OPTIMIZATION OF PRODUCT OUTPUT AND PRODUCT COST ANALYSIS

Thesis submitted in partial fulfillment of the requirements for the award of the degree of P-736

MASTER OF ENGINEERING IN MECHANICAL ENGINEERING

(INDUSTRIAL ENGINEERING)

of BHARATHIAR UNIVERSITY

By

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Under the Guidance of

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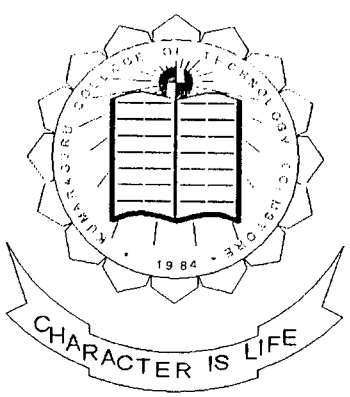

DEPARTMENT OF MECHANICAL ENGINEERING

KUMARAGURU COLLEGE OF TECHNOLOGY

(Affiliated to Bharathiar University)

COIMBATORE – 641 006

2000-2001

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CERTIFICATE

This is to certify that this thesis work entitled "**OPTIMIZATION OF PRODUCTION AND PRODUCT COST ANALYSIS**" being submitted by **Mr. P.N. KARTHIKEYAN (Reg No : 0037H0004)** for the award of degree **MASTER OF ENGINEERING (INDUSTRIAL ENGINEERING)** is a bonafied work carried under my guidance. The results embodied in this thesis have not be submitted to any university or institute for the award of any degree or any diploma

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CERTIFICATE

This is to certify that Mr.P.N.Karthikeyan, a final Year M.E student of Kumaraguru College of technology undertook Project Work titled "OPTIMIZATION OF PRODUCTION AND PRODUCT COST ANALYSIS" in our organisation from 09.06.2001 to 26.11.2001. During this period his Conduct was found to be good.

FOR L.G.BALAKRISHNAN & BROS LTD

P.GANDHIMATHINATHAN
MANAGER (PER & HRD).

Dedicated

To

My Beloved

Parents

Acknowledgement

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Synopsis

SYNOPSIS

Fine blanking is a modern manufacturing process. Since it has been adopted by the company newly there is a need to conduct time study. Previously conventional blanking was used to produce component which are to be further process like chamfering, facing, deburring which adds to the cost of the manufacturing activity. Whereas in Fine Blanking in a single operation finished products are produced which includes inner and outer teeth cutting to the highest accuracy which avoids further process like grinding, drilling etc., Hence due to its smooth finish and uniform stability fine blank components plays a vital role in precision products. Fine blanked components, due to their good finish is used in automobiles, house hold equipment's, sewing machines watches etc., it is also used in measuring instruments like micro meters dial indicators etc., due to its less weight. Due to its tremendous sales where there is a need to improve the operating speed. It is to be compared with the standard normal time. Thus time study technique is conducted.

Time study is conducted to improve the utilization of labour and machines. By optimizing the time of each operation we can improve the profit of the company by conducting time study we can estimate standard time for each operation which can be used to improve shop efficiency.

Cost analysis plays a vital role in the competitive world. Due to the globalization of market there is a need to improve the quality of the product as well as to manufacture the product at competitive rates. The cost should be less compared with the other market rates. Cost analysis is applied to identify the exact cost of labour and material and for proper allocation of overhead expenses this will enable the management to optimize their selling price, and also to adjust the selling price according to the fluctuations in market and without incurring any loss.

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Chapter - I

Introduction

INTRODUCTION

COMPANY PROFILE

L.G.Balakrishnan & Bors. Ltd., is one of the leading and well known industrial houses in India and in south. The seats of L.G.Balakrishnan & Bros Ltd., were sown in the year 1937 by the founder of the group **Shri. L.R.G.NAIDU**. His eldest son Shri.L.G. Balakrishnan took the company to the forefront of the industry with his dynamism and foresight.

It's genesis was a modest bus transport unit and in just over two decades, it metamorphosed into one of south India's largest transport operators. An impressive fleet of 500 busses with captive body building, tyre retreading and engine servicing plant was possessed by L.G.B. In 1959. In 1960, the company entered its present area of strength : Chain manufacturing

Seven manufacturing plants (6 of them with ISO 9001 accreditation, among which one has been awarded the QS 9000), a strong sales and service network and a highly competent management team helped make LGB into one of the largest industrial groups in South India.

LGB has always grown with the customer during all of its six decades. This has been due to their emphasis on customer satisfaction, a result of dedicated team-work and consistent quality. LGB has worked upon each of these facts and honed it finely to meet the customer needs. Every phases of LGB's winning equation has been modelled on these lines.

It is common knowledge that LGB is a pioneer in the manufacture of timing and industrial chains and that LGB's brand of chains, ROLON, is the largest selling in India.

Product Profile :

LG Balakrishnan & Bros. Ltd have a vast range of products that go hand-in - hand with their commitment to the industry and their corporate goal of fulfilling every customer need.

Manufacture :

- Automotive timing chain
- Transmission chain
- Engine mechanism chain
- Sprockets
- Automotive tensioners
- Timing and drive kits
- Industrial chains
- Conveyor, Agricultural and Textile chains
- Bi-cycle chains
- Cogged belts
- Timing belts
- Fine blanked components
- Bus bodies
- Cotton Yarn
- Rubber products
- Precision machined components

Industrial Chains Division :

Rolon industrial chins have played an indispensable role in various industries like textile, sugar, oil and water drilling, material handelling, agriculture etc., The textile industry, in particular, has been hugely benefited by LGB's complete range of chains; a range which covers the gamut right from blow room to weaving and processing.

The products range includes roller, leaf, carding, bush conveyor, and stenter. Special custom-made chains for any application are rendered possible by LGB's exclusive Application Engineering Cell, where skilled engineers analyse a customer's requirements and fabricate appropriate chains.

Automotive Chains Division :

ROLON timing chains is not only a leader in replacement market but also the first choice of INDIA OEMs. ROLON chains are fitted as exclusive, original fitmate in Indian made Fiat cars. The range includes chains for timing, oil pump drive and hand brakes for domestic and export markets.

ROLON Automotive Drive Chains are the most preferred for application as diverse as racing bikes, replacement market and OEMs. The range includes engine mechanism chains, pedaling and clutch chains for 2 & 3 wheelers.

The chains have been introduced as a complete timing and drive kit with specialised timings and drive sprockets with auto tensioners. LGB has an uncompromising stand in maintaining high quality. Rolon Chains of the best precision and durability, are made possible by modern and automatic production facilities, with fine blanking and special heat treatment equipment.

Fine Products And Precision Tool Division :

With an experience of over two decades in pressed components and press tools, this division has perfected fine blanking technology to manufacture precision components.

Precision parts like gear change levers sprocket, contact fingers, clutch holding plates etc., are supplied to OEMs like TVS Suzui, Hero Hondo, Bajaj, Larsen & Toubro etc.,

All these have been facilitated by State - of - the - art fine blanking presses, skilled tool makers and CAD/CAM facilities. This division is poised for capacity enlargement.

The importance of precision tooling in chain - manufacture cannot be overlooked. Its reason why LGB has its own modern, in - house tooling division equipped with CNC wire cutting, spar erosion and Mikron CNC boring machines. Further, the spare capacity of this excellent tool room is employed by industrial heavyweights like English Electric of the GEC groups, TVS, BEL and Larsen & Toubro.

The division is quipped with sophisticated machinery to undertake jobs requiring complete precision and complicated machining.

LGB's tool room equipment with modern machinery and the latest quality control gadgets help manufacture jigs and fixtures required for various operations. The division concentrates on products for MICO fuel injection pumps.

Time Study :

Time study is defined as an art of observing and recording the time to do each detailed element of an industrial operation. The term industrial operation includes manual, mental and machining operations. Time study is conducted to improve the utilization of the labour and machines. The time taken by the operator to do a job is to be compared with the standard normal time. By conducting time study we can select a suitable person who can perform the job in a stipulated standard time. Thus it helps in manpower economy reduce unnecessary operations, idleness of the labour as well as machinery's. By conducting Time study we can easily calculate the time taken for complete operation and it aids in calculating exact delivery dates of the components. It provides labour budgeting and provides the basic costing system. It avoids unnecessary transporting time, on various machines.

