.27	2.7	14	3125	ok	n	n	n	n	n
H5434A	--	H5434A	3292	GKN Screws	2	4	A	12.82	13.82	Retort Plug	10	1	50	50	0	1000	ok	n	n	y	n	n
H55862a	--	H55862a	7491	BL	56	5	cww	16.82	26.82	Hinge	16	.02	.25	10	64	0	ok	n	n	y	n	n
H55141	--	H55141	5864	Hall&Pickles	30	17	bop	14.82	15.82	Exp Panel	1	.001	.001	.001	30	1091	bo	n	n	n	n	n
H53962	--	H53962	7877	J.Woodhead	2	6	flr	10.82	13.82	Plug	1	.25	.75	2.7	2	0	sp	n	y	y	n	n
H53792	--	H53792	7141	NEI	13	7	flr	12.82	19.82	Hanger SCH35	2	.25	.31	3.1	14	0	ok	n	n	n	n	n
H53793	--	H53793	7142	NEI	13	7	flr	12.82	19.82	Hanger SCH36	2	.25	.48	4.2	14	0	ok	n	n	n	n	n
E52794	--	E52794	7792	CES GKN	12	6A	cww	10.82	15.82	KeeperPin628	24	.02	.1	7	24	19	sm	n	y	n	n	n
H55862b	--	H55862b	7491	BL	56	5	cww	26.82	39.82	Hinge	16	.02	.25	10	64	0	ok	n	n	y	n	n
H53794	--	H53794	7143	NEI	13	7	flr	12.82	19.82	Hanger SCH37	2	.25	.52	4.3	14	0	ok	n	n	n	n	n
H53795	--	H53795	7144	NEI	445	7	cww	12.82	19.82	TSpacerSCH38	30	.01	.08	12	450	0	sf	n	y	n	n	n
H53796	--	H53796	7145	NEI	890	7	shl	11.82	19.82	CSpacerSCH39	12	.005	.13	6	0	0	ok	n	n	n	n	n
H55231b	--	H55231b	7934	BL Albion	50	5	cww	18.82	25.82	Corner Post	4	.083	2	19	52	653	np	y	y	n	y	n
G46291	--	G46291	7464	CE	4	23s	cww	06.82	29.82	Support It10	6	.05	.35	5	0	0	ok	n	n	y	n	n
G46292	--	G46292	7465	CE	4	inc	bop	45.81	29.82	Spindle It11	1	1	.001	.001	0	0	ok	n	n	y	y	n
E52795	--	E52795	7806	CES GKN	10	6A	p/s	09.82	15.82	Support 998	1	.6	27	48	0	1264	ok	n	n	n	n	n
H5587Ab	--	H5587Ab	7483	BL	10	5	A	40.82	43.82	Load Fixture	10	.75	15	15	0	0	ok	n	n	y	n	n
G46293	--	G46293	7466	CE	12	inc	bop	45.81	29.82	Spacer It12	1	1	.001	.001	0	0	ok	n	n	y	n	n
H54341	--	H54341	3293	GKN Screws	2	4	flr	07.82	13.82	Bung	1	2.5	34	47	0	0	ok	n	n	y	y	n
E52796	--	E52796	7807	CES GKN	1	6A	p/s	09.82	15.82	TubeSheet996	1	6	274	411	1	1051	sf	n	y	n	n	y
E54071	--	E54071	1619	CES Sweden	5	4	bmm	10.82	13.82	Base Grid	1	.5	11.7	18.2	3	885	dr	n	n	n	n	n
H54342	--	H54342	3294	GKN Screws	2	40	bop	10.82	13.82	Ring	1	.001	.001	.001	0	0	ok	n	n	y	y	n
E52797	--	E52797	7808	CES GKN	1	6A	p/s	09.82	15.82	TubeSheet997	1	5.67	196	294	1	907	sf	n	y	n	n	y
E52798	--	E52798	7788	CES GKN	4	6A	p/s	10.82	15.82	Bracket 428	1	.833	32.7	47.7	0	337	ok	n	n	n	n	y
H54343	--	H54343	3295	GKN Screws	12	5	bop	10.82	13.82	Nut 3/8BSW	1	.001	.001	.001	0	0	es	n	n	y	n	n
H54344	--	H54344	3296	GKN Screws	4	4	flr	07.82	13.82	Tube	2	.333	8	21.9	0	0	ok	n	n	y	y	n
E52799	--	E52799	7789	CES GKN	4	6A	p/s	10.82	15.82	Guide 436	2	.413	11	45	0	185	ok	n	n	n	n	n
IP1/3	--	IP1/3	5068	Stock	10	5	bmm	08.82	09.82	LongSide RH	2	.25	.75	5.5	2	0	ok	n	n	n	n	n
H5436A	--	H5436A	6341	Automotive	4	4	A	12.82	13.82	Side Plate	5	.667	25	25	0	1600	ok	n	n	y	n	n
E54643	--	E54643	5067	CES NAC	20	31	bmm	07.82	13.82	Long Side LH	4	.125	.75	11	0	0	ok	n	n	n	n	n
E52801	--	E52801	7809	CES GKN	24	6A	p/s	09.82	15.82	Support1005	1	.33	26	42	22	1826	si	n	y	n	n	n
H55871b	--	H55871b	7484	BL	20	5	bmm	30.82	43.82	End Plate	2	.167	12	19.2	20	0	pr	n	n	y	n	n
H28881	--	H28881	8167	Lucas	8	57	s/t	08.82	15.82	Tube 5 5/16	17	.05	4.5	92	0	170	ok	n	n	n	y	y
H33941	--	H33941	8167	Lucas	100	57	s/t	08.82	15.82	Tube 5 5/16	17	.058	4.5	92	0	2130	ok	n	n	n	y	y
E52802	--	E52802	7798	CES GKN	32	6A	p/s	10.82	15.82	Bolt 1001	4	.12	8	64	32	769	si	n	y	n	y	n
E52803	--	E52803	7800	CES GKN	16	6A	p/s	10.82	15.82	Bolt 1010	4	.12	8.5	64	16	452	si	n	y	n	y	n
46294	--	G46294	7467	CE	4	inc	bop	45.81	29.82	Flange It13	1	1	.001	.001	0	0	ok	n	n	y	n	n
54361	--	H54361	2662	Automotive	4	4	flr	07.82	13.82	Long Side	1	3	23	32.3	0	0	ok	n	n	y	n	n
55872b	--	H55872b	7485	BL	40	5	bop	40.82	43.82	Pin 1in 1g	1	.001	.001	.001	40	0	bo	n	n	y	n	n
54362	--	H54362	6342	Automotive	16	4	flr	07.82	13.82	Bush	6	.083	.5	4.5	0	0	ok	n	n	y	n	n
55873b	--	H55873b	7486	BL	40	5	bmm	30.82	43.82	Cross Bar	4	.167	2	6.4	40	0	ok	n	n	y	n	n
55981	--	H55981	7978	Belmont	1	4	flr	10.82	13.82	Die Block 1	1	4	255	365	1	0	sf	n	y	n	n	n
5437A	--	H5437A	6343	Automotive	4	4	A	12.82	13.82	End Plate	3	.5	15	15	0	0	ok	n	n	y	n	n
54371	--	H54371	2663	Automotive	4	4	flr	07.82	13.82	Short Side	1	2.25	14	23.3	0	0	ok	n	n	y	n	n
54372	--	H54372	6344	Automotive	8	4	flr	07.82	13.82	Bush	5	.1	.5	4.5	0	0	ok	n	n	y	n	n
5438A	--	H5438A	6345	Automotive	8	5	A	12.82	13.82	Pin	2	.033	.001	.001	0	0	ok	n	n	y	n	n
317A	--	E5317A	1613	CES Belgium	30	5	A	16.82	17.82	Base Tray	2	.5	10.4	10.4	0	1500	ty	n	n	y	n	n

