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TO STUDY THE OVERALL EQUIPMENT EFFECTIVENESS IN SAKTHI AUTO COMPONENTS PRIVATE LIMITED,ERODE

by

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Under the guidance of

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Faculty of KCT Business School

A PROJECT REPORT

submitted

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of

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BONAFIDE CERTICICATE

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Certified that this project report titled "**To Study The Over All Equipment Effectiveness of Sakthi Auto Component Limited-** bonafide work of **Ms.B.SOWBASHINI, Reg No: 1020400055,who** carried out the project under my supervision. Certified project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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Submitted for the project viva-voce examination held on 18/5

Internal Examiner

External Examiner

CERTIFICATE

Sakthi Auto Component Limited

11.05.2012

TO WHOM SOEVER IT MAY CONCERN

This is to Certify that **Ms.B.SOWBASHINI** Reg No : 1020400055, Final year MBA. **(MASTER OF BUISNESS ADMINISTRATION)** students of KUMARAGURU COLLEGE OF TECHNOLOGY **COIMBATORE** , has done the Project on the topic **"A STUDY ON OVERALL EQUIPMENT EFFICIENCY OF KNUCKLE LINE MACHINE AND IDENTIFYING REASON FOR LOSSES AND SUGGESTING THE REMEDAL MEASURES"** at our Organisation during the period from 01.02.2012 to 02.05.2012 .

During this period her Performance and conduct were found to be **Good.**

We wish all success in his future endeavour.

For Sakthi Auto Component Limited.,

K.R.RAJENDRAN,
Dy. General Manager - IR&Welfare

DECLARATION

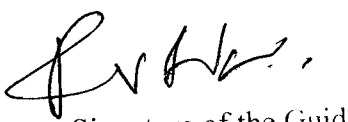
I affirm that the project work titled "**TO STUDY THE OVERALL EQUIPMENT EFFECTIVENESS IN SAKTHI AUTO COMPONENTS PRIVATE LIMITED, ERODE**" being submitted in partial fulfillment for the award of master of business administration is the original work carried out by me. It has not found the party other project work submitted for award of any degree or diploma, either in this or any other university.

Signature of the Candidate

B.Sowbashini

Reg no: 1020400055

I certify that the declaration made above by the candidate is true.



Signature of the Guid

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BSTRACT

oday, Metal Casting companies are often at the heart of the economy in the communities where ıey reside. The continuous casting (here production) is followed in the Metal Casting Industry ıat results in the production of a very high volume of units. The next big thing to happen in ıdia after software , textiles, pharmaceuticals and BPO would undoubtedly be the auto omponent manufacturing industry. To improve up on the auto component industry in India,the ıeed of the hour is to focus on its competitiveness,learn the best manufacturing practices,be ıuality conscious and at the same time inculcate a prompt delivery culture.

The goal of the TPM program is to markedly increase production while, at the same time, increasing employee morale and job satisfaction. This can be achieved by improving the effectiveness of the machines. This is done to achieve the following objectives. Avoid wastage in a quickly changing economic environment.

- Producing goods without reducing product quality.
- Reduce cost.
- Produce a low batch quantity at the earliest possible time.
- Goods send to the customers must be non defective.

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INTRODUCTION

CHAPTER-1

INTRODUCTION

1.1ABOUT THE STUDY:

Today ,with competition in industry at an all time high, TPM may be the only thing that stands between success and total failure for some companies. Cast metal products are found in 90 percent of manufactured goods and equipment. From critical components for aircraft and automobiles to home appliances and surgical equipment, cast metal products are integral to the global economy and our way of life. The manufacturing process which continuously improve the outcome are necessary in such industries. It has been proven to be a program that works. It can be adapted to work not only in industrial plants ,but in construction ,building maintenance, transportation, and in a variety of other situations. The key targets of TPM include obtaining minimum 90% OEE(Overall Equipment Effectiveness),running the machines even during lunch(Lunch is not for operators and not for machines!),achieving 100% success in delivering the goods as required by the customer, reducing the manufacturing cost by 30% , operating in a manner, so that there are no customer complaints, maintaining a accident free environment.

As we all know, manufactured goods are a result of a complex production process- and without the proper measuring tools and formula, except the business to run blindly even in the light of day. Having the right metrics, Iain provides a window to analyze out-of-the-ordinary issues and gives an established framework for improving the whole manufacturing process. The goal is to hold emergency and unscheduled maintenance to a minimum. In this project, the ways to improve and the importance of improving the OEE in GM Knuckle machining lines are discussed. So that the productivity can be increased with the minimization of machine stoppages. Through this the company's objective 100PPM can be achieved.

1.2ABOUT THE INDUSTRY:

According to the Automotive Component Manufacturers Association of India (ACMA), the domestic Indian auto component manufacturing industry is heading for a whopping 18% growth in the coming years compared to the export market which is estimated to reach$2.7 bn by the year 2011. The main automobile components manufacturing hubs in India are situated in Chennai, Pune and Gurgaon. The magnitude of the auto component manufacturing industry stands at Rs 25,000 crores ($5mn approx.). Though relatively small, the Indian automotive component manufacturing industry due to a huge talent pool of skilled automotive engineers and access to the latest technologies has a great potential to emerge as a big player in the near future . The U.S. metal casting industry is the world's largest supplier of castings, shipping cast products valued at over $18 billion annually and directed employing 2,25,000 people. Metal casting companies are often at the heart of the economy in the communities where they reside.

Lacking the required infrastructure, the Indian auto component manufacturing industry falls way behind the major global players in terms of production capacities. Due to this fact, it also lags behind other nations in getting large manufacturing orders. Or even if it manages to get one, it ranges below the $100mn mark, which is considered a mere figure as per the automotive industry standards. Though striving to better its standards, the Indian auto component manufacturing industry has registered a robust growth in the recent past. The three main factors providing impetus to this industry are the ever increasing domestic automobile industry (two-wheelers, commercial vehicles and passenger cars), the aftermarket sales and servicing industry and the outsourcing of component manufacturing to India and China by the global titans to cut down on their cost of productivity and thereby laughing all the way to the banks. To improve upon the auto component industry in India, the need of the hour is to focus on its competitiveness , learn the best manufacturing practices, be qualiry conscious and at the same time inculcate a prompt delivery culture. The Metal Casting Industry employs the process of pouring molten metals ("hot metal" in industry parlance) into casts(or molds), which takes a definite permanent shape after cooling.

The industry casting procedure that is followed in the Metal Casting Industry is be classified as non-disposable, as it involves processes that retain the cast (or mold) for several applications, in contrast to the use of molds made of sand, plaster or plastics etc, which cannot be used more than once, and are therefore unfit for application in the Metal Casting Industry. These rather domestic mold casting procedures are termed as disposable mold casting. However, the particular cost effective method that is followed in the Metal Casting process. The continous casting (here production)procedure followed in the Metal Casting Industry that results in the production of a very high volume of units (which are nonetheless of a higher quality), make the procedures followed in the Metal Casting Industry cost effective and therefore affordable in comparison with the yields of the domestic or small scale metal casting processes.

1.3 ABOUT THE COMPANY:

SACL is one amoung the multi-faceted Sakthi Group situated at Mukasi Pallagoundenpalayam,Erode DT,Tamil Nadu, established in the year 1983. Sakthi Group is one of the leading industrial groups in India engaged in the manufacturing and service activities of sugar, alcohol,tea,textiles,ferrous castings,synthetic gems,soya foods,soft drinks,transport ,retreading and finance. Sakthi Auto Component Limited is an auto and engineering component manufacturing unit having two foundries for producing ferrous castings and more than 350 Cnc and general purpose machines for machining. This unit specializes in the production of safety critical / high quality s.g/grey iron castings requiring high internal soundness and superior metallurgical properties. Sakthi Auto Component Limited has acquired two foundries in Germany and one in Portugal and hence forth called as Sakthi Automotive Group(SAG). The Foundry operation was started in 1983, the Machining operation was started in 1986. The Production capacity is of 40,000 Tonnes per Annum. The Number of Employees working in SACL is around 1,100 numbers. The quantum of exports per month ranges between 250MT to 500 MT. It is likely to go up to 100 MT in near future. SACL has 2 foundries for producing ferrous castings.

Foundry –"A" is a conventional jolt squeeze green sand moulding process where castings up to 50 kgs weight are produced. The ultimate capacity of this foundry is 1500/month.

PRODUCTION PROGRAMME:

The production includes Steering Brake Drums, Brake Calipers and Carriers for Passenger cars, Air Disc Brake parts for heavy duty trucks, Differential case, Vibration Dampers, Hubs and Slack Adjusters.

QUALITY POLICY:

SACL is committed to consistently provide products that meet customer & applicable regulatory requirements and will aim to enhance customer satisfaction. This is achieved through

- Establishing and maintaining a Quality Management System to International specifications.
- Identifying & meeting customer needs& expectations.
- Continual improvements.
- Upgradation of human resources
- Maintaining clean and safe environment throughout the organization.

IMPRESSIVE LIST OF CUSTOMERS:

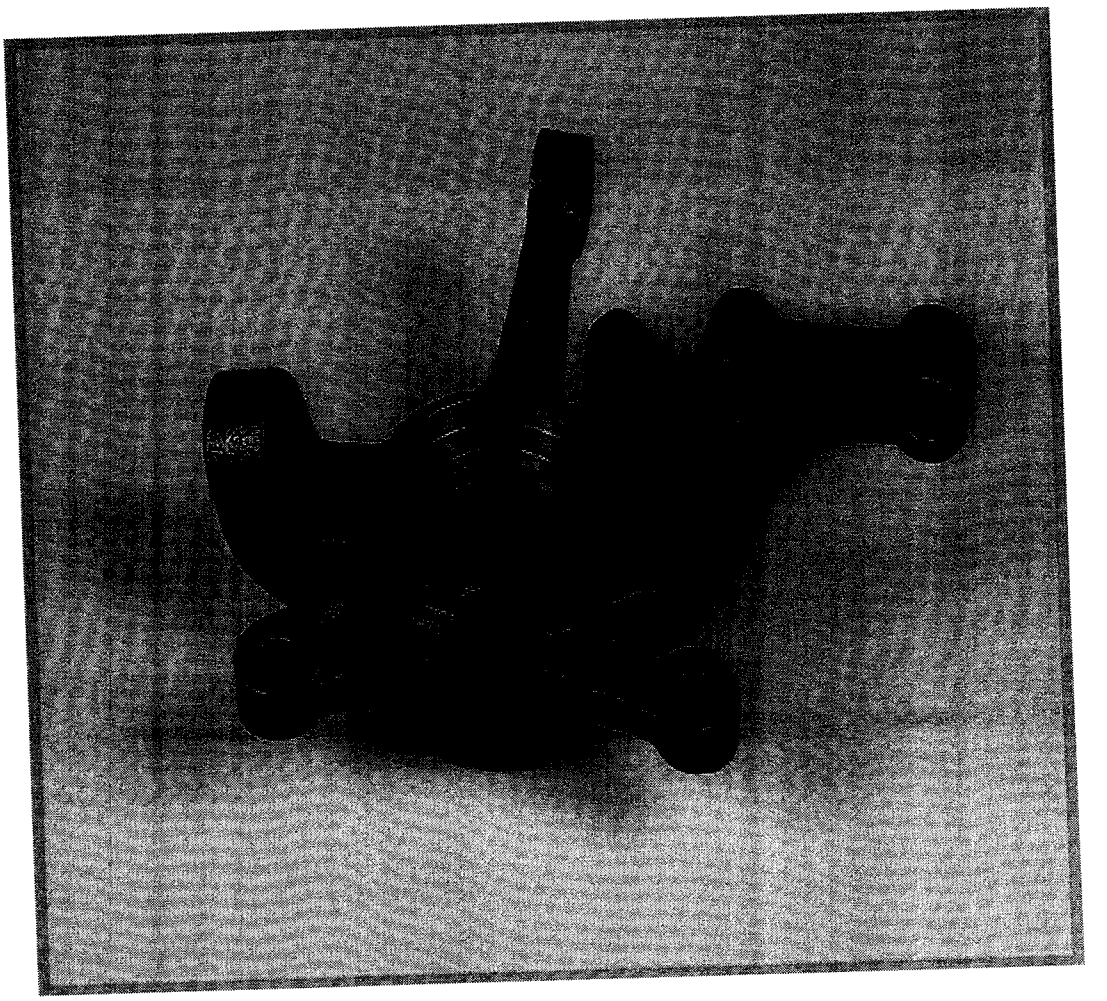
- General Motors
- Mahindra Renault Ltd
- Honda Siel Cars India Ltd
- Maruti Suzuki India Ltd
- Fiat India Ltd
- Volvo India Ltd
- TOYOTOmi KIRLOSKAR AUTOmatically PARTS private Ltd
- Haldex India Ltd
- Haldex Brake Products AB-Swedan
- RHODES INDIAN AUTOMOTIVE Private Ltd
- Lljin Automotive Private Ltd

➢ MAHINDRA&MAHINDRA

TECHNOLOGY UPDATION:

The latest technology is leveraged to the hit with people whose inherent strengths lie in the winning attitube and the willingness to thrive on challenges.This forms the foundation of an organization that races into the future with the surging confidence that it would continue to contributer and the lives of many more people. Due to time constraint only one component is taken for the study.

The component taken under observation is GM Knuckle. The following is the diagrammatic representation of GM Knuckle .



M. NUFACTURING PROCESS:

The Manufacturing Process includes of Foundry and Machining Processes. The Overall Foundry process consists of the following major steps.

- Sand preparation and conditioning;
- Preparation of sand moulds and cores;
- Melting of raw materials in induction furnaces;
- Melting of raw materials in cupola furnace;
- Magnesium treatment to the metal;
- Pouring of molten metal in the sand moulds;
- Cooling and separation of castings;
- Surface finishing of the castings;and
- Quality testing.

Sand Preparation:

Moulds of the required shape and size are prepared under Green sand moulding process. Under this process the required washed, dried and graded sand procured from outside is mixed with bentonite(clay)and coal dust, which acts as a binding material and water. Then they are thoroughly mixed in Intensive Mixer.

Sand Conditioning:

Sand Conditioning is very important as there should be proper permeability to aloe the gases to escape and we should also get the right mould hardness to get quality castings without sand defects like sand drops, blow holes etc.

The surface finish of the casting also depends up on to a certain extent on proper sand conditioning. After proper conditioning of the sand, it is transferred to a storage hopper by means of conveyors. From the hopper the sand is transported using conveyors to the individual moulding machine hoppers. Proper metal to sand ratios will be adopted and the requisite quantity of fresh sand will be added in each mixing cycle. Similarly the unwanted sand in each will be discarded also.

Preparation of Sand Moulds and Cores

Fully automatic Programmable Logic Circuit(PLC) based sand plant with Sand Multi Controller checks and adjusts the compatibility and strength of every batch of the sand mixture before moulding so as to send only accepted quality of sand into the system.

Fully automatic moulding line with High Pressure Match plate Moulding Machines, with an average production rate of about 350moulds/hr,DISMATIC 130B for making vertical flaskless moulds with dimension of 535×650×120-395mm(H×W×T).

Fully automatic and semi automatic core box machines along with shell core making facilities are available. The core box with core print is anchored and supported adequately.

Melting of Raw Materials in Induction Furnace

The raw materials charged into the induction furnaces are Pig iron, Steel scrap,Sorrel metal,Ferro alloy and graphite ,foundry rejects and returns. Depending upon the type of castings to be produced the proportion of raw materials is varied,

The raw materials are charged into the medium frequency induction furnace and melted to molten state by inducing electric current.

Medium frequency melting has been chosen as there is more flexibility, comparatively less installation cost and no heel metal is required in the crucible before switching on to melt. Similarly while tapping , the entire crucible can be emptied,fresh charge added without loss of time for each cycle of melting. The added advantage in induction melting is, if there is power interruption, the metal can be allow to be solidified and on resumption of power supply, the solidified metal can be re-melted.

Melting of Raw Materials in Cupola Furnace(Proposed)

The raw materials charged into the cupola furnaces are Pig iron,Steel Scrap, Sorrel Metal, Ferro alloy,Foundry rejects and returns. Depending upon the type of

The raw materials are charged into the Hot Blast Cupola Furnaces and melted to molten state using coke as fuel.One (1) Hot Blast Cupola Furnace of 12.0-Tons/hr capacity will be used for melting.

