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STUDY ON TECHNOLOGY MANAGEMENT IN TONING UP THE BALL PRODUCTION IN STUMPER INDUSTRIES

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BONAFIDE CERTIFICATE

Certified that the Project report titled "**STUDY ON TECHNOLOGY MANAGEMENT IN TONING UP THE BALL PRODUCTION IN STUMPER INDUSTRIES**" is the bonafide work of **Mr. KANNAN C** who carried out the work under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other 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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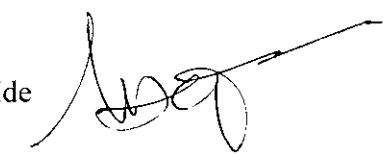

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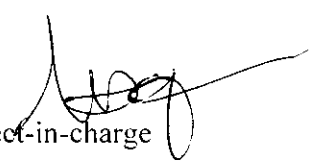

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Abstract

In any process in order to achieve maximum productivity need to have a balanced utilization ratio between men to machine. This project refined more about the men-machine utilization. For the effective implementation undergone a vivid study about the process, workers utilization, machine utilization and the quality control standard adherence.

Following the study and with the statistical report with these parameters, identified some determined areas where the automation can be implemented effectively against or in-phase with the workers so that organization will have maximum production.

This project titled as " **Study On Technology Management in Toning Up the Ball Production in Stumper Industries**" was done to ensure identifying and analysis the present production techniques and to implement the automation tools to maximize the productions and in order to focus on the organizational growth by implementing the advanced technological equipments. Impact on the technological up gradation at workplace is analyzed and appropriate improvement, management strategies are suggested as the end result of this study.

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Chapter 1 - Introduction

Products produced by any company either are based on a set of technology and the set of competencies within the company or are dependent on technology and other companies. In today's rapidly changing technological environment, there is a great need for proper implementation and supervision of new technologies.

To bring these streamlined and customized the strategies, company requires strong foundation and experience in handling such situations. The modern technologies available in the global market need to be analyzed in means of various factors like economic, social, political, ecological, technical, educational, personal health, safety related, and many more.

Choice of technology helps in identifying the best technology. Effective choice is based on preselected criteria for a technology to meet specified needs. Comparative advantage is a mechanism to identify the strengths to select technologies. Technology scale up strategy has to be undertaken to identify whether it is suitable technology for the enterprise or it is better to import technology from outside.

Firms have often been credited with continual improvements in process technology. This has led to lower costs and higher product quality. Process technology changes modify the way a firm conducts its business. Thus, changes in the process technology may bring about changes in the organization, including its human resources practices, logistics, and marketing functions.

Process and product technologies are important for the ultimate success of a firm. Indeed, in addition to developing technological capabilities, the deployment of capabilities in products, and process is central to the value creation by firms.

Introduction or adaption of new technology, or technological change, can have both positive and negative effects on organizational productivity. Productivity is the relationship between output and inputs of business system. Higher the ratio between the two more is the productivity.

Introduction of new technology may increase organizational productivity if new technology facilitates lower consumption of inputs, lower processing time, lower wastages, lower defective, more ease and safety in manufacturing and more efficiency.

1.1. RESEARCH BACKGROUND - DESCRIPTION OF MANUFACTURING INDUSTRY

Process technology pertains to the techniques of producing and marketing goods and services. Process technology also includes work methods, equipments, distribution and logistics. Our study determines the impact of introducing new technology in automating process. The existing system undergoes process change which will create an impact on the productivity of the firm, quality of the product, processing time, reduce wastages, meet the market demand, and increase the revenue of the firm and more ease process. The impacts of introducing new technology are measured using financial, production and statistical tools and techniques.

1.1.1. COMPANY PROFILE

Stumper Industries, A business conglomerate incorporated in the new millennium was known as Rubbers since 1997. We have already achieved phenomenal success and recognition in India under the table guidance of our founder Mr.Prabaharan. We manufacture Rubber play balls for street cricket, Baseball; Throw Ball, etc. (Both indoor and outdoor). Our corporate premise is located in the heart of the Temple City Madurai.

The state-of-the-art factory is located in -Maruthur, Madurai. Stumper Industries is always dedicated to serving our customers better than any of our competitors by providing high quality products and services. We are instrumental in developing products by implementing technological innovations, on a large global scale.

At Stumper Industries we are focused to offer quality products with automated production to match each specific requirement of the industry and customers. We are using experts with hands on real world experience for delivering value additions to enhance our customer satisfaction. The combined work force of over two hundred persons is focused and ready to turn up for the evolving needs of tomorrow. The success of our development methodologies is manifest in product design, development, testing and monitoring. We are committed to find new ways of improving through professional expertise and outlining new goals to reach our objective.

1.2. IDENTIFIED PROBLEM

Man power is the main focus of the Stumper Industries because of the scarcity in labour Production from some of the machine is not meeting the daily demand. Stumper Industry has started concentrating on the steps need to improve the current process by undergoing various study and by using recent developments in the automation.

The analysis is made with the existing process in our organization and with the current ability of the production unit. From this analysis new process technology should be evolved which will increase the productivity, quality of product manufacturing, reduce manually interruption overall process and satisfying the customer's needs.

1.3. NEED FOR STUDY

The Study is done mainly to focus on existing process and to identify the major areas where the process can be changed or improved by implementing the automation machine. Also by introducing the automation in highly risky areas the damage and the risk to vulnerability can be reduced considerably. The reports and the recommendations at the end of this study can help out the process to have maximized production with improved quality.

1.4. OBJECTIVES & SCOPE:

Primary Objective:

- To analyze the existing process and to identify the effective utilization of men and the machines.

Secondary Objective:

- Identifying the lacking process.
- Identifying the resource utilization of both men and machine.
- Analyzing and identifying the major areas where automation can be implemented.
- Suggesting suitable automated process to maximize the productivity.

SCOPE OF THE PROJECT

The end result of the project is to increase the productivity and the quality of the product by reducing the men power and by introducing the new automated machines wherever it is applicable. The study will help to meet the annual demand.

1.5. DELIVERABLES

Effective men and machine utilization for any existing process can be reached at the end of this study. Also the report can be more effective as with the help of the comparison chart which is derived from the Existing process to the current demand. As due to the adherence in the new automation it assures the improvement in the quality and increased productivity.

Chapter 2 – Literature Survey

2.1. REVIEW OF LITERATURE

2.1.1 CASE STUDY 1: BAG-IN BOX TENNIS BALL GRADING LINE

This simulation model was developed to improve the existing production facilities for one of the world's leading producers of tennis ball manufacturer. Plant management had formulated some process modifications and wanted to objectively evaluate the effects of each one. By using a simulation model, plant engineers were able to see the effects of the aforementioned changes in their model before they were introduced into the actual plant systems.

The main objective of the study was to understand the behavior of the existing packaging system and to assist in designing a new and more efficient one. First, a base model, operating under original specification and parameters, was developed for evaluation. Then, alternative scenario's and suggested system modifications, were modeled and evaluated to determine the optimal line configuration.