Time study technique is adopted to record the time taken for each operation and to compare with the standard time calculated by the time study engineer. This time study technique plays a vital role in an industry because it maximize the profit by reducing the time consumption of the process by applying suitable technique by a well trained operator and comparing with the standard time. Thus time study technique is studied and above thesis is carried out at L.G.Balakrishnan Bros. Ltd, at Ganapathy.

Product Cost Analysis :

Product cost analysis is defined as a system of accounts which systematically and accurately records every expenditure in order to determine the cost of a product after knowing the different expenses incurred in various departments. Costing is an essential work for the efficient management of any enterprise and gives most useful information for the preparation of financial accounts. costing shows which type of output will yield a profit and which type does not. Thus it makes up the deficiency. A planned system of cost accounting will point out the weak spots and thus enable the administration to have a clear picture and show up immediately the essential facts in such a way the responsible person can put forth the effects to bring improvements and reduce costs. It indicates where loses and wastage are occurring before the work is finished, so that immediate action may be taken to avoid such loss. This costs include labour cost material cost and overhead expenses. Labour costs is one which actually process the material either manually or with the help of machines. Example : operator

Material cost is one which is consumed in the manufacturing of a product and can be measured and charged directly to the cost of the product. Example : All manufacturing components.

Overhead expense includes building rents, depreciation, tax, insurance, power, administrative expenses, selling expense, marketing expense, repair and maintenance charge, stationeries etc

Chapter - II

Literature Survey

LITERATURE SURVEY

Time Study :

Time study is defined as an art or recording, analyzing and synthesizing the time of elements of manual, mental operations.Time study was developed by F.W.TAYLOR and is also called as stop watch time study. [7]

Time Study Procedure :

1. Identify the job to be time studied.
2. Select the worker for study.
3. Take the worker as well as the shop supervisor into confidence and explain to them the objectives of the time study.
4. Collect the equipment's and arrange machinery, jigs, fixtures etc required to conduct time study.
5. Determine the number of observations to be timed for each element.
6. Conduct the observations and record them on time study form.
7. Record the rate of performance of the worker during time study.
8. Compute observed time from the measure of central tendency.
9. Calculate normal time from observed time by using rating factor.
10. Add allowances, rest and personal allowance in normal time to obtain certain standard time. [7]

Standard Time:

Standard time is defined as the amount of time required to complete a unit of work.

Basic Time :

Basic time is the time required to perform a task by a normal operator working at a standard rate with no allowances for personal delays, fatigue. [1]

$$\text{Normal time} = \text{selected observed Element time} \times \frac{\text{observed rating of the operator}}{\text{standard Rating}}$$

Performance Rating :

Performance rating is a technique for equitably, calculating the time required to perform a task by the normal operator after the observed values of the operation under study have been recorded.

Performance rating means gauging and comparing the rate or performance of the worker against the standard performance level set by the time study engineer.[1]

$$\text{Performance Rating} = \frac{\text{observed performance} \times 100}{\text{Normal performance}}$$

Rating Factor :

A rating factor or the leveling factor is a factor by which the observed time (time takes by the worker to do a job) is multiplied in order to adjust for differences in operator's performance. It can show day to day variations in level performance of same worker.

Referring to 0-100 standard rating scale explained above, '100' represents standard performance. If the work study analyst feels that the operation he is observing is being performed with less effective speed than his concept of standard, he will give a rating factor of less than 100 say 75. Suppose if he feels that the effective rate of working is above standard he may give a rating factor of 110 for worker who is doing that operation. [6]

$$\text{Normal time} = \frac{\text{observed time} \times \text{rating in percent}}{100}$$

Cost Analysis:

It is defined as a system of accounts which systematically and accurately records every expenditure in order to determine the cost of a product after knowing the different expenses incurred in various departments. [6]

Types Of Cost :

The total cost is classified into three main elements. They are

i. Material cost

ii. Labour cost

iii. Overhead expenses

Material Cost :

Material cost is divided into two groups namely

i. Direct Material

ii. Indirect Material

Direct Material Cost :

Direct material is that material which becomes a part of the product. It is the material which is to be consumed in the manufacturing of a product and which can be measured and charged directly to the cost of the product. Thus the cost associated with purchase of materials is called direct material cost. [3]

Indirect Material Cost :

Indirect material is that material which cannot be traced as a part of the product. It is the material required for maintaining and operating the plant and equipment but cannot be a part of the product. Thus the cost associated with indirect materials is called as indirect material cost. [3]

Labour Cost :

The second important element of cost is labour cost. Labour generally constitutes 50% of total cost to produce an article. The labour cost is classified into two types namely

Direct labour cost

Indirect labour cost.

Direct Labour Cost :

Direct labour is one which is directly employed in manufacturing operation. It is the labour which actually processes the material either manually or with the help of machines. The wages of such labour can be charged directly to job under preparation. Thus the workers or operators engaged for operating on various production machines in different shops like machine shop, welding shop, sheet metal shop etc are known as direct labour.[3]

Indirect Labour :

Indirect labour is the non-productive staff engaged upon general service connected with the running of a factory as a whole. It is the labour which helps the productive labour in performing their duties.[3]

Expenses:

Apart form material and labour cost in each factory there are several other expenditures such as a cost of special layouts, insurance, depreciation of machines and buildings, building rent, cost of transportation, selling and distribution expenses, telegram charges, commissions to salaries and salesman, travelling expenses etc. All these expenditures are called as overhead expenses. Thus except direct material and direct labour cost, all other expenditures included for manufacturing a product is known as overhead expenses. [3]

Chapter - III

Problem Description

PROBLEM DESCRIPTION

Introduction :

In fine blanking the production obtained is less when compared with actual data. Sample study technique is conducted and from that we found that most of the time is spend in coil loading, tool loading, coil unloading, tool unloading and miscellaneous activities of the operator. Then the transportation time is more because due to loading of the tool in the store room. Idleness is more in the store room.

Problem Definition

Fine Blanking :

Fine blanking is a modern manufacturing process. In a single operation finished products are produces which includes teeth cuttings without causing any damage to the edges over the entire thickness of material. Thickness may vary from 2mm to 16mm.

Whereas in a standard blanking work pieces are produced which are normally cut only one third of their thickness the rest being broken away from the parent material. Example : Reaming, Drilling, etc. Whereas fine blanking produces totally fracture free edges with a high grade surface finish over the entire material thickness in one operation.

Goal Of The Project :

The goal of the project is to conduct time study and cost analysis to improve the profit of the company. That is to improve the profit of the component by reducing unwanted transportation time, idleness of the worker material etc. Most of the time is wasted in fine blanking division for coil loading tool loading and waiting for the tool, whereas production efficiency is very less. Hence special concentration should be taken in reducing the tool loading time. Coil loading and tool loading plays a major role in miscellaneous activities this is due to the workers attitude. Hence by reducing the tool loading time, coil loading time and idleness of the worker we can improve the profit. Thus we should compare them with the standard time for tool loading and coil loading. Thus time study technique is conducted to establish standard data for coil loading, tool loading and blanking time for individual components.

Objectives Of Time Study :

The time study of an operation is made with a view to find out standard time which an average worker working under average standard conditions with standard methods and exerting average effort can take to perform the operation continuously. The arms and objectives of time study are classified as under

1. Achievement of an equitable standard time for an operation.
2. Improvement in the existing method to minimise human effort.
3. Making full utilization of man, machine and labour.
4. Plan uniform flow of work to have balanced machine capacity.
5. Formulating a proper incentive scheme.
6. Improvement of operating efficiency.

Chapter - IV

Methodology

METHODOLOGY

Fine Product Division :

Fine Blanking :

1. Fine blanking is a modern manufacturing process. In a single operation finished products are produced which includes teeth cuttings without causing any damage to the edges over the entire thickness of material. Thickness may vary from 2mm to 16mm.

Working Principle :

It involves three forces namely

1. Blanking Force
2. V-ring Force
3. Counter Force

Blanking Force:

Blanking force acts downwards and cuts the component by pushing the cutting punch downwards.

V-ring force:

V-ring force acts on the material, it arrests the material without causing any movement to the material while during the blanking force acting on it. It gives stiffness to material.

Counter Force:

Counter force acts upwards which pushes the component out of the female dye. Then air is blown which removes the scrap piece away from the dye.

Blanking Process :

The press has closed in raid mode and the V-ring starts to be impressed. If a part or slug is present in the tool, it will open from this position without cutting.

V-ring is impressed, cutting commences. The V-ring pressure can be reduced in this position.

The fine blanking operation is ended, the work piece is in the die plate, the inner form scrap is in the punch. The counter force is cut off as the press opens to ensure that the work piece is not pressed back into the strip material.