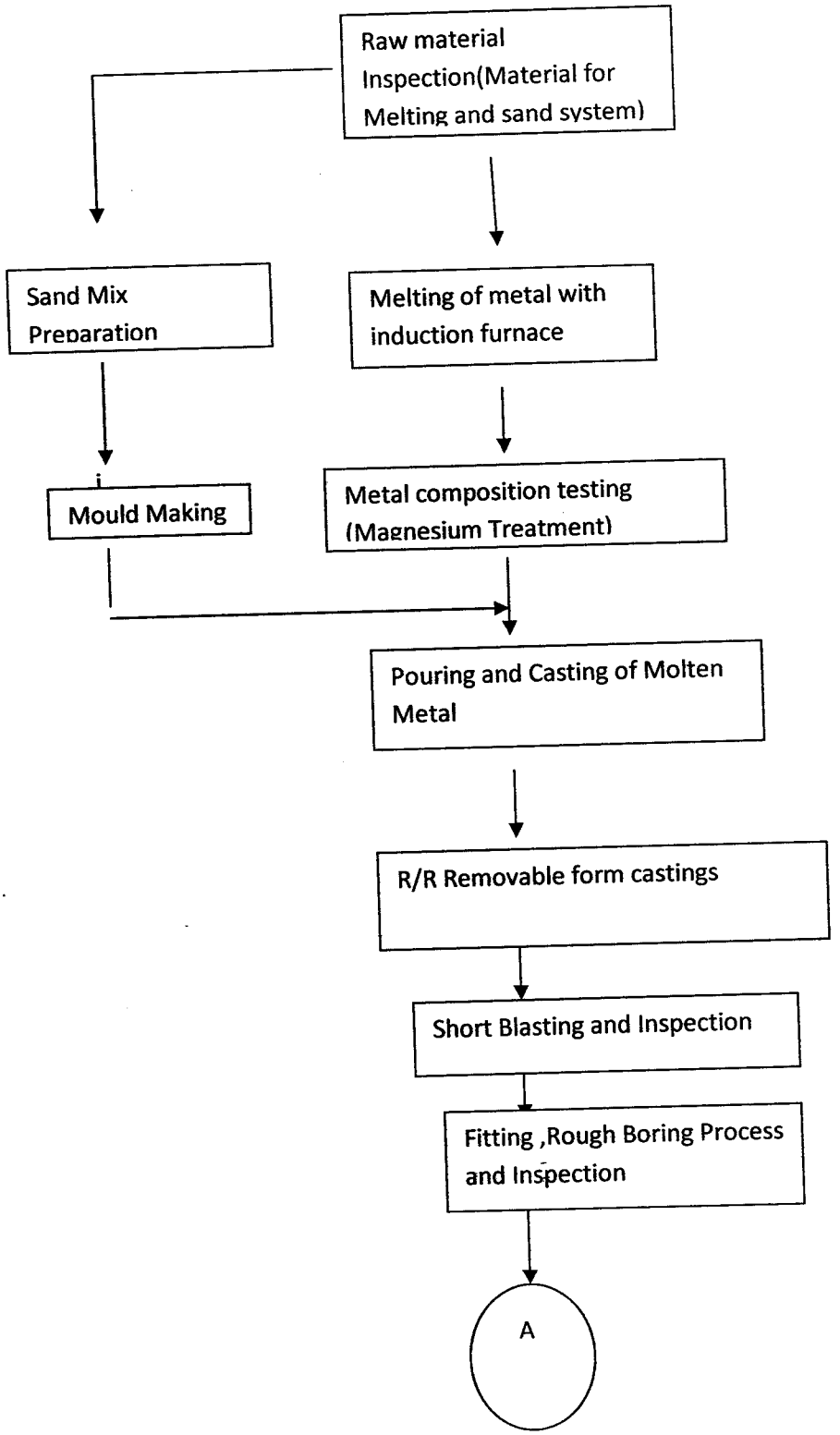
Magnesium Treatment to the Metal

In case of grey iron there is no treatment of metal involved. However in the case of SG Iron, in converter vessel the molten metal with the right composition of other elements has to be treated with pure magnesium of the required percentage. This alloy reacts with the molten metal which when solidified gives properties of steel in physical strength and the properties of cast iron are retained.

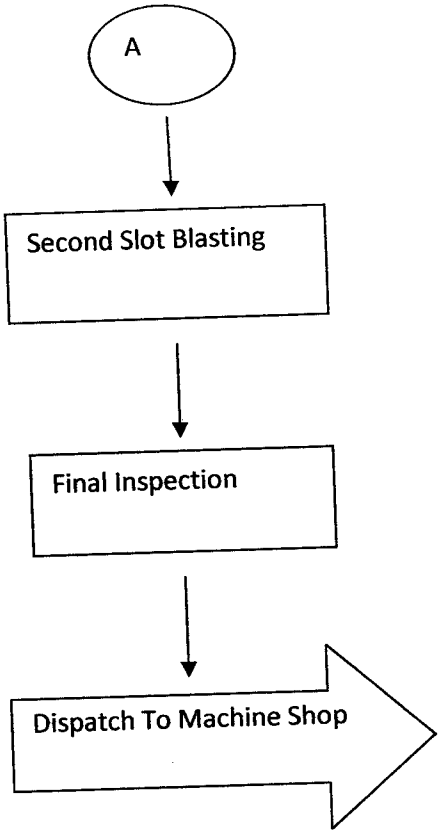
Pouring of Molten metal In the Sand Moulds

In grey iron Castings the melted iron from the furnaces is tapped into ladles and then poured in the sand moulds. For SG iron castings preparation the converter treated molten metal is then poured .

PROCESS FLOW DIAGRAM

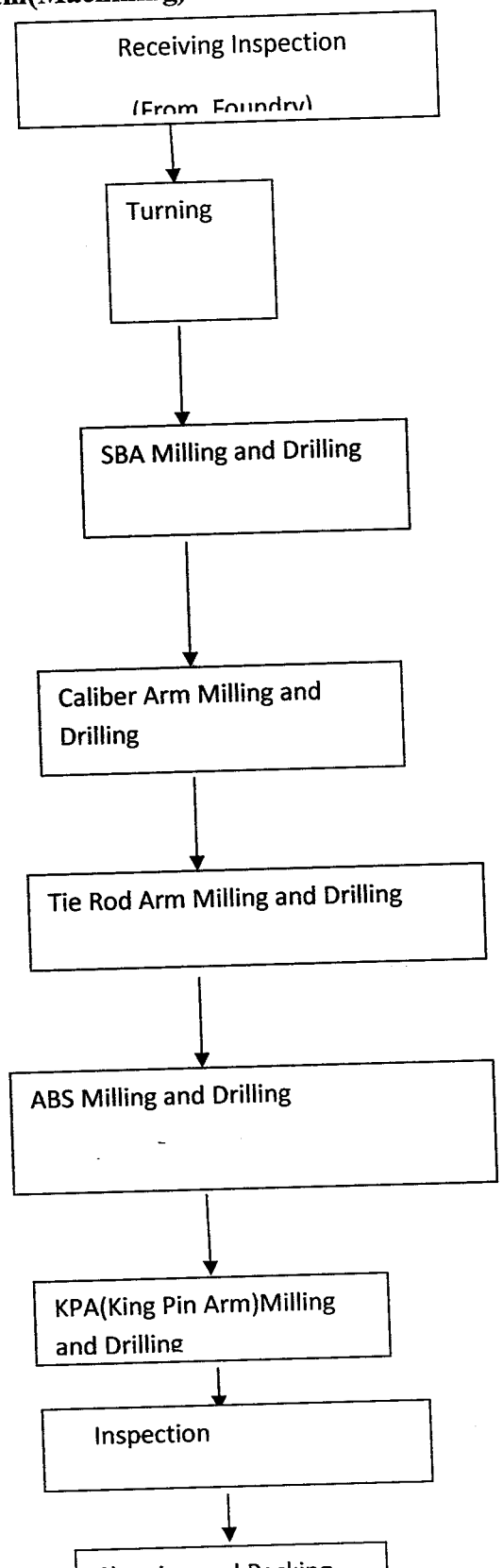


Process Flow Diagram Cont...



The foundry processes are more or less common for all types of components. Whereas ,the machining process varies from one component to another based on the requirements and component types demanded by the customers. The machines involved in further process are done by CNC machines, the tooling and settings are done according to the components. The major operations include Turning,milling,drilling and other miscellaneous operations. The Machining processes for the GM Knuckle Line are done by the machines named Hyundai Vertical Turning Center and Vertical Machining Centre. The Process flow Diagram For the Knuckle machining Line includes the following steps,

Process Flow Diagram(Machining)



2.1OBJECTIVES OF THE STUDY:

Primary Objectives:

To Study the Over All Equipment Effectiveness of GM Knuckle Line .

Secondary Objectives

- To calculate the Overall Equipment Effectiveness for the GM knuckle line in Machine shop.
- To identify the factors and the major losses which affect the improvement of OEE.
- To identify the sources of those losses and to provide the corrective actions in order to overcome the profits.
- To find the ways or techniques to improve OEE and to observe the benefits of improving it.

2.2 SCOPE OF THE STUDY:

Generally in machine shop the efficiency of the machines get affected mainly due to incorrect settings and also the factors such as improper supply of input, human errors, break downs ,etc. By providing the corrective actions for the above impacts will improve the efficiency of the machine as well as productivity, which also pays a way to minimize the rejection rates. The problems which are occurring currently can be avoided in the future period and also the company's objective Zero PPM can be achieved easily. Through this project, the flow of production ,the resources involved, the quality policies, the functions of machines, the operations at the foundry and machine shop can be known.

2.3 LIMITATIONS OF THE STUDY:

- Since, the study was made on the single product flow line, the chances are there for variations, when it comes to the whole production unit.
- The time duration for implementation of the concepts may vary as per the involvement shown by the organizations.
- The study is done only in general shift i.e.,day shift, the remaining two shift data are not observed directly.
- The observations on the CNC machines are difficult.
- All the factors are not being able to cover up.

REVIEW OF LITERATURE

CHAPTER 3
REVIEW OF LITERATURE

3.1 Literature Survey - From Research Papers

It gives the description of literature reviewed from' various research papers published in international and national journals, proceedings of various conferences and books.

(a) Kanthi M.N. Muthiah. SamuelH.Huang. Sangeetha Mahadevan [I] presented a methodology for a quantitative metric for measuring the productivity of individual production equipment in a factory. It was proposed by seiichi nakajimea in the late 1980s.

The overall equipment effectiveness metric is a powerful tool that can be used to measure performance and also perform diagnostics at the equipment level. Although important, gains made in OEE are insufficient; because the ultimate objective is a highly efficient integrated system, not brilliant individual equipment. Factory level performance monitoring and diagnostics can be facilitated by classifying the entire manufacturing system layout's as follows "series, "parallel.·'assembly'-'expansion," and the algorithms are implemented into a software tool called SIMPRO.a glass manufacturing case study is used to illustrate automated performance diagnostics and the benefits obtained by using the approach.

(b) M.Samrout, R.Kouta, FYalaoui, E.Chatelet [2] presented a ant colony algorithm applied in preventive maintenance optimization. this method was initially used for resolution of travelling salesman problem. Meta-heuristic applications have evolved a lot nowadays and have been used in many domains. This paper offers a detailed study about the influence of parameter on the AC operation. An experimental design is done. Obtained results are coherent with the convergence condition of the AC algorithms. Based on those latter: improvements are done to the original AC algorithm and interesting results are obtained.

(c) Zimin(max)yang, drag an Djurdjanovic, jun Ni [3] presented a new method for scheduling of maintenance operation in a manufacturing system using the continuous assessment and prediction of the level of performance degradation of manufacturing equipment as well as the complex interaction b/w the production process and maintenance operation. A genetic algorithm based optimization procedure is used to search for the most cost -effective maintenance schedule, considering both production gains and maintenance expenses. In all case that were studied application of the newly proposed maintenance scheduling tool resulted in a noticeable increase in the cost- benefits, which indicates that the use of predictive information about equipment performance through the newly proposed maintenance scheduling method could result in significant gains obtained by optimal maintenance scheduling.

(d) S.R. Fletcher, T.S.Baines, D.K.harrison [4] presented a paper describes a field study that investigated the extent to which worker's production -task cycle time vary and degree to which such variation are associated with attitude differences result shows that worker performances varies significantly, much more than is assumed by contemporary manufacturing system designers and that this appears to be due to production task characteristics. The finding of this research and their implication and discussed. (e) Chin-chin wu, wen-chiung lee [5] presented a recent empirical studies in several industries have verified that unit costs decline as firms produce more of a product and gain knowledge or experience. This phenomenon is known as the "learning effect." However most of the papers assume that the machine is available at all time. In reality, the machine might become unavailable at due to machine breakdown or preventive maintenance during period. Motivated by this, single machine scheduling problems with consideration of the learning effect and machine availability are considered in this paper.

It is shown that the shortest processing time rule provides the optimal schedules for make span and the total completion time minimization problems when jobs are assumed to be resumable. Moreover .mixed integer programming techniques are used to solve the problem when jobs are non- resumable .

(f) Wen-jinn chen [6] presented as machine is required in many industries, it is

problem where periodic maintenance and jobs are scheduled on a regular basis. In our research, a periodic maintenance sequence consists of several maintenance period and each maintenance period is scheduled after a fixed time interval. The objective is to minimize the total How time and maximum tardiness. A heuristic that utilizes the theorem is proposed to solve the problem by providing a small set of efficient sequences according to his preference. We also propose a branch-and-bound algorithm is to find the optimal sequence. Computational result show that the presented heuristic is highly accurate and efficient.

(g) Mehmet Cakmakei, Mahmut Kernai Karasu [7] presented a higher quality and efficient production requires newer production methods and ideas. As lean manufacturing was introduced to production environments, an important question occurred. What must be done to reduce the setup time? Shigeo shingo tried to solve this problem by his methodology called SMED. Here "sustainability" is used as keeping the success level achieved by using SMED at a desired point and not letting it to drop down. To achieved desired sustainability well-arranged standard procedure must be prepared. In this text optimal changeover procedure is constituted with the aid of a predetermined time system (MTM-UAS) to standardize and preserve the improved changeover operation.

(h) Kunal kant [8] presented a careful search for this led to practices followed in Japanese industries and popularly known as total productive maintenance(TPM).as a concept is rapidly growing in popularly worldwide. The potential benefits of TPM as proclaimed by world-class industries include tangible benefits in production / productivity, quality, cost, delivery and safety and intangible benefits like improved morale amnd skill of work force. The mangnitude of benefits claimed has prompted TATA STEEL to initiate TPM concept on a pilot basis in one of the business units i.e ring plant.

(i) Hongyi sun, Richard yam, Ng Wai Keung [9] presented this paper records the pilot implementation and evaluation of total productivity maintenance (TPM) in the advanced manufacturing environment of a hong kong manufacturing company. The management of the company would like to implement TPM in the company. the mainconcern are: 1) TPM is a Japanese method. 2)the method may not suitable for

RESEARCH METHODOLOGY

CHAPTER 4

RESEARCH METHODOLOGY

4.1 RESEARCH DESIGN:

"A Research Design is purely and simply that frame work or plan for the study that guides the collection of the data."It is a blue print that is followed in completing a study. It resembles the architect's blue print for constructing a house.

A good research design has the following characteristics namely

- Problem definition
- Specific methods of data collections and analysis.
- Time required for research project.
- Estimate of expenses to be incurred.

4.2 TYPES OF RESEARCH DESIGN:

- Exploratory Research Design
- Descriptive Research Design
- Analytical and Predictive Research Design.

4.2.1 RESEARCH DESIGN

The types of research adopted for the study is Analytical and Predictive Research. This type of research explains the nature of certain relationships, or establishes the differences amoung groups or the independence of two or more factors in a situation. This is also termed as Hypothesis testing. It is undertaken to explain the variance in the dependent variables or to protect the organizational outcomes. It could also establish cause and effect relationships, and it can also be done with both qualitative and quantitative data.

4.3 DATA COLLECTION METHODS:

Data Collection Methods are an integral part of the of research design.Problems research design. Problems researched with the use of appropriate methods greatly enhance the value of the research. It includes interviews,questionnaires,observations,motivational techniques such as projective tests. Here, the adopted data collection is through Observational methods, where the items are observed by the researcher to identify the number of defects and the rejection rates.

4.4 DATA SOURCES:

In this study there is a need to gather primary as well as secondary data. The source of the information and the manner in which data are collected could well make a big difference to the rigor and effectiveness of the research project.

4.4.1PRIMARYDATA:

Primary data refer to information obtained first hand by the researcher on the variables of interest for the specific purpose of the study. Primary data can be collected in 4 ways.

Observational research: Fresh data can be gathered by observing relevant factors and settings.

Focus group research: A focus group is a gathering of six to ten people who are invited to spend a few hours with a skilled moderator to discuss the product,service,organization, or other marketing entity.

Survey research: Surveys are bets suited for descriptive research.Companies undertake surveys to learn about people's knowledge, beliefs, preferences, and satisfaction, and to measure these magnitudes in the general population.

Experiment research: This is the most scientifically valid research method. The purpose of experimental research method.The purpose of experimental research is to capture cause and effect relationships by eliminating completing explanations of the observed findings.

SECONDARY DATA:

Secondary data refer to information gathered from sources already existing. Such data can be internal or external to the organization and accessed through the internet or perusal recorded or published information. There are several sources of secondary data, including books and periodicals, statistical abstracts, data bases, the reports of the companies. Here the chart constructed to view the major defects is collected from the Production reports of Sakthi Auto Components Limited, Pallagoundenpalayam.