Index Main File

E52804	--	E52804	7810	CES GKN	1	6A	p/s	09.82	15.82	TubeSheet990	1	6	210	315	1	1029	sf	n	y	n	n	y
H55982	--	H55982	7979	Belmont	1	4	flr	10.82	13.82	Die Block 2	1	4	255	365	1	0	sf	n	y	n	n	n
H54381	--	H54381	6346	Automotive	8	5	bop	10.82	13.82	Rod	1	.001	.001	.001	0	0	ok	n	n	y	y	n
H55071	--	H55071	1230	Ford	1	4	flr	09.82	15.82	Base Grid	1	2	47.5	67	0	0	ok	n	n	y	y	n
E52805	--	E52805	7811	CES GKN	8	6A	p/s	09.82	15.82	Bracket1007	1	1	35	60	8	1080	sf	n	y	n	n	y
E52806	--	E52806	7811	CES GKN	4	6A	p/s	10.82	15.82	Bracket1007	2	1	35	120	4	335	sp	n	y	n	n	y
E54072	--	E54072	7886	CES Sweden	10	4	bmm	10.82	13.82	Support Ring	1	.5	4.5	8.5	8	581	dr	n	n	n	y	n
H51621b	--	H51621b	7737	VF Eng	12499	59	shl	53.99	53.99	Support	16	.05	.35	14	12340	22623	hc	n	y	n	n	y
H53861	--	H53861	2077	Plibrico	6	6	cww	06.82	09.82	HTAH 9 1/2	4	.08	.75	8.3	0	53	ok	n	n	n	n	n
E54644	--	E54644	5068	CES NAC	20	31	bmm	07.82	13.82	Long Side RH	4	.125	.75	11	0	0	ok	n	n	n	n	n
E53171	--	E53171	1623	CES Belgium	30	5	bmm	14.82	17.82	Tray Sect LH	1	.5	5.6	12	23	0	np	y	y	y	n	n
E53172	--	E53172	1624	CES Belgium	30	5	bmm	14.82	17.82	Tray Sect RH	1	.5	4.8	12	23	0	np	y	y	y	n	n
E54721	--	E54721	1629	CES France	5	4	cww	13.82	16.82	Grid	1	.5	3.6	10	5	290	np	y	y	n	y	n
H54611	--	H54611	7920	WildBarfield	1	4	flr	09.82	12.82	Hearthplate	1	1.5	13	25	0	100	ok	n	n	n	n	n
E54821	--	E54821	7919	CES Italy	40	4	cww	13.82	15.82	Box	2	.267	6	20	40	1350	np	y	y	n	n	n
E5281A	--	E5281A	7812	CES GKN	4	36	A	09.82	15.82	Beam 1008	5	.25	237	237	0	11474	ty	n	n	y	n	y
E52811	--	E52811	7813	CES GKN	4	36	s/t	10.82	15.82	Tube 150 od	1	1	233	373	4	0	ok	n	n	y	y	y
E52812	--	E52812	7814	CES GKN	16	6A	flr	10.82	15.82	Lug100*25*15	8	.08	1	16	16	0	sf	n	y	y	n	n
H5558A	--	H5558A	7982	Ford	2	5	A	16.82	17.82	Radiant Tube	7	2	50	50	0	538	ok	n	n	y	n	n
H55581	--	H55581	7980	Ford	2	40	bop	14.82	17.82	Flange	1	.001	.001	.001	2	0	bo	n	n	y	y	n
H55582	--	H55582	8485	Ford	2	5	s/t	12.82	17.82	Tube5 1/8*28	4	.25	21	88	4	0	ok	n	n	y	y	n
E5292A	--	E5292A	7815	CES GKN	2	36	A	09.82	15.82	Beam 1009	5	1	176	176	0	2974	ty	n	n	y	n	y
H55641	--	H55641	1006	Vauxhall	20	4	bmm	10.82	14.82	Grid	1	.5	18.8	24.2	20	1742	ok	n	n	n	n	n
H55583	--	H55583	8486	Ford	2	5	s/t	12.82	17.82	Throat 4inlg	25	.04	3.5	105	25	0	ok	n	n	y	y	n
E52921	--	E52921	7816	CES GKN	2	36	s/t	10.82	15.82	Tube 150 od	2	.5	172	373	2	0	ok	n	n	y	y	y
E55731	--	E55731	2851	CES Italy	10	5	flr	11.82	15.82	Base w/oRing	1	4	25.5	35	10	1000	ok	n	n	n	y	n
E5576A	--	E5576A	6888	CES Holland	2	4	A	15.82	16.82	Muffle	8	5.5	270	270	2	1422	ok	n	n	y	y	n
E55191	--	E55191	2185	CES Holland	300	4	shl	10.82	13.82	Coathanger	2	.05	1.25	5	192	2022	ok	n	n	n	n	n
H55584	--	H55584	8487	Ford	2	5	s/t	12.82	17.82	Tube 1010mm	2	.5	23	69	2	0	ok	n	n	y	y	n
H55585	--	H55585	7981	Ford	6	5	flr	12.82	17.82	Lug	6	.067	0.1	3	6	0	np	y	y	y	n	n
H5559A	--	H5559A	7983	Ford	2	5	A	16.82	17.82	Radiant Tube	7	2	50	50	0	510	ok	n	n	y	n	n
H53797	--	H53797	7146	NEI	445	7	p/s	12.82	19.82	TSpacerSCH40	10	.03	.15	4	450	0	sf	n	y	n	n	n
G54671	--	G54671	7926	Piftin	2	4	flr	10.82	12.82	Basket	1	8	160	183	1	0	dr	n	n	y	n	n
H55591	--	H55591	7980	Ford	2	40	bop	14.82	17.82	Flange	1	.001	.001	.001	2	0	bo	n	n	y	y	n
E52922	--	E52922	7814	CES GKN	8	36	flr	10.82	15.82	Lug100*25*15	8	.08	1	16	8	0	sf	n	y	y	n	n
H55592	--	H55592	8485	Ford	2	5	s/t	12.82	17.82	Tube5 1/8*28	4	.25	21	88	0	0	ok	n	n	y	y	n
H54382	--	H54382	6347	Automotive	8	5	bop	10.82	13.82	Head	1	.001	.001	.001	8	0	bo	n	n	y	y	n
H53821	--	H53821	7861	MH Detrick	6	7	p/s	11.82	14.82	Tube Sheet	1	3.2	182	273	6	2370	sf	n	y	n	n	n
51622b	--	H51622b	7738	VF Eng	12499	15	bop	53.99	53.99	Screw M12	1	.001	.001	.001	8499	0	bo	n	n	n	n	n
E55761	--	E55761	6889	CES Holland	3	4	flr	11.82	16.82	Muffle Sect	1	8	106	152	3	0	ok	n	n	y	n	n
54151b	--	E54151b	1134	CES Sweden	33	5	flr	09.82	13.82	Grid	1	1.5	61.3	87	0	6930	ok	n	n	n	n	n
54081	--	H54081	7866	Superheater	6389	66	cww	14.82	17.82	Block TypeA	20	.005	.65	26	6400	9737	sf	n	y	n	n	y
51623b	--	H51623b	7739	VF Eng	12499	15	bop	53.99	53.99	Nut M12	1	.001	.001	.001	0	0	ok	n	n	n	n	n
55651	--	H55651	5119	Babcock	50	6	p/s	12.82	17.82	Washer1.5od	12	.015	.03	2.2	60	0	ty	n	n	n	n	n
55762	--	E55762	6890	CES Holland	4	40	bop	12.82	16.82	Flange	1	.001	.001	.001	4	0	bo	n	n	y	y	n
55593	--	H55593	8486	Ford	2	5	s/t	12.82	17.82	Throat 4inlg	25	.04	3.5	105	0	0	op	n	n	y	y	n
55661	--	H55661	5335	Babcock	50	4	flr	11.82	17.82	Lock Nut	1	.167	.125	2	50	0	ty	n	n	n	y	n
55594	--	H55594	8488	Ford	2	5	s/t	12.82	17.82	Tube 910mm	2	.5	21	69	2	0	ok	n	n	y	y	n
5595	--	H55595	7981	Ford	6	5	flr	12.82	17.82	Lug	6	.067	0.1	3	6	0	np	y	y	y	n	n
560A	--	H5560A	7984	Ford	2	5	A	16.82	17.82	Radiant Tube	7	2	52	52	0	520	ok	n	n	y	n	n