The press opens and starts to eject the work piece and the slugs and to strip off the strip material from the punch.

Work piece and slugs are ejected and the punch is withdrawn. Work piece and slugs are blown out and the strip material is advanced.

Advantages Of Fine Blanking:

1. High degree of flatness to finished components.
2. Uniform dimensional stability.

Application Of Fine Product Components :

1. The components are used in automobile industry. Automobiles like suzuki, scooters, bikes, disk brakes injection pumps etc.
2. Hand tools : nipper etc
3. Domestic appliances : automatic ironers, sewing machines, mixers, washing machines, etc.
4. Watch industry : components for clocks & alarms.
5. Cutting tools : pocket knives, scissors.
6. Various appliances : window fittings, keys for safety locks.
7. Office & communication equipment : telephone, teleprinters, typewriter, computers.
8. Measuring instrument & apparatus : vernier gauges, micrometer,
9. General machines : textile machinery's, sewing machines, electromagnetic clutches.

Fine Blanked Components :

Product code	Product Name	Company
002	13T sprocket-plated	M/s T.V.S Suzuki Ltd, Hosur
015	Plate shift drum stopper	L&T, Mumbai.
026	Pawl gear shift	M/s Bajaj auto Ltd, Pune.
056	Moving stop	M/s Bajaj auto Ltd, Pune.
013	Plate clutch drive	M/s T.V.S Suzuki Ltd, Hosur
133	14 T sprocket	M/s T.V.S Suzuki Ltd, Hosur

Sequence Of Operation In FPD

i. Receiving the tool from the tool room.

ii. Loading the tool in the machine

iii. Receiving the coil from the store

iv. Loading the coil in the machine

v. Blanking process

vi. Checking for trials.

vii. Inspection.

viii. Waiting for the approval.

ix. Production Process

x. Removing the scrap coil.

xi. Unloading the tool and coil.

xii. Collecting the blanked components.

xiii. Heat treatment.

xiv. Plating.

xv. Packing

xvi. Delivery.

Time Study Technique:

Time study is defined as an art or recording, analyzing and synthesizing the time of elements of manual, mental operations.

Time study is a work measurement technique for recording the times and rates of working for the elements of a specified job carried out under certain specified conditions.

Time study was developed by F.W.TAYLOR and is also called as stop watch time study.

Selecting The Job To Be Time Studied:

Request to conduct time study should preferably come from the component authority such as shop foreman etc.

1. If it is a newly created job.
2. A change in material or method of working has been made towards improvement and a new time standard is required.
3. When cost of a particular job appears to be excessive.
4. To compare the efficiency of two proposed methods.
5. Standard time are required prior to the introduction of an incentive scheme.

Benefits Of Time Study.

Stop watch time study is employed to conduct time study.

1. Determining schedules and planning work.
2. For determining standard costs and as an aid in preparing budgets.
3. For timing repetitive operations employed in manufacturing different jobs.
4. For estimating the cost of a product before manufacturing it.
5. For determining time standards to be used as a basis for the payment of a wage incentive to direct labour and indirect labour.
6. For determining machine effectiveness, the number of machines which one person can operate and as an aid in balancing assembly line.
7. For determining the time standards to be used as a basis for the payment of a wage incentive to direct labour and indirect labour.
8. It determines the time required to do a job, thus it compares alternative method and establishes fastest method.
9. It decides man power required for a job, it helps in man power economy.

Standard Time:

Standard time is defined as the amount of time required to complete a unit of work.

a. Under existing conditions.
b. By an operator able to do work in a proper manner.
c. At standard rate.
d. Using specified method and machinery.

Basic Time :

Basic time is the time required to perform a task by a normal operator working at a standard rate with no allowances for personal delays, fatigue.

Performance Rating :

Performance rating is a technique for equitably, calculating the time required to perform a task by the normal operator after the observed values of the operation under study have been recorded.

Rating Factor :

A rating factor or the leveling factor is a factor by which the observed time (time takes by the worker to do a job) is multiplied in order to adjust for differences in operator's performance. It can show day to day variations in level performance of same worker.

L.G.Balakrishnan & Bros Ltd. Ganapathy	TIME STUDY FORM	Kumaraguru College of Technology,M.E.(I .E)

Component No: Tool No : Component Name : Date :

Machine Name: **100 T LGB** Operation : **Tool Loading** Shift :

S.NO	ELEMENTS	OBSERVED TIME	RATING	NORMAL TIME
1.	Go to tool room	40	-	40
2.	Loading tool in a pallet	45	-	45
3.	Bring back the tool to machine	5	-	5
4.	Setting bush in a machine	325	60%	195
5.	Adjusting the main ram	87	-	87
6.	Raising the pallet to machine platform height	158	-	158
7.	Adjusting main ram	773	60%	463
8.	Adjusting axial movement of the bed	647	60%	388
9.	Clamping top part	120	-	120
10.	Miscellaneous movement	200	-	200
11.	Clamping the bottom part	400	50%	200
12.	Locking the bed	280	-	280
13.	Arresting bar set assembly	120	-	120
14.	Pressure adjustment	700	60%	420
15.	Checking for trial	300	-	300
16.	Checking for 2,3 pieces	400	-	400

Allowances :
Rest + personal allowance = 9%
Standing allowance = 2%
Manual operation = 2%

Standard time :
Total Normal time = 46.00 min
Allowance (13%) = 6.00 min
Total = 52 min

STANDARD TIME FOR TOOL SETTING IN 100T LGB = 52 MIN

Operator signature

Supervisor / Production Engg. Signature

T.S.Engineer Signature

L.G.Balakrishnan & Bros Ltd. Ganapathy	TIME STUDY FORM	Kumaraguru College of Technology,M.E.(I .E)

Component No: Tool No : Component Name :
Date :

Machine Name: **160 T HYDREL** Operation : **Coil Loading**
Shift :

S.NO	ELEMENTS	OBSERVED TIME	RATING	NORMAL TIME
		-	-	-
1.	Go to store	30	-	30
2.	Bring coil to shop floor	50	-	60
3.	Loading coil in a pallet	560	60%	326
4.	Remove the winding	110	-	110
5.	Loading coil in machine	100	-	100
6.	Feeding the strip in machine	1000	-	1000
7.	Air setting & miscellaneous adjustment	500	-	500

Allowances :
Rest + personal allowance = 9%
Standing allowance = 2%
Manual operation = 2%
13%

Standard time :
Total Normal time = 23.50 min
Allowance (13%) = 3.05 min
Total = 26.55 min

STANDARD TIME FOR COIL SETTING IN 160T HYDREL = 26.55 MIN

Operator Signature

Supervisor / Production Engg. Signature

T.S.Engineer Signature

L.G.Balakrishnan & Bros Ltd. Ganapathy	TIME STUDY FORM	Kumaraguru College of Technology,M.E.(I .E)

Component No: Tool No : Component Name : Date :

Machine Name: **100 T ESSA** Operation : **Coil Loading** Shift :

S.NO	ELEMENTS	OBSERVED TIME	RATING	NORMAL TIME
		-	-	-
1.	Go to store	30	-	30
2.	Bring coil to shop floor	130	-	130
3.	Remove the outer cover	180	-	180
4.	Loading coil in a pallet	320	-	320
5.	Placing the coil in machine	120	-	120
6.	Chisiling the coil winding	730	60%	438
7.	Feeding the coil in the machine	1300	70%	910
8.	Air setting & miscellaneous adjustment	500	50%	250

Allowances :
Rest + personal allowance = 9%
Standing allowance = 2%
Manual operation = 2%
13%

Standard time :
Total Normal time = 33.00 min
Allowance (13%) = 4.05 min
Total = 37.05 min

STANDARD TIME FOR COIL LOADING IN 100T ESSA = 37.05 MIN

Operator Signature

Supervisor / Production Engg. Signature

T.S.Engineer Signature

L.G.Balakrishnan & Bros Ltd. Ganapathy	TIME STUDY FORM	Kumaraguru College of Technology,M.E.(I .E)

Component No: Tool No : Component Name : Date :

Machine Name: **100 T ESSA** Operation : **Coil Loading & unloading** Shift :

S.NO	ELEMENTS	OBSERVED TIME	RATING	NORMAL TIME
		-	-	-
1.	Winding the unloaded coil	150	60%	90
2.	Go to store with unloaded coil	170	-	170
3.	Idle in store	130	60%	78
4.	Bring coil to shop floor	40	-	40
5.	Remove the outer cover	400	50%	200
6.	Chiseling the coil	700	60%	420
7.	Feeding the coil in the machine	1910	60%	1146
8.	Air setting & miscellaneous adjustment	300	-	300

Allowances :
Rest + personal allowance = 9%
Standing allowance = 2%
Manual operation = 2%
13%

Standard time :
Total Normal time = 38.00 min
Allowance (13%) = 5.00 min
Total = 43.00 min

STANDARD TIME FOR COIL LOADING & UNLOADING IN 100T ESSA = 43.00 MIN

Operator Signature

Supervisor / Production Engg. Signature

T.S.Engineer Signature

BLANKING TIME FOR FULL COIL:

DATA :

Loading time of coil = 1.30

Finishing time of coil = 3.00

Weight of the coil = 130 Kg

ANALYSIS :

Blanking time for full coil = 90 min

No of strokes per minute = 10

No of strokes per hour = 600

No of strokes per shift = 4800 strokes.