The advantage of seeking secondary data sources is savings in time and cost of acquiring information. However , secondary data as the sole source of information has the drawback of becoming obsolete, and not meeting the specific needs of the particular situation or setting. Hence, the sources that offers current and up to date information

4.5 TOOLS USED:

PARETO CHART:

A Pareto diagram is a graph that ranks data classifications in descending order from left to right. The possible data classifications are problems, complaints, causes, types of non conformities, and so forth. The vital few are on the left, the useful many are on the right of the chart. It is sometimes necessary to combine some of the useful many into one classification called "other".

Pareto diagrams are used to identify the most important problems. Usually 80% of the total results from 20% of the items. Actually , the most important items could be identified by listing them in descending order . The graph has the advantage of providing a visual impact,showing those vital few characteristics that need attention. Resources are then directed to take the necessary corrective action.

Steps in constructing a Pareto diagram,

- Determine the method of classifying the data: by problem, cause, non conformity, and so forth
- Decide the frequency to be used to rank the characteristics.
- Collect data for an appropriate time interval or use historical data.
- Summarize the data and rank order categories from largest to smallest.
- Construct the diagram and find the vital few.

4.6 OVERALL EQUIPMENT EFFECTIVENESS:

OEE is a tool that combines multiple manufacturing issues and data points to provide information about the process. It is an all-inclusive benchmarking tool that serves to gauge the various sub-components of the manufacturing process (i.e;availability,performance, and quality)-and used to measure actual improvements on 5S, WCM,Lean Manufacturing, TPM, Kaizen and Six Sigma. When using OEE with these management systems the benefits become tangible and noteworthy.

- After all factors are taken into account, the OEE result is converted (transmuted) in percentage. The results (in %), therefore can be regarded as a preview of the existing production efficiency of a particular line, cell or machine.
- Manufactured goods are a result of a complex production process – and without the proper measuring tools and formula, expect your business to run blindly even in the light of day. Having the right metrics, OEE provides a window to analyze out-of-the-ordinary issues and gives an established framework for improving the whole manufacturing process.
- There are dozens of formulas, systems and metrics being used to improve the whole manufacturing process, but only OEE correctly reduces complex production problems into simple, easy –to-follow steps in handling data and information. The OEE tool helps you to methodically improve the process using basic measurements.
- The good thing about using OEE is that this particular measuring tool can be manipulated.
- OEE is a very simple metric that immediately indicates the current status of a

allowing to understand the effect of the various issues in the manufacturing process and how they affect the entire process.

- The biggest advantage of Iain is that it allows companies to have separate business functions by applying/using a single, easy- to- understand formula.
- OEE is by far the most effective benchmarking tool in making sound management decisions.

FORMULAS:

OEE = Actual Output / Theoretical maximum output

OEE = Availability Ratio*Performance Ratio* Quality Ratio/10000

Availability Ratio- The share of the actual production time and the planned production time. All planned stops and breakdowns will reduce the availability ratio. Including set-up times, preventive maintenance, breakdowns and lack of opearators. The only time that you may choose to deduct from the availability ratio is lack of orders.

$$\textbf{Availability} = \frac{\text{Available time} - \text{Total Downtime}}{\text{Available Time}} * 100$$

Performance Ratio- Loss of production due to under-utilization of the machinery. In other words, losses are incurred when the equipment is not run with full speed. Short, unregistered, stops may affect the performance ratio as well.

$$\textbf{Performance} = \frac{\text{Cycle Time* Component Produced}}{\text{Availability time- Total Downtime}} * 100$$

Quality Ratio-----The amount of the production that has to be discharged or scrapped.

$$\textbf{Quality} = \frac{\text{Quantity Produced} - \text{Quantity Rejected}}{\text{Quantity Produced}} * 100$$

WHY WHY ANALYSIS:

While the statistical process control(SPC) tools are excellent problem solving tools, there are many situations where they are not appropriate. This why why analysis tool do not use hard data but rely on subjective information. Application of this tool will be useful in process improvement, cost reduction, policy deployment and new –product development. Although this tool is very simple, it is effective. It can be a key to finding the root cause of a problem by focusing on the process rather than on people. The procedure is to describe the problem in specific terms and then ask why. We may have to ask why three or more times to obtain the root cause.

An example will help illustrate the concept.

Why do we miss the delivery date ?

It wasn't scheduled in time.

Why?

There were a lot of engineering changes.

Why?

Customer requested them.

The team suggested changing the delivery date whenever engineering changes occurred.

This tool is very beneficial in developing critical thinking. It is frequently a quick method of solving a problems.

ANALYSIS AND INTERPRETATION

CHAPTER 5

ANALYSIS AND INTERPRETATION

5.1 ANALYSIS OF LOSSES:

An obligation to improve the effectiveness of machines is mainly to overcome the losses. In order to find out the overall equipment effectiveness of the machining line, the kinds of losses which occur during running of the GM Knuckle machining line, the kinds of losses which occur during running of the machines should be known. Here, the losses indicate the idle time of the machines due to some reasons.

There occur sixteen types of losses which are listed as below.

- Machine Brake Down
- Setting Change
- Tool change
- Want of Manpower
- Want of load
- Want of power
- Want of cutting oil
- Want of Jig and Fixtures
- Want of Coolant
- Want of hydraulic & lub oil
- Preventive maintenance
- Want of schedule
- Want of packing material
- Process correction
- Development
- Casting Correction

The machine stoppages can be controlled only when the above mentioned losses are minimized. These losses are added in order to find out the machine's idle time. The stoppaged also affect the machines efficiency rather than the productivity and rejections in produced quantity.

Table 5.1

GM I Line IDLE TIME In Jan 2012

Description	Total Idle Time	M/C Brake Down	Setting Change	Tool Change	Want Of Man Power	Want Of Load
Down Time in Min	3885	762	0	582	387	1863
Down Time %	13.01	2.0	0	1.9	1.0	5.0

Description	Want of Power	Want of Cutting Tool	Want of Jig Fixtures	Want Of Coolant	Want Of Hydrolic & Lub Oil	Preventive Maint
Down Time in Min	105	0	0	0	0	93
Down Time %	0.21	0	0	0	0	0.2

Description	Want Of Schedule	Want of Packing Material	Process Correction	Development	Casting Correction	Correction
Down Time in Min	0	0	93	0	0	0
Down Time %	0	0	0.2	0	0	0

SOURCE:

Secondary Data (Company's Production Report)

Inference:

The above table represents the losses occurred during the month of January for the GM Knuckle I Machining Line.

The total idle time for the losses is 3885 minutes and the major stoppage is due to want of load.

CHART 5.1

GM I LINE IDLE TIME IN JAN-12

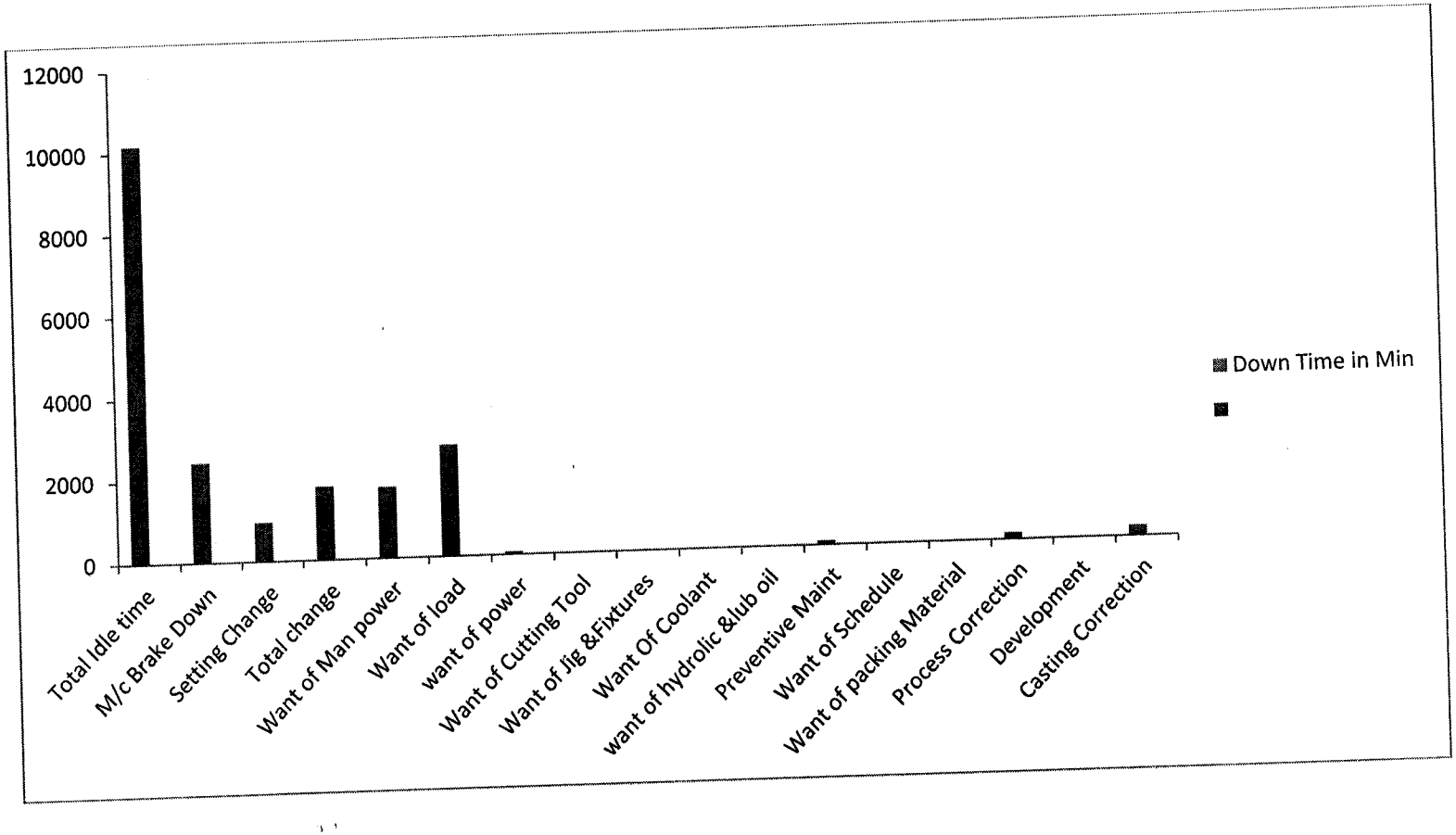


TABLE 5.2 GM II KNUCKLE Line IDLE TIME In Jan 2012

Description	Total Idle Time	M/C Brake Down	Setting Change	Tool Change	Want Of Man Power	Want Of Load
Down Time in Min	3630	831	0	765	360	1386
Down Time %	12.04	2.76	2.54	1.19	4.6	0.19

Description	Want of Power	Want of Cutting Tool	Want of Jig & Fixtures	Want Of Coolant	Want Of Hydrolic & Lub Oil	Preventive Maint
Down Time in Min	57	0	0	0	0	120
Down Time %	0.19	0	0	0	0	0.4

Description	Want Of Schedule	Want of Packing Material	Process Correction	Development	Casting Correction	Correction
Down Time in Min	0	0	111	0	0	0
Down Time %	0	0	0.37	0	0	0

SOURCE:

Secondary Data (Company's Production Report)

Inference:

The above table represents the losses occurred during the month of January for the GM Knuckle I Machining Line.

The total idle time for the losses is 3630 minutes and the major stoppage is due to want of load.

Chart- 5.2

GM II LINE IDLE TINE IN JAN_12

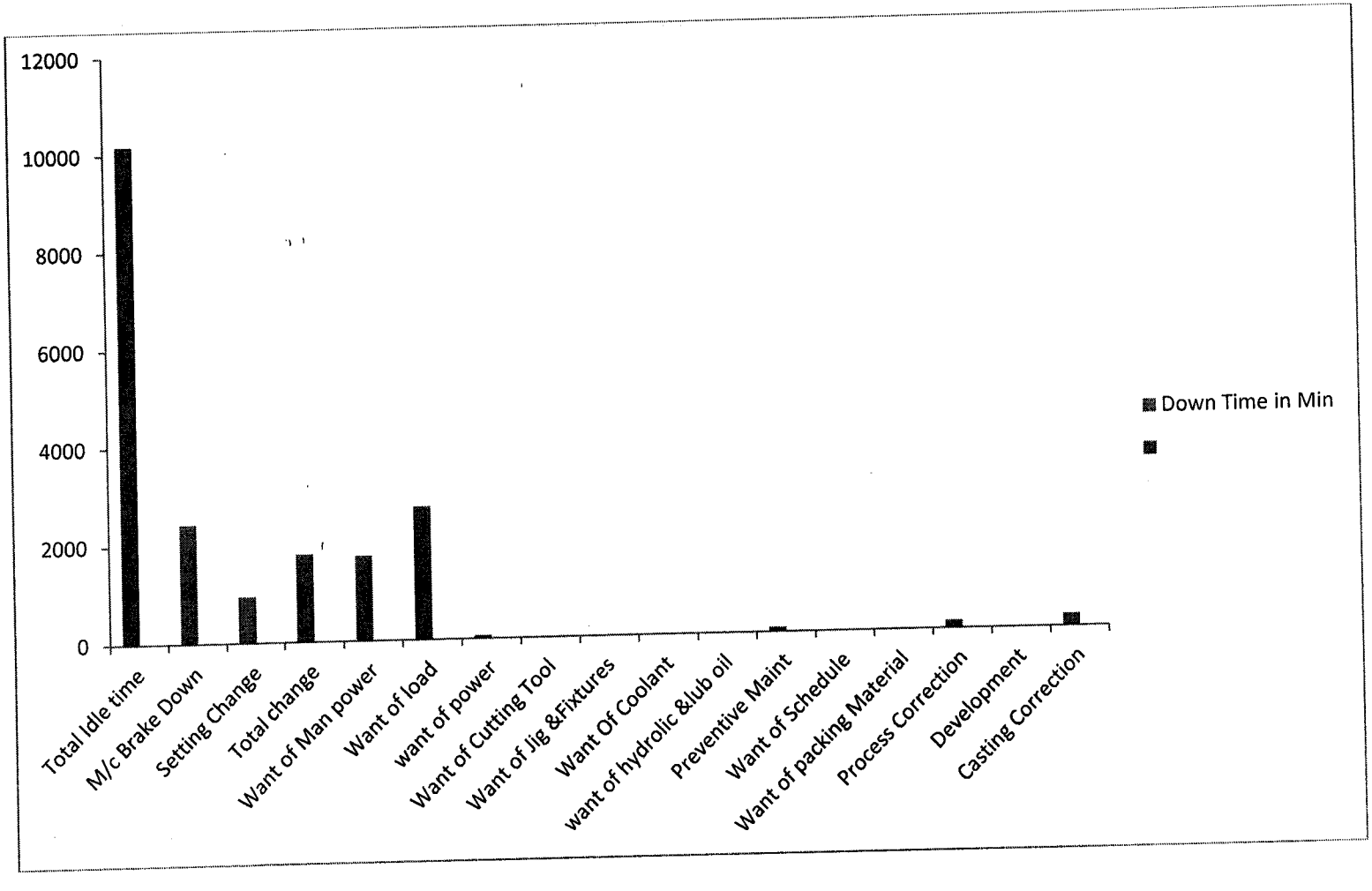


TABLE 5.3

Description	Total Idle Time	M/C Brake Down	Setting Change	Tool Change	Want Of Man Power	Want Of Load
Down Time in Min	4221	942	0	930	552	1324
Down Time %	14	3.12	0	3.08	1.83	4.56

Description	Want Of Power	Want of Cutting Tool	Want of Jig & Fixtures	Want Of Coolant	Want Of Hydrolic & Lub	Preventive Maint
Down Time in Min	75	0	0	105	0	180
Down Time %	0.25	0	0	0.35	0	0.6

Description	Want Of Schedule	Want of Packing Material	Process Correction	Development	Casting Correction	Correction
Down Time in Min	0	0	63	0	0	0
Down Time %	0	0	0.21	0	0	0

SOURCE:

Secondary Data (Company's Production Report)

Inference:

The above table represents the losses occurred during the month of January for the GM Knuckle I Machining Line.

The total idle time for the losses is 4221 minutes and the major stoppage is due to want of load.

