Lean six sigma implementation industry essay sample

Business, Industries

Abstract—The Process Capability Analysis is to determine how well a process meets the specification limits. In manufacturing company it is essential to investigate whether the production process is in control and to state that the process is capable or not. In this study Process capability is performed in Strainer component manufacturing in Pump Industry to check whether the process is capable are not. It is observed that some parts are out of tolerance limit and production was instable. Index Terms— Lean Six Sigma, Process Capability, Process Control, Strainer

INTRODUCTION

Six- Sigma allows only 3. 4 defects per million. Six-Sigma is a management philosophy to eliminate mistakes, rework and waste. It is a problem solving method to increase customer satisfaction and profit and reduce cost. Six Sigma is a financial improvement strategy for an organization. It is a quality improving process by reducing the defects, minimize the variation and improve capability in the manufacturing process. The objective of Six Sigma is to increase the profit.

Lean Six Sigma (LSS) combines principles of Lean with Six Sigma to improve process effectiveness. Lean focus on to reduce lead-time by removing waste and non-value added activities. In this

MAIC

Process capability study is a method of combining the statistical tools developed from the normal curve and control charts with good engineering judgment to interpret and analyze the data representing a process. The process capability study is to determine the variation spread. The

administration, analysis and use of the process capability study should be an integral part of the quality engineering function. The results could be used for new design applications, inspection planning and evaluation techniques. It is type of tool that can be used to prevent defects during the production cycle through better designs, through factual knowledge of machine or process limitations and through knowledge of process factors that can or cannot be controlled. In any manufacturing operation, there is a variability, which is manifested in the product made by the operations. Quantifying the variability with objectives and advantages of reducing it in the manufacturing process is the prime activity of the process management.

Process Capability refers to the evaluation of how well a process meets specifications or the ability of the process to produce parts that conform to engineering specifications, Process Control refers to the evaluation of process stability over time or the ability of the process to maintain a state of good statistical control. The process capability is the range over which the natural variation of the process occurs as determined by the system of common causes.

There are two primary capability indices

• Cp is the capability index. It measures how well the data fit between the upper and lower specification limits. The higher the value, the better the fit.
• Cpk is the centering capability index. It measures how well the data is centered between the specification limits. The higher the value the more centered the data.

LITERATURE REVIEW

Process capability is the long-term performance level of theprocess after it has been brought under statistical control. Theuse of process capability was adopted as far back as 1920s. Itwas used to measures the variability of the output of a processand to compare that variability with a proposed specification or product tolerance [1-3]. According to 1S0 (15504) defined process capability as a process to its purpose as managed by an organization management. For information technology, 1S0 (15504) also specifies a process capability measurement framework for assessing process capability.

The measurement framework has been generalized so that it can be applied to non IT processes [4]. Process capability indices are used effectively to summarize process capability information in a convenient unit less system. These indices are Cp, Cpl, Cpu and Cpk [1]. The indices for process capability are based on the assumption that the underlying process distribution is approximately normal [2]. The data chosen for process capability study should attempt to encompass all natural variables and the number of sample used has a significant influence on the accuracy of the Cpk estimates. Therefore, smaller samples will result in even larger variations of the Cpk statistics [3].

The purpose of this study was to focus on the six sigma methodology of DMAIC process. The tools used for each phase is discussed in further topics. SIPOC diagram is used in Define Phase. Process capability analysis is to eliminate quality problems during machining. Cause and effect diagram to

identify the root cause of failure. Control chart is to check whether the process is within control limit or not.

METHODOLOGY

DMAIC process involves the following steps:

Step 1: Define Phase

Step 1: Measure Phase

Step 1: Analyze Phase

Step 1: Improve Phase

Step 1: Control Phase

DATA COLLECTION

Define Phase

In the Define phase of the project, the focus is to define the Problem statement which specifies what the team wants to improve. In this phase the Scope of the project, the Project Charter, SIPOC – Suppliers, Inputs, Process, Outputs, and Customers are to be used.

To create a SIPOC diagram:

Identify Supplier.

Identify various input required.

Identify process involved.

Identify Outputs of the process

Identify Customers.

Table 1. SIPOC

Supplier Input Process Output Customer

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

Measure Phase

The Measure is the second step of the Six Sigma methodology. The goal of Measure phase is to establish a clear understanding of the current state of the process you want to improve. The Outer diameter of the Strainer is measured in sub group size of three for each component. The measured values are presented in the Table 2 shown below

Analyze Phase

In Analyze phase, identify several possible causes of variation that are affecting the outputs of the process. Commonly used tools in the analyze

phase is the Cause and Effect Diagram. The Cause & Effect Diagram is a technique to graphically identify and organize many possible causes of a problem.

Improve Phase

The purpose of the Improve phase is to identify improvement recommendation. The activities performed during the Improve phase are

Identify improvement

Cost/benefit analysis

Design future state

Establish performance targets and project scorecard

Implementation

The objective of affinity diagram is to develop a understandable and meaningful ideas from a list of many ideas. It is helpful when ideas need to be clarified by making into smaller categories.

Machinery Operator Training Raw Material

Inspect Machine before operation Provide Training Material Standards

Regular Maintenance Assess Operator Performance Raw Material Inspection

Control phase is to verify that the implementation is successful and ensure that the improvement will sustains over time. In the Control phase, the team should verify that training and implementation were carried out correctly. They need to collect and analyze data to ensure process performance and improvements were made. The teams provide recommendation for improvement.

In this control chart is to study how a process changes over time. A control chart consists of three lines

Central line (CL)

Upper Control Limit (UCL).

Lower Control Limit (LCL).

$\bar{x}$ Chart

$UCL = \bar{\bar{x}} + A2\bar{R}$

$LCL = \bar{\bar{x}} – A2\bar{R}$

R Chart

$UCL = \bar{R}D4$

$LCL = \bar{R}D3$

$\bar{R}D3$ is the mean of the ranges in the sample process. A2, D4 and D3 are variables in the appropriate statistical (SQC) table.

RESULTS AND DISCUSSION

Figure 4. Process-capability analysis report

In Fig. 4 Process-capability analysis represents that there is no component under the LCL limit. The component fails due to only higher dimension than the specification limit. From this it is conclude that the process is not capable.

Conclusion

A case study is presented of manufacturing of Strainer was systematically improved by the applying of the LSS methodology. Waste was eliminated by measuring and analyzing the root cause for variation and implement the change. The LSS steps is the systematic approach assessing of the current of

the process. Preparation of the SIPOC to list all process involved and required. In this the process-capability analysis was carried out in Measure phase from this conclude that Cpk of less than 1. 0 means that the process is not capable of meeting its requirements.

The process is not capable of consistently bringing out Strainer with outer diameter as per specification required. The process average is off-centered. From Analyze phase root cause is identified. In improve phase affinity diagram is used to list the ideas in categories. Control chart and Pareto chart are used in control to check whether the process is in control or not. The control chart represents out of control limits and not meeting the specification limit. It is concluded that the process is not under statistical control.

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