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A STUDY ON LEAN MANUFACTURING FEASIBILITY AT SHARP ELECTRODES PRIVATE LIMITED, COIMBATORE

by

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BONAFIDE CERTIFICATE

Certified that this project report titled **"A study on the lean manufacturin feasibility at Sharp Electrodes Private Limited"** is the bonafide work of **Mr.S.Gokulra 10MBA20** who carried out the project under my supervision. Certified further, that to the best my knowledge the work reported herein does not form part of any other project report dissertation on the basis of which a degree or award was conferred on an earlier occasion on th or any other candidate.

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Synopsis

Lean manufacturing or lean production is a production practice that considers the expenditure of resources for any goal other than the creation of value for the end customer to be wasteful, and thus a target for elimination. The goal for any organization is to create value for the customers with minimal spending of its resources.

The title of the research is **"A study on the Lean Manufacturing Feasibility at Sharp Electrodes Private Limited, Coimbatore"** says how the workers in the organization can sort out tools, handle the tools properly, maintain a better workplace, to have knowledge about the materials and work processes that would help them to maintain a mistake proofed manufacturing process thereby improving the quality of the product, saving time and improving production. The type of research used in the study is descriptive research. Census study had been used. The statistical tools used are percentage analysis, crosstabs and weighted average. The major finding states that the workers are not aware about the names of the materials and number of the materials used in the production of the welding electrodes, workers are not aware about the proportion of the wet mix and there is not a standard procedure in place for handling tools. If the organization adopts the suggestions put forward in this study it would help them to bring a better workplace and a mistake proof manufacturing system.

1. INTRODUCTION AND DESIGN OF THE STUDY

1.1 BACKGROUND

The project work entitled **"A STUDY ON LEAN MANUFACTURING FEASIBILITY AT SHARP ELECTRODES PRIVATE LIMITED"** is mainly conducted to improve the production practices followed at SEPL.

Lean Manufacturing:

Lean manufacturing or lean production, often simply, Lean, is a production practice that considers the expenditure of resources for any goal other than the creation of value for the end customer to be wasteful, and thus a target for elimination. Working from the perspective of the customer who consumes a product or service, "value" is defined as any action or process that a customer would be willing to pay for. Essentially, lean is centered on preserving value with less work.

TPS:

Lean manufacturing is a management philosophy derived mostly from the Toyota Production System (TPS) and identified as "Lean" only in the 1990s. TPS is renowned for its focus on reduction of the original Toyota seven wastes to improve overall customer value, but there are varying perspectives on how this is best achieved. The steady growth of Toyota, from a small company to the world's largest automaker has focused attention on how it has achieved this.

Lean manufacturing is a variation on the theme of efficiency based on optimizing flow. It is a present-day instance of the recurring theme towards increasing efficiency, decreasing waste (waste is any activity that consumes time, resources, or space but does not add any value to the product or service), and using empirical methods to decide what is required, rather than uncritically accepting pre-existing ideas.

By following lean practices in an industry they can ensure that the work carried out and the result of the work would be of good quality and has minimal wastage.

Issues facing the Organization:

Companies face many issues regarding quality, consumption of too many resources, time management, non value added activities and production. To stay competitive in today's marketplace, a company must understand its customers' wants and needs and design processes to meet their expectations and requirements. The possibility of maintaining customer satisfaction, on time delivery of quality products becomes a tedious job if proper control and procedures are not derived for the above conditions. A company could fall because of these issues. To overcome those issues, a company can adopt a few lean manufacturing principles after studying the process improvements required by the organisation.

By implementing the lean principles in the organisation, standardized practices would prevail in the organisation thereby the limits are set for wastage in each and every activity.

The study has been carried out in the company in 5 S and Poka Yoke.

5 S:

5S is the name of a workplace organization methodology that uses a list of five Japanese words which are seiri, seiton, seiso, seiketsu and shitsuke. Translated into English, they all start with the letter "S". The list describes how to organize a work space for efficiency and effectiveness by identifying and storing the items used, maintaining the area and items, and sustaining the new order. The decision-making process usually comes from a dialogue about standardization which builds a clear understanding among employees of how work should be done. It also instills ownership of the process in each employee.

Sorting (Seiri)

Eliminate all unnecessary tools, parts, and instructions. Go through all tools, materials, and so forth in the plant and work area. Keep only essential items and eliminate what is not required, prioritizing things as per requirements and keeping them in easily-accessible places. Everything else is stored or discarded.

Straightening or setting in order / stabilize (Seiton)

There should be a place for everything and everything should be in its place. The place for each item should be clearly labeled or demarcated. Items should be arranged in a manner that

promotes efficient work flow, with equipment used most often being the most easily accessible. Workers should not have to bend repetitively to access materials. Each tool, part, supply, or piece of equipment should be kept close to where it will be used – in other words, straightening the flow path. Seiton is one of the features that distinguish 5S from "standardized cleanup". This phase can also be referred to as Simplifying

Sweeping or shining or cleanliness / systematic cleaning (Seiso)

Clean the workspace and all equipment, and keep it clean, tidy and organized. At the end of each shift, clean the work area and be sure everything is restored to its place. This makes it easy to know what goes where and ensures that everything is where it belongs. Spills, leaks, and other messes also then become a visual signal for equipment or process steps that need attention. A key point is that maintaining cleanliness should be part of the daily work – not an occasional activity initiated when things get too messy.

Standardizing (Seiketsu)

Work practices should be consistent and standardized. All work stations for a particular job should be identical. All employees doing the same job should be able to work in any station with the same tools that are in the same location in every station.

Sustaining the discipline or self-discipline (Shitsuke)

Maintain and review standards. Once the previous 4 S's have been established, they become the new way to operate. Maintain focus on this new way and do not allow a gradual decline back to the old ways. While thinking about the new way, also be thinking about yet better ways. When an issue arises such as a suggested improvement, a new way of working, a new tool or a new output requirement, review the first 4 S's and make changes as appropriate.

POKA YOKE:

Poka-Yoke is a fool proofing, which is the basis of the Zero Quality Control (ZQC) approach, which is a technique for avoiding and eliminating mistakes. Poka-yoke can be implemented at any step of a manufacturing process where something can go wrong or an error can be made.

Errors are many types -

1. Processing error - Process operation missed or not performed per the standard operating procedure.

2. Setup error - Using the wrong tooling or setting machine adjustments incorrectly.

3. Missing part - Not all parts included in the assembly, welding, or other processes.

4. Improper part/item - Wrong part used in the process.

5. Operations error - Carrying out an operation incorrectly; having the incorrect version of the specification.

6. Measurement error - Errors in machine adjustment, test measurement or dimensions of a part coming in from a supplier.

The data needed for the study has been collected from the workers through questionnaires.

Significance of 5 S and Poka Yoke

5S

- Workers are made aware on how to sort the tools and place them by prioritizing the tools.
- Saves unwanted movements (non value added activities).
- Promotes efficient work flow by providing right place for right thing.
- A clean workplace ensures proper system functioning.
- Providing a convenient environment for each worker by setting standards.

Poka Yoke

- People and processes work right the first time.
- Techniques that make it impossible to make mistakes.
- Techniques can drive defects out of products and processes and substantially improve quality and reliability.
- Can eliminate both human and mechanical errors.

1.2 ABOUT THE ORGANISATION

Sharp Industries is an **ISO 9001** Certified Company established in the year 1967. Sharp Industries are well known for their **Mini Monobloc pumps** in India. The company manufactures high quality welding electrodes. They manufacture wide variety of electrodes serving different purpose. **Sharp Electrodes Private Limited** was started in the year 1988. The company's electrodes are exported to many countries and the **75%** of their production are targeted at export markets.

Mr. K.K. Ramasamy, a technocrat with pioneering vision to develop a pump which is light in weight established the **Sharp Industry**. **Sharp Electrodes Private Limited** was founded by **Mr. K. Jaganathan** and it is now ably managed by **Ms. J. Mohanasundare**.

The company's electrodes meet international specification and they have certification like DNV and LLOYD'S Register.

A VISION FOR TOMORROW

Sharp Electrodes Private Limited was started with the single minded objective of producing world class electrode to cater to the multi various industrial sectors in India as well as abroad. The company has carved a niche for itself on par with the global players in the international arena through top class products catering to Global buyers. We strive for perfection focusing on the manufacturing processes and surefire delivery modules.