Chart- 5.3

GM III LINE IDLE TINE IN Jan12

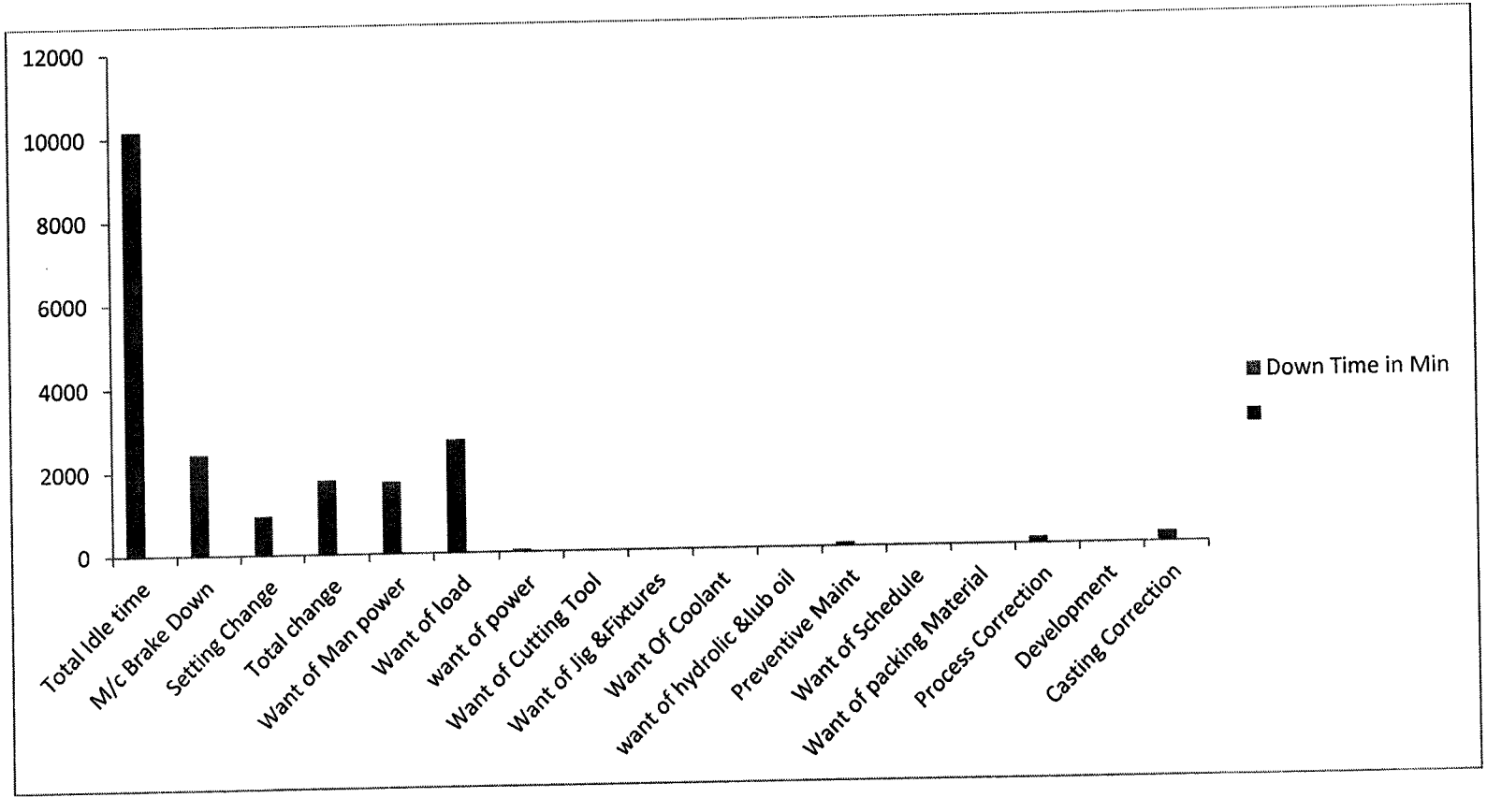


TABLE 5.4

GM IV Knuckle Line IDLE TIME In Jan 2012

Description	Total Idle Time	M/C Brake Down	Setting Change	Tool Change	Want Of Man Power	Want Of Load
Down Time in Min	7173	1626	60	1497	1137	1722
Down Time %	23.79	5.37	0.2	4.96	3.77	5.71

Description	Want of Power	Want of Cutting Tool	Want of Jig & Fixtures	Want Of Coolant	Want Of Hydrolic & Lub Oil	Preventive Maint
Down Time in Min	213	0	0	0	0	555
Down Time %	0.71	0	0	0	0	1.84

Description	Want Of Schedule	Want o f Packing Material	Process Correction	Development	Casting Correction	Correction
Down Time in Min	0	0	363	0	0	0
Down Time %	0	0	1.2	0	0	0

SOURCE:

Secondary Data (Company's Production Report)

Inference:

The above table represents the losses occurred during the month of January for the GM Knuckle IVMachining Line.

The total idle time for the losses is 7173 minutes and the major stoppage is due to want of load.

Chart- 5.4

GM IVLINE IDLE TINE IN JAN-12

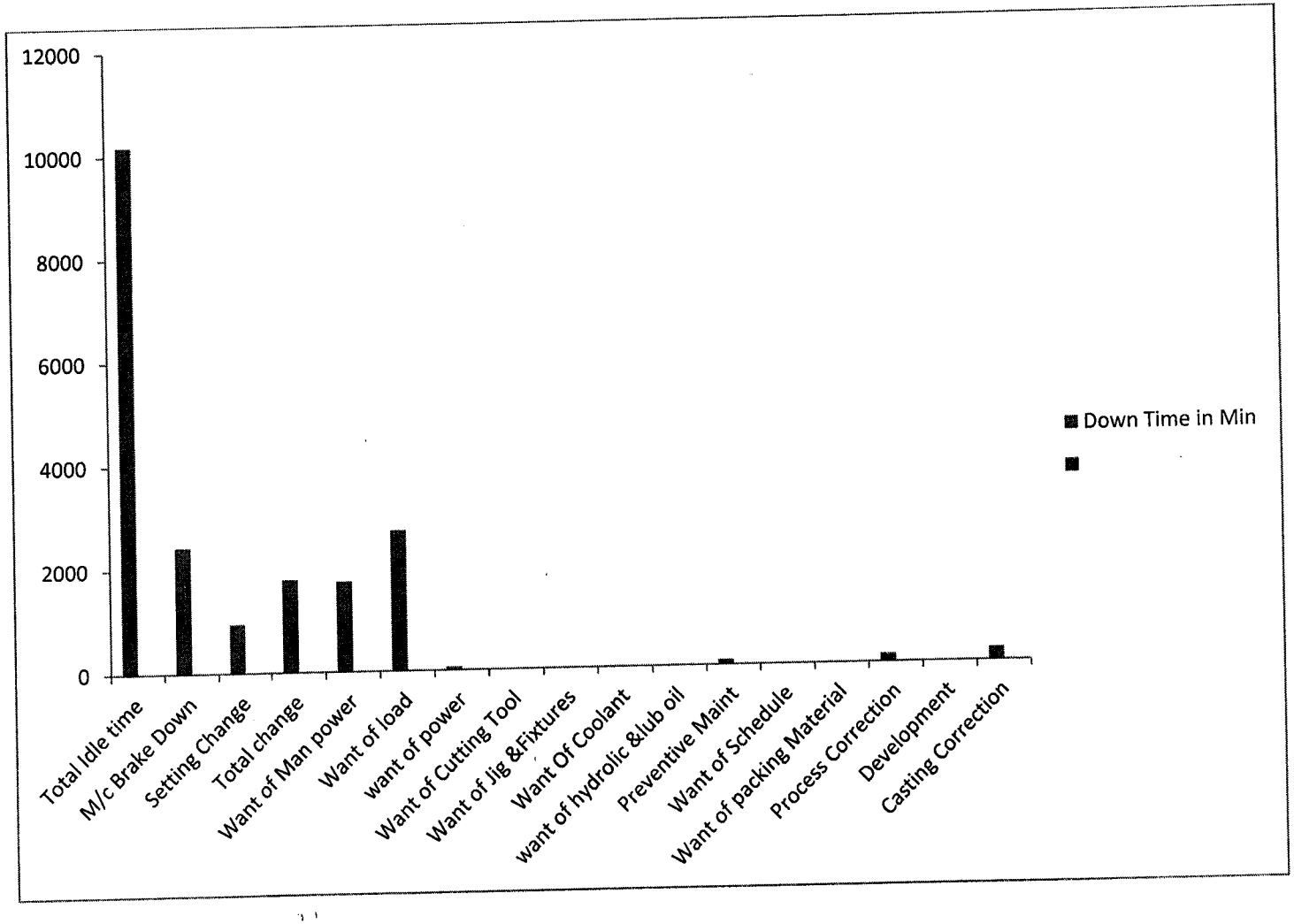


TABLE-5.5

GM I Line IDLE TIME In Feb 2012

Description	Total Idle Time	M/C Brake Dow	Setting Change	Tool Change	Want Of Man Power	Want Of Load
Down Time in M	4047	1521	60	381	135	1914
Down Time %	12.86	4.83	0.19	1.21	0.43	6.08

Description	Want of Power	Want of Cutting Tool	Want of Jig & Fixtures	Want Of Coolan	Want Of Hydro & Lub Oil	Preventive Main
Down Time in M	213	0	0	0	0	555
Down Time %	0.71	0	0	0	0	1.84

Description	Want Of Schedu	Want of Packin Material	Process Correcti	Development	Casting Correcti	Correction
Down Time in M	0	0	363	0	0	0
Down Time %	0	0	1.2	0	0	0

SOURCE:

Secondary Data (Company's Production Report)

Inference:

The above table represents the losses occurred during the month of February for the GM Knuckle I Machining Line.

The total idle time for the losses is 4047minutes and the major stoppage is due to want of load.

Chart- 5.5

GM I LINE IDLE TINE IN Feb-12

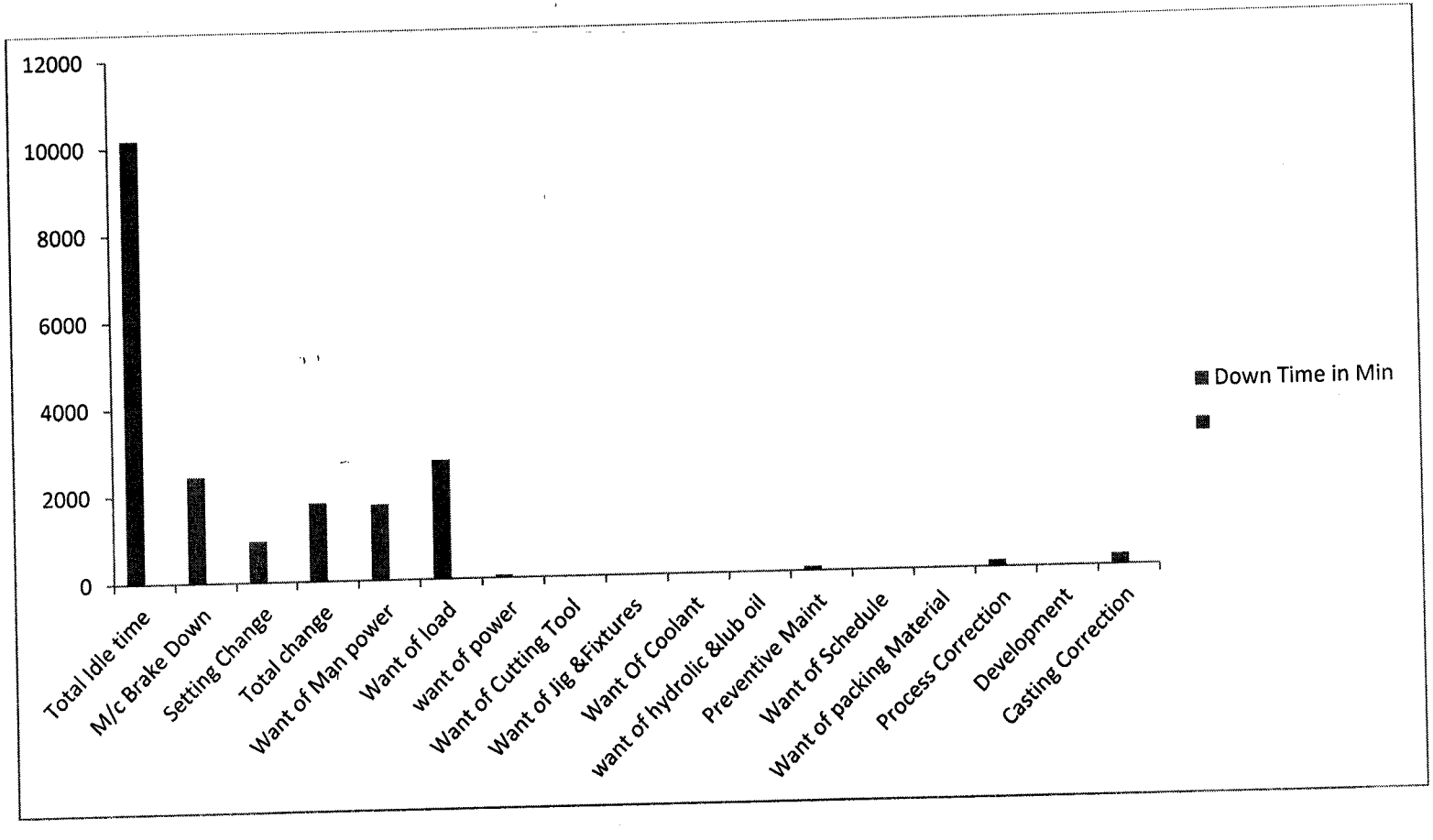


TABLE – 5.6

GM I I Knuckle Line IDLE TIME In Feb 2012

Description	Total Idle Time	M/C Brake Dow	Setting Change	Tool Change	Want Of Man Power	Want Of load
Down Time in M	3723	1422	0	294	147	1776
Down Time %	11.83	4.52	0	0.93	0.47	5.64

Description	Want of power	Want of Cutting Tool	Want of Jig & Fixtures	Want Of Coolan	Want Of Hydrol & Lub Oil	Preventive Maint
Down Time in M	51	0	0	0	0	0
Down Time %	0.16	0	0	0	0	0

Description	Want Of Schedu	Want of Packin Material	Process Correcti	Development	Casting Correcti	Correction
Down Time in M	0	0	33	0	0	0
Down Time %	0	0	0.1	0	0	0

SOURCE:

Secondary Data (Company's Production Report)

Inference:

The above table represents the losses occurred during the month of February for the GM Knuckle II Machining Line.

The total idle time for the losses is 3723 minutes and the major stoppage is due to want of load.

Chart- 5.6

GM II LINE IDLE TIME IN Feb-12

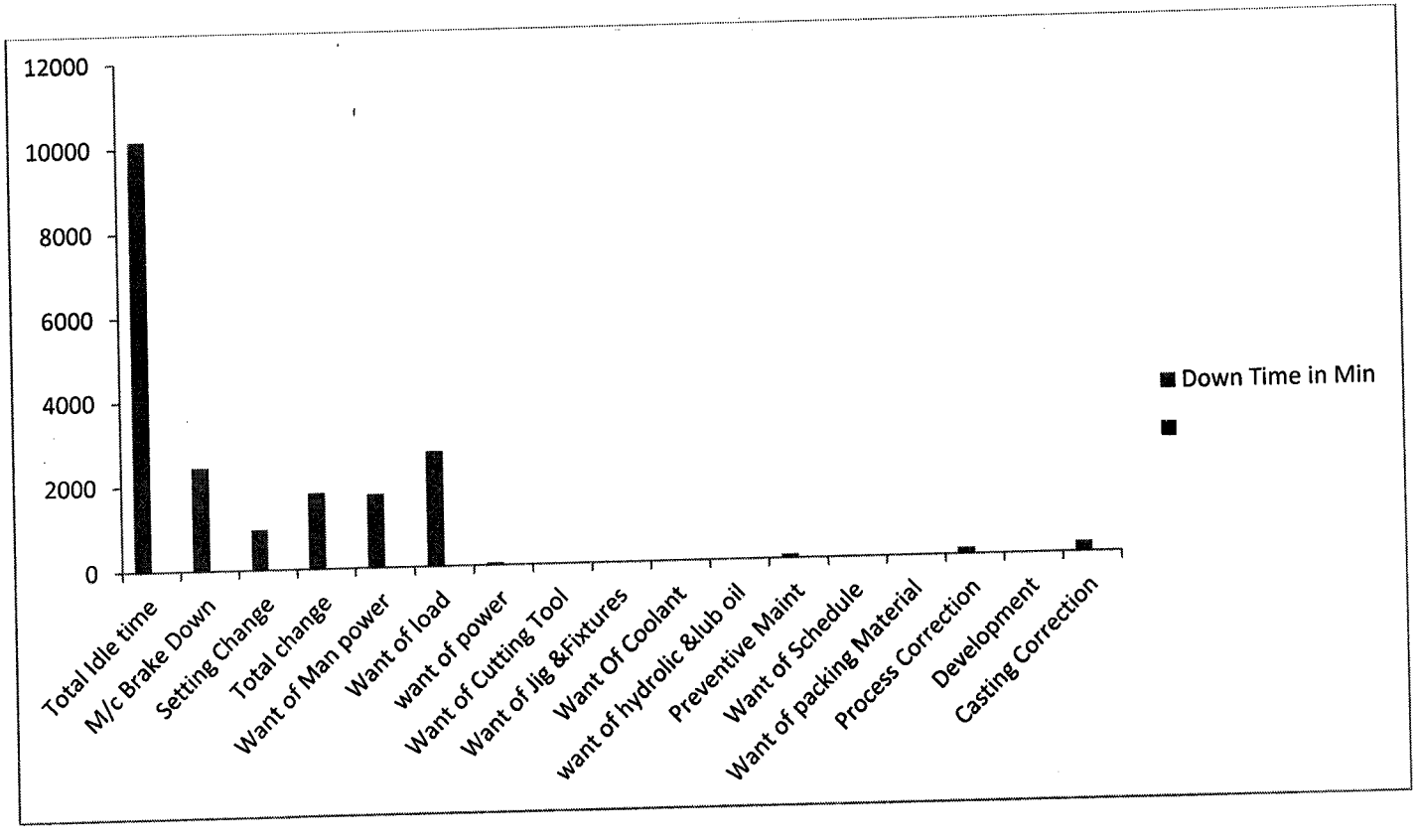


TABLE- 5.7

GM III Line IDLE TIME In February 2012

Description	Total Idle Time	M/C Brake Dow	Setting Change	Tool Change	Want Of Man Power	Want Of Load
Down Time in M	4929	1599	0	441	273	2454
Down Time %	15.67	5.08	0	1.4	0.87	7.8

Description	Want Of Power	Want of Cutting Tool	Want of Jig & Fixtures	Want Of Coolar	Want Of Hydrol & Lub Oil	Preventive Maiin
Down Time in M	9	0	0	0	0	126
Down Time %	0.03	0	0	0	0	0.4

Description	Want Of Schedu	Want of Packin Material	Process Correcti	Development	Casting Correcti	Correction
Down Time in M	0	0	0	0	27	0
Down Time %	0	0	0	0	0.09	0

SOURCE:

Secondary Data (Company's Production Report)

Inference:

The above table represents the losses occurred during the month of February for the GM Knuckle III Machining Line.