Several scenarios in the packaging system were evaluated to determine a configuration that would optimize system throughput. One system modification suggested that the same production efficiency could be achieved by removing a bagging machine from the packaging lines. However, when only one case packer was used in the same system, throughput decreased. Current system difficulties could be resolved by modifying the system configuration, or by increasing the speed of the conveyors.

CASE STUDY 2: SIMULATION MODEL OF A BOTTLING LINE

A major producer of baby-food products desired additional information about their existing bottling system and recommendations to improve production efficiency. To meet the client's goal, they simulated the existing design and then modeled several different scenarios to optimize system throughput.

First, a base model operating under original specifications and parameters was developed for evaluation. Then, alternative scenarios and suggested system improvements were modeled and evaluated to determine the line configuration that would optimize system throughput.

The process simulation allowed engineers to test the system and identify inefficiencies. This study led to the most effective system configuration by quantifying the effect of changes to the system.

2.1.3 CASE STUDY 3: AUTOMATION PLANNING FOR MANUFACTURING

A consumer products manufacturer was considering the purchase of new automation to reduce manpower requirements. Simulation was used to estimate the manpower requirements. Simulation was used to estimate the manpower requirements necessary to meet new customer requirements.

The client is a water faucet manufacturer. The company's strength is that they produce a huge variety of high quality faucets and are able to meet the needs of virtually and customer. Their production system is rather antiquated, resulting in high manufacturing cost due to heavy labor requirements and large inventories.

The objective of the simulation was to provide the client with estimated for the manpower savings that would be achieved if the new automation were purchased. This would allow the company to determine if the purchase of new automation was valuable investment.

2.1.4 CASE STUDY 4: TRANSLATION OF BUSINESS OBJECTIVES INTO PERFORMANCE IMPROVEMENTS INITIATIVES

A company with 80 locations was incurring huge costs (time and money) to support multiple products. In addition, customers complained frequently about the time required to receive the ordered products.

Company went for an analysis to find the cause for the delay in manufacturing the products. They developed and implemented a standardization strategy for all locations. Implemented an evaluation mechanism to measure customer satisfaction and insure that standards and process were strictly followed.

As a result customer complaints decreased by 94% due to on time deliver of the products and also technology maintenance expenses dropped by 40% within 12 months.

2.1.5 CASE STUDY 5: IMPLEMENTATION OF COMPANY WIDE INITIATIVE USING RAPID ROLL-OUT METHODOLOGY FOR PRODUCTIVITY IMPROVEMENT

A global client needed to identify best practices and implement a manufacturing system for 40,000 employees worldwide. They measures taken to improve productivity were they identified best practices for 20 departments in 12 manufacturing plants within the company, performed a gap analysis, then developed and/or redesigned business processes. developed a training program with over 50 modules and leveraged the client's employees for the implementation of sites throughout the world.

After the implementation of measurements they saved $250,000 due to utilizing the client's employees to conduct implementation training and coaching, decrease of 67% in the company's raw work in process inventory and culture change supported the best practice implementation.

2.2 RESEARCH GAP

A number of studies and research has been conducted on the process change the firm has to undergo to increase their productivity and quality of the product. Also a number of studies have been made relating to the troubles faced by the Management and employees when firm implement such process change. Different studies have concentrated and analyzed on various problems like determining the stress undergone by the employees, the company's trend compared in the market, the conflicts and the issues faced that can happen for the management in customer's satisfaction. The management focuses for delivery of the services with the temperament of the clients.

Such studies and researches imply that the management should seek for the higher customer satisfaction level. The managers should get the feedback from the client managers quarterly and improvise the process and product technology.

This study will project the valuable suggestion to the management of the firm in means of productivity improvement according to the demand they have in the market, increase the quality of the product, forecasting their revenue growth, utilization of the manpower by implementation of automation system and process change in the current production system.

Chapter 3 - Literature Survey

3.1 TYPE OF PROJECT

The study has been conducted in existing process carried out by means of man power and machine power. "The Study Process Technology Change" identifies the impact on productivity, revenue growth, quality and labor utilizations. This Study will produce some valuable management strategies, which will help the company to grow towards the future targets. The research design used for the study is "descriptive research design".

Descriptive research is also called Statistical Research. The main goal of this type of research is to describe the data and characteristics about what is being studied. The idea behind this type of research is to study frequencies, averages, and other statistical calculations. Although this research is highly accurate, it does not gather the causes behind a situation. Descriptive research is mainly done when a researcher wants to gain a better understanding of a topic. It is quantitative and uses surveys and panels and also the use of probability sampling.

3.2 TARGET RESPONDENTS

The target respondents are workers and supervisor who mainly involves in the existing 35 process.

The major processes are:

1. Cutting process.
2. Weighing process-I.
3. Cleaning process.
4. Weighing process-II.
5. Weighing process-III.
6. Cleaning process-II.
7. Weighing process-IV.
8. Grinding process.
9. Weighing process-V.
10. Weighing process-VI.

11. Mixing process-I.
12. Mixing process-II.
13. Weighing process-VII.
14. Mixing process-III.
15. Sheet cutting.
16. Weighing process-VIII.
17. Slug making process.
18. Weighing process-IX.
19. Powder coating process.
20. Slug loading to the mold.
21. Mold stacking process.
22. Carrier loading.
23. Curing and cooling.
24. Carrier unloading.
25. Mold releasing.
26. Mold opening.
27. Releasing the ball.
28. Mold cleaning.
29. Grading.
30. Printing.
31. Cleaning-III.
32. Packing.
33. Sack stitching.
34. Testing-I.
35. Testing-II.

3.3 ASSUMPTIONS, CONSTRAINTS AND LIMITATIONS

One of the major constraints the organization facing is it has its own confidential process like cleaning process-II, weighing process-IV, grinding process and weighing process-V. The worker has minimum knowledge about the process.

3.4 PROPOSED SAMPLING METHOD

The sampling technique adopted is Quantitative method.

Quantitative methods help managers tackle the intricate and complex problems of business and industry. These methods can be used to deploy resources efficiently, project long-term capital requirements, forecast demand and estimate customer preferences. Quantitative methods provide an analytical and objective approach to decision making. A quantitative method helps to analyze and interpret the relationships between data.

Here in our study, we consider the number of process as population and the five samples for each process as a mock-up.

3.5 DATA PROCESSING

Data, or facts, may be derived from several sources. Data can be classified as primary data and secondary data. The data mainly used in the project is primary data.

Primary data is data gathered for the first time by the researcher; secondary data is data taken by the researcher from secondary sources, internal or external. The primary data collected from the existing process are:

- Number of works in each process.
- Number of machines in each process.
- Number of operations in each process.
- Operation time for the process.
- Number of unit.
- Working hours.
- Machine capacity.