Index Main File

H55601	--	H55601	7980	Ford	2	40	bop	14.82	17.82	Flange	1	.001	.001	.001	2	0	bo n n y y n
E55763	--	E55763	6891	CES Holland	8	40	bop	12.82	16.82	Nipples	1	.001	.001	.001	8	0	bo n n y y n
G54672	--	G54672	7927	Piftin	8	4	flr	10.82	12.82	Lug	8	.25	.5	5	0	0	ok n n y n n
H55602	--	H55602	8485	Ford	2	5	s/t	12.82	17.82	Tube5 1/8*28	4	.25	21	88	4	0	ok n n y y n
H53822	--	H53822	7862	MH Detrick	54	7	p/s	11.82	14.82	Support19606	1	.83	10.5	21	51	2880	si n y n n n
H5244A	--	H5244A	7283	Leyland	1	5	A	07.82	08.82	Retort	2	2	.001	.001	0	625	ok n n y n n
H5507A	--	H5507A	1229	Ford	1	4	A	14.82	15.82	BaseGridAssy	2	0.5	49.3	49.3	0	420	ok n n y n n
E55201	--	E55201	5973	CES France	12	4	flr	10.82	15.82	Clamp	2	.5	3	12	12	1106	ok n n n y n
H53823	--	H53823	7863	MH Detrick	12	7	p/s	11.82	14.82	Support19607	1	2.33	75	103	10	2040	ok n n n n n
G54681	--	G54681	7922	Piftin	1	4	flr	09.82	12.82	Sand Seal	1	4	89.5	130	0	650	ok n n n n n
H55072	--	H55072	3080	Ford	1	4	flr	09.82	15.82	Handle	1	.167	1.8	4.7	0	0	ok n n y n n
H55603	--	H55603	8486	Ford	2	5	s/t	12.82	17.82	Throat 4inlg	25	.04	3.5	105	0	0	ok n n y y n
E53841	--	E53841	7859	CES Finland	200	1	cww	11.82	13.82	Pin B23	12	.02	.45	10.5	204	750	sf n y n n n
H55604	--	H55604	8489	Ford	2	5	s/t	12.82	17.82	Tube 1110mm	2	.5	26	69	2	0	ok n n y y n
H54082	--	H54082	7867	Superheater	1522	66	cww	13.82	17.82	Block Type B	16	.02	.3	14.5	1536	2389	sf n y n n y
H55605	--	H55605	7981	Ford	6	5	flr	12.82	17.82	Lug	6	.067	0.1	3	6	0	np y y y n n
H55081	--	H55081	2602	Furnace Eng	3	4	flr	15.82	20.82	Fan 19cw BP	1	2	16	22.8	0	645	ok n n n n n
E53842	--	E53842	7860	CES Finland	50	1	p/s	11.82	13.82	Pin B34	8	.05	.73	11.2	50	478	sf n y n n n
H54083	--	H54083	7868	Superheater	154	66	cww	13.82	17.82	Block Type C	4	.08	2.5	20	156	1351	sp n y n n y
H54084	--	H54084	7869	Superheater	154	66	cww	13.82	17.82	Ring Type C	16	.02	.3	15	160	154	sp n y n n y
E53831	--	E53831	3032	CES NAC	1	4	flr	07.82	09.82	Fanhead 25	1	2	38	54	0	204	ok n n n n n
H55121	--	H55121	7178	Serck Glocon	10	84	p/s	12.82	17.82	Cage 150mm	1	1.5	27.5	53.5	4	1436	ok n n n n y
H54085	--	H54085	7870	Superheater	298	66	cww	13.82	17.82	Block Type D	16	.02	.42	16	304	432	sp n y n n y
H54086	--	H54086	7871	Superheater	150	66	cww	13.82	17.82	Plate Type E	8	.03	1	17	152	402	sp n y n n y
G55451	--	G55451		Piftin	4	4	bt5	14.82	16.82	Base Tray	1	.75	46	61	4	880	np y y n y n
E55202	--	E55202	7952	CES France	20	4	flr	10.82	15.82	Tube Support	2	.25	2.1	10	20	340	ok n n n n n
H54087	--	H54087	7872	Superheater	298	66	cww	13.82	17.82	Block Type F	16	.02	.54	17.6	304	519	sf n y n n y
G55101	--	G55101	1625	Piftin	4	4	flr	13.82	15.82	Top Grid	1	1.5	24	40	4	504	np y y n n n
G55111	--	G55111	1626	Piftin	4	4	flr	13.82	15.82	Loading Grid	1	2	34.5	50	4	778	np y y n n n
H52441	--	H52441	7284	Leyland	1	5	bop	04.82	08.82	Tube10*9	1	.001	.001	.001	0	0	bo n n y y n
H52442	--	H52442	6493	Leyland	1	40	bop	04.82	08.82	Flange	1	.001	.001	.001	0	0	ok n n y y n
E54961	--	E54961	1628	CES Sweden	10	4	cww	13.82	15.82	Support Grid	1	.5	2.5	7.5	10	525	np y y n n n
G55051	--	G55051	1627	Piftin	4	4	bt5	13.82	16.82	Base Tray	1	.75	46	61	4	880	np y y n y n
H5561A	--	H5561A	7985	Ford	2	5	A	16.82	17.82	Radiant Tube	7	2	54	54	0	550	ok n n y n n
E5521A	--	E5521A	2188	CES Holland	28	4	A	14.82	15.82	RoofRod 850	2	.25	1.9	1.9	0	0	ok n n y n n
H5533A	--	H5533A	5724	Commonwealth	20	4	A	14.82	15.82	Sheath 421g	3	.25	3.6	3.6	0	1196	ok n n y n n
H52701	--	H52701	7087	Torrington	2	4	flr	52.99	52.99	Body Section	1	2.5	70	91	2	0	op n n y n n
H55331	--	H55331	2655	Commonwealth	47	4	flr	11.82	15.82	Tube 1.25od	2	.167	1.5	10.5	48	0	ok n n y n n
55611	--	H55611	7980	Ford	2	40	bop	14.82	17.82	Flange	1	.001	.001	.001	2	0	bo n n y y n
55612	--	H55612	8485	Ford	2	5	s/t	12.82	17.82	Tube5 1/8*28	4	.25	21	88	0	0	ok n n y y n
52702	--	H52702	7088	Torrington	1	4	flr	52.99	52.99	Drop Chute	1	2.5	40	57	1	0	op n n y n n
52703	--	H52703	7089	Torrington	1	4	flr	52.99	52.99	Large Flange	1	1	12	18	1	0	op n n y n n
55613	--	H55613	8486	Ford	2	5	s/t	12.82	17.82	Throat 4inlg	25	.04	3.5	105	0	0	ok n n y y n
54151c	--	E54151c	1134	CES Sweden	50	5	flr	11.82	13.82	Grid	1	1.5	61.3	87	33	10500	ok n n n n n
416A	--	E5416A	1281	CES NAC	12	7	A	07.82	08.82	Grid 56*30	2	2	76	76	0	2515	ok n n y n n
5332	--	H55332	5725	Commonwealth	20	4	flr	11.82	15.82	Blank 7/8od	72	.005	.02	7	0	0	ok n n y n n
4161	--	E54161	1282	CES NAC	24	7	bt5	05.82	08.82	Grid 28*30	1	.75	38	55	5	0	ok n n y n n
4171	--	E54171	7222	CES Holland	2	14	flr	09.82	13.82	Jaws	2	.25	.75	5.5	2	28	ok n n n n n

Index Main File

E54172	--	E54172	7515	CES Holland	2	14	flr	09.82	13.82	Jaws	2	.167	.75	5.5	2	29	op	y	n	n	n	n
H5418A	--	H5418A	7901	DiamondPower	2	4	A	08.82	09.82	Tube 6 ft	4	.5	16	16	0	277	ok	n	n	y	n	n
H52704	--	H52704	7090	Torrington	1	4	flr	52.99	52.99	Small Flange	1	.75	5	11.1	1	0	op	n	n	y	y	n
H52705	--	H52705	7091	Torrington	1	4	flr	52.99	52.99	Lip End	1	2	30	43	1	0	op	y	n	y	n	n
H54181	--	H54181	7902	DiamondPower	8	4	flr	06.82	09.82	Tube 2 3/8od	2	.333	4	14.8	4	0	ok	n	n	y	n	n
H5577A	--	H5577A	4432	ME Boilers	18	4	A	14.82	15.82	ExpDoorAssy	6	.1	50	50	0	13617	ok	n	n	y	n	n
H55771	--	H55771	4433	ME Boilers	18	4	flr	11.82	15.82	Exp Door	1	3.5	49.5	56	18	0	ok	n	n	y	n	n
G54431	--	G54431	8060	Piftin	3	8	s/t	07.82	08.82	Tube 4.25od	3	.333	19.5	96	0	492	ok	n	n	n	n	n
E55211	--	E55211	2186	CES Holland	28	4	shl	10.82	15.82	RoofRod 600	4	.025	1.3	10	28	0	ok	n	n	y	n	n
H54691	--	H54691	1247	Wellworthy	10	8	bmm	07.82	10.82	Insert Grid	1	.5	13	21.6	10	2492	ok	n	n	n	n	n
E55212	--	E55212	2187	CES Holland	28	4	shl	10.82	15.82	Rod Ext 250	3	.04	.5	4.5	30	0	ok	n	n	y	y	n
H55772	--	H55772	4434	ME Boilers	18	5	bop	12.82	15.82	Hinge Pin	1	.001	.001	.001	18	0	ty	n	n	y	y	n
H55773	--	H55773	4431	ME Boilers	36	4	flr	11.82	15.82	Washer 2 1/8	2	.125	.15	3	36	0	ok	n	n	y	n	n
H54692	--	H54692	1478	Wellworthy	10	8	bmm	07.82	10.82	Base Grid	1	.5	28	40	2	0	ok	n	n	n	y	n
H55774	--	H55774	4435	ME Boilers	36	5	bop	12.82	15.82	Split Pin	1	.001	.001	.001	36	0	ty	n	n	y	n	n
E5522A	--	E5522A	7950	CES Holland	70	4	A	14.82	15.82	RoofRod 870	2	.25	2	2	0	0	ok	n	n	y	n	n
H52971	--	H52971	7837	SSEB	20	4	flr	06.82	09.82	Support Lug	2	.16	.7	3.75	2	150	ok	n	n	n	n	n
H5578A	--	H5578A	5413	ME Boilers	18	4	A	14.82	15.82	Gas SealAssy	3	.75	64.5	64.5	0	0	ok	n	n	y	n	n
H55781	--	H55781	5414	ME Boilers	18	4	p/s	11.82	15.82	Gas Seal	1	1.67	62.5	90	18	0	ok	n	n	y	n	n
H55782	--	H55782	5415	ME Boilers	18	4	flr	11.82	15.82	Lug RH	1	.33	1	2.25	18	0	ok	n	n	y	n	n
H55614	--	H55614	8490	Ford	2	5	s/t	12.82	17.82	Tube 1220mm	2	.5	28	69	2	0	ok	n	n	y	y	n
H55783	--	H55783	7495	ME Boilers	18	4	flr	11.82	15.82	Lug LH	1	.33	1	2.25	18	0	ok	n	n	y	n	n
E55801a	--	E55801a	7976	CES Denmark	350	7	shl	11.82	14.82	Guide	11	.01	.07	2.2	352	1748	ok	n	n	n	n	n
E55221	--	E55221	2186	CES Holland	70	4	shl	10.82	15.82	RoofRod 600	4	.05	1.38	10	72	0	ok	n	n	y	n	n
H52706	--	H52706	7092	Torrington	1	4	flr	52.99	52.99	Cover Plate	1	.42	2	10	1	0	op	n	n	y	n	n
G54432	--	G54432	8060	Piftin	15	8	s/t	07.82	08.82	Tube 4.25od	15	.067	3.7	96	0	0	ok	n	n	n	n	n
E55802a	--	E55802a	7977	CES Denmark	88	7	shl	11.82	14.82	Alignment	19	.007	.08	4	95	0	ok	n	n	n	n	n
E55803a	--	E55803a	5947	CES Denmark	875	7	shl	11.82	14.82	Spacer	12	.01	.06	1.5	876	0	ok	n	n	n	n	n
E50981	--	E50981	2184	CES Holland	135	4	shl	01.82	04.82	Coathanger	2	.05	1.05	4.5	0	972	ok	n	n	n	n	n
H55615	--	H55615	7981	Ford	6	5	flr	12.82	17.82	Lug	6	.067	0.1	3	6	0	np	y	y	y	n	n
H5562A	--	H5562A	7986	Ford	2	5	A	16.82	17.82	Radiant Tube	7	2	50	50	0	720	ok	n	n	y	n	n
H55621	--	H55621	7987	Ford	2	40	bop	14.82	17.82	Flange	1	.001	.001	.001	2	0	bo	n	n	y	y	n
H56131	--	H56131	7992	BL Albion	50	5	bmm	14.82	17.82	End Plate	2	.3	2.05	11.5	50	717	np	y	y	n	n	n
H55622	--	H55622	7989	Ford	2	5	bop	14.82	17.82	Tube27 5/8lg	1	.001	.001	.001	2	0	bo	n	n	y	y	n
H52707	--	H52707	7093	Torrington	4	4	flr	52.99	52.99	Plate	1	.5	1.5	5	4	0	op	n	n	y	n	n
H52708	--	H52708	7094	Torrington	8	4	flr	52.99	52.99	Bracket	1	.5	2.5	12.5	8	0	op	n	n	y	n	n
155623	--	H55623	7990	Ford	2	5	bop	14.82	17.82	Throat 4inlg	1	.001	.001	.001	2	0	bo	n	n	y	y	n
E55222	--	E55222	7951	CES Holland	70	5	bop	10.82	15.82	Rod Ext 270	1	.001	.001	.001	70	0	bo	n	n	y	y	n
5342A	--	H5342A	5726	Land Pyros	2	4	A	08.82	09.82	Sheath 60in	4	.5	5	5	0	160	ok	n	n	y	n	n
52709	--	H52709		Torrington	1	4	flr	52.99	52.99	Thermo Tube	1	.67	6.5	13	1	0	op	y	y	y	n	n
55231a	--	H55231a	7934	BL Albion	50	5	cww	12.82	15.82	Corner Post	4	.083	2	19	52	654	np	y	y	n	y	n
55432	--	H55432	7949	Lindsey Oil	10	6A	p/s	10.82	12.82	Wall Support	2	.75	16	64	4	995	si	n	y	n	n	n
55311	--	G55311	3313	CPC	20	4	flr	10.82	13.82	Dog T11	2	.75	.8	4	20	591	ok	n	n	n	n	n
54451a	--	E54451a	1092	CES Sweden	50	4	shl	08.82	10.82	Grid	1	1	28	50	23	6667	ok	n	n	n	n	n
54451b	--	E54451b	1092	CES Sweden	25	4	shl	09.82	13.82	Grid	1	1	28.8	46.5	25	3333	ok	n	n	n	n	n
5251	--	H55251	7941	UOP Equitec	10	7	flr	14.82	17.82	Locking Bar	1	1.08	7.7	15	10	615	np	y	y	n	n	n
5341	--	H55341	3358	Babcock	5	4	flr	11.82	15.82	Deflector	1	.5	1.4	3.5	5	271	ok	n	n	n	y	n