The total idle time for the losses is 4929 minutes and the major stoppage is due to want of load.

Chart- 5.7

GM III LINE IDLE TIME IN Feb-12

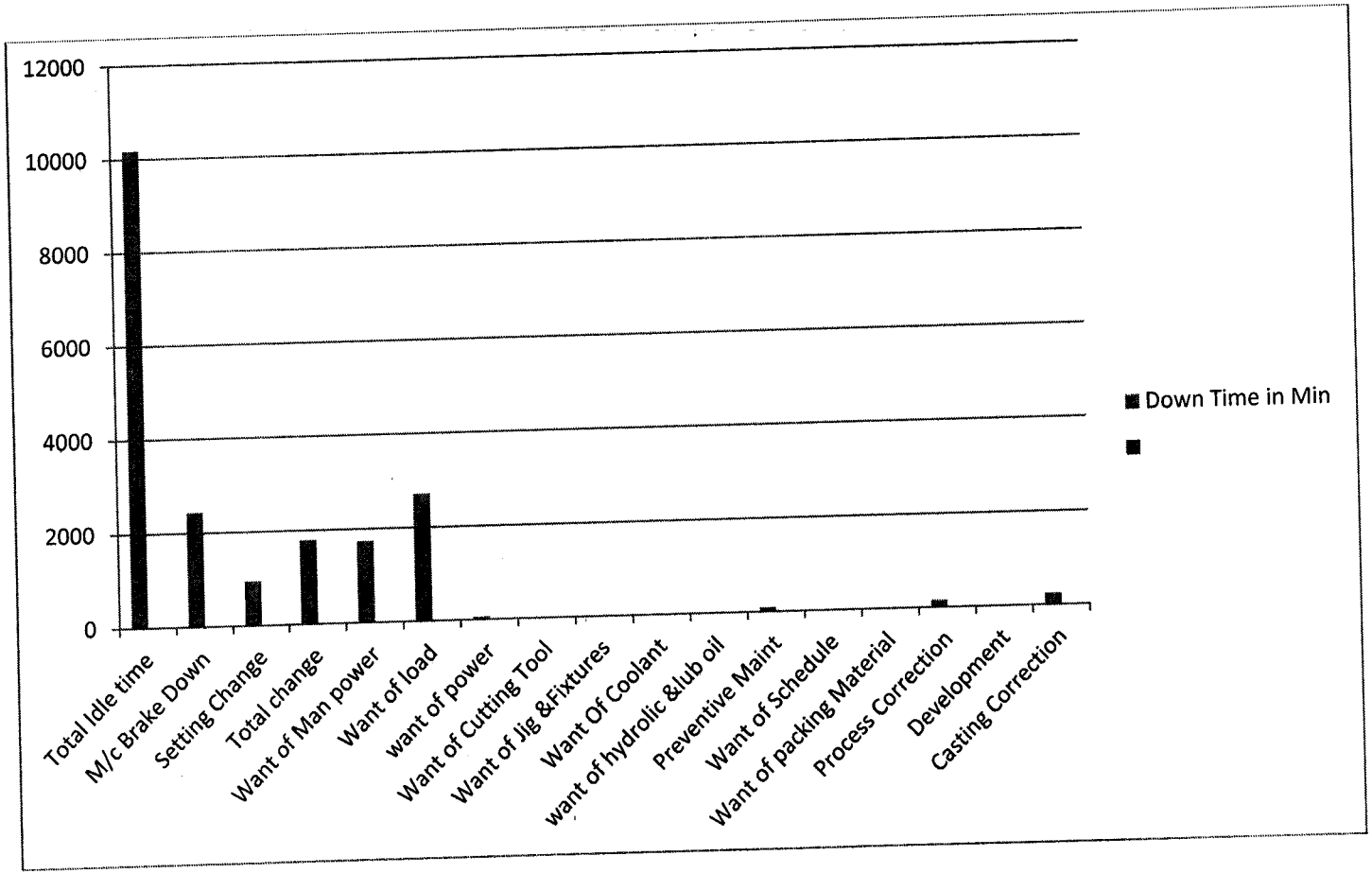


TABLE-5.8 GM IV KNUCKLE Line IDLE TIME in February 2012

Description	Total Idle Time	M/C Brake Dow	Setting Change	Tool Change	Want Of Man Power	Want Of Load
Down Time in M	11178	1962	975	2031	372	5676
Down Time %	35.53	6.24	3.1	6.45	1.18	18.04

Description	Want Of Power	Want of Cutting Tool	Want of Jig & Fixtures	Want Of Coolan	Want Of Hydrol & Lub Oil	Preventive Main
Down Time in M	24	0	0	0	0	99
Down Time %	0.08	0	0	0	0	0.31

Description	Want Of Schedu	Want of Packin Material	Process Correcti	Development	Casting Correcti	Correction
Down Time in M	0	0	39	0	0	0
Down Time %	0	0	0.12	0	0	0

SOURCE:

Secondary Data (Company's Production Report)

Inference:

The above table represents the losses occurred during the month of January for the GM Knuckle I Machining Line.

The total idle time for the losses is 11178 minutes and the major stoppage is due to want of load.

Chart- 5.8

GM IV LINE IDLE TIME IN Feb-12

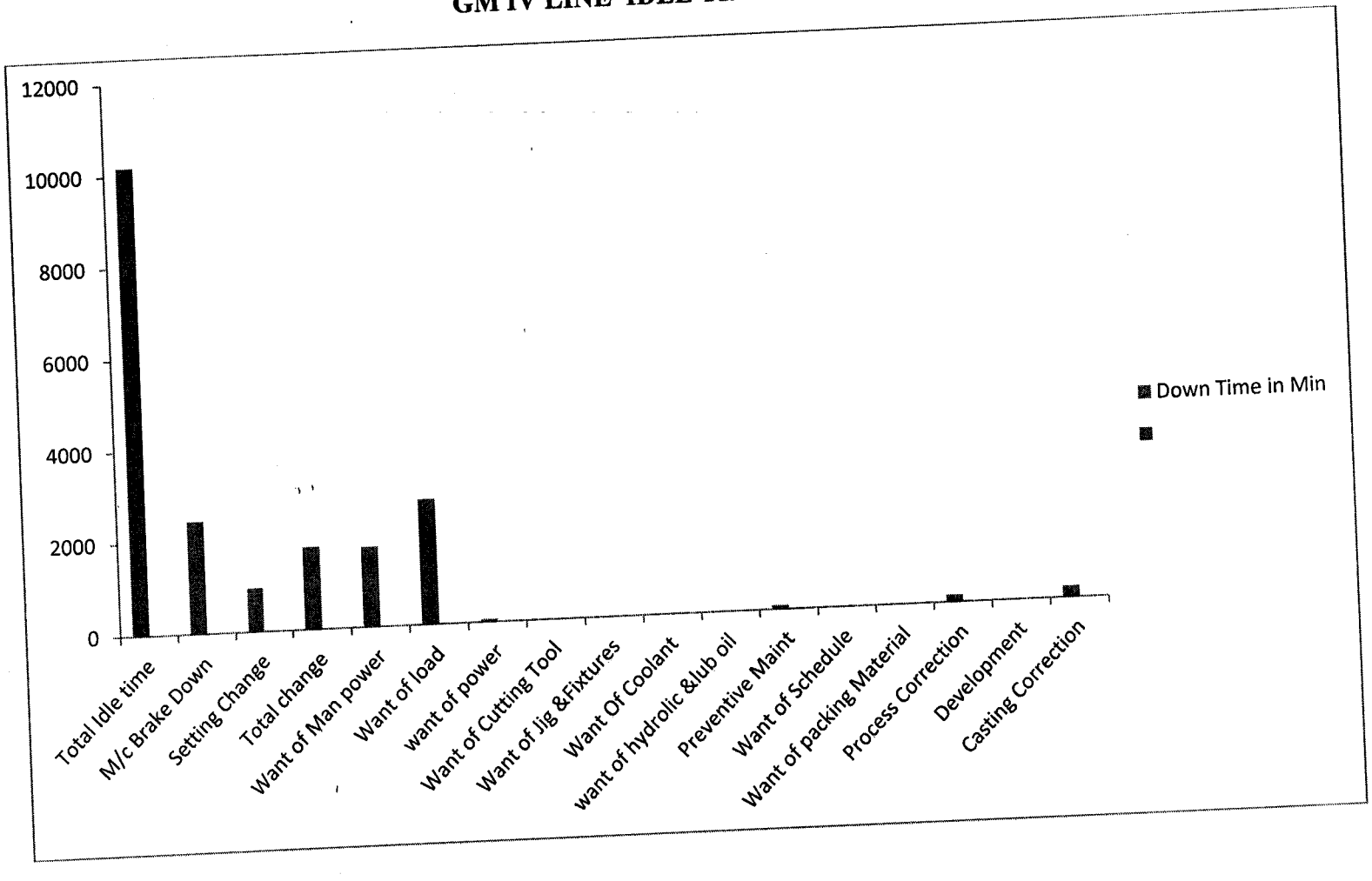


TABLE- 5.9

GM I KNUCKLE Line IDLE TIME In March 2012

Description	Total Idle Time	M/C Brake Dow	Setting Change	Tool Change	Want Of Man Power	Want Of Load
Down Time in M	6469	1640	165	903	708	2844
Down Time %	18.33	4.63	0.47	2.55	2	8.03

Description	Want Of Power	Want of Cutting Tool	Want of Jig & Fixtures	Want Of Coolan	Want Of Hydrol & Lub Oil	Preventive Main
Down Time in Min	60	0	170	0	0	0
Down Time %	0.17	0	1.48	0	0	0

Description	Want Of Schedu	Want of Packin Material	Process Correcti	Development	Casting Correcti	Correction
Down Time in M	0	0	0	0	0	0
Down Time %	0	0	0	0	0	0

SOURCE:

Secondary Data (Company's Production Report)

Inference:

The above table represents the losses occurred during the month of January for the GM Knuckle I Machining Line.

The total idle time for the losses is 6469 minutes and the major stoppage is due to want of load.

Chart- 5.9

GM I LINE IDLE TIME IN March-12

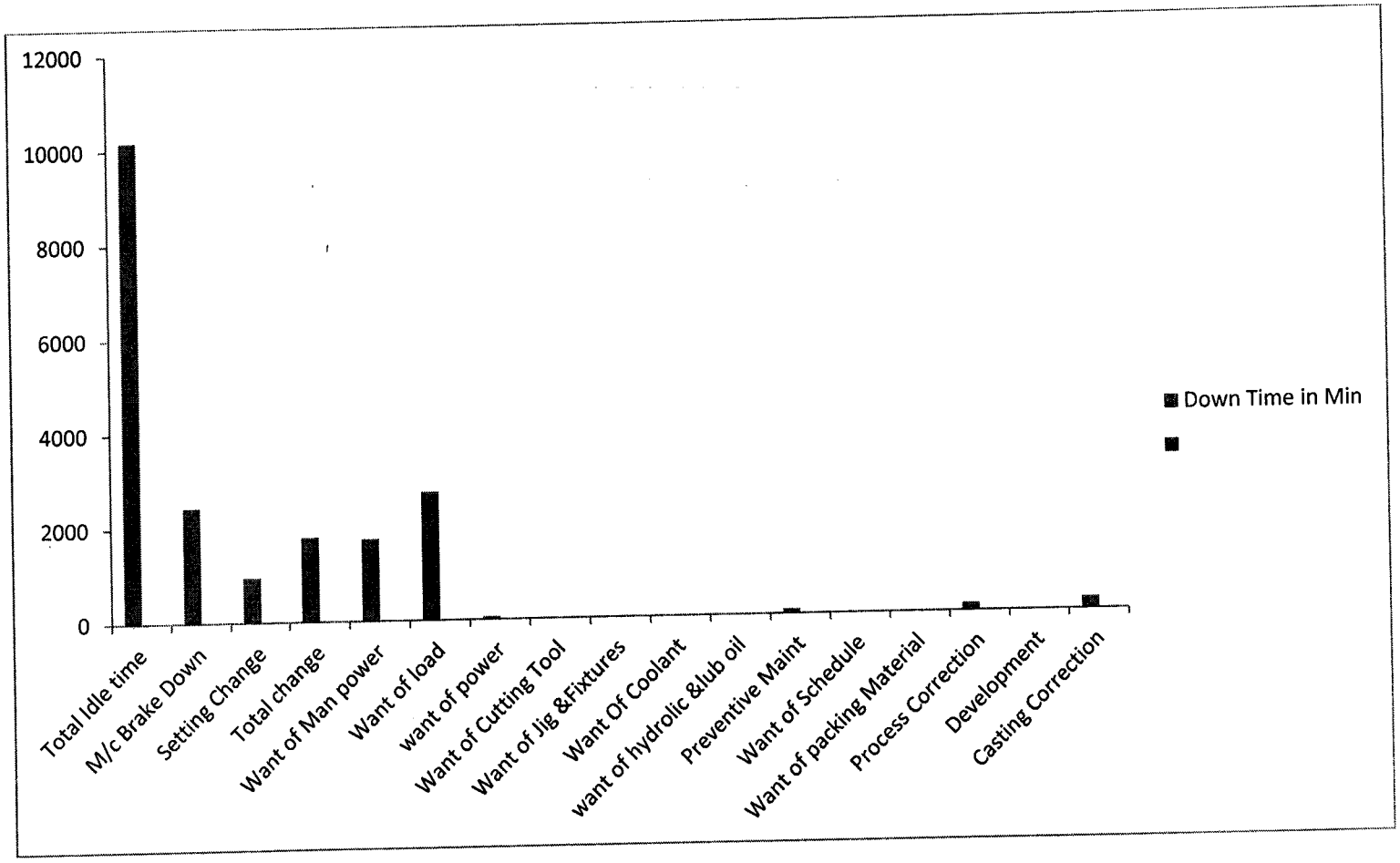


TABLE -5.10

GM II KNUCKLE Line IDLE TIME In March 2012

Description	Total Idle Time	M/C Brake Dow	Setting Change	Tool Change	Want Of Man Power	Want Of Load
Down Time in M	5034	1152	0	1512	264	2073
Down Time %	14.22	3.25	0	4.27	0.75	5.86

Description	Want Of Power	Want of Cutting Tool	Want of Jig & Fixtures	Want Of Coolan	Want Of Hydroli & Lub Oil	Preventive Main
Down Time in M	33	0	0	0	0	0
Down Time %	0.09	0	0	0	0	0

Description	Want Of Schedu	Want of Packin Material	Process Correcti	Development	Casting Correcti	Correction
Down Time in M	0	0	0	0	0	0
Down Time %	0	0	0	0	0	0

SOURCE:

Secondary Data (Company's Production Report)

Inference:

The above table represents the losses occurred during the month of January for the GM Knuckle I Machining Line.

The total idle time for the losses is 5034 minutes and the major stoppage is due to want of load.