To provide reliable and efficient welding solutions through innovative and eco- friendly process technology, at competitive prices, powering the company's growth at an annualized rate of 30%.

The Mission will be to achieve the projected growth with single minded devotion, unflinching and concerted effort of the team on the various functional areas with a conscious attempt to reduce cost through effective reengineering thereby providing quality products at affordable price.

The company has its presence in the markets of USA, UK, Dubai, Kuwait, Jordan, Saudi Arabia, Angola, Qatar, Lebanon, Oman, Sri Lanka, Myanmar, Guyana, Trinidad & Tobago, Jamaica, Panama, Guatemala, Ivory Coast and Zambia. They would surely work hard to add more countries to the list.

OBJECTIVE

- Manufacturing products as specified by the customer with utmost quality
- Providing quality products at affordable price.
- Effective utilization of men, material, machinery and natural resource

CAPITAL

Sharp Electrodes Private Limited exports 75% of its produce of electrodes to the international markets. Their products are being exported to many parts of world today. The company's domestic customers are like SAIL and Shanti Gears.

PLANT CAPACITY

They are manufacturing wide varieties of electrodes, around 34 types of electrodes. Per day they manufacture 4.5 tons of electrodes.

AWARDS AND RECOGNITION

- EEPC Trophy for achieving highest export performance for the years 1997 – 98, 1998-99, 2000-01 and 2002-03
- EEPC Trophy for outstanding contribution to engineering during the year 2001 – 02
- EEPC Trophy- Awarded Silver Steel for Star Performer as Small Enterprise in the product group of Iron/Steel - Electrodes during the year 2004 – 05
- EEPC Trophy- Awarded the star performer (Medium Enterprise) in the product group of Basic Iron and Steel during the year 2005 – 06

PRODUCTS

- Welding electrodes
- Dry flux

- Electrode equipments

ORGANISATION STRENGTH

Following are some of the factors that has helped us winning a competitive edge over the competitors:

- Pool of qualified and experienced personnel
- On time delivery of products
- Trusted by overseas as well as domestic clients
- Rich industry experience
- Quality assurance
- Transparent business dealing
- Motivated employees
- Quality suppliers

QUALITY

All the raw materials used in the manufacturing process of the electrode are supplied with superior quality. The company has its own test center to check the metal quality after welding process. Once in a year officials of certifying institutes check the quality of the electrode to renew the certification. Quality is much more than just investing in the right machinery and processes. Good vendor selection and rating, in process and final stage inspection, internal quality audits among a host of other activities are judiciously carried out. Organization quality consciousness has always kept them ahead of competition and enabled them to maintain ever growing clientele both domestic and international.

QUALITY POLICY

"We resolve to manufacture and supply internationally acceptable quality products to fulfill or exceed customers' expectations through continual improvement of our quality management system"

CLIENTS

The organization's quality products have earned them ever growing clientele in both domestic and international market. The top management makes visits to many industrial trade fairs in India and also in other countries to present their products. The sales volume of welding electrodes is 900 tons per year.

Their main overseas clients are from

1. **Angola**
2. **USA**
3. **UK**
4. **Saudi Arabia**
5. **Qatar**

1.3 STATEMENT OF THE PROBLEM

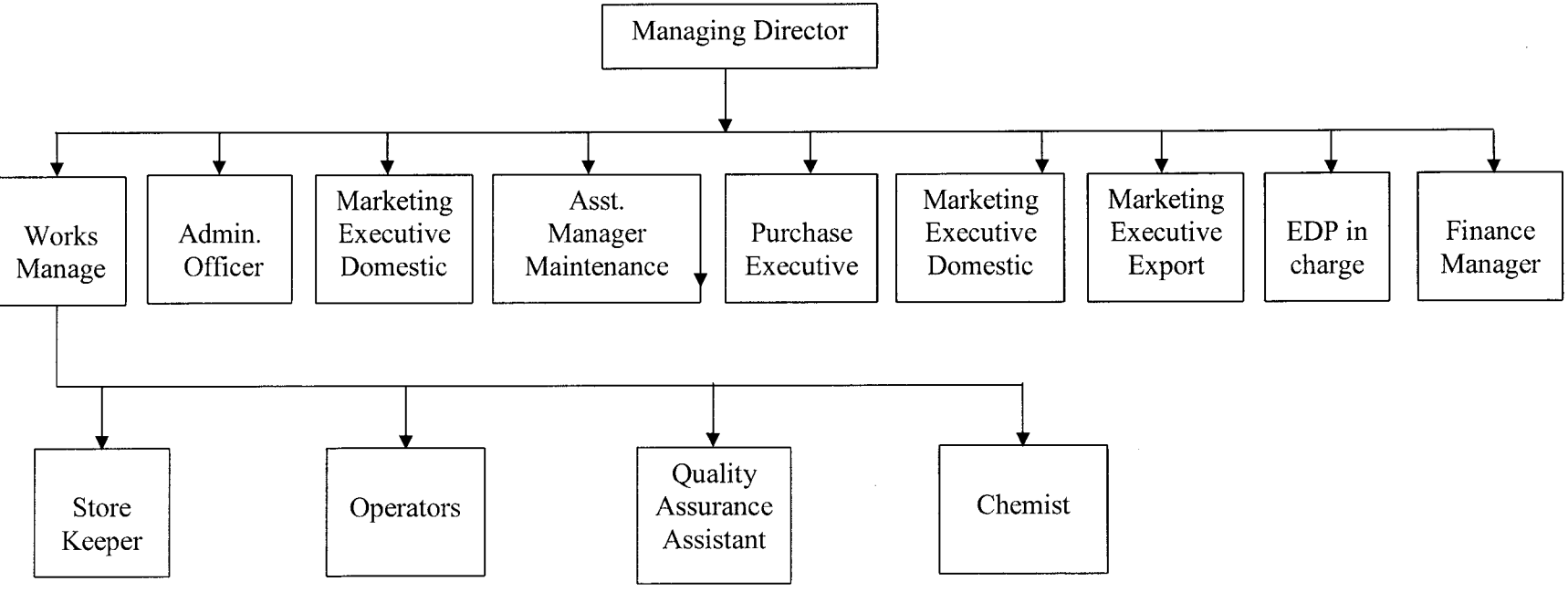
Organization has few sections that handle many tools and the arrangements of the tools are not proper. The 5 S study findings will help them to implement proper arrangements of tools and workplace maintenance. The organization deals with dry and wet mix sections were mistake of those sections affects the other processes. This kind of problem can be solved through Poke yoke (mistake proofing).

This study finds provides suggestions for the organization to correct the above problems.

1.4 SCOPE OF THE STUDY

The scope of the study is to improve the tools handling and manufacturing process through the implementation of 5S and Poka Yoke respectively. In this study only wire drawing, extruder, dry and wet mix sections are included. The study can be further made on other departments in the organization.

ORGANIZATION CHART



2. REVIEW OF LITERATURE

Sam K. M. Ho (1999)[1] This paper says the importance of 5 S in any industry to manufacture quality products, to provide quality service and maintain a systematic way of handling things in an industry. The study reveals that many service sector organizations such as the fast food restaurants, libraries, super markets and hotels use the concept of 5S without knowing that they are using it. The paper says the points that can be considered in implementing each of the 5S in an organization.

J Venkatesh (2007)[2] This paper says 5S is a systematic process of housekeeping to achieve a serene environment in the work place involving the employees with a commitment to sincerely implement and practice housekeeping. Problems cannot be clearly seen when the work place is unorganized. Cleaning and organizing the workplace helps the team to uncover problems. Making problems visible is the first step of improvement. 5s is a foundation program before the implementation of TPM. If 5S is not taken up seriously, then it leads to 5D. They are Delays, Defects, Dissatisfied customers, declining profits and Demoralized employees. The paper says the procedures that can be adopted in each of the 5s. The procedures might vary for different organizations.

Michael Fisher (1999)[3] This paper says the goal of poka yoke is to engineer process in a organization so that mistakes can be prevented or detected and corrected quickly. The organizations need to follow the simple procedures of mistake proofing in a systematic manner to reduce error that may occur due to lack of concentration or external distraction, this helps to keep the cost of recovering from the error low. This paper says the type of inspections that can be carried out to cut the error occurrence, maintain quality and improve the responsibility and commitment of the workforce.