Index Main File

H55252	--	H55252	7942	UOP Equitec	10	7	flr	14.82	17.82	TubeHanger1	1	0.75	4.1	8.5	10	432	np	y	y	n	n	n
E52761	--	E52761	7794	CES GKN	32	6A	p/s	09.82	15.82	Ret.Plate	3	.1	3.5	26.3	30	592	si	n	y	n	n	n
E52762	--	E52762	7792	CES GKN	32	6A	cww	10.82	15.82	KeeperPin628	24	.02	.1	7	48	50	sm	n	y	n	n	n
H55253	--	H55253	7943	UOP Equitec	30	7	flr	14.82	17.82	TubeHanger2	1	.583	2.7	6	30	995	np	y	y	n	n	n
H54523	--	H54523	4230	SmithClayton	5	5	bop	08.82	13.82	Pin	1	.001	.001	.001	5	0	bo	n	n	y	y	n
H55254	--	H55254	7944	UOP Equitec	125	7	cpc	14.82	17.82	Screwc/wNut	1	.001	.001	.001	125	575	cp	n	n	n	n	n
H55624	--	H55624	8493	Ford	2	5	s/t	12.82	17.82	Tube3.75*62	1	1	26	41	2	0	ok	n	n	y	y	n
E52763	--	E52763	7795	CES GKN	36	6A	p/s	09.82	15.82	TubeGuide986	1	.41	22.5	45	34	2282	si	n	y	n	y	n
H55351	--	H55351	3327	SpearJackson	1	4	flr	10.82	13.82	Bath	1	5	133	171	1	855	ok	n	n	n	n	n
H55255	--	H55255	7945	UOP Equitec	10	7	flr	14.82	17.82	TubeHanger1	1	1	7.2	14	10	614	np	y	y	n	n	n
E52764	--	E52764	7794	CES GKN	36	6A	p/s	10.82	15.82	Ret.Plate	3	.1	3.5	26.3	36	445	si	n	y	n	n	n
H51941	--	H51941	7751	BP Llandarcy	10	7	p/s	07.82	13.82	Tube Hanger	2	.5	8	32	0	749	si	n	y	n	n	y
H55256	--	H55256	7946	UOP Equitec	35	304	cpc	14.82	17.82	Bolt3/4*80mm	1	.001	.001	.001	35	134	cp	n	n	n	n	n
H55625	--	H55625	7981	Ford	6	5	flr	12.82	17.82	Lug	6	.067	0.1	3	6	0	np	y	y	y	n	n
H55257	--	H55257	7947	UOP Equitec	35	304	cpc	14.82	17.82	Nut 3/4	1	.001	.001	.001	35	63	cp	n	n	n	n	n
H5563A	--	H5563A	7988	Ford	2	5	A	16.82	17.82	radiant Tube	7	2	50	50	0	568	ok	n	n	y	n	n
H55631	--	H55631	7987	Ford	2	40	bop	14.82	17.82	Flange	1	.001	.001	.001	2	0	bo	n	n	y	y	n
H55632	--	H55632	7989	Ford	2	5	bop	14.82	17.82	Tube27 5/8	1	.001	.001	.001	2	0	bo	n	n	y	y	n
H55633	--	H55633	7990	Ford	2	5	bop	14.82	17.82	Throat 4inlg	1	.001	.001	.001	2	0	bo	n	n	y	y	n
H55634	--	H55634	8494	Ford	2	5	s/t	12.82	17.82	Tube3.75*32	2	.5	14	41	2	0	ok	n	n	y	y	n
E52765	--	E52765	7792	CES GKN	36	6A	cww	10.82	15.82	KeeperPin628	24	.02	.1	7	48	57	sm	n	y	n	n	n
H55635	--	H55635	7981	Ford	6	5	flr	12.82	17.82	Lug	6	.067	0.1	3	6	0	np	y	y	y	n	n
H54524	--	H54524	4231	SmithClayton	10	5	bop	13.82	13.82	Wire	1	.001	.001	.001	0	0	ok	n	n	y	n	n
E56111a	--	E56111a	3895	CES France	30	6	shl	10.82	10.82	Dog T4	2	.067	.32	2.3	0	495	ok	n	n	n	y	n
E56111b	--	E56111b	3895	CES France	70	6	shl	11.82	14.82	Dog T4	2	.067	.32	2.3	0	0	ok	n	n	n	y	n
H55951	--	H55951	2655	Land Pyros	107	4	flr	12.82	15.82	Tube1.25*18	2	.167	1.5	10.5	108	0	ok	n	n	y	n	n
E53161	--	E53161	7836	CES Sweden	300	4	cww	08.82	10.82	Spacer	12	.02	.16	4.8	300	818	sf	n	y	n	n	n
H55161	--	H55161	8204	Wask	6	33	s/t	13.82	17.82	Tube 143od	1	1	79.8	82	6	1800	ok	n	n	n	n	n
H55162	--	H55162	7940	Wask	6	33	flr	14.82	17.82	Cap	1	.417	2.8	8	6	256	np	y	y	n	n	n
G53902	--	G53902	7882	Piftin	8	4	flr	11.82	12.82	Long SideY=5	1	.75	3	6	7	0	ok	n	n	n	n	n
E52756	--	E52756	7790	CES GKN	24	6A	p/s	09.82	15.82	TubeGuide984	1	.5	18	33	22	1465	si	n	y	n	y	n
E52757	--	E52757	7791	CES GKN	24	6A	cww	09.82	15.82	Ret.Plate	4	.08	2.25	18	24	412	sf	n	y	n	n	n
H5453A	--	H5453A	7912	FHD	1	4	A	11.82	12.82	Tube 12ft lg	6	1	20	20	0	150	ok	n	n	y	n	n
H55361	--	H55361	3078	Morganite	30	4	flr	09.82	12.82	Socket	4	.083	.6	6	32	380	ok	n	n	n	y	n
H55401	--	H55401	7963	NEI	32	5	flr	12.82	15.82	Stabiliser	1	.5	7	14	32	4728	sf	n	y	n	y	n
H55402	--	H55402	4621	NEI	32	3	flr	10.82	15.82	Rim	1	2.5	11.4	17.1	32	6280	ok	n	n	n	y	n
H55441	--	H55441	7958	Lindsey Oil	60	6	bop	09.82	09.82	Bolt/Nut	1	.001	.001	.001	60	870	bo	n	n	n	n	n
H54531	--	H54531	2580	FHD	6	4	p/s	08.82	12.82	Tube 1.5od	2	.333	3.3	10.1	6	0	ok	n	n	y	n	n
E52766	--	E52766	7796	CES GKN	30	6A	p/s	09.82	15.82	Support 999	1	.6	39	60	11	3403	ok	n	n	n	n	n
H54421	--	H54421	8483	Masterfil	18	84	s/t	11.82	13.82	Tube143od	9	.111	11.3	110	18	546	ok	n	n	n	n	y
55952	--	H55952	5725	Land Pyros	32	4	flr	12.82	15.82	Blank7/8*1/4	72	.008	.02	7	72	0	ok	n	n	y	n	n
55971	--	H55971	3926	Oxymetal	2	6	flr	13.82	16.82	Fan 17in	1	1.5	12.5	17.2	2	330	ok	n	n	n	n	n
54422	--	H54422	8484	Masterfil	8	84	s/t	11.82	13.82	Tube 6 3/4od	8	.125	18.9	161	8	364	ok	n	n	n	n	y
53211	--	H53211	7840	Hunslet	2	5	bop	07.82	08.82	Basket	1	.001	.001	.001	2	688	bo	n	n	n	n	n
5456A	--	H5456A	7537	BL Cars	2	4	A	12.82	13.82	Guide Rail	5	.5	36	36	0	713	ok	n	n	y	n	n
54088	--	H54088	7873	Superheater	150	66	cww	13.82	17.82	Ring Type G	20	.01	.1	6	160	243	sp	n	y	n	n	y
54089	--	H54089	7874	Superheater	150	66	cww	13.82	17.82	Plate type H	8	.03	.94	16	152	402	sp	n	y	n	n	y
4091	--	H54091	7866	Superheater	5933	69	cww	15.82	17.82	Block Type A	20	.005	.65	26	5960	8781	np	y	y	n	n	y
4092	--	H54092	7867	Superheater	914	69	cww	14.82	17.82	Block Type B	16	.02	.3	14.5	928	1462	np	y	y	n	n	y
4093	--	H54093	7868	Superheater	154	69	cww	14.82	17.82	Block Type C	4	.08	2.5	20	156	1401	np	y	y	n	n	y