Process Name & Workers:

1	Cutting process.	3
2	Weighing process-I.	1
3	Cleaning process.	5
4	Weighing process-II.	2
5	Weighing process-III.	1
6	Cleaning process-II.	2
7	Weighing process-IV.	2
8	Grinding process.	2
9	Weighing process-V.	2
10	Weighing process-VI.	2
11	Mixing process-I.	2
12	Mixing process-II.	2
13	Weighing process-VII.	2
14	Mixing process-III.	5
15	Sheet cutting.	10
16	Weighing process-VIII.	2
17	Slug making process.	9
18	Weighing process-IX.	3
19	Powder coating process.	5
20	Slug loading to the mold.	3
21	Mold stacking process.	4
22	Carrier loading.	1

23	Curing and cooling.	0
24	Carrier unloading.	1
25	Mold releasing.	1
26	Mold opening.	4
27	Releasing the ball.	4
28	Mold cleaning.	3
29	Grading.	6
30	Printing.	3
31	Cleaning-III.	7
32	Packing.	10
33	Sack stitching.	2
34	Testing-I.	1
35	Testing-II.	2

Table 3.5.1

Secondary data is data taken by the researcher from secondary sources. internal or external. The researcher must thoroughly search secondary data sources before commissioning any efforts for collecting primary data.

The secondary considered are.

- Daily production rate.
- Maximum and minimum production rate in a year.
- Current targets.

Secondary data Table:

DATA		
Production Target /year	104000	bags
Balls / bag	300	Nos
Total no. of balls/year	31200000	balls
No. of working days/month	26	days
Production Target/day	100000	balls
No. of balls per batch	300	balls
No. of batches required per day	333.3	batches
No. of batches required to meet daily balls	334	batches
Target Production of balls/day	100000	balls
Actual Max. No. of Balls/Day produces in two months	43988	Balls
Actual Min. No. of Balls/Day produces in two months	15118	Balls/Day
Actual Ave. No. of Balls/Day produces in two months	32830	Balls/Day
Working hrs per day	19.5	hrs/day
No. of shifts	2	/Day
Working hrs per shift	9.75	hrs/day
Min. No. of Workers/Shift	90	Nos

Table 3.5.2

3.6 TOOLS FOR ANALYSIS

The major tools used in this project are;

1. Average method.
2. Technical tools.

Chapter 4 – Data Analysis and Interpretation

4.1 DATA ANALYSIS

Data analysis is done with the view to identify the efficiency of the man power and the machine power and to implement the process in such a way where the man power and machine power utilization can be identified.

Through data analysis can identify the major areas where high resources are needed and to provide the alternative solution in those areas to reach the maximum productivity. Here the alternative solution mainly denotes the automation in the process.

In our course of action the MIXING PROCESS-I plays a key role as the output of this process is directly proportional to the output or the total productivity of the rest of all process. The number of batches is directly proportional to the operational time (10 min 35 sec).

S.NO	Process Name	No. Of Machines	No. Of batches/Hour
1	Mixing Process-I	3	16.98

Table 4.1.1

The data analyses done under major process are below:

Process Analysis-1 (Cutting process):

This process mainly comprises of five major operations they are bundle picking, bundle transfer, loading, cutting and picking and transfer. The maximum number of workers involved in this process of five operations are three (w1, w2 and w5). The maximum capacity of this process is 2, 90000 balls per day. As per our analysis, the maximum or peak production is only 43,988 balls per day. In order to reach the maximum production of 100000 balls per day can utilize the available three workers in this process. The machine utilization in this process is just 34%.

S.No	Process Name	Process Time (mines)	Total No. Of Operators/shift	Production Capacity/Day
1	Cutting Process	6.69	3	291552.45

Table 4.1.2

Process Analysis-2 (Weighing process):

This process mainly consists of three operations like picking and loading, weighing and adjusting and picking and transfer. The maximum number of workers involved in this process is one (w1). The maximum capacity of this process is 2, 80800 balls per day. As per our analysis, the maximum or peak production is only 43,988 balls per day. In order to reach the maximum production of 100000 balls per day can utilize the available one worker in this process. The machine utilization in this process is just 36%. Ring

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Weighing Process	1.25	1	280800

Table 4.1.3

Process analysis-3 (Cleaning process):

This process mainly consists of seven operations like sack picking, transfer, sack opening and loading, cleaning, releasing, filling and transferring. The maximum number of workers involved in this process is five (w3, w4, w5, w1 and 2). The maximum capacity of this process is 46956.522 balls per day. The machine utilization in this process is just 213%. In this process don't have sufficient machine capacity to meet the demand. Hence forth this process has to be concentrated more and reviewed further to meet the demands.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Cleaning Process	13	5	469565.522

Table 4.1.4

Process Analysis -4 (Weighing process-II):

This process mainly consists of three operations like lifting/loading, weighing and adjusting and then transfer. The maximum number of workers involved in this process is two (w5 and w2). The maximum capacity of this process is 167142.86 balls per day. In order to reach the maximum production of 100000 balls per day can utilize the available two workers in this process. The machine utilization in this process is just 60%..

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Weighing Process-II	1.05	2	167142.86

Table 4.1.5

Process Analysis-5 (Weighing Process-III):

This process mainly consists of three operations like collecting, weighing and adjusting and then pouring into the pan. The maximum number of workers involved in this process is one (w5). The maximum capacity of this process is 329062.5 balls per day. The machine utilization in this process is just 30%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Weighing Process-III	1.07	1	329062.5

Table 4.1.6

Process Analysis-6, 7, 8, 9, 10 are confidential and the capacity of the workers and the machines used in this process are in such a way to meet the future production as expected.

Process Analysis -11(Mixing process-I):

This is one of the major and important process as rest of the production mainly depends on this mixing process. This process mainly consists of five operations like loading 1, mixing 1, loading 2, mixing 2, and unloading. The maximum number of workers involved in this process is two (w8 and w9). The maximum capacity of this process is 68432.169 balls per day. The machine utilization in this process is just 146%..

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Mixing Process-I	10.26	2	68432.169

Table 4.1.7

Process Analysis -12(Mixing process-II):

This process mainly consists of four operations like loading, mixing, cutting for proper mixing, unloading and transfer. The maximum number of workers involved in this process is two (w8 and w9). The maximum capacity of this process is 150428.57 balls per day. The machine utilization in this process is 67%...