BLANKING TIME FOR 13 T SPROCKET

00	105	107	105	105	106	102	7	7	6	7	6	5	7	5	4	8	5	30	8	5	14	3	102	10	7
6	11	14	14	13	15	10	14	14	14	15	14	12	15	7	12	14	12	37	23	3	20	11	10	17	15
13	16	20	23	20	23	22	21	27	21	24	21	18	23	20	25	23	19	45	36	21	29	20	18	25	23
21	23	28	ST	27	27	29	29	35	29	32	28	26	32	27	33	31	27	53	50	25	40	28	24	33	30
28	30	ST	50	35	33	36	39	42	37	43	35	35	39	35	42	39	35	60	58	30	49	35	30	40	37
35	38	40	65	42	42	42	47	51	44	54	42	42	46	42	50	40	43	68	66	35	57	48	37	58	43
43	45	48	77	50	50	49	55	65	52	60	49	50	55	50	64	58	50	76	74	42	64	57	45	60	52
51	55	56	82	57	57	57	63	76	60	68	55	58	67	65	71	66	58	85	82	52	72	64	53	74	61
59	66	64	91	77	65	64	70	83	67	76	63	70	76	74	80	72	70	92	90	60	79	72	60	80	70
66	69	73	98	85	73	71	77	92	75	84	71	77	84	81	88	80	77	100	98	68	88	80	70	90	78
76	75	81		90	81	78	84	99	83	91	80	85	91	90	94	88	85			77	95	88	78	100	86
83	83	88			88	86	93		100	100	87	93	96	96	100	96	93			88		95	88		95
ST	91	97			95	93	100				95	100					100			97			94		101
	100					100																	100		
100/11	100/14	100/12	100/9	100/13	100/13	100/14	100/13	100/11	100/12	100/12	100/13	100/13	100/12	100/12	100/12	100/12	100/13	100/10	100/10	100/13	100/11	100/12	100/14	100/11	100/13
9.09	7.14	8.33	11.11	7.69	7.69	7.14	7.69	9.09	8.33	8.33	7.69	7.69	8.33	8.33	8.33	8.33	7.69	10.00	10.00	7.69	9.09	8.33	7.14	9.09	7.69

BLANKING TIME FOR 13T SPROCKET:

Observed time	=	224.3 / 26
Blanking Time / Stroke	=	8.6 Centi Mins / stroke
	=	5.16 Sec.
Total Normal Time	=	5.16 Sec.
Allowance 13%	=	0.67
	=	5.83 secs/stroke

BLANKING TIME FOR 13T SPROCKET = 5.83 SECS / STROKE

BLANKING TIME FOR PLATE SHIFT DRUM STOPPER

00	5	29	2	19	4	2	1	5	4	4	5	4	5	5	5	5	5	5
5	9	34	15	25	9	6	6	10	9	8	10	15	10	9	10	10	10	9
10	14	39	21	29	13	11	10	14	13	13	15	20	14	14	14	14	13	13
14	18	44	25	33	17	16	15	18	18	18	19	24	18	18	18	18	18	18
19	23	48	29	37	22	20	19	23	22	22	23	ST	23	23	23	23	23	23
23	27	53	34	41	27	24	24	27	27	26	27	40	27	ST	27	27	27	27
28	33	55	39	46	31	29	28	32	32	31	33	45	42	70	32	31	32	32
33	38	60	43	50	36	33	33	37	36	35	37	50	50	75	37	36	37	37
37	43	65	47	55	40	38	37	41	40	40	41	55	55	80	40	40	41	41
41	48	70	52	59	45	42	42	46	45	45	46	59	59	85	45	46	45	46
46	52	75	56	64	49	47	46	50	49	49	50	64	63	90	50	50	50	50
50	57	83	61	69	54	52	51	55	54	54	55	69	68	93	55	54	55	55
55	61	88	66	73	60	56	55	60	59	58	60	74	73	98	63	63	59	59
60	65	93	70	78	69	60	60	65	63	63	64	78	98		68	69	64	64
64	70	97	75	83	72	65	65	68	68	68	68	82	82		73	72	68	69
69	75		79	86	76	69	69	73	72	73	73	88	91		77	77	72	73
73	79		83	90	80	74	74	77	77	78	77	92	96		82	82	77	77
77	ST		88	95	84	79	79	81	81	83	82	96	100		87	86	82	82
82	97		93	100	89	83	83	86	86	88	86	100			91	91	86	86
86	ST		97		93	87	87	90	90	92	91				95	95	91	96
91					98	92	92	95	95	96	95				100	100	95	100
95						96	96	100	100	100	100						100	
100							100											
100/22	100/18	100/16	100/20	100/19	100/21	100/22	100/23	100/22	100/22	100/22	100/22	100/18	100/18	100/13	100/21	100/21	100/22	100/21
4.55	5.56	6.25	5.00	5.26	4.76	4.55	4.35	4.55	4.55	4.55	4.55	5.56	5.56	7.69	4.76	4.76	4.55	4.76

BLANKING TIME FOR 015(PLATE SHIFT DRUM STOPPER):

Observed time	=	96.07 / 21
Blanking Time / Stroke	=	4.75 Centi Mins / stroke
	=	2.07 Sec.
Total Normal Time	=	2.07 Sec.
Allowance 13%	=	0.35
	=	3.05 secs/stroke

BLANKING TIME FOR 015 (PSDS) = 3.05 SECS / STROKE

Work Sampling:

Work sampling is a technique of analysing work by taking a large number of observations at random intervals for establishing standards providing useful work and delay data as well as improving methods.

Work sampling is preferably useful for improving work efficiency as well as analysis of non-repetitive or irregular occurring activity were frequency of occurrence as well as complete method of analysis are not available.

Theory Of Work Sampling:

Laws of probability are the basic of work sampling necessitating no proof of its working. By comparing its results with the true evidence it can still be tested, but it is seen in most of the cases that true evidence is not possible to obtain. It is necessary that the sampling should be random.

Generally a accuracy of 5% is used accurately. Therefore with this accuracy, a a confidence level of 95% is used which means that portability is the 95% of the times, random observation will represent facts and 5% they will not hence the number of observations determined are necessarily always for a given degree of accuracy. The accuracy of +- 5% is also stated as percentage of standard error by assuming binomial distribution as the basic for determining the error. The number of observation required are given by the following formula.

$$S.P = 2\sqrt{p(1-p)/N}$$

Where

S.P. = desired relative accuracy

p = percent occurrence of an activity

N = no of random observation (Sample Size)

Advantages Of Work Sampling:

1. It involves much less cost as compared to stop watch time study.
2. It can be carried out with little training
3. It can time long operations which are almost impractical to be measured (i.e. timed) by stop watch time study.
4. It is very advantageous for timing group activities.
5. It does not need any timing device like stop watch or microchronometer, etc.,
6. Even if the study gets interrupted in between, it does not introduce any error in the results.
7. Observation can be made within the desired accuracy.
8. Large number of observation extended over days/weeks damp down the influence of day to day fluctuations on the results.
9. It can increase efficiency by uncovering the sources of delay.

Limitations Of Work Sampling:

1. It is uneconomical both as regards time and money to study activities of short duration by Work Sampling.
2. It is also uneconomical in case one worker or one machine is to be studied.
3. It does not break job into elements and thus does not provide element details.
4. It does not assist in improving work method.
5. It normally does not account for the speed at which an operator is working.
6. Workers may not understand the principles of work sampling and hence may not trust it.
7. Observation, neither random nor sufficient in number may produce inaccurate results.