Index ----- Main File ---------

H54561	--	H54561	2668	BL Cars	2	4	flr	08.82	13.82	Rail	1	4	31	44.2	0	0	ok	n	n	y	y	n
E56101	--	E56101	4981	CES Sweden	30	5	bmm	12.82	16.82	Corner Post	6	.14	1.25	15	30	737	ok	n	n	n	n	n
E5323A	--	E5323A	5654	CES Belgium	2	4	A	06.82	07.82	Rad.Tube	3	1.5	90	90	0	911	ok	n	n	y	n	n
E56102	--	E56102	4982	CES Sweden	10	5	cww	12.82	16.82	Centre Post	6	.06	.71	9	12	0	ok	n	n	n	n	n
H54562	--	H54562	2670	BL Cars	2	4	flr	08.82	13.82	Extension	1	1	4	8	0	0	ok	n	n	y	n	n
H54701	--	H54701	7916	Ferro GB	260	5	bmm	08.82	13.82	Coathanger	8	.1	.8	12.9	72	1687	ok	n	n	n	n	n
H54563	--	H54563	7538	BL Cars	6	4	flr	08.82	13.82	Webs	3	.167	.3	2.6	0	0	ty	n	n	y	n	n
H55671	--	H55671		Pennwalt	10	85	p/s	52.99	52.99	Hub End	1	.583	18.6	31	10	1573	op	y	y	n	y	y
E53231	--	E53231	8173	CES Belgium	2	4	s/t	05.82	07.82	Tube 5 1/4od	1	1	39	68	0	0	ok	n	n	y	y	n
E53232	--	E53232	8112	CES Belgium	2	4	s/t	05.82	07.82	Tube 4 3/4od	1	1	35	71	0	0	ok	n	n	y	y	n
E56103	--	E56103	1426	CES Sweden	10	5	bmm	12.82	16.82	Top Grid	1	.85	3.6	9	10	0	ok	n	n	n	n	n
H55461	--	H55461	7959	Babcock	40	1	cww	14.82	17.82	T Hanger Lug	12	.033	.7	24	48	395	np	y	y	n	n	n
H55471	--	H55471	7960	VanDerVleit	20	1	flr	13.82	15.82	Male Lug	2	.117	.11	1	20	155	np	y	y	n	n	n
E52758	--	E52758	7792	CES GKN	24	6A	cww	09.82	15.82	KeeperPin628	24	.03	.1	7	24	155	sm	n	y	n	n	n
H55472	--	H55472	7961	VanDerVleit	20	1	flr	13.82	15.82	Female Lug	2	.125	.3	2	20	224	np	y	y	n	n	n
G56121	--	G56121	4556	CE	2	5	flr	12.82	15.82	Lead Pot	1	2.5	70	91.5	2	544	ok	n	n	n	n	n
H55911	--	H55911	3517	Barltrop	4	82	flr	13.82	17.82	Paddle	1	2	131	297	4	4611	ok	n	n	n	n	y
H55912	--	H55912	3518	Barltrop	8	82	flr	13.82	17.82	Shaft	1	2	47.7	79.7	8	0	ok	n	n	n	n	y
H56001	--	H56001	5463	NEI	10	3	p/s	12.82	15.82	OrificePlate	2	.333	1.6	9.7	10	430	ok	n	n	n	n	n
E56041	--	E56041	8022	CES Italy	20	5	s/t	10.82	10.82	Tube88.9od	1	1	33	36	20	573	ok	n	n	n	n	n
H56051	--	H56051	2420	Moore&Wright	2	4	flr	12.82	15.82	Lead Pot	1	2	13	20.9	2	270	ok	n	n	n	n	n
G53903	--	G53903	7883	Piftin	8	4	flr	11.82	12.82	ShortSideY=5	1	.75	2	4	7	0	ok	n	n	n	n	n
H56031	--	H56031	3085	CEGB	30	6	flr	13.82	17.82	Male Spacer	12	.03	.12	4.2	36	67	ok	n	n	n	n	n
H54801	--	H54801	7915	Babcock	5	7	flr	12.82	14.82	ConeImpeller	1	.833	36.1	60	5	815	sp	n	y	n	n	n
G54251	--	G54251	1621	Piftin	6	4	bt5	12.82	14.82	Support Grid	1	.5	30	50	6	996	sf	n	y	n	n	n
H54892	--	H54892	2912	CEGB	2	6	flr	09.82	12.82	Lug	1	.292	1.1	4.1	2	0	ok	n	n	n	n	n
H56061	--	H56061	6967	Berol	2	4	flr	52.99	52.99	Box	1	1.17	6.5	18	2	120	pc	y	y	n	n	n
E53233	--	E53233	2502	CES Belgium	2	4	cpc	05.82	07.82	U Bend	1	.001	.001	.001	0	0	ok	n	n	y	n	n
E5324A	--	E5324A	7204	CES Belgium	1	4	A	06.82	07.82	Rad.Tube	16	6	45	45	0	359	ok	n	n	y	n	n
E53241	--	E53241	8101	CES Belgium	2	4	s/t	05.82	07.82	Tube 121od	3	.33	19	55	0	0	ok	n	n	y	n	n
E53242	--	E53242	8101	CES Belgium	1	4	s/t	05.82	07.82	Tube 121 od	3	.34	5.5	55	0	0	ok	n	n	y	n	n
E53243	--	E53243	7205	CES Belgium	2	40	bop	06.82	07.82	Flange	1	.001	.001	.001	0	0	bo	n	n	y	n	n
E53244	--	E53244	7206	CES Belgium	4	4	flr	05.82	07.82	Angle	2	.25	.35	2.5	0	0	ok	n	n	y	n	n
E53245	--	E53245	7207	CES Belgium	1	4	flr	05.82	07.82	Tube	2	.25	.8	5.25	0	0	ok	n	n	y	n	n
E52759	--	E52759	7793	CES GKN	32	6A	p/s	09.82	15.82	TubeGuide985	2	.43	23	92	28	2084	si	n	y	n	y	n
653911	--	G53911	7878	Piftin	2	4	flr	06.82	10.82	AdaptorPlate	1	1	8	20	0	83	ok	n	n	n	y	n
651432	--	G51432	1611	Piftin	4	8	flr	04.82	08.82	Inter Grid	1	2	82	112	2	1700	ok	n	n	n	n	n
:53246	--	E53246	7234	CES Belgium	6	5	bop	05.82	07.82	Lug	1	.001	.001	.001	0	0	ok	n	n	y	n	n
5320A	--	E5320A	1238	CES Belgium	10	5	A	12.82	13.82	Grid Assy	14	.1	57	57	0	3440	ok	n	n	y	n	n
53201	--	E53201	1127	CES Belgium	20	5	flr	10.82	13.82	Grid	1	1.67	28	56	20	0	np	y	y	y	y	n
00104	--	S00104		Stores	10	4	p/s	08.82	10.82	FormerBase5	1	1	19	32	10	0	ok	n	n	n	n	n
53202	--	E53202	3121	CES Belgium	40	5	flr	10.82	13.82	Clip	4	.08	.2	3.2	40	0	np	y	y	y	n	n
53912	--	G53912	7879	Piftin	6	4	flr	08.82	10.82	Support Rack	1	.5	3	8	4	105	dr	n	n	n	n	n
51401	--	G51401	7716	Piftin	11	4	bmm	03.82	06.82	Frame	1	.5	8.25	16	0	388	ok	n	n	n	n	n
56062	--	H56062	6968	Berol	2	4	flr	52.99	52.99	Lid	1	.5	1.4	4	2	0	pc	n	n	n	n	n