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Mixing Process-II	7	2	150428.57

Table 4.1.8

Process Analysis -13(Weighing Process-VII):

This process mainly consists of three operations like loading, weighing and adjusting, unloading and transfer. The maximum number of workers involved in this process is two (w8 and w9). The maximum capacity of this process is 129202.45 balls per day. The machine utilization in this process is just 78%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Weighing process-VII	2.72	2	129202.45

Table 4.1.9

Process Analysis -14(Mixing Process-III):

This process mainly consists of four operations like loading, mixing, cutting, and unloading. The maximum number of workers involved in this process is five (w10, w11, w12, w14 and w15). The maximum capacity of this process is 58500 balls per day. The machine utilization in this process is just 171%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Weighing process-III	6	5	58500

Table 4.1.10

Process Analysis -15(Sheet Cutting):

This process mainly consists of three operations like loading, sheet cutting and splitting. The maximum number of workers involved in this process is ten (w12, w13, w 14, w15, w 16, w17, w 18, w19, w20 and w21). The maximum capacity of this process is 73894.737 balls per day. The machine utilization in this process is just 136%

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Weighing process-VII	2.72	2	129202.45

Table 4.1.11

Process Analysis -16 (Weighing Process-VIII):

This process mainly consists of six operations like sieving, loading, weighing and adjusting, unloading, mixing and transfer. The maximum number of workers involved in this process is two (w22 and w23). The maximum capacity of this process is 96939.01 balls per day. The machine utilization in this process is just 103%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Weighing process-VIII	3.62	2	96939.01

Table 4.1.12

Process Analysis -17 (Slug making Process):

This process mainly consists of eight operations like placing BA, picking, loading-I, loading –II, Appling load, removing quality and transfer. The maximum number of workers involved in this process is nine (w24, w25, w26, w27, w28, w29, w30, w31 and w32). The maximum capacity of this process is 101088 balls per day. The machine utilization in this process is just 99%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Slug making process	6.25	9	101088

Table 4.1.13

Process Analysis -18 (Weighing Process-IX):

This process mainly consists of four operations like collecting, transfer & loading, weighing & adjusting and transfer. The maximum number of workers involved in this process is three (w33, w34 and w35). The maximum capacity of this process is 87750 balls per day. The machine utilization in this process is just 114%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Weighing process-IX	2	3	87750

Table 4.1.14

Process Analysis -19 (Coating Process):

This process mainly consists of six operations like picking & transfer, loading, applying, unloading, counting and then transfer. The maximum number of workers involved in this process is five (w36, w37, w38, w39 and w40). The maximum capacity of this process is 137279.19 balls per day. The machine utilization in this process is just 73%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Coating Process	.77	5	137279.19

Table 4.1.15

Process Analysis -20 (Slug loading to mold):

This process mainly consists of three operations like picking & loading, closing and transfer. The maximum number of workers involved in this process is three (w41, w42 and w43). The maximum capacity of this process is 140400 balls per day. The machine utilization in this process is just 71%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Slug loading to mold	0.03	3	140400

Table 4.1.16

Process Analysis -21 (Mold Stacking):

This process mainly consists of eight operations like Carrier picking, locknut releasing, carrier placing, mold picking & stacking, closing mold, carrier fixture and carrier lifting & transfer. The maximum number of workers involved in this process is four (w44, w45. w46 and w47). The maximum capacity of this process is 87750 balls per day. The machine utilization in this process is just 114%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Mold stacking	.80	4	87750

Table 4.1.17

Process Analysis -22 (Carrier loading):

This process mainly consists of only two operations like picking & transfer, Lifting & hanging. The maximum number of workers involved in this process is one (w47). The maximum capacity of this process is 108000 balls per day. The machine utilization in this process is just 93%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Carrier loading	.36	1	108000

Table 4.1.18

Process Analysis -23 (Curing and cooling):

This process mainly consists of only one operation without any manual intervention like curing and cooling. The maximum capacity of this process is 65302.326 balls per day. The machine utilization in this process is just 153%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Curing and cooling	.36	0	65302.326

Table 4.1.19

Process Analysis -24 (Carrier unloading):

This process mainly consists of four operations like picking, lifting & loading, transfer and placing. The maximum number of workers involved in this process is one (w48). The maximum capacity of this process is 187200 balls per day. The machine utilization in this process is just 54%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Carrier unloading	0.13	1	187200

Table 4.1.20

Process Analysis -25 (Mold Releasing):

This process mainly consists of three operations like holding & loosening the carrier, pushing the mold and transfer. The maximum number of workers involved in this process is one (w48). The maximum capacity of this process is 140400 balls per day. The machine utilization in this process is just 71%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Mold Releasing	0.17	1	140400

Table 4.1.21

Process Analysis -26 (Mold Opening):

This process mainly consists of three operations like picking & holding, ball release and transfer. The maximum number of workers involved in this process is four (w49, w50, w51 and w52). The maximum capacity of this process is 140400 balls per day. The machine utilization in this process is just 71%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Mold Opening	0.03	4	140400

Table 4.1.22

Process Analysis -27 (Releasing the Ball):

This process mainly consists of three operations like picking & holding, Cleaning and transfers. The maximum number of workers involved in this process is four (w53, w54, w55 and w56). The maximum capacity of this process is 140400 balls per day. The machine utilization in this process is just 71%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Releasing the ball	0.03	4	140400

Table 4.1.23

Process Analysis -28 (Mold Cleaning):

This process mainly consists of three operations like picking & holding, cleaning and transfer. The maximum number of workers involved in this process is three (w57, w58 and 59). The maximum capacity of this process is 60171.429 balls per day. The machine utilization in this process is just 167%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Mold Cleaning	0,06	3	60171.429

Table 4.1.24

Process Analysis -29 (Grading):

This process mainly consists of three operations like picking, grading and transfer. The maximum number of workers involved in this process is six (w60, w61, w62, w63, w64 and w65). The maximum capacity of this process is 42120 balls per day. The machine utilization in this process is just 238%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Grading	0.17	6	42120

Table 4.1.25

Process Analysis -30 (Printing):

This process mainly consists of three operations like picking, printing and transfer. The maximum number of workers involved in this process is three (w66, w67 and w68). The maximum capacity of this process is 87750 balls per day. The machine utilization in this process is just 114%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Printing	0.04	3	87750

Table 4.1.26

Process Analysis -31 (Cleaning):

This process mainly consists of three operations like picking, cleaning and transfer. The maximum number of workers involved in this process is seven (w69, w70, w71, w72, w73, w74 and w75). The maximum capacity of this process is 109200 balls per day. The machine utilization in this process is just 92%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Cleaning	0.08	7	109200

Table 4.1.27

Process Analysis -32 (Packing):

This process mainly consists of seven operations like picking1, picking2, placing, closing, loading, secondary packing and transfer the secondary packing. The maximum number of workers involved in this process is ten (w76, w77, w78, w79, w80, w81, w82, w83 and w85). The maximum capacity of this process is 78000 balls per day. The machine utilization in this process is just 128%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Packing	0.15	10	78000

Table 4.1.28

Process Analysis -33 (sack stitching):

This process mainly consists of four operations like picking, folding, stitching and picking & transfer. The maximum number of workers involved in this process is two (w86 and w87). The maximum capacity of this process is 117000 balls per day. The machine utilization in this process is just 86%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Sack stitching	3	2	117000

Table 4.1.29

Process Analysis -34 (Testing-I):

This process mainly consists of four operations like picking, transfer & loading, applying load and unloading. The maximum number of workers involved in this process is one (w88). The maximum capacity of this process is 265.90 balls per day. The machine utilization in this process is just 113%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Packing	0.15	10	78000

Table 4.1.30

Process Analysis -35 (Testing-II):

This process mainly consists of four operations like weighing, curing, checking and testing. The maximum number of workers involved in this process is two (w89 and w90). The maximum capacity of this process is 1592.27 balls per day. The machine utilization in this process is just 19%.