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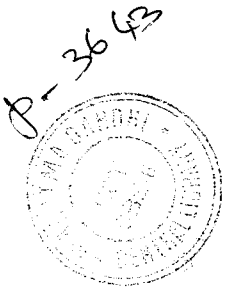
[1] **Sam K. M. Ho(1999)** TQM and Change Management via 5-S

(http://www.saferpak.com/fives_art7.htm)

M. Dudek-Burlikowska, D. Szewieczek (2009)[4] This paper says that poka yoke requires course of repetitive operations which depend on vigilance or memory to stop error occurrence thereby the customers are not discontented and disappointed. The use of poka yoke in an automotive company and bearing shaft production process are explained. There is a possibility of prevention of errors to the fullest if poka yoke and other quality control systems are operated together.



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[2] **J Venkatesh (2007)** An introduction to Total Productive Maintenance (http://www.plant-maintenance.com/articles/tpm_intro.pdf)

[3] **Michael Fisher (1999)** Process improvement by Poka Yoke (http://people.plan.aau.dk/~henrik/er/Fisch.pdf)

[4] **M. Dudek-Burlikowska, D. Szewieczek (2009)** The Poka-Yoke method as an improving quality tool of operations in the process *(Silesian University of technology)*

3. RESEARCH METHODOLOGY

3.1 TYPE OF RESEARCH

Descriptive Research, also known as statistical research, describes data and characteristics about the population or phenomenon begin studied. Descriptive research is used here to study the existing sorting, cleaning practices and placing of tools by the employees. It also studies their awareness about the processes and the problems in the dry and wet mixing sections.

3.2 OBJECTIVES OF THE STUDY

PRIMARY OBJECTIVES

- To study the extruder and wire drawing section to correct the tools handling problem in those sections and develop a corrective mechanism.
- To study the dry and wet mixing section and suggest improvements to have a mistake proofing process.

SECONDARY OBJECTIVES

- To study the existing process and develop sorting, systemizing, standardizing, cleaning systems for the company, to set up a proper tool handling system.
- To study the existing processes in the dry and wet mixing section
- To study the problems in the system and suggest mistake proofing processes to avoid quality and work delay problems in the following sections

3.3 SOURCE OF DATA

Primary Sources

The primary sources of data are collected through interview schedule.

Secondary Sources

The secondary mainly consists of data mainly consists of data and information collected from records, company websites and also with the management of the organization.

3.4 CENSUS STUDY POPULATION

In SEPL there are 6 workers in the dry mixing section, 2 workers in extruder section and 4 workers in wire drawing section.

Poka Yoke census study was conducted for the dry and wet mixing section and the 5 S study was conducted for the wire drawing and the extruder section.

3.5 TECHNIQUE USED

- Census study had been carried out.

3.6 STATISTICAL TOOLS USED

- Percentage analysis
- Cross tabs
- Weighted average

3.7 LIMITATIONS OF THE STUDY

The limitations of the study are the following

- Limited time-span of the project.
- Due to time constraint study was possible only for the two sections of the company.

4. ANALYSIS AND INTERPRETATION

5 S:

Table No. 4.1

Table showing whether the respondents using all the tools every time in the organization

S.No	Are all the tools used every time by workers	No. Of Respondents	Percentage (%)
1.	Yes	0	0
2.	No	6	100.0

Source : Primary data

INTERPRETATION:

100% of the respondents do not use all the tools each and every time

INFERENCE:

All the workers use only few tools during the production activities

Table No. 4.2

Table showing the rate of usage of the screw driver by the respondents

S.No	Rate of usage of Screw Driver	No. Of Respondents	Percentage (%)
1.	Often Used	6	100.0
2.	Moderately Used	0	0
3.	Rarely Used	0	0
	Total	6	100

Source : Primary data

INTERPRETATION: 100% of the respondents use screw driver often

INFERENCE: All the workers use screw driver frequently

Table No. 4.3

Table showing the rate of usage of the allen key by the respondents

S.No	Rate of usage of Allen Key	No. of Respondents	Percentage (%)
1.	Often used	3	50.0
2.	Moderately used	1	17
3.	Rarely used	2	33
	Total	6	100.0

Source : Primary data

INTERPRETATION:

50% of the respondents use the allen key often and 17% of them use it moderately and 33% of them use it rarely.

INFERENCE:

It is inferred that 50% of the workers use allen key often.

Table No. 4.4

Table showing the rate of usage of the spanner set by the respondents

S.No	Rate of usage of Spanner set	No. of Respondents	Percentage (%)
1.	Often used	3	50.0
2.	Moderately used	3	50.0
3.	Rarely Used	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

50% of the employees use the spanner set often and 50% of the respondents use the spanner set moderately

INFERENCE:

It is inferred that the 50% workers use the spanners set often and moderately

Table No. 4.5

Table showing the rate of usage of the cutting pliers by the respondents

S.No	Rate of usage of Cutting Pliers	No. of Respondents	Percentage (%)
1.	Often used	2	34
2.	Moderately used	2	33
3.	Rarely used	2	33
	Total	6	100.0

Source : Primary data

INTERPRETATION:

33% of the respondents use cutting pliers moderately, 33% of the respondents use cutting pliers moderately and 33% of the employees use cutting pliers rarely.

INFERENCE:

It is inferred that 33% of the employees use cutting pliers often and moderately

Table No. 4.6

Table showing the rate of usage of the screw gauge by the respondents

S.No	Rate of usage of Screw Gauge	No. of Respondents	Percentage (%)
1.	Often used	2	34
2.	Moderately used	2	33
3.	Rarely used	2	33
	Total	6	100.0

Source : Primary data

INTERPRETATION:

33% of the respondents use screw gauge moderately, 33% of the respondents use screw gauge moderately and 33% of the employees use screw gauge rarely.

INFERENCE:

It is inferred that 33% of the employees use cutting pliers often and moderately

Table No. 4.7

Table showing the rate of usage of the micro meter by the respondents

S.No	Rate of usage of Micro meter	No. of Respondents	Percentage (%)
1.	Often used	2	33
2.	Moderately Used	0	0
3.	Rarely used	4	67
	Total	6	100.0

Source : Primary data

INTERPRETATION:

67 % of the respondents use the micrometer rarely and 33% of the employees use micrometer rarely.

INFERENCE:

It is inferred that 67% of the employees use the micro meter rarely.

Table No. 4.8

Table showing the rate of usage of the vernier caliper by the respondents

S.No	Rate of usage of Vernier Caliper	No. of Respondents	Percentage (%)
1.	Rarely used	6	100.0
2.	Moderately Used	0	0
3.	Often Used	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

100 % of the respondents rarely use the vernier caliper.

INFERENCE:

It is inferred that all the respondents do not use vernier caliper often.

Table No. 4.9

Table showing the rate of usage of the steel scale by the respondents

S.No	Rate of usage of Steel Scale	No. of Respondents	Percentage (%)
1.	Often used	4	67
2.	Rarely used	2	33
3.	Moderately used	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

67 % of the respondents use the steel scale often and 33% of the employees use steel scale rarely.

INFERENCE:

It is inferred that 67% of the employees use the steel scale often.

Table No. 4.10

Table showing the rate of usage of the wire cutter by the respondents

S.No	Rate of usage of Wire cutter	No. of Respondents	Percentage (%)
1.	Often used	4	67
2.	Rarely used	2	33
3.	Moderately Used	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

67 % of the respondents use the wire cutter often and 33% of the employees use wire cutter rarely.

INFERENCE:

It is inferred that 67% of the employees use the wire cutter often.

Table No. 4.11

Table showing the rate of usage of the crow bar by the respondents

S.No	Rate of usage of Crow Bar	No. of Respondents	Percentage (%)
1.	Often used	2	33
2.	Moderately used	1	17
3.	Rarely used	3	50.0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

33% of the respondents use crow bar often, 17% of the respondents uses it moderately and 50% of the respondents use it rarely.

INFERENCE:

It is inferred that 50% of the employees do not use the crow bar often.

Table No. 4.12

Table showing where the employees place their frequently used tools

S.No	Placing of frequently used tools by the employees	No. of Respondents	Percentage (%)
1.	Near the machine	6	100.0
2.	In cupboard	0	0
3.	On the table	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

100% of the respondents prefer to place the frequently used tools near the machine.

INFERENCE:

It is inferred that all the employees place the frequently used tools near the machine.