Applications/Uses Of Work Sampling:

1. To determine working time and idle time of men and machine
2. To time long duration activities which are regular / irregular, frequent / infrequent.
3. To estimate the time for which material handling equipment's are actually operating in a day.
4. For setting time standards
5. For the purpose of cost control and accounting.

TIME SPECIFICATION	7.00	7.12	7.30	7.42	7.55	8.05	8.13	8.20	8.35	8.50	9.00
achine No : 100T LGB perator Name : P. Nanjappan omponent No : 092 omponent Name : Lever ool No : 092	-	Store	Coil Unloading	Coil Loading	Coil Loading	Coil Feeding	Trial	Stuck Up	Idle	M/C Adjustment	Idel
achine No : 100T ESSA perator Name : Sundarajan omponent No : 013 omponent Name : Plate Clutch Drive ool No : 013	-	Tool Loading	Tool Loading	Tool Loading	Tool Loading	Tool Setting	Pressure Adjustment	Trial	Component Inspection	Coil Unloading [W.F.I.]	Coil Load
achine No : 160T HYDREL perator Name : Tamilazhan omponent No : 002 omponent Name : 13T Sprocket ool No : 002	-	Production	Production	Production	Production	Production	Production	Production	Production	Idle Operator	Production
achine No : 250T HYDREL perator Name : Siju omponent No : 056 omponent Name : Moving Stop ool No : 056	-	Coil Unloading	Coil Loading	Coil Loading	Coil Feeding	Coil Feeding	Struck Up	Struck Up	Production	Production	Production

TIME SPECIFICATION	9.05	9.15	9.22	9.29	9.36	9.45	9.51	9.59	10.05	10.15	10.22	10.29
Machine No : 100T LGB Operator Name : P. Nanjappan Component No : 092 Component Name : Lever Tool No : 092	Tea	Production	Production	Production	Struck up	Idle	Idle Op	Idle Per	M/C Adjusting	Production	Production	Idel Offical
Machine No : 100T ESSA Operator Name : Sundarajan Component No : 013 Component Name : Plate Clutch Drive Tool No : 013	Tea	Coil Loading	Coil Loading	Air Setting	M/C Setting Adjustment	Struckup	Coil Removal	Coil Unload	Cutting Trial Piece	Coil Loading	Coil Loading	Coil Loading
Machine No : 160T HYDREL Operator Name : Tamilazan Component No : 002 Component Name : 13t Sprocket Tool No : 002	Tea	Production	M/C Adjustment	Coil Loading	Coil Loading	M/C Setting	M/C Setting	M/C Setting	Coil Feeding	Fastening	Production	Productio n
Machine No : 250T HYDREL Operator Name : Siju Component No : 056 Component Name : Moving Stop Tool No : 056	Tea	Struckup	Production	Production	Lubrication	Prod.	Idle Op	Prod.	Adjusting	Entering Process Sheet	Tool Unload	Tool Unloading

Time Specification	10.38	10.47	10.55	11.02	11.1	11.21	11.29	12.17	12.22	12.3	12.39
Machine No : 100T LGB Operator Name : P. Nanjappan Component No : 092 Component Name : Lever Tool No : 092	Prod.	Adjustment	Taken For lift	Writing Letter	Waiting For Tool	Waiting For Tool	Waiting For Tool	Idle Sub	Idle S	Idle S	Idle Sub
Machine No : 100T ESSA Operator Name : Sundarajan Component No : 013 Component Name : Plate Clutch Drive Tool No : 013	M/C Setting	Adjustment	Prod.	Prod.	M/C Adjustment	Prod.	Prod.	Lunch	Lunch	Lunch	Lunch
Machine No : 160T HYDREL Operator Name : Tamilazhan Component No : 002 Component Name : 13t Sprocket Tool No : 002	Prod.	Prod.	Struck Up	Prod.	Prod.	Prod.	Struck Up	Prod.	Prod.	Prod.	Prod.
Machine No : 250T HYDREL Operator Name : Siju Component No : 056 Component Name : Moving Stop	Idle Personal	Production Stopped	Idle	Idle	W.F Tool	Tool Setting	W.F Approval	W.F.A Ins	Coil Loading	Coil Loading	W.F.I.

Time Specification	12.45	12.57	1.05	1.15	1.21	1.27	1.32	1.39	1.45	1.55	2.01	2.15
Machine No : 100T LGB Operator Name : P. Nanjappan Component No : 092 Component Name : Lever Tool No : 092	Waiting For Tool (M/C Idle)	Waiting For Tool	Waiting For Tool	Tool Setting	Tool Setting	Tool Setting	Tool Setting	Tool Setting	Tool Setting	Tea	Trial	Coil Unloading
Machine No : 100T ESSA Operator Name : Sundarajan Component No : 013 Component Name : Plate Clutch Drive Tool No : 013	Lunch	Lunch	Prod.	Prod.	Prod.	Prod.	Prod.	Prod.	Prod.	Tea	Prod.	Coil Feeding
Machine No : 160T HYDREL Operator Name : Tamilazhan Component No : 002 Component Name : 13t Sprocket Tool No : 002	Coil Loading	Coil Loading	Coil Loading	Coil Loading	Prod.	Prod.	Prod.	Prod.	Prod.	Tea	Prod.	Prod.
Machine No : 250T HYDREL Operator Name : Siju Component No : 056 Component Name : Moving Stop Tool No : 056	In.F Inspection (Approval) From Q.C)	Setting Coil Hand Feeding (SCHF)	SCHF	SCHF	Manual Feeding	Manual Coil Feeding	Manual Coil Feeding	Manual Coil Feeding	Manual Coil Feeding	Tea	Manual Coil Feeding	Manual Coil Feeding

[Assembly Of Manual Coil Feeding]

Time Specification	2.29	2.32	3.05	3.15	3.22	3.29	3.35	3.42
Machine No : 100T LGB Operator Name : P. Nanjappan Component No : 092 Component Name : Lever Tool No : 092	Winding the coil or (coil unloading)	Coil Unloading	Coil Feeding	Idle official	-	Entering Job Sheet	Machine Cleaning	Collecting Components
Machine No : 100T ESSA Operator Name : Sundarajan Component No : 013 Component Name : Plate Clutch Drive Tool No : 013	Production	Production	Production	Production	Production	Entering Job Sheet	Entering Job Sheet	Component Cleaning
Machine No : 160T HYDREI Operator Name : Tamilazan Component No : 002 Component Name : 13t Sprocket Tool No : 002	Production	Production	Production	Production	M/c Maintenance	Collecting components	Entering Job Sheet	Clearing Component
Machine No : 250T HYDREL Operator Name : Siju Component No : 056 Component Name : Moving Stop Tool No : 056	Air Setting	Struckup	Production	Production	W.F. R.m.	Coil Loading	Coil Loading	M/c Cleaning

SAMPLE STUDY

[Ist SHIFT] [19.7.2001]

PRODUCTION = 65

N = 212

= 29%

5% $= 2\sqrt{p(1-p)/N}$

$= 2 \times \sqrt{(0.306 \times 0.694)/212}$

= 6.3 %

SHOP EFFICIENCY	=	40%
MISCELLANEOUS ACTIVITIES	=	60%
PRODUCTION	**=**	**29 %**
Coil Loading = 45, N = 212	=	21.2%
Tool Setting = 35 , N = 212	=	16%
Idle = 29, N = 212	=	13.6%
Trial = 2, N = 212	=	1.8%
Struck Up = 8 , N = 212	=	3.7%
Waiting for tool = 8, N = 212	=	3.7%
Inspection = 8, N = 212	=	3.7%
Official idle = 10, N = 212	=	4.7%
Miscellaneous	=	2.8%
Total	=	100 %

SAMPLE STUDY
ANALYSIS

SAMPLING STUDY:

N	=	413
p	=	175
p	=	175 / 413 = 0.423
1-p	=	0.577
A	=	$2 \sqrt{p(1-p)/N}$
	=	$2 \times \sqrt{(0.423 \times 0.577)} / 413$
	=	0.04
	=	4%

Production Efficiency	=	40%
Miscellaneous Activity	=	60%

For a company the production efficiency should be 40% then only the company can earn profit. But here the shop efficiency is 29% where as the miscellaneous efficiency is about 71% most of the time is wasted for coil loading, tool loading, tool unloading, coil unloading, trail checking, idleness of the labour, struck up etc., they are explained below. If necessary actions or if suitable steps are taken to reduce the coil loading and unloading time and also tool setting time. Suppose if we concentrated on those fields we can improve the shop efficiency to great extent which ultimately improve the profit. The sample study of other for 400 observations are taken and found that the sample study lies within the limit (i.e) 5%.

