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## ENACTMENT OF LEAN SIX SIGMA IN STRAINER BUILT-UP INDUSTRY

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### ABSTRACT

Lean Six Sigma is a methodology in a network arranged joint effort to improve the show by productively ousting waste and diminishing assortment. It joins lean collecting and Six Sigma to get rid of the waste. In a collecting association, it is major to improve the methodology. In this examination, Lean Six Sigma gadgets are used to the Strainer fragment creating industry to dismember and improve the collecting system. It is seen that the strainer part amassing is out of detail most remote point and age was unreliable. The primary driver of frustration is recognized, poor down and by using Lean six sigma devices improvement is made.

### KEYWORDS

DMAIC, Lean Six Sigma, Process capability analysis, Process Control and Strainer.

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### INTRODUCTION

Six-Sigma permits just 3.4 imperfections per million. Six-Sigma is an administration theory to kill botches, improve and squander. It is a critical thinking technique to expand consumer loyalty, benefit and lessen cost. Six-Sigma is an improvement technique for an association. It is a quality improvement process by diminishing the imperfections, limit the variety and improve capacity in the assembling procedure. The goal of Six Sigma is to build the benefit. Lean Six Sigma (LSS) consolidates standards of Lean with Six Sigma to improve process adequacy. Lean spotlight on to diminish lead-time by evacuating waste and non-esteem

included exercises. Procedure capacity examination is a strategy for consolidating the factual devices created from the typical bend and control graphs to investigate the information speaking to a procedure. The procedure capacity study is to decide the procedure variety. The utilization of the procedure capacity study ought to be a fundamental piece of the quality building. Evaluate the fluctuation and diminishing it in the assembling procedure is the primary movement of the procedure the executives. Procedure Capability implies an assessment of how well a procedure meets determinations or the capacity of the procedure to create and that fit in with building particulars. Procedure Control implies an assessment of procedure soundness after some time or the capacity of the procedure to keep up a condition of good factual control. The procedure capacity is the range over which the procedure regular variety happens. There are two essential capacity files Cp is the ability record. It quantifies how well the information fit into and between the upper and lower determination limits. The higher the worth, the better the process. Cpk is the focusing ability record. It gauges how well the information is focused and inside as far as possible. The higher is the worth then information is focused.

## LITERATURE REVIEW

Lean Six Sigma preparing gives solid administration and supports the activity. LSS drives the quality improvement approach and lessens the impact in execution process Achievement towards nonstop improvement, consumer loyalty, increment deals at a limited expense to accomplish focused on piece of the overall industry and benefit level<sup>1</sup>. The examination and comprehension of value and procedure at various levels will help to consistent procedure estimation and improvement framework. A methodical and cognizant exertion to impact and control the progression of data that prompts a productive procedure and improves the adequacy of the association<sup>2-4</sup>. Procedure capacity is an exhibition level of the procedure after it has been checked under factual control. It is utilized to quantify the changeability of the yield of a procedure and to contrast that inconstancy and a proposed

determination or item resistance<sup>5-8</sup>. The records for procedure ability depend on the suspicion that the basic procedure dispersion is around typical<sup>9</sup>. The procedure capacity study includes every single characteristic variable and the quantity of the example affects the precision of the Cpk gauges, littler examples will result in much bigger varieties of the Cpk insights<sup>10-12</sup>. The motivation behind this investigation is the six sigma approach of DMAIC process. The instruments utilized for each stage are examined in further points. Venture contract and SIPOC charts are utilized in the Define Phase. Procedure capacity examination is to dispense with quality issues during machining. Circumstances and logical results graph to distinguish the main driver of disappointment. A control graph is to check whether the procedure is inside as far as possible or not.

## METHODOLOGY

Six-Sigma utilizes an institutionalized bit by bit process with explicit apparatuses for leading the investigation. This is called DMAIC, which represents Define, Measure, Analyze, Improve, and Control.

DMAIC procedure includes the accompanying advances:

Stage 1: Define Phase

Stage 2: Measure Phase

Stage 3: Analyze Phase

Stage 4: Improve Phase

Stage 5: Control Phase

### Define Phase

In the Define time of the evaluation, the truth is to depict the issue explanation, which makes sense of what the get-together needs to improve. The essential for undertaking execution and its great conditions are to be depicted in this stage. In this stage, the Project Charter, SIPOC - Suppliers, Inputs, Process, Outputs, and Customers are utilized.

