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Quality Management of Propeller Shaft Using Seven Quality Tools

Scholar Sourav Choukade, Assistant Professor Vipul Upadhyay
Department of Mechanical Engineering, SDITS Khandwa

Abstract- Quality, a beacon of human civilization's advancement, signifies not just the excellence of a product or service, but the very essence of progress itself. As humanity marches forward, propelled by innovation and ingenuity, the significance of quality control in business becomes indisputably profound. Indeed, it can be unequivocally stated: without quality control, economic prosperity remains an elusive dream. In today's landscape of relentless global competition, manufacturing and service entities alike find themselves at a pivotal juncture. The imperative to enhance the quality of their offerings looms large, casting a shadow over complacency and mediocrity. In this era of heightened consumer discernment and ever-evolving market dynamics, organizations are compelled to embark on a relentless pursuit of perfection. The ethos of quality control permeates every facet of modern enterprise, from meticulous production processes to attentive customer service. It is the cornerstone upon which reputations are built, and the currency through which trust is earned. By embracing quality as a guiding principle, businesses not only meet the demands of today but also lay the groundwork for sustained success in the future.

Keywords- Quality management, propeller shaft, seven quality tools

I. INTRODUCTION

In the realm of commerce, mastering the art of meeting customer specifications stands as a paramount pursuit, now encapsulated in the term "quality." Quality, a beacon of human civilization's advancement, signifies not just the excellence of a product or service, but the very essence of progress itself. As humanity marches forward, propelled by innovation and ingenuity, the significance of quality control in business becomes indisputably profound. Indeed, it can be unequivocally stated: without quality control, economic prosperity remains an elusive dream.

In today's landscape of relentless global competition, manufacturing and service entities alike find themselves at a pivotal juncture. The imperative to enhance the quality of their offerings looms large, casting a shadow over complacency and mediocrity. In this era of heightened consumer discernment and ever-evolving market dynamics, organizations are compelled to embark on a relentless pursuit of perfection.

The ethos of quality control permeates every facet of modern enterprise, from meticulous production processes to attentive customer service. It is the cornerstone upon which reputations are built, and the currency through which trust is earned. By embracing quality as a guiding principle, businesses not only meet the demands of today but also lay the groundwork for sustained success in the future.
In the crucible of competition, where margins are razor-thin and expectations are sky-high, quality emerges as the differentiator par excellence. It is the means by which brands carve out their niche, and the catalyst for enduring customer loyalty.

Moreover, quality serves as a testament to an organization's commitment to excellence, echoing its ethos and values across the vast expanse of the marketplace.

In essence, the pursuit of quality transcends mere profitability; it embodies a profound reverence for craftsmanship, a reverence for the customer, and a reverence for the very essence of human endeavor. As we navigate the complexities of the modern business landscape, let us heed the clarion call of quality, for therein lies the path to prosperity and distinction.

In today highly competitive scenario the markets are becoming global and economic conditions are changing fast. Customers are more quality conscious and demand for high quality product at competitive prices with product variety and reduced lead time. It is a data-driven quality strategy used to improve processes. It is an integral part of a Six Sigma initiative, but in general can be implemented as a standalone quality improvement procedure or as part of other process improvement initiatives such as lean [2].

Any enterprises that cannot manage the quality of its methods and products have a tendency to fall apart. Quality is crucial to sales, price control, productivity, risk control and compliance. As essential as quality is, there's little agreement as to its definition. The following definitions observe excellent from a control, high-quality guarantee, product, advertising and marketing, production and economic point of view [3].

II. RESEARCH METHODOLOGY

1. Data Collection

In this phase we collect the data. Therefore it becomes very important to secure a correct measuring system before the project. So a list of problems better to say opportunities for improvements were identified, following problems were listed down in their operations. These problems serve as focal points for potential enhancements:

Inconsistent Measurement Accuracy

Variability in measurement accuracy across different instruments or devices can lead to discrepancies in collected data. Ensuring the calibration and standardization of measuring equipment can mitigate this issue and promote uniformity in data collection.

Lack of Standardized Procedures

Absence of standardized procedures for data collection may result in inconsistent methodologies, leading to unreliable or incomparable data sets. Establishing clear protocols and guidelines for data collection ensures consistency and enhances the reliability of collected data.

Human Error in Data Entry

Manual data entry processes are susceptible to human error, potentially leading to inaccuracies in recorded data. Implementing automated data capture systems or employing validation checks can help minimize errors and improve data accuracy.

Insufficient Data Sampling

Inadequate sampling frequency or sample size may limit the representativeness of collected data, compromising the validity of analysis outcomes. Conducting thorough assessments to determine appropriate sampling methods and frequencies can enhance the robustness of data collection efforts.