Cost Analysis:

It is defined as a system of accounts which systematically and accurately records every expenditure in order to determine the cost of a product after knowing the different expenses incurred in various departments.

Cost Analysis Procedure:

The planning department sets down the requirement and specification types, quantities of materials, drawings, lays down the methods and sequence of operations, machines to be used, allowed times and rates of labour. The main sequences of estimation are

1. To prepare the list of all the components of the product.
2. To decide which components should be made in the factory itself and which component should be procured from the market.
3. Determination of the weights of the materials with various allowances.
4. Determination of the material cost either at market price or at a forecast price.
5. Determination of labour cost of each operation from performance times and wage rates, including manufacturing and testing.
6. Determination of cost of necessary special tools or equipment etc.
7. Determination of prime cost by adding labour cost into material cost.
8. Determination of factory on cost and generally overhead charges.
9. Determination of package and delivery charges.
10. To decide whether discount is to be allowed or not.
11. To calculate the total cost.

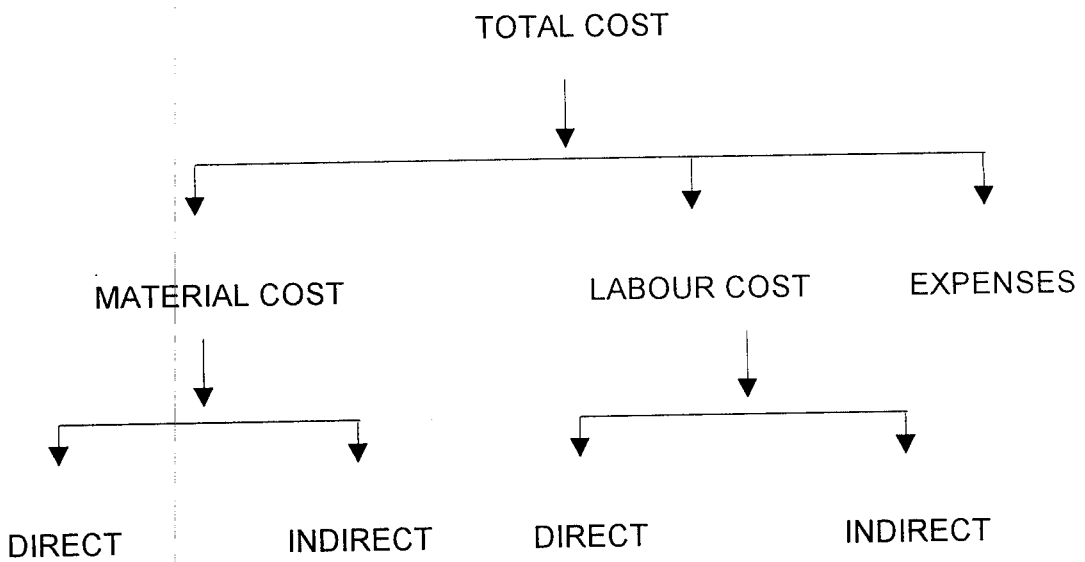
Types Of Cost :

The total cost is classified into three main elements. They are

i. Material cost

ii. Labour cost

iii. Overhead expenses



Material Cost :

Material cost is divided into two groups namely

i. Direct Material

ii. Indirect Material

Direct Material Cost :

Direct material is that material which becomes a part of the product. It is the material which is to be consumed in the manufacturing of a product and which can be measured and charged directly to the cost of the product.

Eg: Steel used in manufacturing of a shaft.

Wood used for making a chair.

Description Of Direct Material :-

1. All materials specially purchased for a particular job, order or process.
2. All components that are produced or purchased.
3. All materials passing from one operation to another.
4. Primary packing materials like cardboards, wrappings cartons etc.

DIRECT MATERIAL is also called as "PRIMARY COST MATERIAL", "PROCESS MATERIAL", "STORE MATERIAL", etc.

Thus the cost associated with purchase of materials is called direct material cost.

Indirect Material Cost :

Indirect material is that material which cannot be traced as a part of the product. It is the material required for maintaining and operating the plant and equipment but cannot be a part of the product.

Thus the cost associated with indirect materials is called as indirect material cost.

Eg. Lubricants, cotton waste, grease, coolants and allied materials.

Labour Cost :

The second important element of cost is labour cost. Labour generally constitutes 50% of total cost to produce an article. The labour cost is classified into two types namely

Direct labour cost

Indirect labour cost.

Direct Labour Cost :

Direct labour is one which is directly employed in manufacturing operation. It is the labour which actually processes the material either manually or with the help of machines. The wages of such labour can be charged directly to job under preparation. Thus the workers or operators engaged for operating on various production machines in different shops like machine shop, welding shop, sheet metal shop etc are known as direct labour.

Direct labour is also called as "PRODUCTION LABOUR", "OPERATING LABOUR", "PROCESS LABOUR", etc.

Indirect Labour :

Indirect labour is the non-productive staff engaged upon general service connected with the running of a factory as a whole. It is the labour which helps the productive labour in performing their duties.

Eg. Foreman, supervisors, storekeepers, chowkidars, crane drivers.

Determination Of Labour Cost :

Determination of labour cost is complicated problem than calculating material cost. To find out labour cost one must have the knowledge of all the operations which are carried out for production of the component or product, tools, machines to be used and the departments in which the product is to be manufactured. For calculation purpose, the operation time at rate per hour of different operation must be known.

Now for calculating time required for a particular job following considerations should be taken into account.

a. Setup time.
b. Operation time.
    i. handling time.
    ii. Machining time.
c. tear down time.
d. Miscellaneous allowance.
    i. personnel allowances
    ii. fatigue allowance
    iii. oiling and cleaning
    iv. tool sharpening & changing allowance.

Setup Time :

Before starting any operation, first we have to set the job tools and other auxillary equipment. So set up time is the time required for setting and fixing the jobs and tools on the machine.

Operation Time :

The operation time includes all the time necessary to perform all the elements of an operation. An operation is all the work done in a work piece by a worker till the elements of operation repeat themselves.

The operation elements are divided into

i. handling elements

ii. Machining elements.

Handling Elements:

Handling elements are considered to be comprising all physical movements by the operator that are necessary to prepare the job piece for machining and disposing of the job piece after the machining process has been completed. they contribute to the loading and unloading processes.

Machining Elements :

Machining elements are those which are performed by the machine and include time from the start when the tool touches the work to the end when the tool leaves the work.

Tear-Down Time :

Tear down time starts when the last part or element of operation has been completed. It includes the removal of tools used on the operation.

Miscellaneous Allowances :

Besides above factors there are other factors which are taken into account while calculating the time taken to complete a job or a batch or products. A worker cannot work for 8 hours continuously without rest. Also efficiency decreases as the time pass due to fatigue etc. He also requires time for tool sharpening, checking measurements and personnel calls. These allowances generally consume 13% of total time. Some of the allowances are as follows.

i. Personal Allowance :

This time allowed to a worker for his personal needs like going to rest room, smoking, having a cup of tea, going to lavatories, to take water, for personal cleanliness etc, is called personal allowance. Generally 9% of total time is allowed for personal allowance. These are times of relaxation. Therefore a personal allowance must be added to the estimate in addition to the rest period.

ii. Fatigue Allowance :

A worker cannot work whole of the day with same speed. After sometime he starts feeling some tiredness caused by excessive work. Poor lighting, poor ventilation and machine noises etc. also routine work reduces his efficiency towards the end of the day. About 2% of total time is allowed for fatigue allowance.

Expenses:

Apart form material and labour cost in each factory there are several other expenditures such as a cost of special layounts, insurance, depreciation of machines and buildings, building rent, cost of transportation, selling and distribution expenses, telegram charges, commissions to salaries and salesman, travelling expenses etc. All these expenditures are called as overhead expenses. Thus except direct material and direct labour cost, all other expenditures included for manufacturing a product is known as overhead expenses.

They are classified into

i. Factory expenses or production expenses

ii. Administrative expenses.

iii. Selling expenses.

iv. Distribution expenses.

1. Factory Expenses :

These expenses cover all indirect expenditures incurred by the undertaking from the receipt of the order until its completion ready for dispatch. Factory expenses are also known as factory on cost, production overhead, factory overhead, works oncost. Some examples of factory expenses or production expenses are

i. Rent, rates, insurance chargeable against the works.

ii. Indirect labour eg, supervisor, such as salaries of foreman, factory manager etc.

iii. Consumable stores and all forms of indirect material such as cotton waste, grease, oil etc.

iv. Power charge, gas, electricity, internal transport etc.

v. Depreciation, maintenance and repair of building, plant, machine etc.