S.No	Process Name	Process Time (mins)	Total No. Of Operators/shift	Production Capacity/Day
1	Testing-II	3.30	2	1592.27

Table 4.1.31

4.2 DISCUSSION

Based on the above mentioned process identified the major areas to be improved by alternative means. In all the thirty five process selected process need to be concentrated more to get the maximum productivity. The measures take in each process to improve it is:

Utilization Table:

Process No	***Process Name***	***Man power utilization***	***Machine power utilization in %***
1	Cutting process.	Sufficient	34
2	Weighing process-I.	Sufficient	36
3	Cleaning process.	Sufficient	213
4	Weighing process-II.	Sufficient	60
5	Weighing process-III.	Sufficient	30
6	Cleaning process-II.	Confidential	29
7	Weighing process-IV.	Confidential	59
8	Grinding process.	Confidential	58
9	Weighing process-V.	Confidential	46
10	Weighing process-VI.	Confidential	20
11	Mixing process-I.	Sufficient	146
12	Mixing process-II.	Sufficient	67
13	Weighing process-VII.	Sufficient	78

14	Mixing process-III.	Can be occupied	171
15	Sheet cutting.	Can be occupied	136
16	Weighing process-VIII.	Can be occupied	103
17	Slug making process.	In- Sufficient	99
18	Weighing process-IX.	Sufficient	119
19	Powder coating process.	In- Sufficient	73
20	Slug loading to the mold.	In- Sufficient	71
21	Mold stacking process.	In- Sufficient	114
22	Carrier loading.	In- Sufficient	93
23	Curing and cooling.	NA	153
24	Carrier unloading.	In- Sufficient	54
25	Mold releasing.	In- Sufficient	71
26	Mold opening.	Sufficient	71
27	Releasing the ball.	Sufficient	71
28	Mold cleaning.	In- Sufficient	167
29	Grading.	In- Sufficient	238
30	Printing.	Can be occupied	114
31	Cleaning-III.	Sufficient	92
32	Packing.	Sufficient	128
33	Sack stitching.	Sufficient	86
34	Testing-I.	Can be occupied	113
35	Testing-II.	Can be occupied	19

Table 4.2.1

4.3 DIAGRAMATIC REPRESENTATION

Worker Utilization Chart:

After considering the various aspects in the process based on the worker efficiency the following bar chart has been developed. The chart is drawn with the parameters workers versus utilization. Also the mean value is taken as 100%.

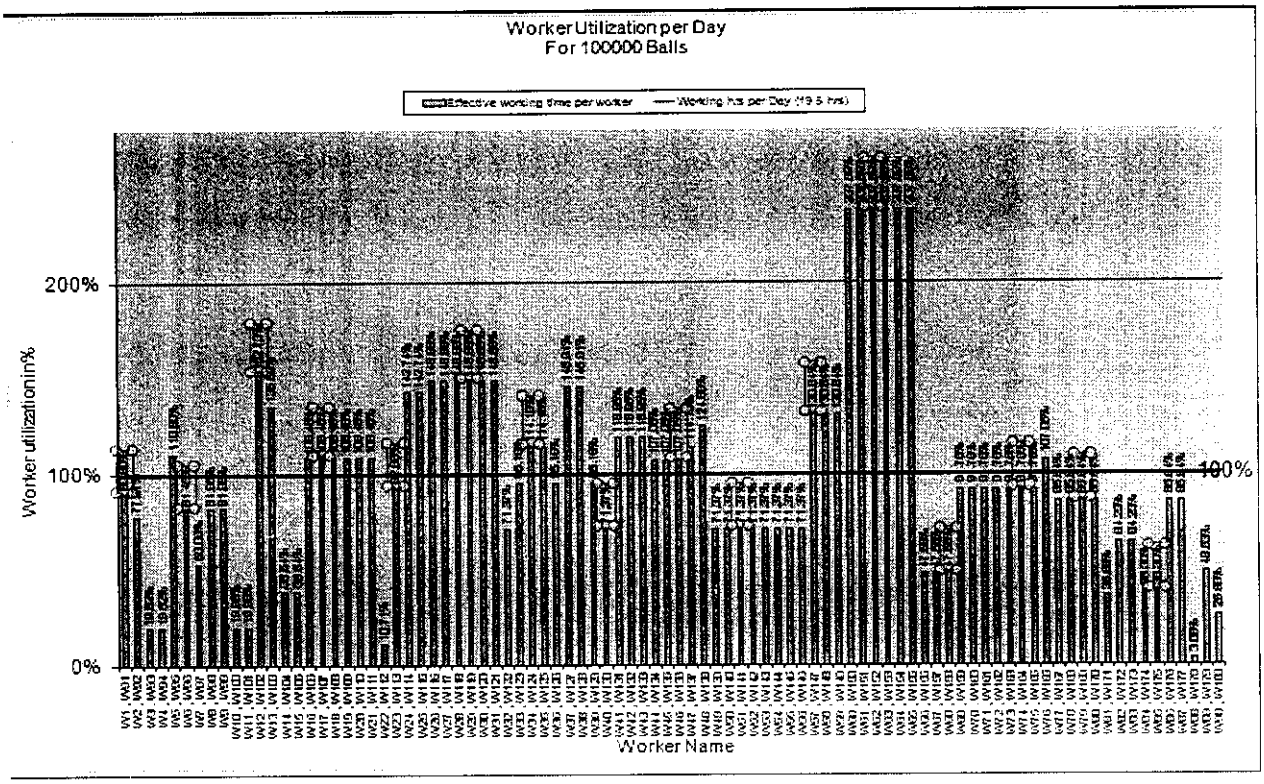

Figure 4.3.1

Machine utilization Chart:

After considering the various aspects in the process based on the machine efficiency the following bar chart has been developed. The chart is drawn with the parameters each process versus machine utilization. Also the mean value is taken as 100%.