Table No. 4.13

Table showing the awareness of the employees on where to place the tools

S.No	Awareness of the employees on where to place the tools	No. of Respondents	Percentage (%)
1.	In trays	6	100.0
2.	Separations in holders	0	0
3.	In hangers	0	0
4.	In covers	0	0
		6	100.0

Source : Primary data

INTERPRETATION:

100% of the employees prefer placing the tools in trays.

INFERENCE:

All the employees choose trays as comfortable means to place the tools.

Table No. 4.14

Table showing the ease of access of the tools by the employees

S.No	Ease of accessing the tools	No. of Respondents	Percentage (%)
1.	Very easy	3	50.0
2.	Moderate	3	50.0
3.	Tough	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

50% of the respondents feel very easy to access the tools after replacing and 50% of the respondents feel moderately easy to access the tools after replacing

INFERENCE:

It is inferred that 50% of the employees feel that accessing tools is very easy.

Table No. 4.15

Table showing placing of tools at the same place after usage by the employees

S.No	Placing tools at same place from where it was taken	No. of Respondents	Percentage (%)
1.	Every time	5	83
2.	Occassionally	1	17
3.	Not at all	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

83% of the respondents place the tools at the same place every time and 17% of the employees place the tools at the same place occasionally.

INFERENCE:

It is inferred that 83% of the employees place the tools at the same place every time from where they have taken it.

Table No. 4.16

Table showing ease of finding tools after use of tools by others

S.No	Finding of tools by others	No. of Respondents	Percentage (%)
1.	Very easy	2	33
2.	Moderately easy	4	67
3.	Hard to find	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

67% of the respondents feel moderately easy to find the tools and 33% of the respondents find it very easy to find the tools.

INFERENCE:

It is inferred that 67% of the employees find it moderately easy to find the tools after someone used it.

Table No. 4.17

Table showing searching of tools that are used often by the employees

S.No	Searching of tools that are used often	No. of Respondents	Percentage (%)
1.	Often	0	0
2.	Sometimes	6	100.0
3.	Rarely	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

100% of the respondents search for the most often used tools sometimes.

INFERENCE:

All the employees search for the most often used tools sometimes.

Table No. 4.18

Table showing the time taken to search the tools by the employees

S.No	Time taken to search tools	No. of Respondents	Percentage (%)
1.	Less than 5 minutes	4	67
2.	5-10 minutes	2	33
3.	More than 10 minutes	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

67% of the respondents say that they find the tools less than 5 minutes and 33% of the respondents say that they search for tools 5-10 minutes.

INFERENCE:

It is inferred that 67% of the employees search and find the tools before five minutes.

Table No. 4.19

Table showing tool searching time effect on production

S.No	Searching time effect on production	No. of Respondents	Percentage (%)
1.	To large extent	0	0
2.	To some extent	6	100.0
3.	Not at all	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

100% of the employees say that the searching of tools affects production to some extent.

INFERENCE:

It is inferred that searching for tools definitely affects the production to some extent.

Table No. 4.20

Table showing losing of tools by the employees

S.No	Losing the tools	No. of Respondents	Percentage (%)
1.	Often	0	0
2.	Sometimes	1	17
3.	Rarely	5	83
	Total	6	100.0

Source : Primary data

INTERPRETATION:

83% of respondents state that they lose tools rarely and 17 % of the respondents say they lose tools rarely.

INFERENCE:

It is inferred that the 83% of the employees lose the tools that they use.

Table No. 4.21

Table showing where the rarely used tools are placed by the employees

S.No	Place for rarely used tools	No. of Respondents	Percentage (%)
1.	In cupboard	6	100.0
2.	Near the machine	0	0
3.	Others	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

100% of the respondents have stated that the rarely used tools are placed in the cupboard.

INFERENCE:

It is inferred that all the employees place the rarely used tools only in the cupboard.

Table No. 4.22

Table showing whether labels are used to indicate the location for tool placement

S.No	Label indication for tool placement	No. of Respondents	Percentage (%)
1.	No	6	100.0
2.	Yes	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

100% of the respondents state that there are no labels for placing the tools.

INFERENCE:

It is inferred that there are no labels for placing various tools at the right location.

Table No. 4.23

Table showing finding of the tools by the workers while searching

S.No	Identification of tools by workers	No. of Respondents	Percentage (%)
1.	By asking you	4	67
2.	A practice	2	33
3.	They search	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

67% of the respondents state that they take the tools by asking someone and 33% of the respondents state that there is a practice of placing tools at some location.

INFERENCE:

It is inferred that the 67% of the employees find the tools by asking someone who might have used it before.

Table No. 4.24

Table showing awareness of workers in placing the tools within a particular height

S.No	Awareness of workers in placing the tools within a particular height	No. of Respondents	Percentage (%)
1.	Below knee level	2	33
2.	Above knee level	4	67
3.	Above forehead level	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

67 % of the respondents place the tools above knee level and 33% of the respondents place the tools below knee level.

INFERENCE:

It is inferred that 67% employees are aware that tools have to be placed above knee level.

Table No. 4.25

Table showing the frequency at which the work place are cleaned by the employees

S.No	Frequency at which the work place are cleaned	No. of respondents	Percentage (%)
1.	Every 1 hour	0	0
2.	Every 2 hours	2	33
3.	Every 4 hours	1	17
4.	Only in the evening	3	50.0
5.	Not at all	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

50% of the respondents clean the workplace only in the evening, 33% of the respondents clean the workplace every 4 hours and 17% of the respondents clean the workplace every 2 hours.

INFERENCE:

It is inferred that 50% of the employees clean their workplace only in the evening.

Table No. 4.26

Table showing the reason for cleaning of the workplace by the employees

S.No	Reason for cleaning	No. of Respondents	Percentage (%)
1.	Your interest	6	100.0
2.	Company standard	0	0
3.	Others Specify	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

100% of the respondents sated that they clean their place on their own interest.

INFERENCE:

It is inferred that all the employees clean their workplace on their interest and satisfaction.

Table No. 4.27

Table showing the problems noticed while cleaning of the workplace by the employees

S.No	Problem noticed while cleaning	No. of Respondents	Percentage (%)
1.	Leakage of oil	5	83
2.	Do nothing	1	17
3.	Parts missing	0	0
4.	Spills	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

83% of the respondents noticed the leakage of oil and 17% of the respondents did nothing.

INFERENCE:

It is inferred that the 83% of the employees have noticed the leakage of oil from the machines while cleaning the workplace.

Table No. 4.28

Table showing the usefulness of a standard procedure if it is set for placing tools

S.No	Usefulness of standard procedure	No. of Respondents	Percentage (%)
1.	Very helpful	6	100.0
2.	Moderately Helpful	0	0
3.	Will remain the same	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

100% of the respondents have stated that a standard procedure for tool placing will be very helpful.

INFERENCE:

All the employees feel that a standard procedure for placing the tools would be very much useful to them.

POKA YOKE :

PERCENTAGE ANALYSIS OF DRY MIXING:

Table No. 4.29

Table showing the awareness of the employees on the number of material in the mix

S.No	Number of Material in the mix	No. of Respondents	Percentage (%)
1.	Fully aware	2	33
2.	Partially aware	0	0
3.	Unaware	4	67
	Total	6	100.0

Source : Primary data

INTERPRETATION:

67% of the respondents are unaware about the number of materials used in the dry mixing process and 33% of the respondents are fully aware of the numbers.

INFERENCE:

It is inferred that 67% of the employees are unaware of the number of materials added into the dry mix.

Table No. 4.30

Table showing the awareness of the employees on the names of the materials added in the mix

S.No	Names of the Materials added in the mix	No. of Respondents	Percentage (%)
1.	Fully aware	1	17
2.	Partially aware	1	17
3.	Unaware	4	66
	Total	6	100.0

Source : Primary data

INTERPRETATION:

66% of the respondents are unaware of the names of the materials,17% of the respondents are partially aware and 17% of the respondents are fully aware of the names of the materials.

INFERENCE:

It is inferred that the 66% of the employees are unaware about the names of the materials added in the dry mix.

Table No. 4.31

Table showing the awareness of the employees on the order of the materials added in the mix

S.No	Order of the materials to be added	No. of Respondents	Percentage (%)
1.	Fully aware	5	83
2.	Partially aware	1	17
3.	Unaware	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

83% of the respondents are fully aware of the order of the materials and 17% are partially aware of the order of the materials.

INFERENCE:

It is inferred that the 83% of employees are fully aware of the materials to be mixed to form the dry mix.