Chart- 5.10

GM II LINE IDLE TIME IN March-12

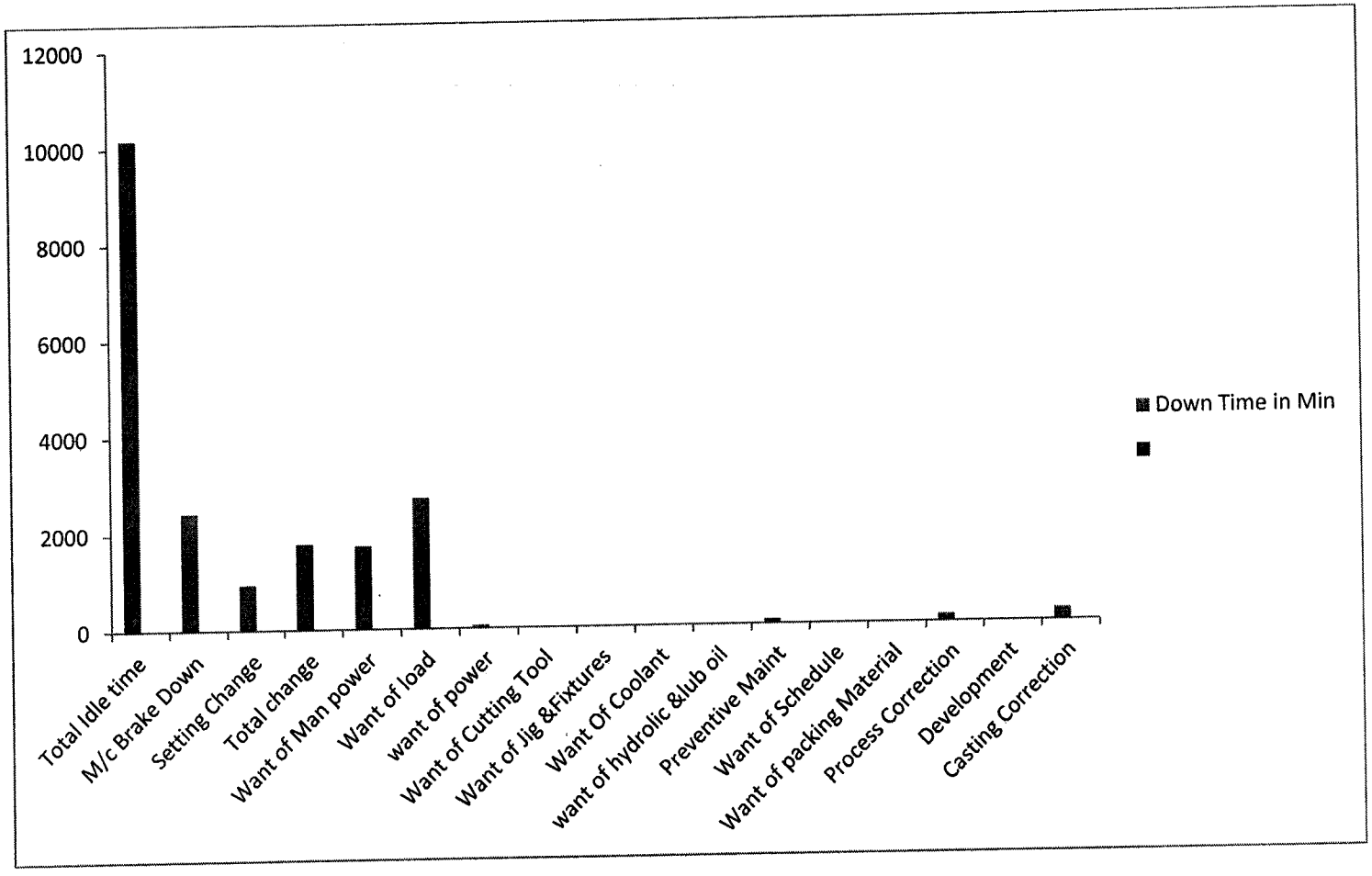


TABLE-5.11

GM III KNUCKLE Line IDLE TIME In March 2012

Description	Total Idle Time	M/C Brake Dow	Setting Change	Tool Change	Want Of Man Power	Want Of Load
Down Time in M	6504	1812	0	1668	681	2199
Down Time %	18.37	5.12	0	4.71	1.92	6.21

Description	Want Of Power	Want of Cutting Tool	Want of Jig & Fixtures	Want Of Coolar	Want Of Hydrol & Lub Oil	Preventive Main
Down Time in M	60	0	0	0	0	84
Down Time %	0.17	0	0	0	0	0.24

Description	Want Of Schedu	Want of Packin Material	Process Correcti	Development	Casting Correcti	Correction
Down Time in M	0	0	0	0	0	0
Down Time %	0	0	0	0	0	0

SOURCE:

Secondary Data (Company's Production Report)

Inference:

The above table represents the losses occurred during the month of January for the GM Knuckle I Machining Line.

The total idle time for the losses is 6504 minutes and the major stoppage is due to want of load.

Chart- 5.11

GM III LINE IDLE TIME IN March-12

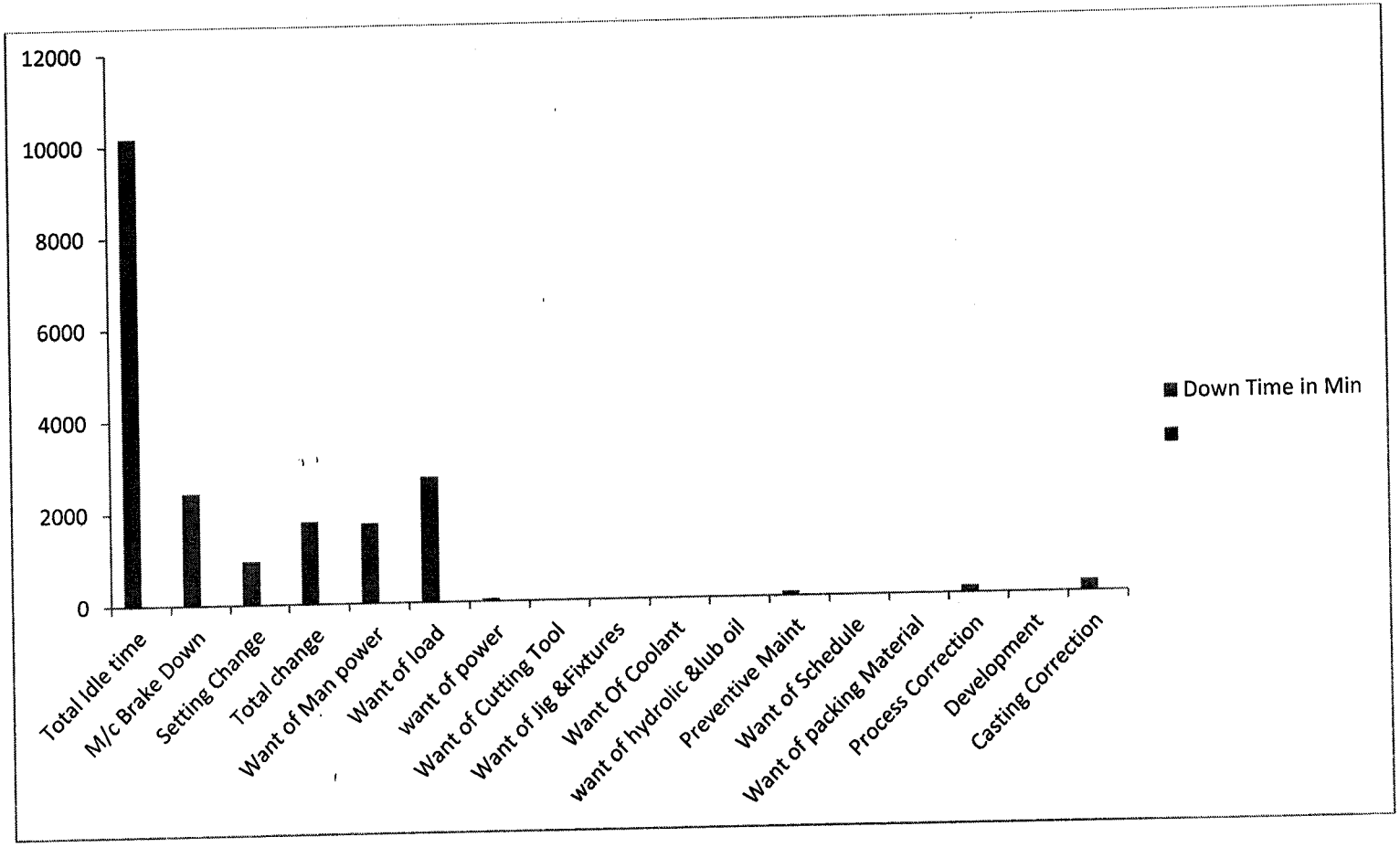


TABLE-5.12

GM IV KNUCKLE Line IDLE TIME In March 2012

Description	Total Idle Time	M/C Brake Dow	Setting Change	Tool Change	Want Of Man Power	Want Of Load
Down Time in M	10174	2433	950	1789	1737	2717
Down Time %	28.77	6.88	2.69	5.06	4.91	7.68

Description	Want Of Power	Want of Cutting Tool	Want of Jig & Fixtures	Want Of Coolant	Want Of Hydro & Lub Oil	Preventive Maint
Down Time in M	61	0	0	0	0	89
Down Time %	0.17	0	0	0	0	0.25

Description	Want Of Schedu	Want of Packin Material	Process Correcti	Development	Casting Correcti	Correction
Down Time in M	0	0	153	0	245	0
Down Time %	0	0	0.43	0	0.69	0

SOURCE:

Secondary Data (Company's Production Report)

Inference:

The above table represents the losses occurred during the month of January for the GM Knuckle IVMachining Line.

The total idle time for the losses is 10174 minutes and the major stoppage is due to want of load

Chart- 5.13

GM IV LINE IDLE TIME IN March-12

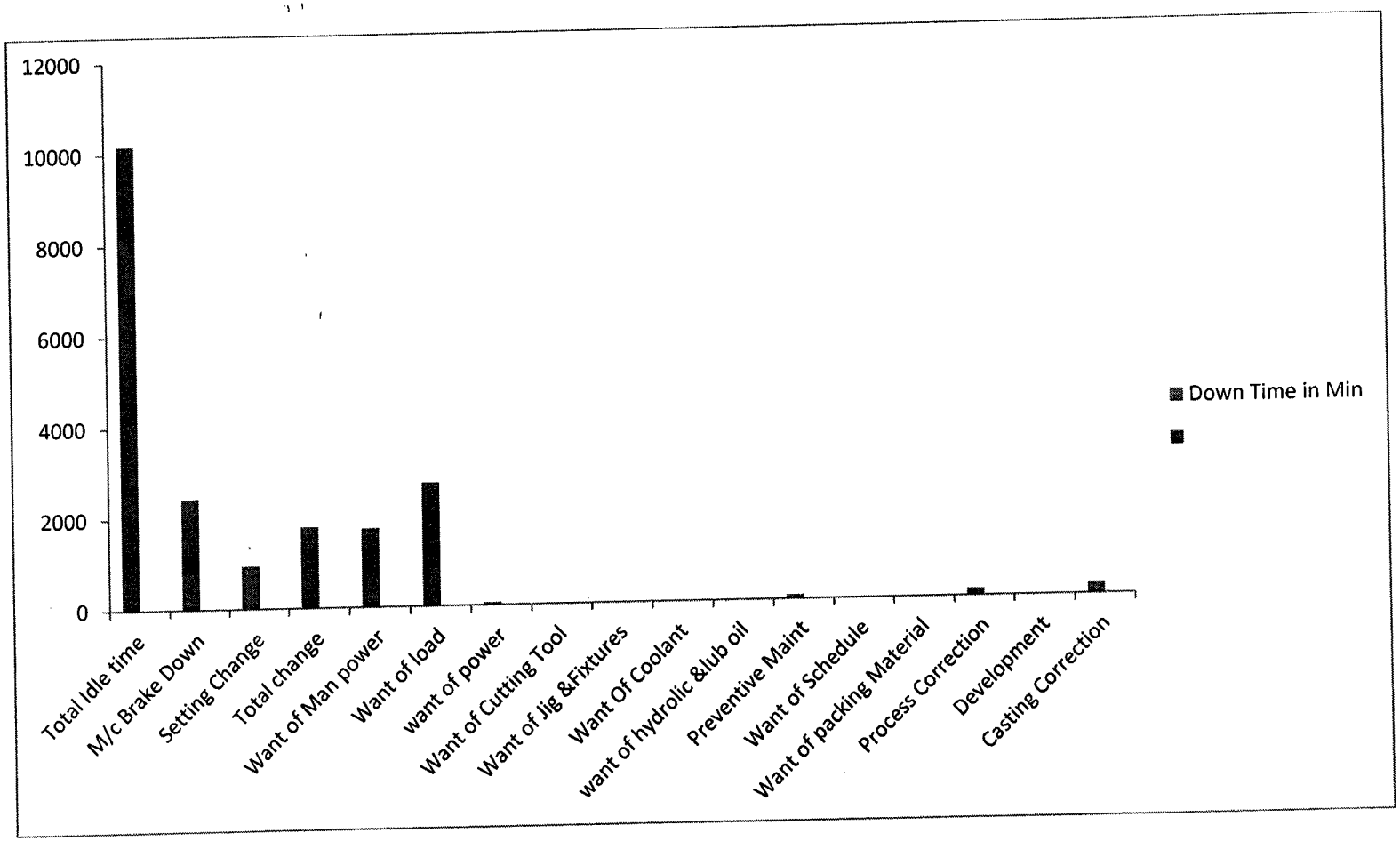


TABLE-5.13

GM KNUCKLE MACHINING LINE REJECTIONS IN January 2012

S.I No	GM LINE	QUANTITY PRODUCED			QUANTITY REJECTED		
		LH	RH	TOTAL	LH	RH	TOTAL
1	I	11662	11662	23324	83	83	166
2	II	11729	11759	23488	89	89	178
3	III	11434	11081	22515	81	80	161
4	IV	9731	9731	19462	78	78	156
TOTAL		44556	44233	88789	331	330	661

Source : Secondary data (company production report)

INFERENCE:

This table implies the total produced quantity and also be rejected quantity in the month of JANUARY for the GM knuckle Machining line.