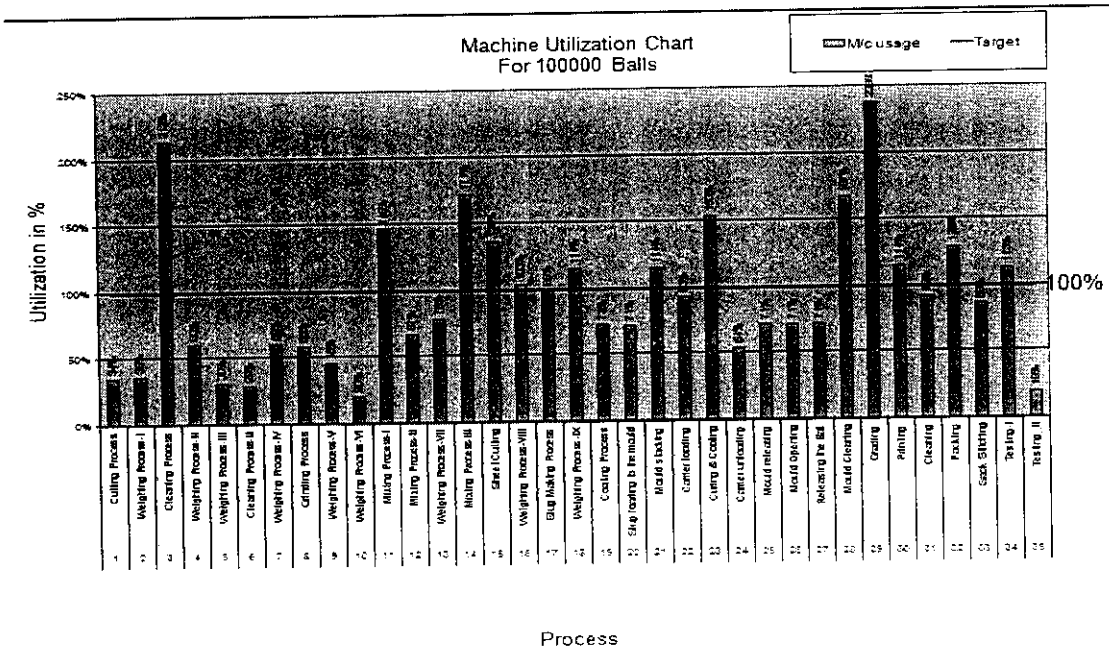

Figure 4.3.2

Machine Capacity Chart:

In the machine capacity chart can derive the maximum capacity of any machine used in any selected process. The following chart has been derived with respect to the parameters process to the production per day. Here mean value is 100000 balls per day.

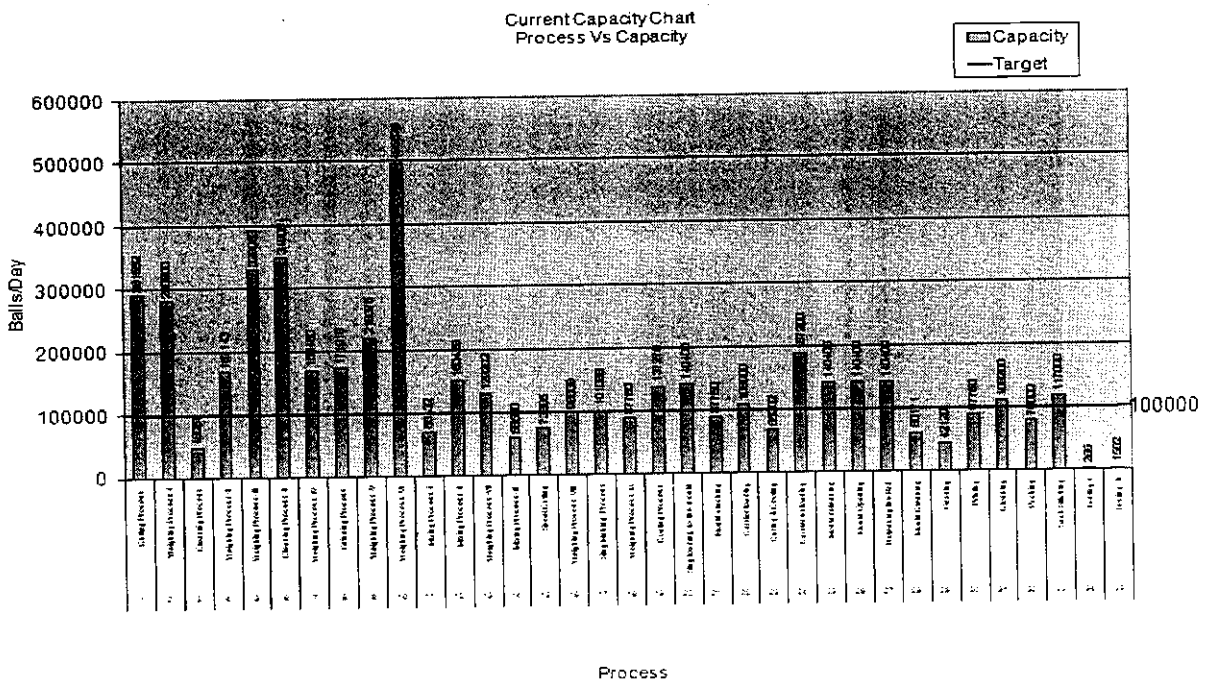

Figure 4.3.3

Maximum Number of workers:

In this chart it depicts clearly the maximum number of workers that can be used in each process effectively for effective production. In the below chart take the parameters as process versus workers.

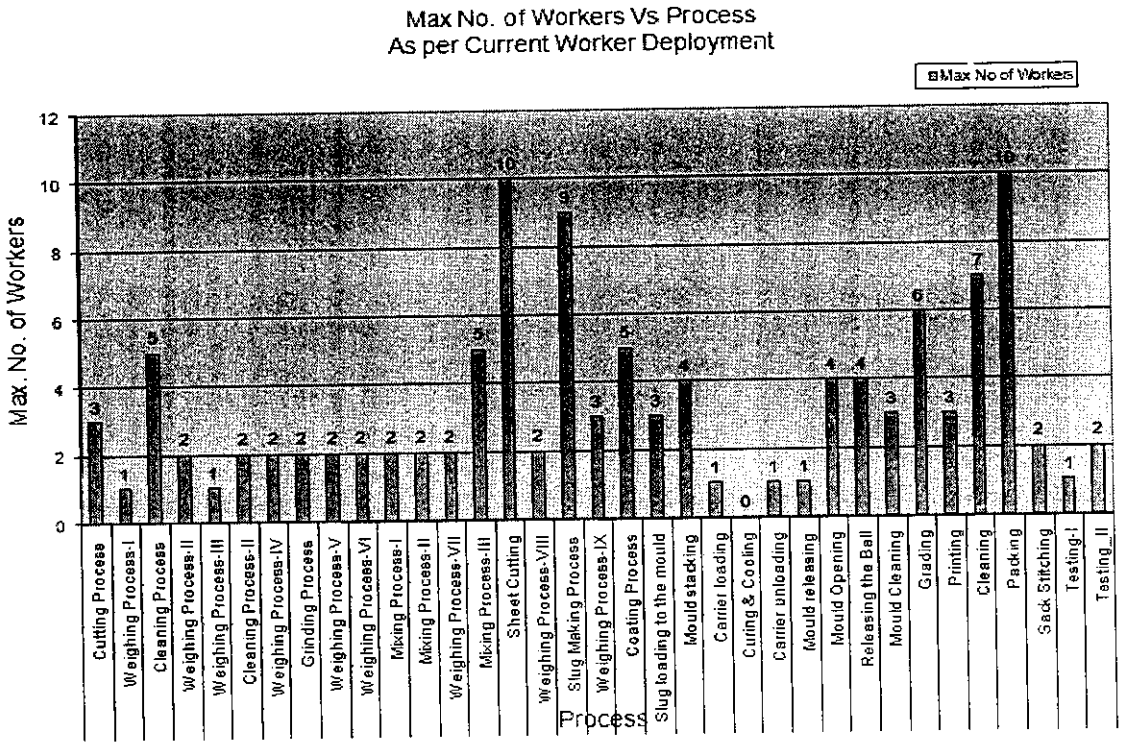

Figure 4.3.4

Comparison Chart:

Our project has derived two comparison chart as machine utilization chart and the worker utilization chart. For the utilization charts considered the minimum production in a year to the maximum production in a year. Also the values have been derived from the july 2009 and august 2009 data to forecast the future production (100000 balls/day).