Table No. 4.32

Table showing how the employees find the materials to be added to form dry mix

S.No	Finding the materials	No. of Respondents	Percentage (%)
1.	By name	6	100.0
2.	By code	0	0
3.	By color	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

100% of the respondents say that they find materials by the name of the materials.

INFERENCE:

It is inferred that all the employees find the materials to be added in the mixture by the names of those materials.

Table No. 4.33

Table showing the problems faced if proper order of the materials is not followed

S.No	Problems that would occur if proper order not followed	No. of Respondents	Percentage (%)
1.	Quality Degrades	3	50.0
2.	Others	3	50.0
3.	Materials do not mix	0	0
4.	Nothing Happens	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

50% percentage of respondents state the quality gets degraded and 50 % state there may be some other problems

INFERENCE:

50% of the employees are aware that quality gets degraded if proper order is not followed while mixing the materials.

Table No. 4.34

Table showing the problems faced if sinker is not used

S.No	Problems faced if sinker is not used	No. of Respondents	Percentage (%)
1.	Wire bends	6	100.0
2.	Spattering	0	0
3.	Excess smoke	0	0
4.	Nothing happens	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

100% of the respondents are aware that wire bends may occur if the sinker is not used.

INFERENCE:

It is inferred that all the employees are aware that wire bends occur if sinker is not used to remove the unwanted materials in the powder to be mixed.

Table No. 4.35

Table showing the frequency of spilling of the materials

S.No	Frequency of spilling the materials	No. of Respondents	Percentage
1.	Very often	6	100.0
2.	Rarely	0	0
3.	Never spill	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

100% of the respondents have opined that they spill the materials very often.

INFERENCE:

It is inferred that all the employees spill the materials in the dry mixing process very often.

Table No. 4.36

Table showing awareness of the employees on the process to be followed with the spilled powder

S.No	Process with spilled powder	No. of Respondents	Percentage (%)
1.	Mix after sinking	5	83
2.	Mix without sinking	1	17
3.	Waste it	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

83% of the respondents have opined that they mix the spilled powder only after sinking and 17% of the respondents say that they mix without sinking.

INFERENCE:

It is inferred that the 83% of the employees are aware that the spilled powder has to be cleared of impurities in the sinker before it is added into the dry mixture.

Table No. 4.37

Table shows the check on missing any material

S.No	Missing out any material	No. of Respondents	Percentage (%)
1.	No	6	100.0
2.	Yes	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

100% of the respondents state that they have not missed any material in the mixing process.

INFERENCE:

It is inferred that all the employees are conscious in not missing out any material in the mixing process.

Table No. 4.38

Table showing happenings if materials to be added in the mix are missed out

S.No	Happening due to missing out materials	No. of Respondents	Percentage (%)
1.	Waste of mix	6	100.0
2.	Spattering and smoke	0	0
3.	Nothing happens	0	0
	Total	6	100.0

Source : Primary data

INTERPRETATION:

100% of the respondents state that the dry mixture would be a waste.

INFERENCE:

All the employees are aware that missing out a material would result in waste of the mix.

PERCENTAGE ANALYSIS OF WET MIXING:

Table No. 4.39

Table showing the awareness of employees about the wet mix proportion

S.No	Awareness of employees about the wet mix proportion	No. of respondents	Percentage (%)
1.	Fully aware	1	33
2.	Partially aware	1	33
3.	Unaware	1	34
	Total	3	100.0

Source : Primary data

INTERPRETATION:

34% of the respondent is unaware about the wet mix proportion, 33% of the respondent is partially aware about the wet mix proportion and 33% of the respondent fully aware about the wet mix proportion.

INFERENCE:

It is that 34% of the respondent is not aware about the proportion of the dry mix and the silicate solution.

Table No. 4.40

Table showing the measuring of the silicate solution to be added to the dry mix

S.No	Measuring of the silicate solution to be added to the dry mix	No. of respondents	Percentage (%)
1.	By weighing	3	100.0
2.	Using beakers	0	0
3.	By experience	0	0
4.	Others	0	0
	Total	3	100.0

Source : Primary data

INTERPRETATION:

100% of the respondents say that the solution is measured by weighing.

INFERENCE:

The three employees are aware that the solution must be weighed before added into the dry mix.

Table No. 4.41

Table showing the Happenings if improper proportion of the wet mix is used in the extruder process

S.No	Happenings if improper proportion of the wet mix is used	No. of respondents	Percentage (%)
1.	Breakdown	3	100.0
2.	Wastage	0	0
3.	Cracks	0	0
4.	Uneven coating	0	0
5.	Pressure to be increased	0	0
6.	Others	0	0
	Total	3	100.0

Source : Primary data

INTERPRETATION:

100% of the respondents say that improper shall lead to breakdown of the machinery.

INFERENCE:

All the employees say that improper wet mix proportion shall lead to break down of the extruder machine.

Table No. 4.42

Table showing whether the employees remove the waste during the wet mix process

S.No	Removal of wastes in the wet mix process	No. of respondents	Percentage (%)
1.	Yes	3	100.0
2.	No	0	0
	Total	3	100.0

Source : Primary data

INTERPRETATION:

100% of the respondents say that they remove waste during the wet mixing process.

INFERENCE:

All the employees are aware that the wastes had to be removed in the wet mixing process.

Table No. 4.43

Table showing the result if waste is not removed from the wet mix

S.No	Result if waste are not removed	No. of respondents	Percentage (%)
1.	Uneven coating	2	67
2.	Others	1	33
3.	Wire bend	0	0
4.	Air gaps	0	0
	Total	3	100.0

Source : Primary data

INTERPRETATION:

67% of the respondents say that wastes, if not removed from the mix may result in uneven coating and 33% of the respondent is says that, if waste not removed from the mix it will result in stoppage.

INFERENCE:

It is inferred that 67% of the respondents opined that if waste are not removed from the mix there will be uneven coating over the welding wires.

Table No. 4.44

Table showing the frequency of occurrence of mistake in the wet mix proportion

S.No	Frequency of occurrence of mistake in the wet mix proportion	No. of respondents	Percentage (%)
1.	Once in a while	1	33
2.	Rarely	1	33
3.	Very often	1	34
	Total	3	100.0

Source : Primary data

INTERPRETATION:

34% of the respondent says that mistakes occur often in the wet mix section and 33% of the respondents say that mistakes occur once in a while and 33% of the respondent says mistakes occur rarely in the wet mix section.

INFERENCE:

It is inferred that 34% of the respondent opined that mistake in the wet mix process occur often.

Table No. 4.45

Table showing the level of the effect due to mistake in the wet mix proportion

S.No	Level of the effect due to mistake in the wet mix proportion	No. of respondents	Percentage (%)
1.	Very largely	2	67
2.	Not much	1	33
3.	No effect	0	0
	Total	3	100.0

Source : Primary data

INTERPRETATION:

67% of the respondents say that the level of effect due to the mistake of the wet mix proportion is very large and 33% of the respondent say that the level of effect due to the mistake of the wet mix proportion is not much.

INFERENCE:

It is inferred that 67% of the respondents have opined that the mistake in wet mix proportion will affect the following processes very largely.

5 S CROSS TABS:

Table No. 4.46

Table showing the rate of usage of screw driver and the placing of the frequently used tools

Placing of frequently used tools * Rate of usage (Screw Driver)						
			Rate of usage			Total
			Often Used	Moderately Used	Rarely Used	
Placing of frequently used tools	Near the machine	Count	6	0		6
		% within Placing of frequently used tools	100.0%	0%	0%	100.0%
		% of Total	100.0%	0%	0%	100.0%
Total		Count	6	0	0	6
		% within Placing of frequently used tools	100.0%	0%	0%	100.0%
		% of Total	100.0%	0%	0%	100.0%

Source : Primary data

INTERPRETATION:

100% of the respondents state that the screw driver is used most often and they place the tools near the machine.

INFERENCE:

All the workers are aware that the most often used screw driver should be placed near the machine.

Table No. 4.47

Table showing the rate of usage of allen key and the placing of the frequently used tools

Placing of frequently used tools * Rate of usage (Allen Key)						
			Rate of usage			
			Often used	**Moderately used**	**Rarely used**	**Total**
Placing of frequently used tools	Near the machine	Count	3	1	2	6
		% within Placing of frequently used tools	50.0%	17%	33%	100.0%
		% of Total	50.0%	17%	33%	100.0%
Total		Count	3	1	2	6
		% within Placing of frequently used tools	50.0%	17%	33%	100.0%
		% of Total	50.0%	17%	33%	100.0%

Source : Primary data

INTERPRETATION:

50% of the respondents place the allen key tool near the machine as the respondents use the tool often, 17% of the respondents use it moderately and 33% of the respondents use it rarely.