Chart 5.13

GM KNUCLKLE MACHINING LINE PRODUCED IN JAN-12

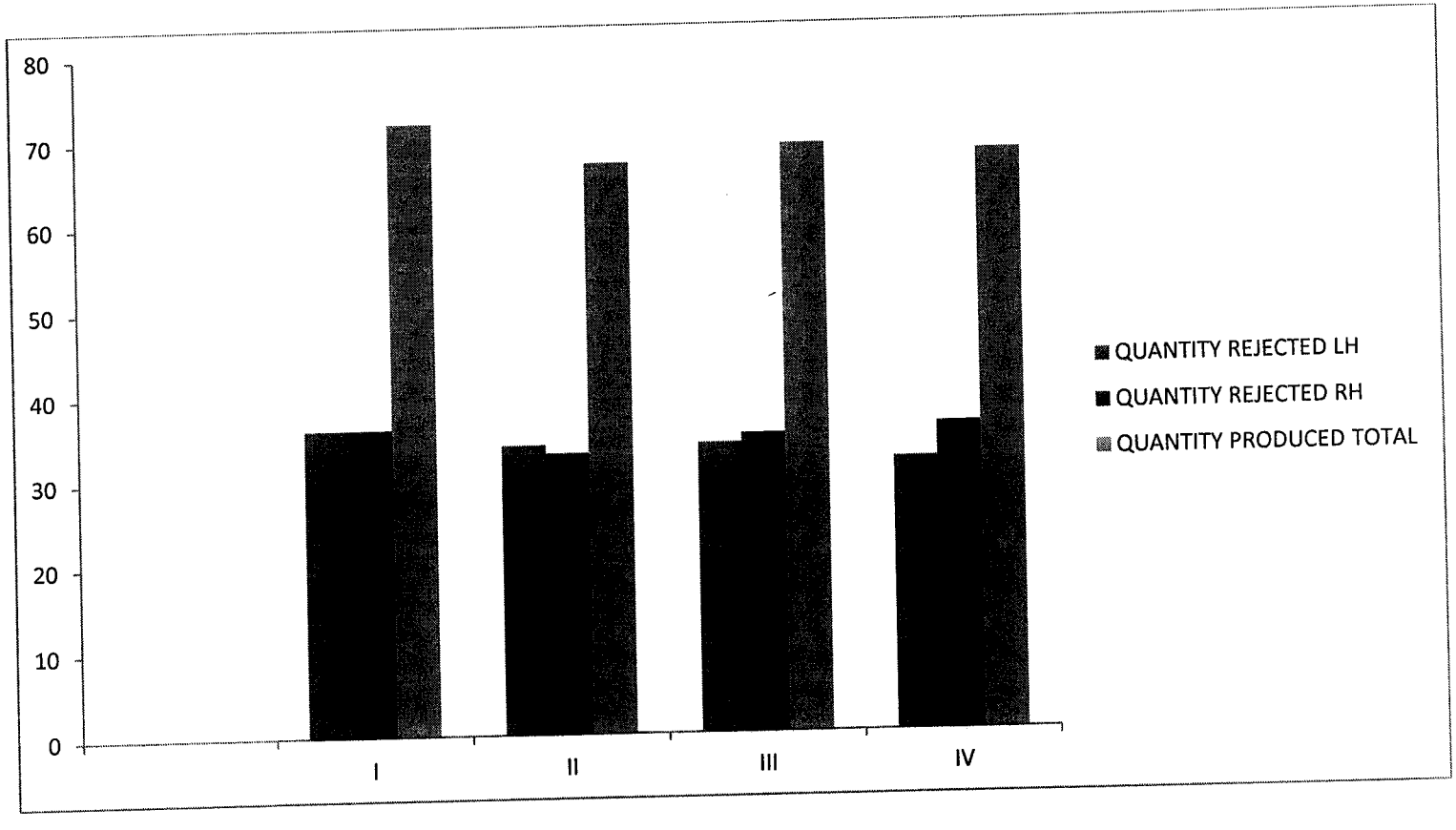


Chart 5.14

GM KNUCLKLE MACHINING LINE REJECTIONS IN JAN-12

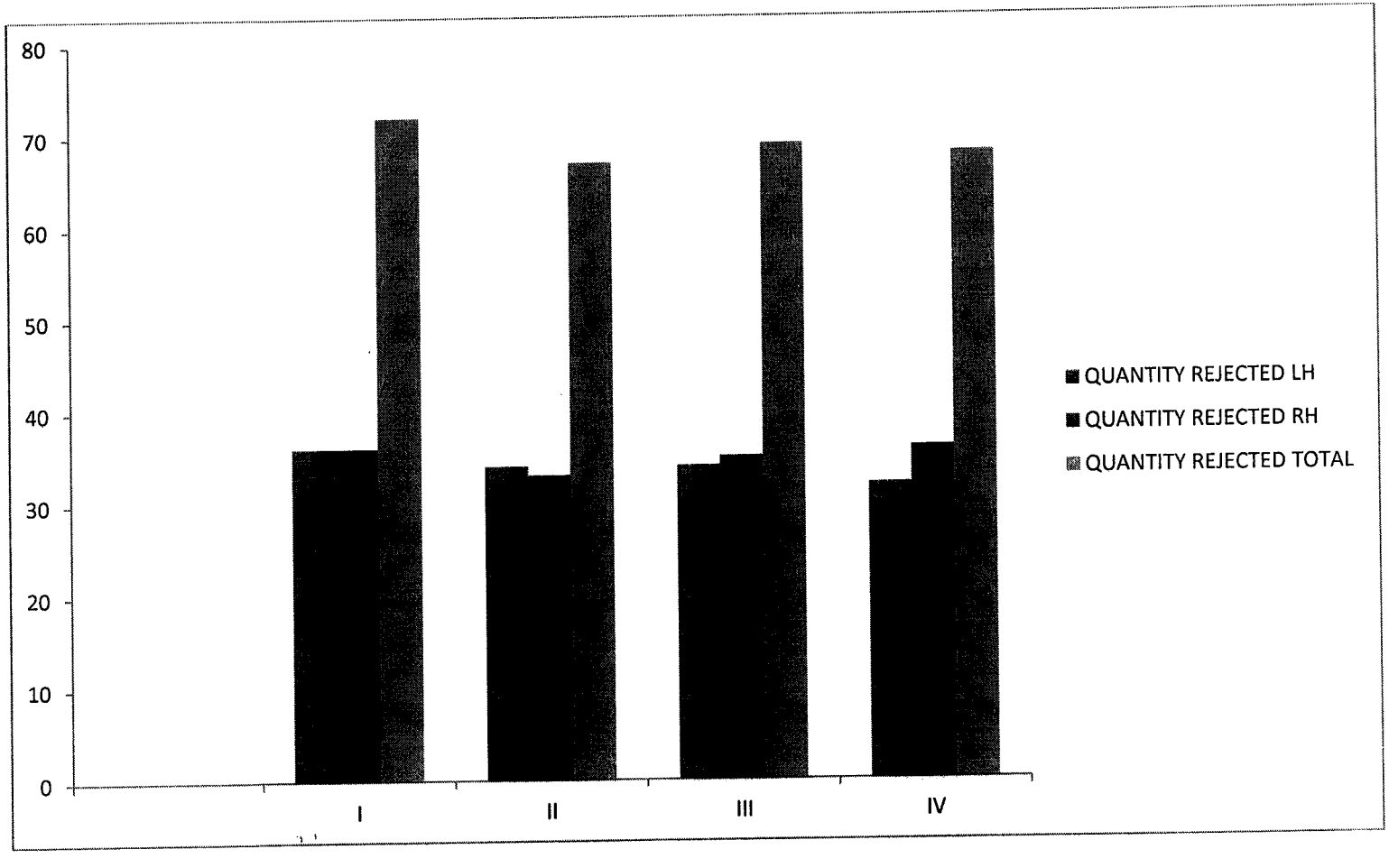


TABLE- 5.14

GM KNUCKLE MACHINING LINE REJECTIONS IN FEBRUARY 2012

S.I No	GM LINE	QUANTITY PRODUCED			QUANTITY REJECTED		
		LH	RH	TOTAL	LH	RH	TOTAL
1	I	10806	10806	21612	51	51	102
2	II	10650	10718	21368	41	42	83
3	III	10532	10450	20992	49	49	98
4	IV	9000	9260	18260	41	42	83
TOTAL		40998	41234	82232	182	184	366

Source :

Secondary data (company production report)

INFERENCE:

This table implies the total produced quantity and also be rejected quantity in the month of February for the GM knuckle machining l

Chart 5.15

GM KNUCLKLE MACHINING LINE PRODUCED IN FEB-12

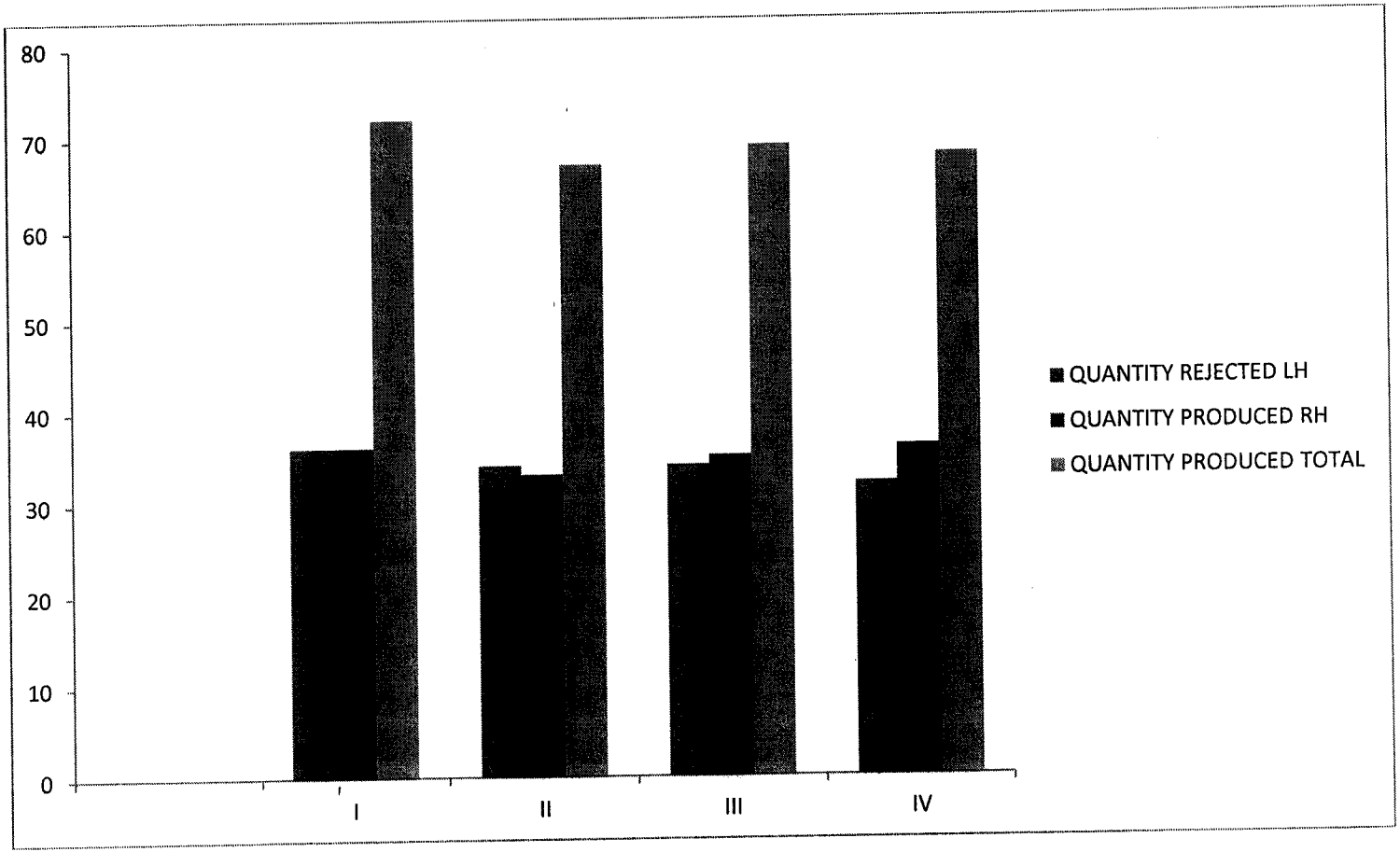


Chart 5.16

GM KNUCLKLE MACHINING LINE REJECTIONS IN FEB12

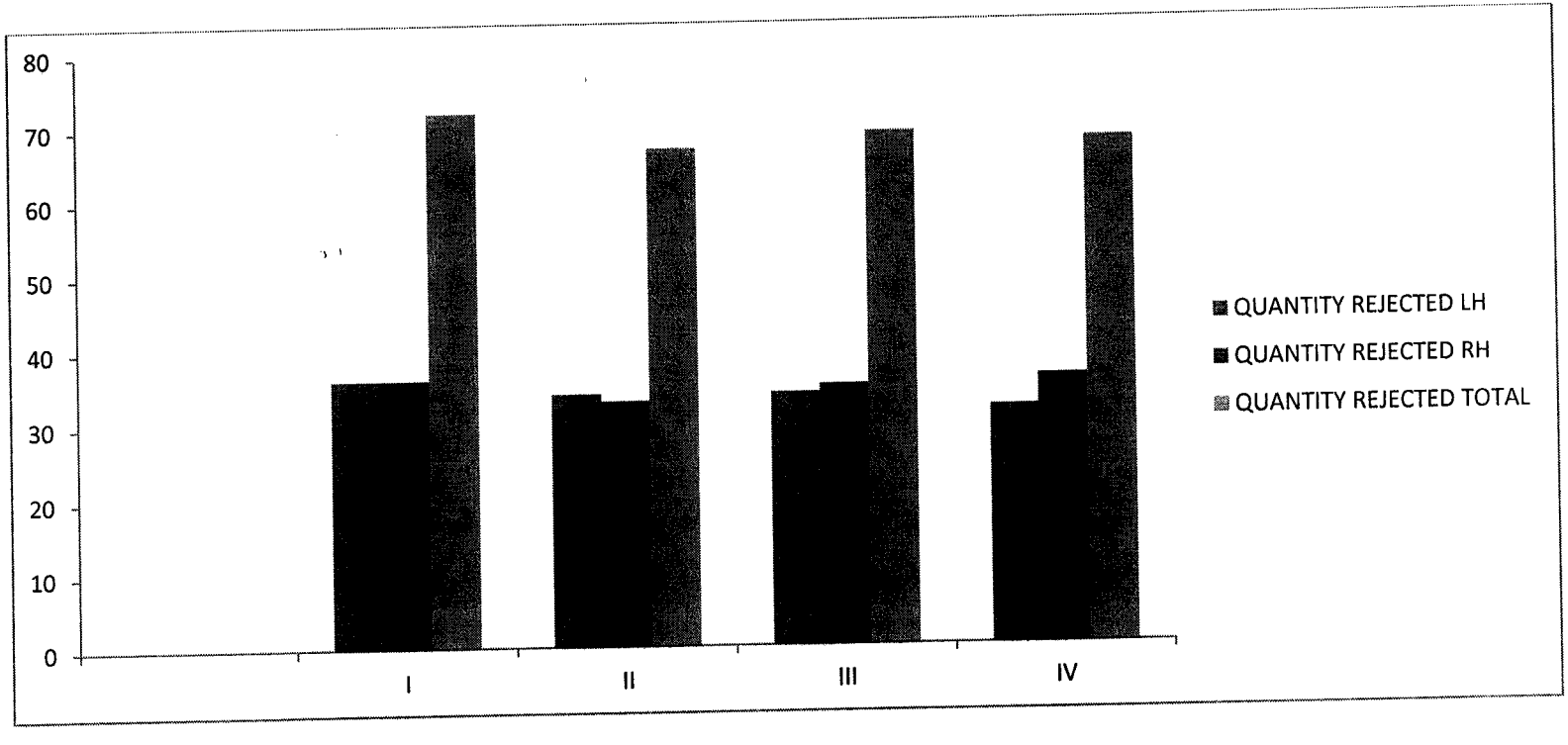


TABLE- 4.15

GM KNUCKLE MACHINING LINE REJECTIONS IN MARCH 2012

S.I No	GM LINE	QUANTITY PRODUCED			QUANTITY REJECTED		
		LH	RH	TOTAL	LH	RH	TOTAL
1	I	11123	11123	22246	36	36	72
2	II	11600	11654	23254	34	33	67
3	III	10986	10900	21886	34	35	69
4	IV	9160	9100	18260	32	36	68
TOTAL		42886	42794	85646	132	140	276

Source :

Secondary data (company production report)

INFERENCE:

This table implies the total produced quantity and also be rejected quantity in the month of March for the GM knuckle machining lin