2. Administrative Expenses :

These include all the expenses incurred on managerial or administrative staff for the planning and policy making work. Some examples of administrative expenses are

i. Salaries of directors and managing directors.

ii. Expenses of direct amenities like telephone, coolers and other modern equipments.

iii. Travelling expenses for attending meetings etc.

iv. Stationary, auditing expenses.

v. Insurance of employees and building.

3. Selling Expenses :

These consist of the expenditure spent towards securing orders and finding or retaining markets for the products manufactured. The selling expenses are

i. Advertising and publicity expenses

ii. Travelling expenses of sales engineers

iii. Cost of preparing tenders and estimates.

iv. Expenses of making blocks and posters.

v. Salaries of sales department staff including sales manager, salesmen, etc.

4. Distribution Expenses :

These are the expenses which are paid for the distribution of the product. It includes packing cost, dispatching to customer, this type of expenses include.

i. Cost of packing

ii. Loading charge, unloading charge, transport cost.

iii. Expenses of transportation and vehicles.

iv. Finished stock storage.

Cost Of Product (Ladder Of Cost) :

The different components of cost and their relations are summarised below

i. Prime cost

ii. Factory or work cost

iii. Production cost

iv. Total cost

v. Selling price.

i. Prime Cost:

Prime cost or direct cost is the sum of the cost of direct material, direct labour, and other direct expenses.

Prime cost = Direct Labour cost + Direct Material cost + over head expenses.

ii. Factory cost :

Factory cost includes all the expenses necessary to produce the various articles. It includes salary for supervisor, time keeper, rent and rates on the factory, charge for power, maintenance of building, depreciation on machine.

Factory cost = prime cost + factory on cost.

It is the sum of prime cost and factory on cost. Factory cost is also called works cost.

iii. Production Cost :

It is the sum of factory cost and administrative expenses.

Production cost = factory cost + administrative expenses.

iv. Total Cost :

It is the sum of production cost, selling expenses and distribution expenses.

Total cost = production cost + selling expenses + distribution expenses.

Total cost is also called as selling cost.

v. Selling Price :

It is nothing but sum of total cost and profit.

Selling price = total cost + profit.

vi. Market Price Or Catalogue Price :

It is nothing but some percentage of discount allowed to the distributor of product is added into the selling price and the result obtained is called the market price.

DETAILS OF FINE BLANKED COMPONENTS

Prod No	NAME	PERIMETER LENGTH				RAW MATERIAL GRADE	STRIP SIZE TOLERANCE		FEED STEP	MATERIAL REQUIRED	COMPONENT	
CODE	COMPONENT	BLANKING	PIERCING	P1	P2		WIDTH (mm)	THICKNESS (mm)	mm	COMP(gm)	WT(gm)	NO
001	SPROCKET-13T	248.6	73.1	0	0	16 MNCR 5	66	7.2	60.5	243.74	91.9	1
015	PLATE SHIFT DRUM STOPPER	134.5	10.7	10.7	19.1	IS513-D	47.0	3.20	35	44.63	19.1	1
013	PLATE CLUTCH DRIVE	314.2	31.00	0.0	0.0	IS513-D	104.0	1.58	103	143.49	35.31	1

DATA FROM COMPANY ANNUAL REPORT

MATERIAL COST:

OPENING STOCK :

Raw Materials	=	66,50,759.00
SemiFinished goods	=	15,08,550.00
Finished goods	=	1,04,25,628.00

PURCHASES:

Raw Materials	=	3,86,46,166.13
Packing materials	=	3,94,196.29
Trading goods	=	2,958.00

CLOSING STOCK:

Raw Materials	=	97,61,952.00
SemiFinished goods	=	36,34,465.00
Finished goods	=	1,07,43,752.00
MATERIAL COST	**=**	**Rs. 3,34,88,089.84**

LABOUR COST:

Salary, wages, Bonus, gratuity etc(direct)	=	57,15,578.59
Contribution to Profident Fund	=	4,17,559.00
Staff Welfare(indirect)	=	3,66,310.22
TOTAL LABOUR COST	**=**	**Rs. 64,99,447.81**

EXCISE DUTY AND SALES TAX :

Excise duty	=	1,55,47,030.00
Sales Tax	=	8,09,698.91
Others	=	423.00
TOTAL EXCISE DUTY	**=**	**1,63,56,305.91**

OVERHEAD EXPENSES:		
Processing charge (blanking)	-	1,56,55,939.32
Consumption of stores, spare parts	-	8,90,435.70
Rates and taxes	-	64,250.00
Printing and stationary	-	1,76,467.75
Postage, telegram & telephones	-	28,806.72
Motor vehicle maintenance	-	20.00
Travelling & conveyance	-	3,42,131.30
Warranty claims & damages	-	6,503.44
Service charges	-	20,000.00
Freight packing & forwarding	-	3,82,951.75
Commission and discount	-	7,38,134.14
Periodicals and subscription	-	200.00
Insurance	-	33,312.00
Miscellaneous expenses	-	81,085.53
REPAIR AND MAINTENANCE :		
Buildings	-	1,22,939.15
Machinery	-	27,78,607.45
Other Assets	-	2,29,878.58
Lease & Rental on machinery	-	44,109.00
INTEREST :		
Bank charges	-	82,711.16
Depreciation	-	19,14,872.21
CONTRA		
Purchase - transfer	-	79,40,282.26
Service charges payment - transfer	-	63,10,842.42
Processing Charges - transfer	-	7,72,217.50
Interest Payment - transfer	-	47,76,000.00
Excise Duty - transfer payment	-	19,55,539.00
TOTAL OVERHEAD EXPENSE	**-**	**4,53,48,296.38**
TOTAL SALES	=	10,90,62,042.07
PROFIT	**=**	**Rs. 73,69,902.13**

CALCULATION

LABOUR COST	=	64,99,447.81
MATERIAL COST	=	3,34,88,089.84
TOTAL OVERHEADS	=	4,53,48,296.30
SALES	=	10,90,62,042.02
EXCISE DUTY	=	1,63,56,305.91

MATERIAL COST

DIAMETER OF THE COMPONENT	=	66 mm → 6.6 cm
THICKNESS OF THE COMPONENT	=	7.2 mm → 0.72 cm
VOLUME OF THE MATERIAL	=	$\Pi(d^2 t) /4$ cm^3
	=	$\Pi(6.6^2 * 0.72) /4$ cm^3
	=	24.620112 cm^3
WEIGHT OF THE MATERIAL	=	24.62 * 7.85
	=	193.2678792 g/ cm^3
COST OF THE MATERIAL	=	22 / kg
COST OF THE COMPONENT	=	193.26 * 0.022
	=	Rs 4.25189 / Piece.

LABOUR COST $= \dfrac{\text{DIRECT LABOUR}}{\text{SALES}}$

$= \dfrac{6499447.81}{10,90,62,042.02}$

= Rs 0.0592 / Piece

OVERHEAD EXPENSES

700% OF DIRECT LABOUR

=Rs.41

EXCISE DUTY AND SALES TAX

$$= \frac{\text{TAX}}{\text{SALES}}$$

$$= \frac{1,63,56,305.91}{10,90,62,042.02}$$

= Rs 0.1499

TOTAL COST = LABOUR COST+MATERIAL COST+OVERHEAD +EXCISE DUTY

=Rs 46.66

MANUFACTURING COST OF ONE COMPONENT =Rs 46.66

Chapter - V

Results & Discussion

RESULTS AND DISCUSSION :

Tool Loading Time :

Standard time for tool Loading time 100 T LGB = 52Min

Coil Loading Time :

Standard time for Coil Loading time 160T HYDREL = 26.55min

Standard time for coil loading in 100 T ESSA = 37.05 min

Standard time for coil loading & unloading in 100 T ESSA = 43.00 min

Blanking Time :

Blanking Time for 13 T sprocket = 5.83 sec/stroke

Blanking time for Plate Shift Drum Stopper = 3.05 sec/stroke

In fine product division the production efficiency is less whereas most of the time is spend for tool loading, coil loading, idleness of the labour. There is no standard normal time for miscellaneous activities like tool loading & coil loading so I conducted time study to obtain standard time for tool loading coil loading and blanking operations. I took blanking time for some components like sprockets and plate shift drum stopper. If we minimize the tool loading and coil loading time we can improve the shop efficiency, which ultimately improves the profit of the company and decreases idle of the labour, wastage of material etc. I conducted sample study technique from sample study technique I found coil loading constitutes about 21.2 % of the total time. Tool setting constitutes about 16% of the total time. Idleness constitute 13.6% of the total time. Whereas production constitutes about 29% only. Therefore we should reduce miscellaneous activities like tool loading, coil loading time.