INFERENCE:

The workers place the allen key near the machine as it is used often.

Table No. 4.48

Table showing the rate of usage of spanner set and the placing of the frequently used tools

Placing of frequently used tools * Rate of usage (Spanner Set)						
			Rate of usage			
			Often used	Moderately used	Rarely Used	Total
Placing of frequently used tools	Near the machine	Count	3	3	0	6
		% within Placing of frequently used tools	50.0%	50.0%	0%	100.0%
		% of Total	50.0%	50.0%	0%	100.0%
Total		Count	3	3	0	6
		% within Placing of frequently used tools	50.0%	50.0%	0%	100.0%
		% of Total	50.0%	50.0%	0%	100.0%

Source : Primary data

INTERPRETATION:

50% of the respondents place the spanner set near the machine as it is often used and 50% of the respondents use the tool moderately.

INFERENCE:

It is inferred that 50 % of the workers place the spanner set near the machine.

Table No. 4.49

Table showing the rate of usage of cutting pliers and the placing of the frequently used tools

Placing of frequently used tools * Rate of usage (Cutting Pliers)						
			Rate of usage			
			Often used	**Moderately used**	**Rarely used**	**Total**
Placing of frequently used tools	Near the machine	Count	2	2	2	6
		% within Placing of frequently used tools	34%	33%	33%	100.0%
		% of Total	34%	33%	33%	100.0%
Total		Count	2	2	2	6
		% within Placing of frequently used tools	34%	33%	33%	100.0%
		% of Total	34%	33%	33%	100.0%

Source : Primary data

INTERPRETATION:

34% of the respondents use cutting pliers frequently and the respondents place it near the machine, 33% of the respondents use the tool moderately and 33% of the respondents use the tool rarely.

INFERENCE:

It is inferred that 34% of the workers place the tools near the machine when the cutting pliers are used frequently.

Table No. 4.50

Table showing the rate of usage of screw gauge and the placing of the frequently used tools

Placing of frequently used tools * Rate of usage (Screw Gauge)						
			Rate of usage			Total
			Often used	Moderately used	Rarely used	
Placing of frequently used tools	Near the machine	Count	2	2	2	6
		% within Placing of frequently used tools	34%	33%	33%	100.0%
		% of Total	34%	33%	33%	100.0%
Total		Count	2	2	2	6
		% within Placing of frequently used tools	34%	33%	33%	100.0%
		% of Total	34%	33%	33%	100.0%

Source : Primary data

INTERPRETATION:

34% of the respondents place the screw gauge near the machine as they use it frequently, 33% of the respondents use the tool moderately and 33% of the respondents use the tool rarely.

INFERENCE:

It is inferred that 34% of the workers place the tools near the machine and others place the tools in the cupboard as they do not use the tool frequently.

Table No. 4.51

Table showing the rate of usage of microscope and the placing of the frequently used tools

Placing of frequently used tools * Rate of usage (Microscope)						
				Rate of usage		
			Often used	Moderately Used	Rarely used	Total
Placing of frequently used tools	In cupboard	Count	2	0	4	6
		% within Placing of frequently used tools	33%	0%	67%	100.0%
		% of Total	33%	0%	67%	100.0%
Total		Count	2	0	4	6
		% within Placing of frequently used tools	33%	0%	67%	100.0%
		% of Total	33%	0%	67%	100.0%

Source : Primary data

INTERPRETATION:

67% of the respondents place the microscope in the cupboard as it is rarely used and 33% of the respondents use the tool frequently.

INFERENCE:

It is inferred that 67% of the workers place the tools in the cupboard as the microscope is a rarely used tool in their workplace.

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Table No. 4.52

Table showing the rate of usage of vernier caliper and the placing of the frequently used tools

Placing of frequently used tools * Rate of usage (Vernier Caliper)				
			Rate of usage	
			Rarely used	Total
Placing of frequently used tools	In cupboard	Count	6	6
		% within Placing of frequently used tools	100.0%	100.0%
		% of Total	100.0%	100.0%
Total		Count	6	6
		% within Placing of frequently used tools	100.0%	100.0%
		% of Total	100.0%	100.0%

Source : Primary data

INTERPRETATION:

All the respondents use vernier caliper rarely and the place the tool in the cupboard.

INFERENCE:

It is inferred that all the workers place the vernier caliper only in the cupboard as they use it rarely.

Table No 4.53

Table showing the rate of usage of steel scale and the placing of the frequently used tools

Placing of frequently used tools * Rate of usage (Steel Scale)					
			Rate of usage		
			Often used	Rarely used	Total
Placing of frequently used tools	Near the machine	Count	4	2	6
		% within Placing of frequently used tools	67%	33%	100.0%
		% of Total	67%	33%	100.0%
Total		Count	4	2	6
		% within Placing of frequently used tools	67%	33%	100.0%
		% of Total	67%	33%	100.0%

Source : Primary data

INTERPRETATION:

67% of the respondents place the steel scale near the machine as they use it frequently and 33% of the respondents use the tool rarely.

INFERENCE:

It is inferred that only 67% of the workers place the scale near the machine.

Table No. 4.54

Table showing the rate of usage of wire cutter and the placing of the frequently used tools

Placing of frequently used tools * Rate of usage (Wire Cutter)					
			Rate of usage		
			Often used	Rarely used	Total
Placing of frequently used tools	Near the machine	Count	4	2	6
		% within Placing of frequently used tools	67%	33%	100.0%
		% of Total	67%	33%	100.0%
Total		Count	4	2	6
		% within Placing of frequently used tools	67%	33%	100.0%
		% of Total	67%	33%	100.0%

Source : Primary data

INTERPRETATION:

67% of the respondents use the wire cutter often and they place it near the machine and 33% of the respondents use the tool rarely.

INFERENCE:

It is inferred that only 67% of the workers use the wire cutter frequently and the place the tool near the machine.

Table No. 4.55

Table showing the rate of usage of crow bar and the placing of the frequently used tools

Placing of frequently used tools * Rate of usage (Crow Bar)						
			Rate of usage			Total
			Often used	Moderately used	Rarely used	
Placing of frequently used tools	In cupboard	Count	2	1	3	6
		% within Placing of frequently used tools	33%	17%	50.0%	100.0 %
		% of Total	33%	17%	50.0%	100.0 %
Total		Count	2	1	3	6
		% within Placing of frequently used tools	33%	17%	50.0%	100.0 %
		% of Total	33%	17%	50.0%	100.0 %

Source : Primary data

INTERPRETATION:

50% of the respondents use crow bar rarely and place it in cupboard, 33% of the respondents use the tool often and 17% of the respondents use it moderately.

INFERENCE:

It is inferred that only 50% of the workers use crow bar rarely and they place it in the cupboard.

Table No. 4.56

Table showing searching time of tools and its effect on production

Searching time effect on production * Time taken to search tools						
			Time taken to search tools			
			Less than 5 minutes	5-10 minutes	More than 10 minutes	Total
Searching time effect on production	To some extent	Count	4	2	0	6
		% within Searching time effect on production	67%	33%	0	100.0%
		% of Total	67%	33%	0	100.0%
Total		Count	4	2	0	6
		% within Searching time effect on production	67%	33%	0	100.0%
		% of Total	67%	33%	0	100.0%

Source : Primary data

INTERPRETATION:

67% of the respondents search the tools for less than five minutes and 33% of the respondents search the tool for between five to ten minutes. And the production id affected to some extent.

INFERENCE:

It is inferred that all the respondents state that the production gets affected to some extent when they search tools for 0-10 minutes.

Table No. 4.57

Table showing the effect of absence of labels on the search for tools

Labels to indicate where to place the tools * Frequency of workers searching tools						
			Frequency of workers searching tools			
			Often	Sometimes	Rarely	Total
Labels to indicate where to place the tools	No	Count	0	6	0	6
		% within Labels to indicate where to place the tools	0	100.0%	0	100.0%
		% of Total	0	100.0%	0	100.0%
Total		Count	0	6	0	6
		% within Labels to indicate where to place the tools	0	100.0%	0	100.0%
		% of Total	0	100.0%	0	100.0%

Source : Primary data

INTERPRETATION:

All the respondents state that there are no labels to indicate where to place the tools and all the respondents state that they search for tools sometimes.