The key elements of a Six Sigma Project charter are listed below and explained each element in Table No.1.

1. Business case
2. Problem Statement
3. Goal statement
4. Roles and responsibilities

5. Scope of the project,
6. Preliminary project plan
7. Communication plan

To create a SIPOC diagram

- Identify Supplier.
- Identify various input required.
- Identify activities involved.
- Identify Outputs of the process.
- Identify Customers.

The SIPOC diagram that lists all the activities that convert the raw material into a final product of strainer is shown in Table No.2.

#### Measure Phase

The Measure Phase is the second step of the Six Sigma technique. The objective of the Measure stage is to set up a reasonable comprehension of the present condition of the procedure you need to improve. The Outer breadth of the Strainer is estimated in a subgroup size of three for every segment. The deliberate qualities are displayed in Table No.3 demonstrated as follows. From the table, it is seen that the example number 15 has the greatest deviation in estimation of range 0.7mm.

#### Analyze Phase

In the Analyze mastermind, two or three potential clarifications behind grouping that are influencing the yields of the technique are perceived. Generally, utilized contraptions in the investigate stage are the Cause and Effect Diagram. The Cause and Effect Diagram is a philosophy to see the potential clarifications behind an issue. The different foundations for the removal of the strainer part are human error in measurement, Tight tolerance, size of raw work piece, setting up of dies, placement of fixtures Drilling in rolled sheets operating force, methods and process environment. The gigantic reason behind the disappointment of the part is a consequence of the executive.

#### Improve Phase

The motivation behind the Improve stage is to distinguish improvement proposal. The exercises performed during the Improve stage are

- Identify improvement
- Cost/advantage examination
- Design future state

- Establish execution targets and undertaking scorecard
- Implementation

The goal of proclivity chart is to create reasonable and significant thoughts from a rundown of numerous thoughts. It is useful when thoughts are explained by making into littler classes. The thoughts produced are gathered into three classifications and are recorded under every class is appeared in Figure No.1.

#### Control Phase

The control stage is to check that the usage is fruitful and guarantee that the improvement will support after some time. In the Control stage, the group ought to confirm that preparation and usage were completed accurately. It is required to gather and break down information to guarantee that the procedure execution and upgrades are made. The groups give a suggestion to progress.

A control diagram comprises of three lines

- Central line (CL)
- Upper Control Limit (UCL).
- Lower Control Limit (LCL).

#### $\bar{x}$ Chart

$$UCL = \bar{x} + A_2\bar{R}$$

$$LCL = \bar{x} - A_2\bar{R}$$

#### R Chart

$$UCL = \bar{R}D_4$$

$$LCL = \bar{R}D_3$$

$\bar{R}D_3$  is the mean of the ranges in the sample process.  $A_2$ ,  $D_4$  and  $D_3$  are variables in the appropriate statistical (SQC) table.

## RESULTS AND DISCUSSION

By technique capacity examination that there is no portion under beyond what many would consider possible. The portion bombs as a result of simply higher estimation than beyond what many would consider possible. From this, it is contemplated that the method isn't capable.

Histogram of the Outer Diameter is the part assortment is higher in estimation on the right half of the mean worth and more than quite far. The course of huge worth isn't in a predefined limit this makes a low quality thing.

The speculation testing resulted that p-esteem more prominent than 1 which means irrelevant finding and practically zero proof to expel the invalid theory. It is gathered that the system isn't under true control. Sample 15 range is above the Upper Boundary limit represents that range is maximum and is not acceptable of huge variation. Irregularity in the condition of the strainer is the genuine responsibility of the mistake. This can be diminished by the right confining pass on and the moving method is managed to improve the strategy.