Chart 5.17

GM KNUCLKLE MACHINING LINE REJECTIONS IN MAR -12

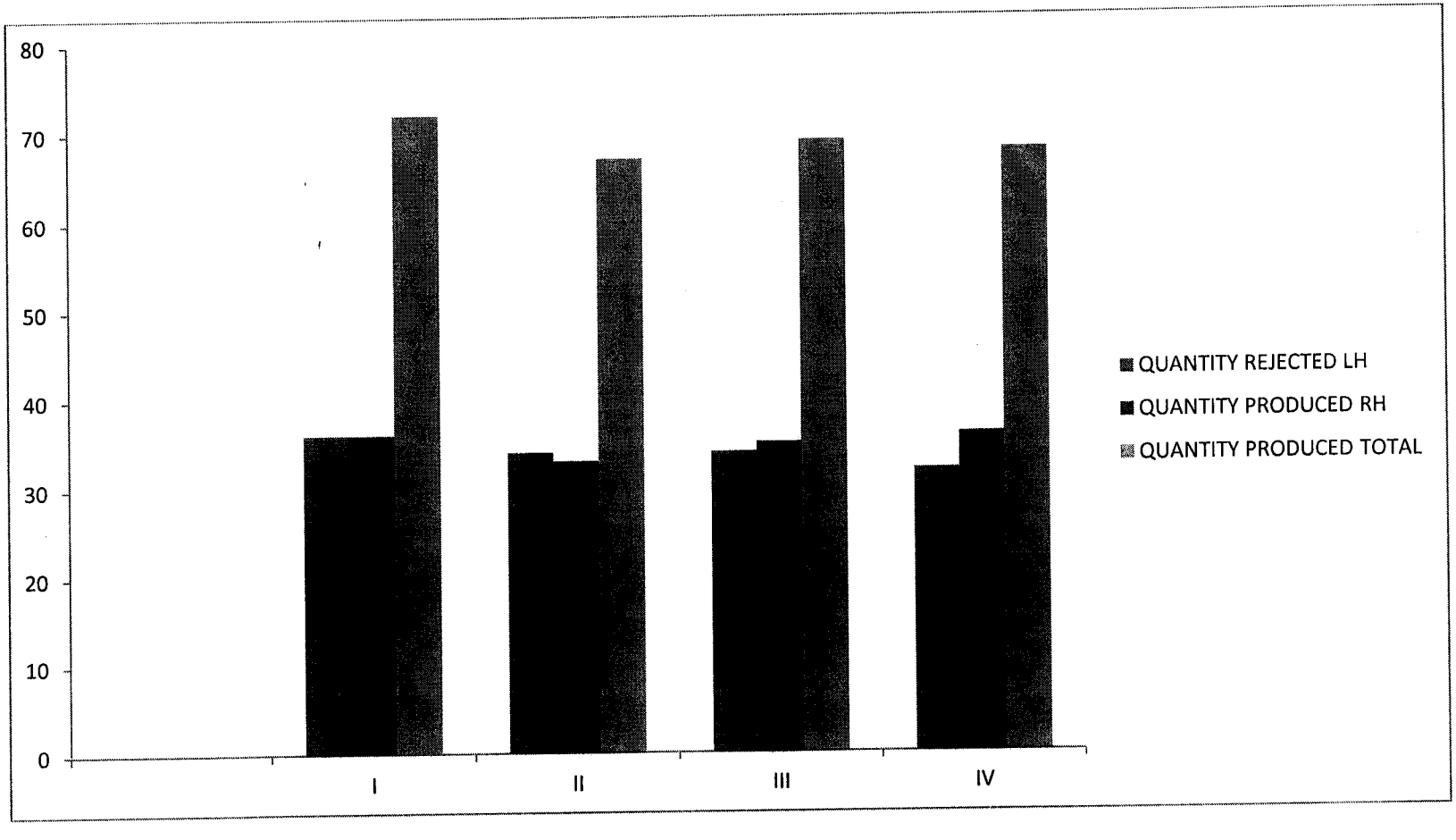


Chart 5.18

GM KNUCLKLE MACHINING LINE REJECTIONS IN MAR -12

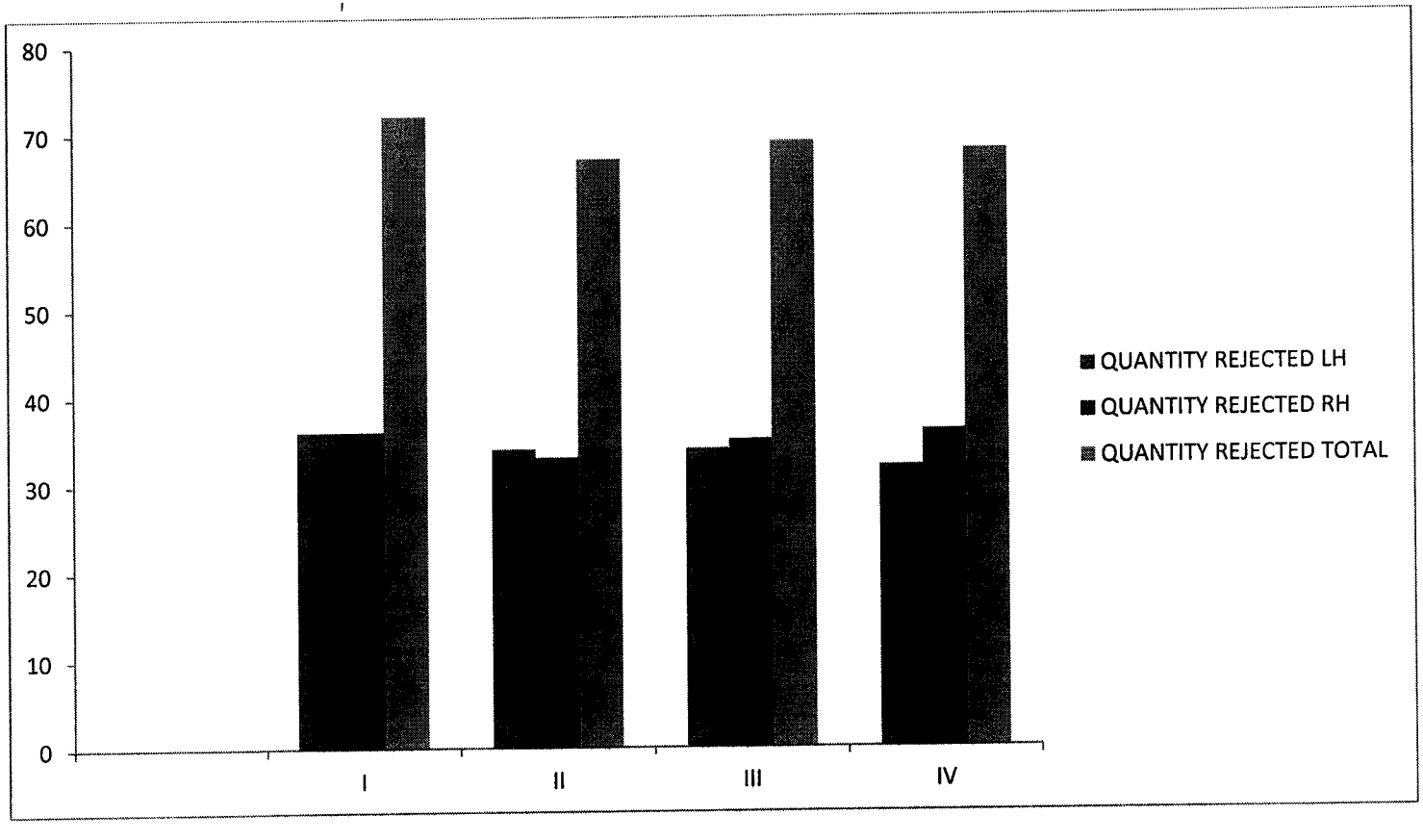


TABLE- 5.16

OEE FOR GM MACHINING LINE IN JANUARY- 2012

S.No	GM LINE	TOTAL LOSSES	QTY PRODUCED	QTY REJECTE	AVAILABIL (%)	PERFORMANCE (%)	QUANTITY (%)	OEE (%)
1	I	3885	23324	166	89.77	97.84	99.28	87
2	II	3630	23488	178	90.25	97.78	99.24	87.58
3	III	4221	22515	161	88.67	95.41	99.28	83.99
4	IV	7173	19462	156	80.75	90.56	99.2	72.37

INFERENCE:

The above table shows the OEE for Machine lines in the month of JANUARY 2012

The availability, performance, quality are calculated using the formula with cycle time 1 min 24sec.

TABLE- 5.17

OEE FOR GM MACHINING LINE IN FEBRUARY- 2012

S.No	GM LINE	TOTAL LOSSES	QTY PRODUCED	QTY REJECTE	AVAILABII (%)	PERFORMANCE (%)	QUANTITY (%)	OEE (%)
1	I	4047	21612	102	88.72	95.05	99.52	83.92
2	II	3723	21368	83	89.62	93.03	99.61	83.05
3	III	4929	20992	98	86.26	94.95	99.53	81.52
4	IV	11178	18260	83	68.85	100	99.54	68.53

INFERENCE:

The above table shows the OEE for Machine lines in the month of March 2012

The availability, performance, quality are calculated using the formula with cycle time 1 min 24sec.

TABLE- 4.18

OEE FOR GM MACHINING LINE IN MARCH- 2012

S.No	GM LINE	TOTAL LOSSES	QTY PRODUCED	QTY REJECTE	AVAILABII (%)	PERFORMANCE (%)	QUANTITY (%)	OEE (%)
1	I	6489	22246	72	82.58	100	99.68	83.32
2	II	5034	23254	67	86.49	100	99.71	83.24
3	III	6504	21886	69	82.54	99.62	99.68	81.96
4	IV	10174	18260	68	72.69	94.38	99.63	68.35

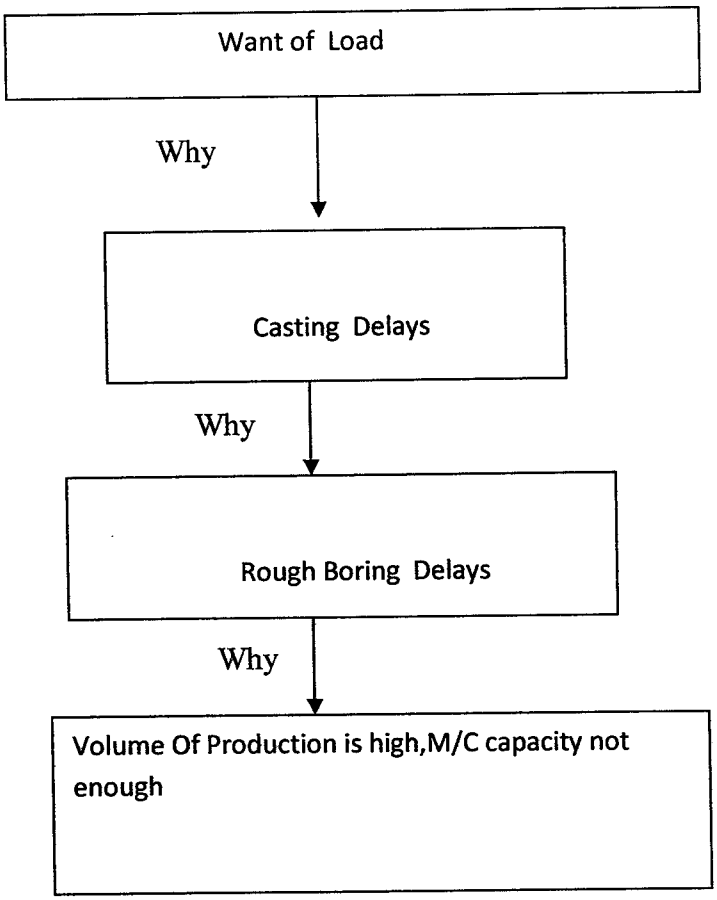
INFERENCE:

The above table shows the OEE for Machine lines in the month of MARCH 2012

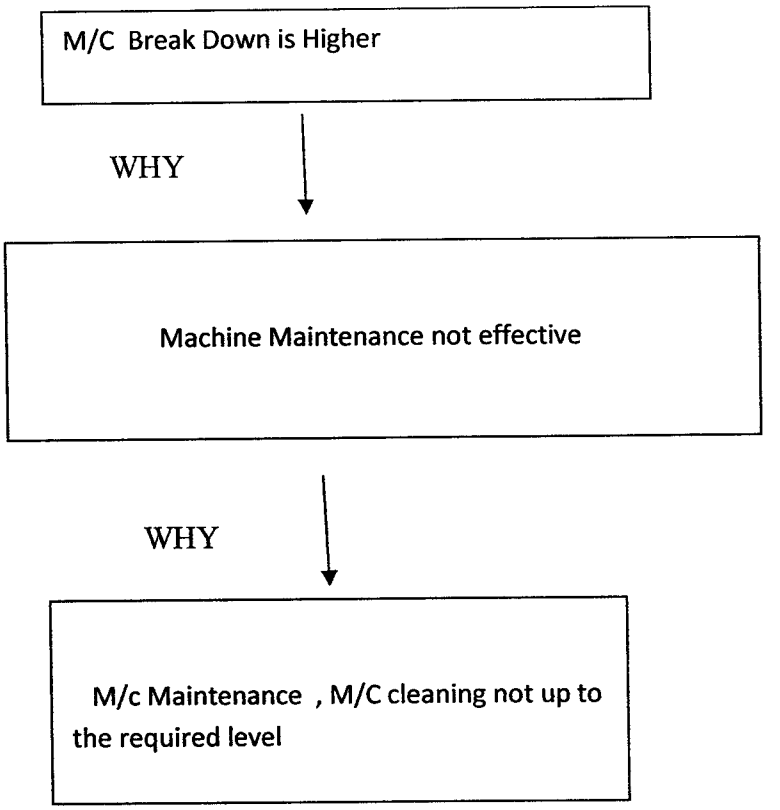
The availability, performance, quality are calculated using the formula with cycle time 1 min 24sec.

ANALYSIS OF REASONS FOR LOSSES:

WANT OF LOAD:

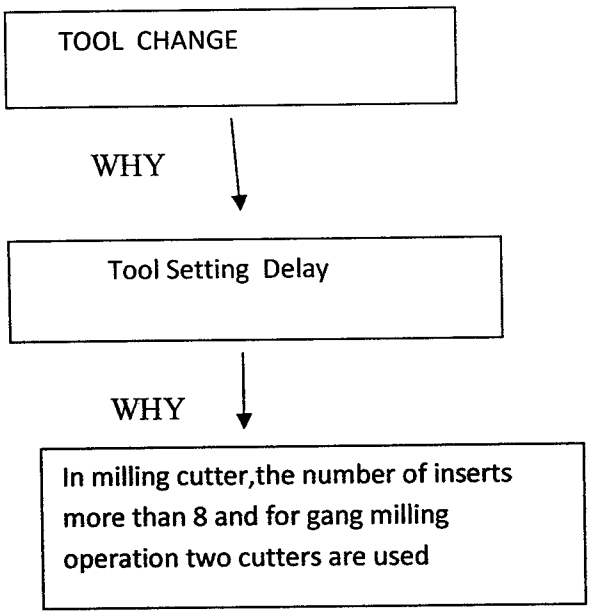


M/C BREAK DOWN :

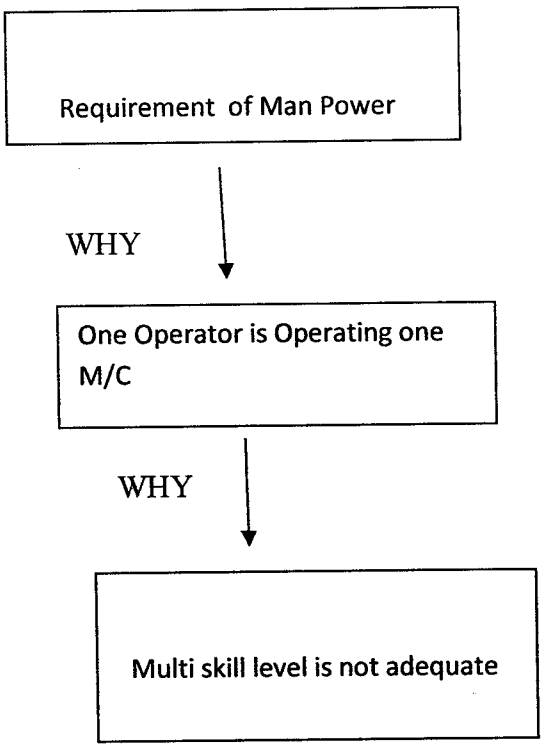


Each shift / every machine,the machine cleaning , machine daily check sheet ,monthly weekly prevention schedule effectiveness is not up to the required level.

TOOL CHANGE:


TOOL CHANGE
WHY
Tool Setting Delay
WHY
In milling cutter,the number of inserts more than 8 and for gang milling operation two cutters are used

WANT OF MAN POWER:



FINDINGS SUGGESTIONS & CONCLUSION

FINDINGS,RECOMMENDATIONS AND CONCLUSION

FINDINGS:

- In case of Machining, the company will have a profitable measure only the Over all Equipment Effectiveness will be greater than 90% . From the calculated values of the OEE it was found that the values falls below the required limit.
- The OEE in the GM Knuckle IV line is observed to be lower when comparing to the other machining lines because of the longer Machine Break Down.
- From the Study, it was known that the Over All Equipment Effectiveness is affected mainly due to Availability. The Availability is calculated by means of available time and the idle time. i.e; the losses.
- It was found that the Quality of the machine is increased from the month of January to March. The rejection rate is gradually decreased. However , the rate should be reduced further in order to achieve the company's objective 100 PPM.
- The Quality of the Machine is acceptable, where as all the four machine line has the quality percentage above 99. However , the quality is calculated only based on the ratio of rejected items with respective to the total quantity of production, there occurs chances of producing wrong results when the machines are stops for a long time.
- The Performance of the machines also acceptable and even the performance found to be at 100% in some cases, even though there occurs a short come, i.e; the machines are 0perated irregular of the lunch time and other intervals, the output should be increased in case it is operated at such time intervals.
- The performance is affected due to cycle time taken by the component. Here, the cycle time may also be increased due to careless operations of the workers.
- The availability of the machine is mainly affected due to four major losses such as want of load, Machine breakdowns, time taken for tool setting and Want of Man Power.
- Other losses include setting change , preventive maintenance and casting

RECOMMENDATIONS:

The OEE can be improved by minimizing the losses and also the rejections. The corrective actions for the four major losses are given below

Corrective actions for Inadequate supply of load:

- In casting stage, the bore dimension should be modified and eliminate rough boring operation.
- After first shot blasting, rough boring process is done, after which the second shot blasting should be done in order to remove the waste particles added during Rough Boring process. Such process can be eliminated so that there is no need of second shot blasting.
- The other delays can be minimized by implementing the 5S principle properly in the entire production floor. By this the loading and Unloading of the items will be easier.
- The Kanban system should be implemented . It means when the product is taken from its place,we have to fill that space with the same kind of product by getting it from the factory warehouse. So that the shortage of inputs will be rectified.
- The Lean Manufacturing concept should be implemented throughout the organizations to minimize the wastes.

Corrective actions for M/C Breakdown:

- Shift Wise Machine cleaning to be implemented.
- M/C Cleaning effectiveness to be maintained daily.
- Daily Check sheet to be updated.
- M/C Preventive Maintenance to be done as per schedule.
- Autonomous Maintenance system should be introduced.
- My machine concept should be introduced.

Corrective actions For Tool Setting:

Corrective actions for Inadequate Man power:

- Trained Man Power to be recruited and Skilled People should be given the permanent opportunity.
- Multi Skill level is important, so that one operator can operate more than one machine.

CONCLUSION:

To conclude the analysis of Iain and the losses in the GM Knuckle Machining Line of Sakthi Auto Components Limited may help the management to pay insight in improving the Machine conditions and the Overall Performance. In this study an attempt is made to provide an aid about the way in which a decision can be taken to decide in the field of production for better progress. This Project is very useful to me in comparing the theoretical knowledge with the practical knowledge. This also helped me in gaining knowledge about the production process and to identify the ways and scope for implementing the concepts.

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APPENDIX

APPENDIX

MODEL CALCULATION FOR FINDING OEE

AVAILABILITY:

$$\text{Availability} = \frac{\text{Available time- Total Downtime}}{\text{Available Time}} * 100$$

$$\text{Availabity} = \frac{(23*60*27) - 3885}{(23*60*27)} * 100$$

$$= 89.57\%$$

Performance :

$$\text{Performance} = \frac{\text{Cycle Time* Component Produced}}{\text{Availability time- Total Downtime}} * 100$$

$$\text{Performance} = \frac{1`24* 23324}{(23*60*27) - (3885)} * 100$$

$$= 97.84\%$$

Quality:

$$\text{Quality} = \frac{\text{Quantity Produced} - \text{Quantity Rejected}}{\text{Quantity Produced}} * 100$$

$$\text{Quality} = \frac{23324 - 166}{23324} * 100$$

OEE:

OEE = Availability Ratio* Performance Ratio*Quality Ratio/1000

= 89.57 * 97.84 * 99.28/1000

= 87%