INFERENCE:

It is inferred that all the workers state that they sear for tools sometimes and this is because they don't have place with labels to keep the tools in order.

CROSSTABS FOR WET MIX:

Table No. 4.58

Table showing the awareness of proportion of the mix and how frequently mistake occurs in the wet mix proportion

Awareness of proportion of the mix * Frequency of occurrence of mistakes in wet mixing						
			Frequency of occurrence of mistakes			
			Very often	Once in a while	Rarely	Total
Awareness of proportion of the mix	Fully aware	% within Awareness of proportion of the mix	100.0%	0%	-	100.0%
		% of Total	34%			34%
	Partially aware	% within Awareness of proportion of the mix		100.0%	-	100.0%
		% of Total		33%		33%
	Unaware	% within Awareness of proportion of the mix		100.0%	-	100.0%
		% of Total		33%		33%
Total		% within Awareness of proportion of the mix	34%	66%	-	100.0%
		% of Total	34%	66%	0%	100.0%

INFERENCE:

It is inferred that 34% of the respondents are fully aware about the operations in the wet mix says that the mistakes occur very often and this will definitely affect the production process.

WEIGHTED AVERAGE

Table No. 4.59

Table showing ranking of the usage of tools using weighted average method:

S.No	Tools	Often used	Moderately used	Rarely used	Total	Weighted average	Rank
1.	Screw driver	6	0	0	18	3	1
2.	Allen key	3	1	2	13	2.17	4
3.	Spanner	3	3	0	15	2.5	2
4.	Cutting plier	2	2	2	12	2	5
5.	Screw gauge	2	2	2	12	2	5
6.	Micro meter	2	0	4	10	1.67	9
7.	Vernier Caliper	0	0	6	6	1	10
8.	Steel scale	4	0	2	14	2.33	3
9.	Wire cutter	2	1	3	11	1.83	7
10.	Crow bar	2	1	3	11	1.83	7

Source : Primary data

INTERPRETATION:

The ranking shows that the employees use screw driver, spanner set, steel scale often and the vernier caliper, micrometer, Wire cutter are the rarely used tools.

PROFILE OF THE RESPONDENT:

Table No. 4.60

CRITERIA	CHARACTERISTICS
Are all the tools used every time by workers	No (100%)
Rate of usage of Screw Driver	Often Used (100%)
Rate of usage of Allen Key	Often Used (50%)
Rate of usage of Spanner set	Moderately Used (50%)
Rate of usage of Cutting Pliers	Often Used (34%)
Rate of usage of Screw Gauge	Rarely Used (33%)
Rate of usage of Micro meter	Often Used (33%)
Rate of usage of Vernier Caliper	Rarely Used (100%)
Rate of usage of Steel Scale	Often Used (67%)
Rate of usage of Wire cutter	Often Used (67%)
Rate of usage of Crow Bar	Rarely used (50%)
Placing of frequently used tools by the employees	Often Used (100%)
Awareness of the employees on where to place the tools	In trays (100%)
Ease of accessing the tools	Moderate (50%)
Placing tools at same place from where it was taken	Occasionally (17%)
Finding of tools by others	Moderately easy (67%)
Searching of tools that are used often	Sometimes (100%)
Time taken to search tools	5-10 minutes (33%)
Searching time effect on production	To some extent (100%)
Losing the tools	Sometimes (17%)
Place for rarely used tools	In cupboard (100%)
Label indication for tool placement	No (100%)
Identification of tools by workers	By asking you (67%)
Awareness of workers in placing the tools within a particular height	Below knee level (33%)
Frequency at which the work place are cleaned	Only in the evening (50%)

Reason for cleaning	Your interest (100%)
Problem noticed while cleaning	Do nothing (17%)
Usefulness of standard procedure	Very helpful (100%)
Number of Material in the mix	Unaware (67%)
Names of the Materials added in the mix	Unaware (66%)
Order of the materials to be added	Partially aware (17%)
Finding the materials	By name (100%)
Problems that would occur if proper order not followed	Quality Degrades (50%)
Problems faced if sinker is not used	Wire bends (100%)
Frequency of spilling the materials	Very often (100%)
Process with spilled powder	Mix after sinking (83%)
Missing out any material	No (100%)
Happening due to missing out materials	Waste of mix (100%)
Awareness of employees about the wet mix proportion	Unaware (34%)
Measuring of the silicate solution to be added to the dry mix	By weighing (100%)
Happenings if improper proportion of the wet mix is used	Breakdown (100%)
Removal of wastes in the wet mix process	Yes (100%)
Result if waste are not removed	Uneven coating (67%)
Frequency of occurrence of mistake in the wet mix proportion	Very often (34%)
Level of the effect due to mistake in the wet mix proportion	Very largely (67%)

5.1 FINDINGS

- It is inferred that all the workers use only few tools during the production activities.
- It is inferred that all the workers use screw driver frequently.
- It is inferred that 50% of the workers use allen key often.
- It is inferred that 50% of the workers use allen key often.
- It is inferred that 33% of the employees use cutting pliers often and moderately.
- It is inferred that 67% of the employees use the micro meter rarely.
- It is inferred that 100% of the respondents do not use vernier caliper often.
- It is inferred that 67% of the employees use the steel scale often.
- It is inferred that 67% of the employees use the wire cutter often.
- It is inferred that 50% of the employees do not use the crow bar often.
- It is inferred that all the employees place the frequently used tools near the machine.
- All the employees choose trays as comfortable means to place the tools.
- It is inferred that 50% of the employees feel that accessing tools is very easy.
- It is inferred that 83% of the employees place the tools at the same place every time from where they have taken it from.
- It is inferred that 67% of the employees find it moderately easy to find the tools after someone used it.
- It is inferred all the employees search for the most often used tools sometimes.
- It is inferred that 67% of the employees search and find the tools before five minutes.
- It is inferred that searching for tools definitely affects the production to some extent.
- It is inferred that the 83% of the employees lose the tools that they use.
- It is inferred that all the employees place the rarely used tools only in the cupboard.
- It is inferred that there are no labels for placing various tools at the right location.
- It is inferred that the 67% of the employees find the tools by asking someone who might have used it before.
- It is inferred that 67% employees are aware that tools have to be placed above knee level.
- It is inferred that 50% of the employees clean their workplace only in the evening.

- It is inferred that all the employees clean their workplace on their interest and satisfaction.
- It is inferred that the 83% of the employees note the leakage of oil from the machines while cleaning the workplace.
- It is inferred that all the employees feel that a standard procedure for placing the tools would be very much useful to them.

POKA YOKE

- It is inferred that 67% of the employees are unaware of the number of materials added into the dry mix.
- It is inferred that the 66% of the employees are unaware about the names of the materials added in the dry mix.
- It is inferred that the 83% of employees are fully aware of the materials to be mixed to form the dry mix.
- It is inferred that all the employees find the materials to be added in the mixture by the names of those materials.
- It is inferred that 50% of the employees are aware that quality gets degraded if proper order is not followed while mixing the materials.
- It is inferred that all the employees are aware that wire bends occur if sinker is not used to remove the unwanted materials in the powder to be mixed.
- It is inferred that all the employees spill the materials in the dry mixing process very often.
- It is inferred that the 83% of the employees are aware that the spilled powder has to be cleared of impurities in the sinker before it is added into the dry mixture.
- It is inferred that all the employees are conscious in not missing out any material in the mixing process.
- It is inferred that all the employees are aware that missing out a material would result in waste of the mix.

WET MIXING

- One respondent is not aware about the proportion of the dry mix and the silicate solution.
- The three employees are aware that the solution must be weighed before added into the dry mix.

- All the employees say that improper wet mix proportion will lead to break down of the extruder machine.
- It is inferred that all the employees are aware that the wastes had to be removed in the wet mixing process.
- It is inferred that two employees say that if waste are not removed from the mix there will be uneven coating over the welding wires.
- It is inferred that one of the three employees say that mistake in the wet mix process occur often.
- Two employees say that the mistake in wet mix proportion will affect the following processes very largely.