Index ----- Main File ----------

E56071	--	E56071	1191	CES Swiss	5	5	bt5	11.82	14.82	Base Grid	1	.75	37.6	53.3	5	1895	ok n n n n n
E54951	--	E54951		CES France	4	5	flr	53.99	53.99	Grid	1	1	27	40.5	4	384	hc y y n n n
G54241b	--	G54241b	1622	Piftin	9	5	bmm	12.82	14.82	Base Tray	1	.5	7	14.5	9	278	np y y n n n
H54931	--	H54931	1287	Prestige	10	5	cww	23.82	29.82	Tray	2	.167	3	9.5	0	285	ok n n n y n
E53203	--	E53203	4402	CES Belgium	40	5	cpc	09.82	13.82	Bolt1/2*2.5	1	.001	.001	.001	0	0	ok n n y y n
H54971	--	H54971	2774	Laporte	1	4	flr	12.82	17.82	Damper Plate	1	3	61.5	80	0	330	ok n n n y n
E56072	--	E56072	1192	CES Swiss	15	5	bt5	11.82	14.82	Inter Grid	1	1	24.8	33	15	0	ok n n n n n
E5614A	--	E5614A	5438	CES Sweden	1	4	A	16.82	17.82	Fan	2	.167	27.5	27.5	0	232	ok n n y n n
E56141	--	E56141	5439	CES Sweden	1	4	fi	12.82	17.82	Fan	1	2	16	22.5	0	0	fi n n y y n
E56142	--	E56142	5440	CES Sweden	1	4	flr	13.82	17.82	Shaft	2	.333	11.5	36	2	0	ok n n y y n
E53204	--	E53204	4403	CES Belgium	40	5	cpc	09.82	13.82	Nut 1/2 bsw	1	.001	.001	.001	0	0	es n n y n n
H5616A	--	H5616A	5275	Babcock	8	6	A	16.82	17.82	Gas Baffle	3	.5	6	6	0	1104	ok n n y n n
H56161	--	H56161	5276	Babcock	8	6	flr	13.82	17.82	Channel	2	1.5	5.1	31	8	0	ok n n y n n
H55481	--	H55481	2075	Plibrico	120	6	cww	10.82	14.82	HTAH Bell	6	.05	.7	8.3	0	870	ok n n n n n
H56162	--	H56162	2051	Babcock	16	6	cww	13.82	17.82	End Plate	8	.025	.46	8.75	16	0	ok n n y n n
H5549Aa	--	H5549Aa	2801	Steel Cords	20	4	A	12.82	13.82	TubeAssy10ft	6.75	1	9	9	0	1480	ok n n y n n
H5617A	--	H5617A	5277	Babcock	8	6	A	16.82	17.82	Gas Baffle	3	.5	6	6	0	0	ok n n y n n
H56171	--	H56171	5278	Babcock	8	6	flr	13.82	17.82	Channel	2	.75	5	23	8	0	ok n n y n n
E53391	--	E53391	1171	CES Italy	8	5	bt5	08.82	09.82	Tray	1	.75	20	26.5	6	628	si n y n n n
H55022	--	H55022	6568	NEI	4	3	p/s	13.82	29.82	NozzleTip OH	1	1.83	179	200	4	6386	ok n n n y n
H54201c	--	H54201c	3079	Glossop	1 ht	69	p/s	14.82	17.82	Ingot	1 ht	5	750	1000	0	383	ok n n n n n
H5549Ab	--	H5549Ab	2801	Steel Cords	20	4	A	15.82	16.82	TubeAssy10ft	6.67	1	9	9	0	1480	ok n n y n n
H55491a	--	H55491a	2802	Steel Cords	134	4	flr	10.82	13.82	Tube 1 3/8od	2	.125	1.4	5.25	134	0	ok n n y n n
H53401	--	H53401	5241	NEI	10	3	p/s	04.82	09.82	Air Swirler	1	1	10	13.9	0	2640	ok n n n y n
H56172	--	H56172	2051	Babcock	16	6	cww	13.82	17.82	End Plate	8	.025	.46	8.75	16	0	ok n n y n n
H55491b	--	H55491b	2802	Steel Cords	134	4	flr	13.82	16.82	Tube 1 3/8od	2	.125	1.4	5.25	134	0	ok n n y n n
H55501	--	H55501	3340	DiamondPower	10	4	flr	11.82	15.82	Jet	2	.209	2.1	9.3	10	223	ok n n n n n
H52381	--	H52381	7824	WildBarfield	2	5	bop	07.82	08.82	Liner 5inch	1	.001	.001	.001	2	0	bo n n n n n
H55511	--	H55511	4301	Steel Gauges	50	4	p/s	10.82	13.82	Nose 7/8	6	.041	.3	12.7	0	1600	ok n n n n n
H56181	--	H56181	2736	Babcock	32	6	bop	15.82	17.82	Ret Strip	1	.001	.001	.001	32	0	bo n n n n n
H56191	--	H56191	8005	Barltrop	1	6	s/t	11.82	14.82	Tube3in*2.75	1	1	31	31	1	90	ok n n n n n
H52382	--	H52382	7825	WildBarfield	2	5	bop	07.82	08.82	Liner 8inch	1	.001	.001	.001	2	0	bo n n n n n
E56081	--	E56081		CES Norway	11	8	flr	52.99	52.99	ChargingGrid	1	1.67	42	64	11	3246	op y y n n n
H54201d	--	H54201d	3079	Glossop	2 ht	69	p/s	19.82	21.82	Ingot	1 ht	5	750	1000	1 ht	765	ok n n n n n
H55961	--	H55961		CEGB	12	4	flr	52.99	52.99	Brick Shelf	1	.833	15	26	12	0	op y y n n n
G53931	--	G53931	7881	Piftin	48	4	cww	09.82	11.82	Support Bar	6	.05	1	12	36	270	ok n n n n n
G53941	--	G53941	7880	Piftin	72	4	cww	09.82	11.82	Loading Bar7	4	.083	1.5	4	64	209	ok n n n n n
H55512	--	H55512	2608	Steel Gauges	100	4	p/s	10.82	13.82	Nose 1 1/4	6	.07	.5	8	0	0	ok n n n n n
H49961	--	H49961	7639	Normalair	59	16	flr	49.81	52.81	Butterfly	6	.13	.3	24	0	725	si n y n n y
H53951	--	H53951	8093	MurrayWilson	6	6	s/t	20.82	23.82	Tube 4 1/2od	1	1	108	115	6	1014	ok n n n n n
55962	--	H55962		CEGB	24	4	flr	52.99	52.99	Fin	2	.333	2.2	11	24	0	op y y n y n
5552A	--	H5552A	5736	BL Cars	1	4	A	13.82	14.82	Base Plate	2	1.5	58.5	58.5	0	475	ok n n y n n
48141	--	H48141	7551	BL	20	5	p/s	38.81	18.82	Spacer Bush	24	.02	.4	22.2	0	52	ok n n n n y
5398A	--	H5398A	7954	Caterpillar	2	5	A	12.82	13.82	Basket Assy	4	5	252	252	0	2056	ok n n y n n
53981	--	H53981	7955	Caterpillar	8	5	flr	10.82	13.82	Basket Sect.	1	1	66	95	8	0	sf n y y n n
55832	--	H55832		John Littler	4	4	bmm	52.99	52.99	Grid	1	.6	34.6	58	4	0	op y y n n n
53421	--	H53421	2655	Land Pyros	7	4	flr	06.82	09.82	Tube 1 1/4	2	.17	1.5	10.5	0	0	ok n n y n n
54201e	--	H54201e	3079	Glossop	2 ht	69	p/s	23.82	25.82	Ingot	1 ht	5	750	1000	2 ht	765	ok n n n n n
54201f	--	H54201f	3079	Glossop	2 ht	69	p/s	27.82	29.82	Ingot	1 ht	5	750	1000	2 ht	765	ok n n n n n
5521	--	H55521	4397	BL Cars	1	4	flr	11.82	14.82	Plate	1	6	52	68	0	0	ok n n y n n