Workers Utilization Graph:

This graph depicts the worker utilization with respect to the parameters workers to the utilization of workers/day in percentage. This graph shows three values stating the difference in the performance of the workers like minimum utilization of the workers, maximum utilization of the workers and target level of utilization. Which is recommends the areas need to be concentrate. In this graph considered the mean to be 100% utilization (100000 balls/day)

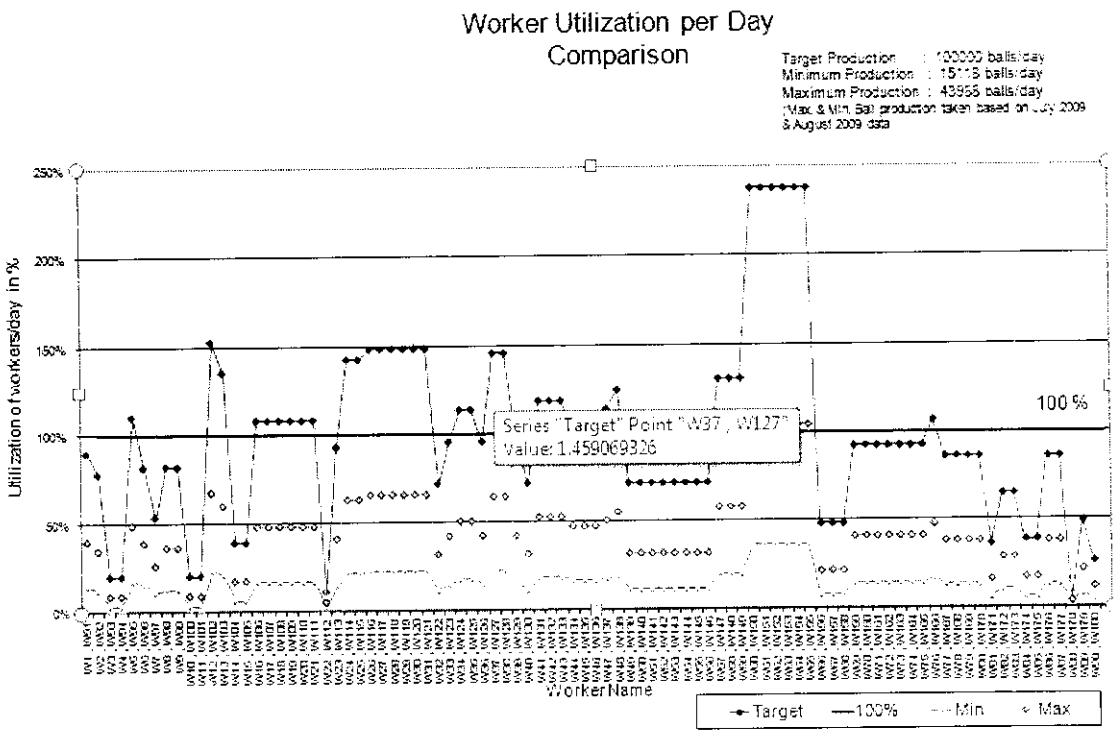

Figure 4.3.5

Machine Utilization Graph:

This graph depicts the machine utilization with the parameter of process to the machine utilization in percentage. This graph depicts the three minimum utilization and maximum utilization of the machines. Also it dictates the target value for each process so that machines can utilize to the maximum.