5 S CROSSTABS

- It is inferred that all the workers are aware that the most often used screw driver should be placed near the machine.
- It is inferred that 50% of the workers place the allen key near the machine as it is used often.
- It is inferred that 50 % of the workers place the spanner set near the machine.
- It is inferred that the workers place the tools near the machine when the cutting pliers are used frequently.
- It is inferred that 34% of the workers place the tools near the machine and others place the tools in the cupboard as they do not use the tool frequently.
- It is inferred that 67% of the workers place the tools in the cupboard as the microscope is a rarely used tool in their workplace.
- It is inferred that all the workers place the vernier caliper only in the cupboard as they use it rarely.
- It is inferred that 67% of the workers place the steel scale near the machine.
- It is inferred that 67% of the workers use the wire cutter frequently and the place the tool near the machine.
- It is inferred that 50% of the employees use crow bar rarely and they place it in the cupboard.

- It is inferred that all the respondents state that the production gets affected to some extent when they search tools for 0-10 minutes.
- It is inferred that all the workers state that they sear for tools sometimes and this is because they don't have place with labels to keep the tools in order.

CROSSTABS FOR WET MIX

- One employee, fully aware about the operations in the wet mix says that the mistakes occur very often and this will definitely affect the production process.

WEIGHTED AVERAGE METHOD

- The ranking shows that the employees use screw driver, spanner set, steel scale often and the vernier caliper, micrometer, Wire cutter are the rarely used tools.

5.2 SUGGESTIONS

- Enough trays has to be provided to the workers as they prefer to place the most frequently used tools in trays and the trays shall be placed near the machine.
- Names of the tools can be printed as labels. The labels can be appropriately placed in the cupboards or near the machines where the workers can place the tools at the assigned place after using it every time. This would help those workers who find accessing of tools moderately easy.
- The workers should be leaving the tools at the same place after usage of the tools every time and it should be made as a standard practice. This would help each worker to access the tools easily after someone's replacement of the same. The search time for the tools would be reduced to a great extent and would not affect the production process
- The cupboards shall be split into sections like a section for the often used tools, a section for the moderately used tools and a section for the rarely used tools. The rare occurrence of tools getting lost can be prevented. Ease of access of tools as the workers know where the tools can be found.
- Stands should be provided for the workers in the wire drawing segment to place the tools near the machine to place the tools above the knee level.
- Workers should notice if there are any spills, leakage of oil or any parts missing while carrying out the cleaning work every day.
- Names of the materials and the number of materials to be added in the dry mix are not known to workers in the dry mixing section. As the names of the materials are confidential, color codes can be given to each of the material which would make it easy for them to add and mix materials through color codes.
- A sheet can be provided in the dry mix section which will help them to easily transfer the spilled powder to the sinker as the workers spill the materials very often.
- Workers at the wet mixing section have to be clearly instructed about the proportion of the dry powder and the silicate solution.
- The workers in wet mixing shall be trained by the extruder operators for delivering a right mix to the extruder section.
- The workers shall be explained about the problems that the following processes would face if the wet mix proportion is not good.

5.3 CONCLUSION

The study states the drawbacks of the system in the organization where employees do not have a standard tool handling procedure and their awareness regarding the materials in the wet and dry mixing section. The researcher after analysis has given suggestions to remove the above drawbacks from the present system of operations. The implementation of the suggestions by the organization shall help them to have a improved tool handling system and a mistake proof work procedure in the dry and wet mixing sections. Through the implementation they can save time, the resource and provide a high quality product as desired by the customer.

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APPENDIX

A STUDY ON THE LEAN MANUFACTURING FEASIBILITY AT SHARP ELECTRODES PRIVATE LIMITED, COIMBATORE

5's:

EXTRUDER AND WIRE DRAWING:

1. Do you use each and every tool every time?

   a. Yes ☐ b. No ☐

2. Tick the option according to the usage of the tools

S.No	TOOLS USED	RATE OF USAGE		
		OFTEN USED	MODERATELY USED	RARELY USED
1.	Screw Driver			
2.	Allen Key			
3.	Spanner set			
4.	Cutting Pliers			
5.	Screw Gauge			
6.	Micro Meter			
7.	Vernier Caliper			
8.	Steel Scale			
9.	Wire Cutter			
10.	Crow bar			

3. Where do you place the most frequently used tools?

   a. Near the machine ☐ b. In cupboard ☐ c. On the table ☐

4. Do you know where the tools have to be placed?

   a. In trays ☐ b. Separations in holders ☐ c. In hangers ☐ d. In covers ☐

5. How easy is it to you to access the tools?

   a. Very easy ☐ b. Moderate ☐ c. Tough ☐

6. Do you place the tools in the same place after usage?

a. Every time ☐ b. Occasionally ☐ c. Not at all ☐

7. How easy it is for others to find the tools after you use it?

a. Very easy ☐ b. Moderately easy ☐ c. Hard to find ☐

8. Do you search for the tools that are used often?

a. Often ☐ b. Sometimes ☐ Rarely ☐

9. How much time you would take to find the tool(s)?

a. Less than 5 minutes ☐ b. 5-10 minutes ☐ c. More than 10 minutes ☐

10. Does it affect the production?

a. To large extent ☐ b. To some extent ☐ c. Not at all ☐

11. Do you lose tools?

a. Often ☐ b. Sometimes ☐ c. Rarely ☐

12. Where do you place the most rarely used tools?

a. Near the machine ☐ b. In cupboard ☐ c. If others specify _____

13. Do you have labels to indicate where to place the tools?

a. Yes ☐ b. No ☐

13. a. If no, how other workers will be able to find the tools?

a. By asking you ☐ b. A practice ☐ c. They search ☐

d. Others specify _____

14. At what height do you place the tools after usage?

a. Below knee level ☐ b. Above knee level ☐ c. Above forehead level ☐

15. When do you clean your workplace?

a. Every 1 hour ☐ b. Every 2 hours ☐ c. Every 4 hours ☐

d. Only in the evening ☐ e. Not at all ☐

16. What makes you to clean the workplace?

a. Company standard ☐ b. Your interest ☐ c. Others specify ☐

17. Why do you clean the workplace, for what reason?

18. While cleaning the workplace do you note down any problems, like?

a. Leakage of oil ☐ b. Parts missing ☐ c. Spills ☐ d. Do nothing ☐

19. If a standard procedure is set to place the tools, how helpful will it be to you?

a. Very helpful ☐ b. Moderately helpful ☐ c. Will remain the same ☐

POKE YOKE: (DRY MIXING)

1. Material Awareness:

Particular	Fully Aware	Partially Aware	Unaware
Number of materials used in the mix			
Names of the materials			
Order of materials to be mixed			

2. How do you find the materials to be mixed?

a. By name ☐ b. By Code ☐ c. By colour ☐

3. Do you know what happens if proper order is not followed?

a. Quality degrades ☐ b. Materials do not mix ☐ c. Nothing happens ☐

d. If others specify _____

4. When the sinker is not used, what happens in the welding electrode manufactured?

a. Spattering ☐ b. Excess Smoke ☐ c. Wire bends ☐ d. Nothing happens ☐

5. Do you spill the materials?

a. Very often ☐ b. Rarely ☐ c. Never spill ☐

6. What will you do with the spilled powder?

a. Mix after sinking ☐ b. Mix without sinking ☐ c. Waste it ☐

7. Have you missed out any material in dry mixing process?

a. Yes ☐ b. No ☐

7.a. If yes , how frequently it happens?

8. What happens on missing a material?

a. Waste of mix ☐ b. Spattering and smoke ☐ c. Nothing happens ☐

WET MIXING:

9. Do you know the proportion of wet mix?

a. Fully Aware ☐ b. Partially Aware ☐ c. Unaware ☐

10. How do you measure the silicate solution that is to be added with the dry mixture?

a. By experience ☐ b. Using beakers ☐ c. By weighing ☐

d. If others specify _____

11. If the proportion of the dry powder and silicate solution is not meeting the standard, do you know what will happen?

a. Cracks ☐ b. Wastage ☐ c. Breakdown ☐

d. Uneven coating ☐ e . Pressure to be increased ☐ f. Others specify _____

12. Do you remove the unwanted materials during wet mixing?

a. Yes ☐ b. No ☐

12 a. If no, do you know what will happen?

a. wire bend ☐ b. uneven coating ☐ c. air gaps ☐

d. If others specify _____

13. In what frequency the mistake occurs?

a. Very often ☐ b. once in a while ☐ c. Rarely ☐

14. How the mistakes in the wet mixing process affects the following processes?

a. Very largely ☐ b. Not much ☐ c. No effect ☐