Cronite Ltd Date:15.02.82 Time:16:09:29 Week No: 11.82 User:Saba pag

12/1

Index Main File

H55522	--	H55522	5737	BL Cars	1	4	flr	11.82	14.82	Extension12	1	1	6.5	13	0	0	ok	n n y n n
H54201g	--	H54201g	3079	Glossop	2 ht	69	p/s	32.82	34.82	Ingot	1 ht	5	750	1000	2 ht	765	ok	n n n n n
H54201h	--	H54201h	3079	Glossop	2 ht	69	p/s	35.82	38.82	Ingot	1 ht	5	750	1000	2 ht	765	ok	n n n n n
H5601A	--	H5601A		Land Rover	6	5	A	52.99	52.99	Fixture	6	1	16.5	16.5	0	1577	op	n n y y n
H54211	--	H54211	3079	Glossop	1 ht	52	p/s	53.99	53.99	Ingot	1 ht	5	750	1000	1 ht	525	hc	n n n n n
H56011	--	H56011		Land Rover	6	5	bmm	52.99	52.99	Plate A	1	.667	7.8	16	6	0	op	y y y n n
G5553A	--	G5553A	5556	CE	5	5	A	13.82	13.82	Pot15.75*18	3	4	81	81	0	2000	ok	n n y n n
H54221a	--	H54221a	1167	Vauxhall	2	5	bmm	07.82	10.82	TSM Grid	1	.5	8	13.5	0	105	ok	n n n y n
H54221b	--	H54221b	1167	Vauxhall	2	5	bmm	09.82	14.82	TSM Grid	1	.5	8	13.5	0	105	ok	n n n y n
G5554A	--	G5554A	5558	CE	1	5	A	12.82	13.82	Pot18*24	3	6	132	132	0	600	ok	n n y n n
H56012	--	H56012		Land Rover	6	5	bmm	52.99	52.99	Plate B	1	.667	8	16	6	0	op	y y y n n
H55561	--	H55561	3559	Babcock	1	3	p/s	10.82	13.82	Venturi End	1	1	25	34	0	248	ok	n n n y n
H5399A	--	H5399A	7956	Caterpillar	2	5	A	12.82	13.82	Basket Assy	4	6	276	276	0	2392	ok	n n y n n
H53991	--	H53991	7957	Caterpillar	8	5	flr	10.82	13.82	Basket Sect	1	1.17	69	100	8	0	sf	n y y n n
E55571	--	E55571	1069	CES NAC	20	5	bmm	10.82	13.82	Grid	1	.5	20.5	29	0	1362	ok	n n n n n
H54001	--	H54001	1630	Caterpillar	4	5	flr	10.82	13.82	Grid	1	2.33	95	152	4	1654	sf	n y n n n
H56013	--	H56013		Land Rover	24	5	cww	52.99	52.99	Tie Bar	8	.04	.59	12	24	0	op	y y y n n
H56021	--	H56021		Land Rover	110	5	cww	52.99	52.99	Spacer Tube	12	.033	.5	15	120	624	op	y y n n n
H56022	--	H56022		Land Rover	5	5	bmm	52.99	52.99	SupportPlate	1	.533	17	34	5	928	op	y y n y n
H56023	--	H56023		Land Rover	10	5	bmm	52.99	52.99	Plate	1	.533	10.4	24	10	1091	op	y y n y n
E5428A	--	E5428A	9231	CES Canada	1	5	A	11.82	12.82	Belt	3159	40	3300	3300	0	12474	ok	n n y n n
E54281	--	E54281	2204	CES Canada	2349	5	shl	09.82	12.82	Centre Link	4	.03	1.2	10	680	0	ok	n n y n n
E54282	--	E54282	2237	CES Canada	81	5	shl	07.82	12.82	Side Link	2	.03	1.5	5	0	0	ok	n n y n n
H56024	--	H56024		Land Rover	50	5	flr	52.99	52.99	Spacer E	12	.055	.73	23.5	60	278	op	n n n n n
E52767	--	E52767	7797	CES GKN	24	6A	p/s	09.82	15.82	Support1002	1	.33	27	45	22	1873	si	n y n n n
E52768	--	E52768	7798	CES GKN	48	6A	p/s	09.82	15.82	Bolt 1001	4	.12	8	64	44	1505	si	n y n y n
E52769	--	E52769	7799	CES GKN	24	6A	p/s	09.82	15.82	Support 1003	1	.33	30	50	22	1987	si	n y n n n
E54283	--	E54283	2238	CES Canada	81	5	shl	07.82	12.82	Side Link	2	.03	1.5	5	2	0	ok	n n y n n
H53351	--	H53351	3664	Glosssop	2 ht	52	p/s	53.99	53.99	Ingot	1 ht	1.5	250	350	2 ht	500	hc	n n n n n
H53422	--	H53422	5725	Land Pyros	2	4	p/s	08.82	09.82	Blank	72	.001	.01	.01	0	0	ok	n n y n n
H53451	--	H53451	7931	Serck Glocon	10	91	p/s	11.82	14.82	100mm Cage	1	.67	8	16.5	10	528	sf	n y n n y
H56025	--	H56025		Land Rover	50	5	flr	52.99	52.99	Spacer F	8	.083	.86	23.5	56	278	op	n n n n n
H56026	--	H56026		Land Rover	25	5	bop	52.99	52.99	Loading Bar	1	.001	.001	.001	25	319	bo	n n n y n
H56281	--	H56281	3079	Ingot	1 ht	57	p/s	11.82	11.82	Ingot	1 ht	5	750	1000	1 ht	885	ok	n n n n n
H56271	--	H56271	3447	Glossop	1 ht	69	shl	11.82	11.82	Stick	1 ht	5	750	1000	1 ht	698	ok	n n n n n
H56291	--	H56291	3447	Glossop	1 ht	76	shl	11.82	11.82	Stick	1 ht	5	100	150	1 ht	1331	ok	n n n n n
156221	--	H56221		Blue Circle	12	6	flr	52.99	52.99	Segments	1	2.33	98	144	12	2520	op	y y n y n
155921	--	H55921	7293	J.Moncrieff	6metr	6	bop	11.82	12.82	Bar38mm dia	1	.001	.001	.001	6metr	0	bo	n n n n n
156151	--	H56151		NEI	4	7	flr	52.99	52.99	Spacer	1	.667	5.6	12	4	525	op	y y n n n
53112	--	E53112	7843	CES Belgium	32	3	cww	07.82	09.82	Plate	8	.035	.22	5.5	0	92	ok	n n n n n
53116	--	E53116	7845	CES Belgium	156	3	cww	07.82	09.82	Plate	20	.02	.07	4.5	0	225	ok	n n n n n
53117	--	E53117	7846	CES Belgium	156	3	cww	07.82	09.82	Plate	20	.02	.08	5	0	320	ok	n n n n n
53118	--	E53118	7847	CES Belgium	76	3	cww	07.82	09.82	Plate	16	.02	.07	3.5	0	260	ok	n n n n n
53461	--	H53461	7841	Normalair	8	57	flr	09.82	10.82	Ring	1	1	13.5	27	0	670	si	n y n n n
53611	--	E53611	2184	CES Holland	500	4	shl	07.82	10.82	Coathanger	2	.05	1.05	4.5	244	3600	ok	n n n n n
56152	--	H56152		NEI	4	7	flr	52.99	52.99	Spacer	1	.667	5.6	12	4	250	op	y y n n n
3631	--	H53631	7933	BSC	3	86	flr	11.82	16.82	Cassette	1	2	49	73	3	939	sf	n y n y y

Index   Main File

H56153	-- H56153		NEI	7	7	flr	52.99	52.99	Spacer	1	.667	5.6	12	7	438	op	y	y	n	n	n
H5402A	-- H5402A	7884	BL Cars	1	4	A	09.82	10.82	ChainGuideRH	2	.5	44	44	0	315	ok	n	n	y	y	n
H54021	-- H54021	4510	BL Cars	1	4	flr	07.82	10.82	GuideRailRH	1	3	38	67.8	0	0	ok	n	n	y	n	n
H54022	-- H54022	4511	BL Cars	1	4	flr	07.82	10.82	Extension	1	1.25	6	10.7	0	0	ok	n	n	y	n	n
H5403A	-- H5403A	7885	BL Cars	1	4	A	09.82	10.82	ChainGuideLH	2	.5	44	44	0	315	ok	n	n	y	y	n
H54031	-- H54031	4509	BL Cars	1	4	flr	07.82	10.82	GuideRail LH	1	3	38	67.8	0	0	ok	n	n	y	n	n
H54032	-- H54032	4511	BL Cars	1	4	flr	07.82	10.82	Extension	1	1.25	6	10.7	0	0	ok	n	n	y	n	n
H56154	-- H56154		NEI	20	7	cww	52.99	52.99	Support	4	.083	2.3	17	20	601	op	y	y	n	n	n
E54051	-- E54051	4627	CES Sweden	8	5	flr	07.82	10.82	Fanhead 17	1	.5	10.5	15	6	458	ok	n	n	n	n	n
E54061	-- E54061	1620	CES Sweden	40	5	bmm	06.82	08.82	Guide Grid	1	.5	3.2	10	8	1836	ok	n	n	n	n	n
H56201	-- H56201	1179	Rolls Royce	9	4	bmm	52.99	52.99	Grid	1	.8	13.7	24.4	9	990	pc	n	n	n	n	n
H54094	-- H54094	7869	Superheater	154	69	cww	14.82	17.82	Ring Type C	16	.01	.3	15	160	160	np	y	y	n	n	y
H54095	-- H54095	7870	Superheater	298	69	cww	14.82	17.82	Block Type D	16	.02	.42	16	304	462	np	y	y	n	n	y
H54096	-- H54096	7871	Superheater	150	69	cww	14.82	17.82	Plate Type E	8	.03	1	17	152	420	np	y	y	n	n	y
H54097	-- H54097	7872	Superheater	298	69	cww	14.82	17.82	Block Type F	16	.02	.54	17.6	304	519	np	y	y	n	n	y
H54098	-- H54098	7873	Superheater	150	69	cww	14.82	17.82	Ring Type G	20	.01	.1	6	160	249	np	y	y	n	n	y
H54099	-- H54099	7874	Superheater	150	69	cww	14.82	17.82	Plate Type H	8	.03	.94	16	152	420	np	y	y	n	n	y
H56251	-- H56251	1242	Vauxhall	2	5	bmm	52.99	52.99	Grid Plate	1	.75	10.5	15	2	453	pc	n	n	n	y	n
E54284	-- E54284	2239	CES Canada	81	5	shl	07.82	12.82	Side Link	2	.03	1.4	5	0	0	ok	n	n	y	n	n
E54285	-- E54285	2240	CES Canada	81	5	shl	07.82	12.82	Side Link	1	.03	1.4	5	0	0	ok	n	n	y	n	n
E54286	-- E54286	2105	CES Canada	162	5	cpc	08.82	12.82	Step Washer	1	.001	.001	.001	0	0	es	n	n	y	n	n
E54287	-- E54287	2106	CES Canada	162	5	cpc	08.82	12.82	Plain Washer	1	.001	.001	.001	0	0	es	n	n	y	n	n
E54288	-- E54288	2111	CES Canada	162	5	bop	08.82	12.82	Rod	1	.001	.001	.001	0	0	bo	n	n	y	n	n
H56252	-- H56252	4322	Vauxhall	30	5	flr	52.99	52.99	Spigot	8	.04	.3	7.5	32	0	pc	n	n	n	y	n
H56253	-- H56253	7406	Vauxhall	4	5	flr	52.99	52.99	Support Post	1	.417	2.66	7	4	0	pc	n	n	n	y	n
H56254	-- H56254	2428	Vauxhall	2	5	cww	52.99	52.99	Centre Post	6	.033	1.9	16	6	0	pc	n	n	n	y	n
H56211	-- H56211		VF Engineer	2	81	flr	52.99	52.99	L/H Angle	1	.75	4.6	11	2	183	op	y	y	n	n	n
H56212	-- H56212		VF Engineer	2	81	flr	52.99	52.99	R/H Angle	1	.75	4.6	11	2	184	op	y	y	n	n	n
H5594A	-- H5594A		RHP Bearings	2	5	A	16.82	17.82	Radiant Tube	3	1	85	85	0	760	ok	n	n	y	n	n
H55941	-- H55941		RHP Bearings	2	5	bop	16.82	17.82	Bend U	1	.001	.001	.001	2	0	bo	n	n	n	n	n
H55942	-- H55942		RHP Bearings	2	5	s/t	13.82	17.82	Tube4.75*55	1	1	36.6	84	2	0	ok	n	n	y	y	n
H55943	-- H55943	8163	RHP Bearings	2	5	s/t	13.82	17.82	Tube5.25*50	1	1	32	69	2	0	ok	n	n	y	n	n
H5589A	-- H5589A		RHP Bearings	2	5	A	16.82	17.82	Radiant Tube	3	1	95	95	0	900	ok	n	n	y	n	n
H55891	-- H55891		RHP Bearings	2	5	bop	16.82	17.82	Bend U	1	.001	.001	.001	2	0	bo	n	n	y	n	n
H55892	-- H55892		RHP Bearings	2	5	s/t	13.82	17.82	Tube4.75*70	1	1	46.6	84	2	0	ok	n	n	y	y	n
H55893	-- H55893	8163	RHP Bearings	2	5	s/t	13.82	17.82	Tube5.25*65	1	1	41.6	69	2	0	ok	n	n	y	n	n