**Table No.1: Project Charter**

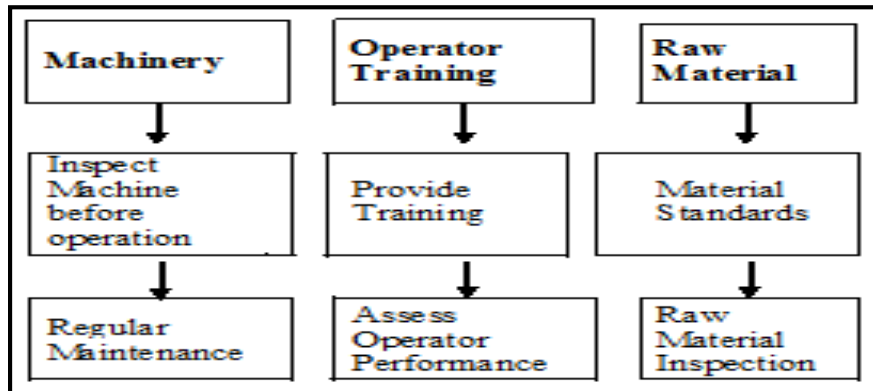
S.No	Project Charter	
1	Project Name	Defect Rate Reduction
2	Business Unit	Calmet
3	Department	Production
4	Start Date	01-10-17
5	Project Budget	30000
6	Project Stakeholder	Name
7	Project Champion	Ram
8	Process Owner	Praveen
9	Black/ Green Belt	Guru
10	Team Members	Anand, Murugan
<b>Business Case</b>		
11	The number of orders for strainer is more but there is a problem of high rejection due to variation in size and irregularity shape. If this continues the cost of production will increase and cost of rework also increases.	
<b>Problem Statement</b>		
12	Strainer Defect Rate is high due to manufacturing shape as per design of the final product. Rework of component is more.	
<b>Goal Statement</b>		
13	The goal of the project is to reduce the number of defective items.	
<b>Project Scope</b>		
14	The scope of the Project is to examine all processes, identify the cause for defective items and suggest the alternative method to reduce defects.	
<b>Benefits</b>		
15	Satisfy Customer	
16	Produce Quality Products	
17	Reduce Defects	
18	Avoid Rework	

**Table No.2: SIPOC for Strainer**

S.No	Supplier	Input	Process	Output	Customer
1	Sheet Metal Machines Welding Gas Cylinder Protective Devices	Manpower Machine Tool Equipment	Sheet metal Shearing Forming Rolling Spot Welding Drilling Rivet Welding Net Inserting Packing	Strainer	Pump Manufacturer  Retailer

**Table No.3: The measured values of outer diameter**

Sample	Subgroup			Mean (mm)	Range (mm)
	1	2	3		
1	102.6	102.3	102.4	102.43	0.3
2	102.4	102.7	102.5	102.53	0.3
3	102.4	102.6	102.4	102.47	0.2
4	102.3	102.6	102.5	102.47	0.3
5	102.3	102.1	102.2	102.20	0.2
6	102.6	102.7	102.4	102.57	0.3
7	102.8	102.4	102.3	102.50	0.5
8	102.5	102.6	102.2	102.43	0.4
9	102.7	102.6	102.7	102.67	0.1
10	102.5	102.4	102.6	102.50	0.2
11	102.3	102.4	102.5	102.40	0.2
12	102.4	102.6	102.2	102.40	0.4
13	102.3	102.5	102.2	102.33	0.3
14	102.4	102.6	102.4	102.47	0.2
15	102.5	102.9	102.2	102.53	0.7



**Figure No.1: Affinity diagram**

**CONCLUSION**

A contextual investigation is exhibited for the assembling of Strainer was methodically improved by the applying of the Lean Six Sigma strategy. Waste is disposed of by estimating and investigating the underlying driver of variety and actualizes the change. The LSS steps are the efficient methodology evaluating the present condition of the procedure. Readiness of the SIPOC to list all procedures included. In this, the procedure ability investigation was completed in the Measure stage to reason that Cpk of under 1.0 implies that the procedure isn't fit for gathering its prerequisites. The procedure isn't able to do reliably carrying out Strainer with an external breadth according to particular required.

The procedure normal is off kilter. From Analyze, stage main driver is recognized. In improve; the stage fondness outline is utilized to list the thoughts in classes. The control outline and Pareto diagram are utilized in charge to check whether the procedure is in charge or not. The control outline speaks to of control limits and not meeting as far as possible.

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## CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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