Data Security Risks

Vulnerabilities in data storage and transmission systems pose risks to data security, including unauthorized access or data loss. Implementing robust data encryption protocols and access controls can safeguard sensitive information and ensure compliance with data protection regulations.

Technological Limitations

Outdated or inadequate technology infrastructure may hinder data collection capabilities, limiting the scope or accuracy of collected data. Investing in modern, scalable technologies and software solutions can overcome these limitations and enhance data collection efficiency and accuracy.

III. RESULTS AND DISCUSSION

Control chart is the seventh and most effective tool of Total Quality Management (TQM). This chart displays of a quality characteristic that has been measured or computed from a sample versus the sample number or time. The chart contains a centre line that represents the average value of the quality characteristic corresponding to the in-control state (That is, only chance causes are present). Two other horizontal lines, called the upper control limit (UCL) and the lower control limit (LCL). These control limits are chosen so that if the process is in control, nearly all the sample points will fall between them. As long as the points plot within the control limits, the process is assumed to be in control and no action is necessary.

However, a point that plots outside of the control limits is interpreted as evidence that the process is out of control, and investigation and corrective action are required to find and eliminate the assignable cause or causes responsible for this behaviour. It is customary to connect the sample points on the control chart with straight-line segments so that it is easier to visualize how the sequence of points has evolved over time.

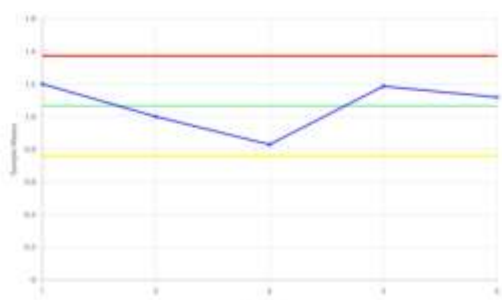

Fig. 1: Control chart for surface scratches

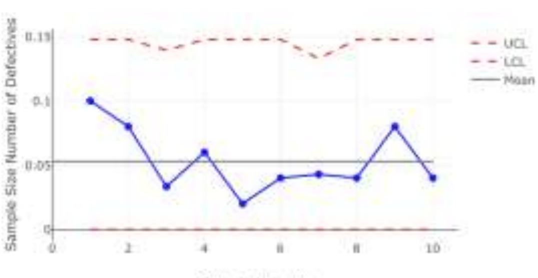

Fig. 2: Control chart (p-type) for the data set for surface scratches

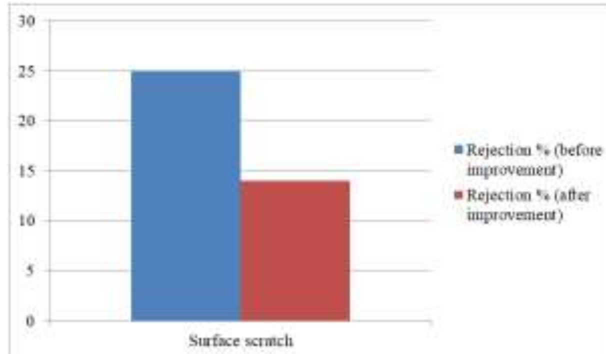

Fig. 3: Rejection before and after improvement

IV. CONCLUSION

For shaft manufacturing problem, after observing all the data and analysis we find that its production quality is very close to the six sigma limits. Some variation occurs due to natural causes which can be eliminated. Type-I error occurred. So, if the shaft manufacturing company continuing their quality research, it will help them to acquire a best product quality and make a highest position in the market.

In this thesis, the most effective way of quality control and productivity improvement has tried to find by experimenting on a manufacturing company. Using all quality tools and sampling plan is an expensive procedure. For any industry, using the control chart is the best way for quality testing. Cause and effect diagram, histogram are used to determine the causes and effects of production process. Acceptance sampling is used to determine the errors in control chart.

Statistical process control is a powerful tool to achieve sig sigma level. The following improved tools used in shaft manufacturing can be used in any industry to achieve their desired level of quality and productivity.

There are several approaches to choose from when the goal is to increase the quality and productivity of a shaft manufacturing company. The techniques used in this thesis have been limited due to insufficient time and resources. In this work only the quality tools have been used and tried to find the most effective way of quality testing and improving productivity. These have given a better solution. But if any one uses other technique of industrial engineering then he will get more benefit than this thesis. If it is decided to use the data in future studies it would be interesting. By this way it may be possible to specify high quality and productivity. The quest for higher quality and productivity will never stop and the project extreme shaft manufacturing will proceed. An important suggestion for future work is to test if the findings are applicable to other products and machines within the factory. A deeper understanding could possibly make the conclusions from this study more understandable and easier to apply to other products.

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