APPENDIX 4

List of foundry personnel contacted

List of foundry personnel contacted

1. Mr. B. Smith, Director
Knowels Foundry
Willenhall, Wolverhampton.

2. Mr. R. Wright, Production Control Manager
Aeroplane and Motor Aluminium Castings Ltd.
Erdington, Birmingham.

3. Mr. R. Cooper, Data Processing Manager
John Harper and Co. Ltd.
Willenhall, Wolverhampton.

4. Mr. N. Newton, Managing Director
H. Broadbent & Sons Ltd.
Aston-under-Lyne, Lancs.

5. Mr. C.J. Batty, Data Processing Manager
Cronite Ltd.
Crewkerne, Somerset.

6. Mr. R. Wooton, Technical Director
Bradley & Foster Ltd
Wednesbury, West Midlands.

7. Mr. J. Kruger, Managing Director
Butterly Foundry Ltd.
Ripley, Derbyshire.

8. Mr. J. Pearson, Director
Hockley Foundry Co. Ltd.
Hockley, Essex.

9. Mr. K. Gamble, Production Director
Stone Manganese Marines Ltd.
Charlton, London.

10. Mr. J. Day
Bryan Donkin Co. Ltd.
Chesterfield, Derbyshire.

REFERENCES

1. Andres, C.E., 'Meeting casting delivery date', Foundry, July 1968, p 109-114.

2. Andres, C.E., 'Practical production controls for the jobbing foundry', Modern Casting, October 1967, p 77-87.

3. Anon, 'Small computer reduces growing pain', Foundry, November 1971, p 120-122.

4. Anon, 'Deere Waterloo's computer reporting system', Foundry M & T, September 1975, p 91-94.

5. Anon, 'On-line computer aids Fick Foundry marketing', Foundry M & T, June 1979.

6. Anon 'A pragmatic approach to foundry computerisation', Foundry Trade Journal, December 6, 1979, p 1212-1216.

7. Benz, H. 'Production control and scheduling in a foundry by means of electronic data processing', Foundry Trade Journal, April 11, 1974, p 395-400.

8. Binmore, A.C., 'An introduction to the use of the computer as an aid to foundry management', The British Foundryman, June 1969, p 224-229.

9. Brown D.B. and Lomax, D.P., 'Computerised quality control reduces rejects', Foundry, September 1971, p 122-125.

10. Burbidge, J.L. 'Principles of production control', Macdonald Evans Ltd., Plymouth, 1978.

11. Daily, A.C., 'Using packages : The BCIRA/Hoskins system', Proceeding of B.N.F. fifth computer conference, 27-28 November 1978, BNF Technology Centre, Wantage, Oxfordshire.

12. Dahlke, D.W., 'Steel metalcaster computerises operations', Modern Castings, April 1969, p 93-95.

13. Dale, B.G., 'Some problems of production controllers', Production Management and Control, January/February 1982, p 31-36.

14. Daniels, G.D., 'Batch processing : Production control in a sand foundry', Proceeding of B.N.F. fifth computer conference, 27-28 November 1978, BNF Technology Centre, Wantage, Oxfordshire.

15. Drago, D., 'Production planning with an office computer', Foundry M & T, April 1976, p 62-70.

16. Drucker, P.F. 'The effective executive', Pan Books, London, 1970.

17. Duff, J.R., 'A computer based administration for a medium sized foundry', Production Engineer, May 1976, p 253- .

18. Foundry Industry Training Committee, 'Annual report 1981/82'.

19. Fuller, A.G., Montgomery-Smith, A., Deaner, R.G., and Owen, M.S., ' The development of computer-assisted production control', The British Foundryman, May 1973, p 142-152.

20. Gamble, K., 'Using packages : The BNF system', Proceeding of B.N.F. fifth computer conference, 27-28 November 1978, BNF Technology Centre, Wantage, Oxfordshire.

21. Green, R., 'Devolopment in disk design', Minicomputer News, June 1982, p 19.

22. Hall, P.E. and Holden, G.K., 'Computer guide 9: Production control', The National Computing Centre, 1973.

23. Hill, T. and Stevens, G., 'How to bridge the decision gap', Production Management and Control, May 1981, p 5-8.

24. Hollinshead, H.W. 'Foundry control by computer', Proceedings of 1972 anual conference - Steel Castings Research and Trade Association, paper 12, 9 pages.

25. Hollwey, M.W.M., Kochhar, A.K. and Parnaby, J., 'Using a real-time computer for production control', The Production Engineer, November 1978, p 37-42.

26. Hourke, J.W., 'Profitable production control by computer', Proceedings of the 2nd International Conference on Production Research, Copehagen, August 1973, Taylor Francis, London.

27. Institute of British Foundrymen - First report of working group E2, 'The use of computer in foundry management control', The British Foundryman, July 1974, p 180-186.

28. Insstitute of British Foundrymen - Second report of working group E2, 'Computer applications in foundries', The British Foundryman, 1979, p 204-208.

29. Institute of British Foundrymen - Third report of working group E2, 'Computer applications in foundries', The British Foundryman, 1979, p 237-239.

30. Jones, G.L., 'Computer-aided production control for jobbing and short-series foundry work', Foundry Trade Journal, March 3,1977, p 439-468.

31. Jones, N., 'Computing in the Dudley foundry holding group', Proceeding of B.N.F. fifth computer conference, 27-28 November 1978, BNF Technology Centre, Wantage, Oxfordshire.

32. King, J.R., 'Production planning and control by computer - A survey', Production Engineer, October 1972, p 333-336.

33. King, J.R., 'The theory-practice gap in job shop scheduling', The Production Engineer, March 1976, p 137-141.

34. Kochhar, A.K., 'Development of computer-based production systems', Edward Arnold, London, 1979.

35. Koskella, W.I., 'Systems approach', Foundry, April 1970, p 94-97.

36. Law, T.D. and Humphrey, C.D., 'The application of computers in the foundry industry', The British Foundryman, March 1969, p 117-131.

37. Law, T.D. and Green, R.J. 'The use of computers for foundry scheduling and production control', The British Foundryman, May 1970, p 138-153.

38. Law, T.D. and Thapar, A.K., 'Computer programs for production planning and control in foundries - An assessment of current situation', Journal of Research, B.C.I.R.A., September 1975, p 20-31.

39. Malcomb, D., 'How a small foundry uses a computer', Foundry, September 1969, p 181-189.

40. Maynard, T. and Cooper, R., 'On-line computer bureau system for a foundry', Foundry Trade Journal, February 12, 1981, p 202-203.

41. Martino, R.L., 'Information Management', McGraw-Hill, New York, 1968.

42. Montgomery-Smith, A. and Owen, M.S. 'What a computer can do for you', Proceedings of 1972 anual conference - Steel Castings Research and Trade Association, paper 11, 7 pages.

43. Moorecroft, T., 'Developing disk storage', Minicomputer News, June 1982, p 20.

44. Nicholson, T.A.J., 'New developments in production control', Proceeding of B.N.F. fifth computer conference, 27-28 November 1978, BNF Technology Centre, Wantage, Oxfordshire.

45. Niehuas, K., 'Computer system coordinates results of modernisation', Foundry M & T, September 1978, p 124-127.

46. Rhodes, D. and Wright, M., 'The use of computers in the efficient control of small manufacturing systems', Journal of Applied Systems Analysis, Volume 8, 1981, p 85-99.

47. Rogers, B.G., 'Batch processing : Production control for diecasting', Proceeding of B.N.F. fifth computer conference, 27-28 November 1978, BNF Technology Centre, Wantage, Oxfordshire.

48. Sargeaunt, M.J. 'Scientific decision-making in the molten metal industry', The British Foundryman, June 1969, p 230-237.

49. Seman, N.G., 'Computer utilisation in the foundry', Foundry M&T, November 1978, p 44-57.

50. Simons, G.L., 'Introducing microprocessors', The National computing centre ltd., 1979.

51. Sims, C., 'How production can benefit from small computers', Small computer application in industry conference, 27-29 March, Birniehill Institute, Glasgow.

52. Southall, J.T., 'Aspects of management control in the foundry industry', Ph.D. thesis, University of Aston, 1978.

53. Trinder, C.V. and Watts, G.A., 'Production control in the non-ferrous castings industry', The British Foundryman, August 1973, p237-244.

54. Trinder, C.V., 'Comparison of approaches to production control', Proceeding of B.N.F. fifth computer conference, 27-28 November 1978, BNF Technology Centre, Wantage, Oxfordshire.

55. Varley, C. and Danials, G.M., 'Computer assisted production control in a small jobbing repetition foundry', The British Foundryman, May 1972, p 198-201.

56. Waespi, W. 'Electronic data processing in the foundry operations', The British Foundryman, February 1970, p 44-59.

57. Wakefield, B.D., 'Computer untangles foundry problem', Iron age, March 1971, p 57- .

58. Watts, G.A., 'What do we mean by production control?', Proceeding of B.N.F. fifth computer conference, 27-28 November 1978, BNF Technology Centre, Wantage, Oxfordshire.

59. Weil, J., 'Real time production control in a small foundry', Proceeding of B.N.F. fifth computer conference, 27-28 November 1978, BNF Technology Centre, Wantage, Oxfordshire.

60. Which Computer, 'Annual survey of production control systems', December 1980, p 29-37.