Chapter - VI

Conclusion

CONCLUSION

Time Standards:

Time standards were worked out for various operations of some fast moving components in Fine Blanking section. It is found that by adopting this standards the company can improve the production by 20%.

The time study concepts also be adopted for other components that are under production. Since the production process involved in the manufacture of these components are almost the same.

In future there is a scope to adopt various time study techniques like predetermined motion time system and motion time measurement.

Cost analysis:

The company is adopting an adhoc percentage to recover the overhead expenses it is found that this figure has to be revised upwards so that the total overhead expenses can be recovered by the company through the sales process.

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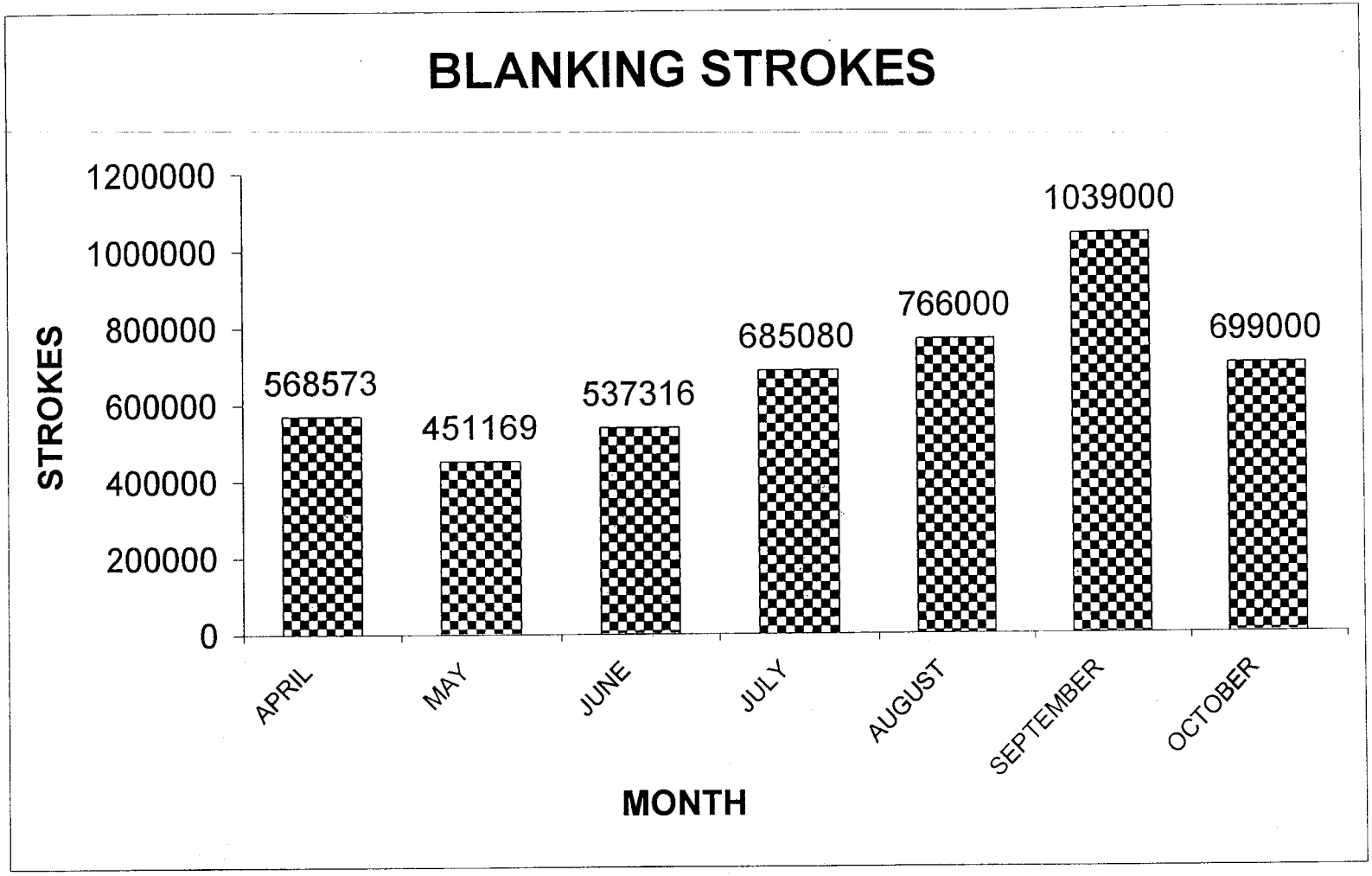
Appendix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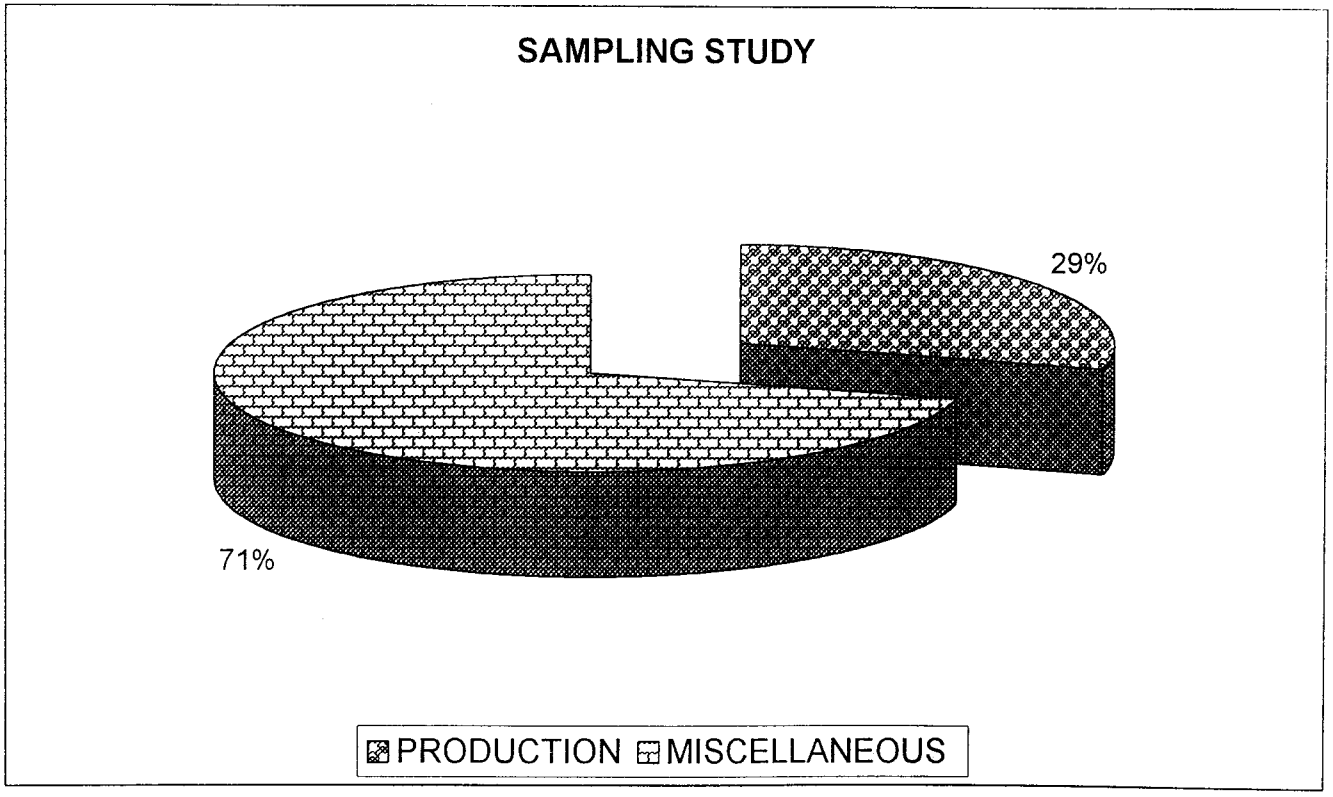
SEPTEMBER
OCTOBER
MONTH


SAMPLING STUDY
29%
71%
PRODUCTION
MISCELLANEOUS