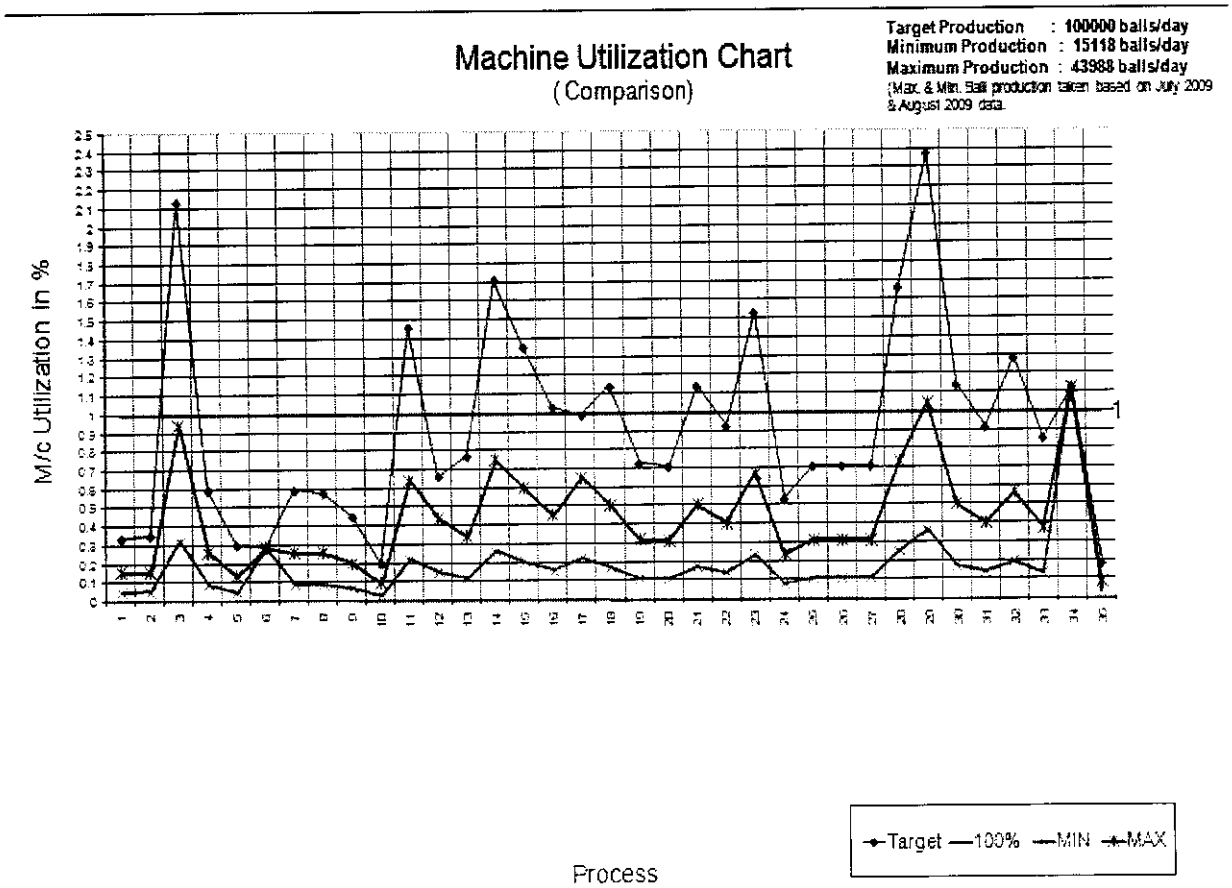

Figure 4.3.6

4.4 DELIVERABLES

After analyzing the existing process, deliver a set of charts which shows the existing and forecast values. A production manager which accepts the existing data as input and suggest estimated values to improve the process by identifying the major areas to be improved.

Example

If a manager wants to increase the target as 2 lakh balls/day this tool(Production Matrix Excel) will help him to analyze the areas to be focused(Workers and machine)

The below given chart that helps in improving the productions are.

1. Worker utilization chart
2. Machine utilization chart
3. Machine capacity chart
4. Comparison chart.

Theses chart helps the process to identify the major areas where the breaches have to be filled to meet the target production.

Chapter 5 - Conclusions

5.1 SUMMARY OF FINDINGS

- From the study of the process identified some of the process where the resources like man power and machine power were not utilized effectively. In those areas the process can be improved by effective utilization of thee resources by means of integrating with other process so that the man power and machine power can be utilized effectively.
- Cleaning process machine capacity is not meeting the current target
- Mixing process-I machine capacity is not meeting the current target
- Mixing process-II machine capacity is not meeting the current target
- Mixing process-III machine capacity is not meeting the current target
- Sheet cutting machine capacity is not meeting the target
- Weighing process-VIII machine is not meeting the target
- Weighing process-IX machine is not meeting the target
- Curing & cooling machine capacity is not meeting the target
- No. of workers in the Mould cleaning, grading, printing & packing is not meeting the current target.
- Testing-I & Testing-II are not meeting the current target.

5.2 SUGGESTIONS & RECOMMENDATIONS

- Worker utilization and Machine utilization of the cutting process is fulfilling the current target.
- Weighing process-I can be integrated with cutting process by introducing the automated weighing system.
- New machine can be introduced for cleaning process to meet the current requirement or else process time of the operation to be reduced.

- Weighing process-II can be integrated with cleaning process by adding new weighing automation technique.
- Weighing process-III can be combined with cleaning process by introducing special purpose machine.
- Raw material mixing is less in the mixing process so it can be added by a new machine or process to be automated.
- Weighing process-VII can be incorporated with the mixing process-II; it will be reduce the operator usage.
- Mixing process-III can be automated because it has the less ball production (58500 balls/day).Some of the operation like cutting for proper mixing & unloading can be eliminated by adding new conveyor technology.
- Worker utilization (W17 to W21) is 108% in sheet cutting process. So that the process to be automated.
- Utilization of w22 is less (10.71 %) so that the worker can be eliminated. Assigning this work to W23.
- Worker utilization of slug making process is more (147%).So that the process to be automate to meet the target.
- Weighing process –IX can be integrated with slug making process.
- Coating process can be eliminated from the ball production process.
- As per the existing data, mould stacking process is less in ball production. So it can be automated.
- Worker utilization (107.05%) of carrier loading process is more, so it can be automated.
- Process time of the curing & cooling process is more; it can be improved by increasing the speed of the conveyor technology.
- Mould cleaning process has high worker utilization (130.84%).This process can be automated.
- Worker utilization in the grading process is more (237%). This process to be introduced with new automated technology.

5.3 CONCLUSIONS

- The present study has made an in-depth analysis for Worker & Machine utilization of Ball manufacturing company through which identified some of machines to be automated and improved to meet the production target. Some of the unwanted operations can be eliminated to reduce the manpower.

- This analysis proved a great deal to the management to take a decision suitable to their business. The findings of the project help the company to become as one of the market leader in the business. The study paves way for enabling the future researchers to undertake similar studies.

5.4 DIRECTIONS FOR FUTURE RESEARCH

Future researches in these areas can be focused on the following aspects which were not deeply analyzed or covered in this study:

- The Organization should expand their business network across the districts by recruiting sales representatives for marketing purposes
- The Organization implementing few Technology Transfer programs which helps associates see the organization from a different angle.
- The Organization should implement few more Process Change which helps in increase in the efficiency of the production.

Questionnaire

How to feed the rubber bundles?

Longitudinal

Diagonal

How many pieces to be cut in Cutting machine?

4 – Pieces

6-Pieces

8-Pieces

How much kilogram to be weigh in Weighing machine-I

9.0 kg

9.1 kg

9.2 kg

9.3 kg

Are you following any standard in weighing machine?

Yes

No

How much powder to be weighed in Weighing Machine-II?

23.0 kg

23.1 kg

23.2 kg

23.4 kg

What are inputs to be provided in the Mill-I?

Rubber, Powder, chemical-I

Rubber, fluid, Chemical-I

Rubber, fluid, chemical-II,

All of the above

What is the process time in Mill – I

9 min

9 min 30 sec

9 min 45 sec

None of the above

What is the output product temperature of Mill – I

50-55 degree centigrade

60-65 degree centigrade

70-75 degree centigrade

80-85 degree centigrade

What is the temperature to be maintained in mill –I

70 degree centigrade

90 degree centigrade

100 degree centigrade

100-120 degree centigrade

What is the process time in Mill-II

5 min 30 sec

6 min

6.5 min

7.0 min

When need to add the chemicals in Mill-II

Starting itself

After 2 min

After 4 min

At the end

What is the temperature range in mill –II output

50-55 degree centigrade

55-60 degree centigrade

60-65 degree centigrade

65-70 degree centigrade

How many pieces has to be divide the Mill-II output

Single Piece

Two Pieces

What is the maximum ideal time for Mill-II OUTPUT?

15 min

30 min

45 min

60 min

What is the process time for Mill – III

3 min 10 sec

3 min 20 sec

3 min 30 sec

3 min 40 sec

What is the output product matrix size?

3x4

4x3

4x4

4x5

How much pressure to be maintained in the press

50 bar

60 bar

65 bar

70 bar

Which position to be inserting the centrepiece?

After 10^{th} piece

Before 10^{th} piece

After 12^{th} piece

Before 12^{th} piece

What is the Process time of the furnace?

1 hr 30 min

2 hrs

2 hrs 30 min

What is the pressure in the ball?

2 kg/cm2

4 kg/cm2

6 kg/cm2

8 kg/cm2

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