A Study on The Quality Management System At Anand Water Meter Mfg. Co. (P) Ltd, Kochi

Mr.Shinekumar[1], Mr.Rajkumar Narayanan[2]
[1]Dept of MBA
[2]AssistantProfessor, Dept of MBA
[1, 2] Jawaharlal College of Engineering And Technology, Ottapalam.

Abstract- *In today's highly competitive business world, companies in all sectors are working hard to standout from the competition. This is especially true in manufacturing, where product quality is a major factor that sets companies apart, especially in industries like agricultural tools. Consumers are becoming more selective and demanding making a essential for companies to consistently deliver high-quality products as a way to survive and succeed. Anand Water Meter, kochi, is a respected manufacturer The company places high importance on product quality so maintain its reputation and success in the market. Anand Water Meter offers a variety of water meters, and, understands the necessity of adhering strict quality standards to satisfy customers' changing needs and expectations*

Keywords- Quality control, Quality assurance, Root cause analysis, Iso 9001:2015, Process STANDARDIZATION, SIX SIGMA, Defect per million opportunities (DPMO)

I. INTRODUCTION

In today's competitive market, organizations need to differentiate themselves from competitors. Consistently delivering quality products builds trust and credibility among consumers, enhancing the brand's image and increasing its perceived value. Product quality significantly impacts consumer perception, satisfaction, and brand loyalty, ultimately shaping an organization's reputation and financial success. High-quality products meet or exceed customer expectations, leading to greater satisfaction. A quality management system (QMS) is defined as a formalized system that documents processes, procedures, and responsibilities for achieving quality policies and objectives. A QMS helps coordinate and direct an organization's activities to meet customer and regulatory requirements and improve its effectiveness and efficiency on a continuous basis. The key components of QMS include quality planning, control, assurance, and improvement. Quality planning involves defining quality objectives, identifying customer needs, and developing a plan to meet those needs Quality control involves monitoring and controlling processes to ensure that they mech the required quality standards.

II. REVIEW OF LITERATURE

David Hoyle (2007) – ISO 9001 as a Strategic Tool

Hoyle emphasized that ISO 9001 is more than a compliance standard, describing it as a business strategy that enhances efficiency, risk management, and customer satisfaction.

Psomas & Fotopoulos (2010) – Impact of ISO 9001 on Business Performance

They conducted an empirical study on ISO 9001-certified firms, concluding that leadership commitment and employee involvement were key factors in achieving higher productivity and customer trust.

Singh & Shrivastava (2018) – ISO 9001 Certification in SMEs

They highlighted the challenges of ISO 9001 adoption in SMEs, including high costs, resource limitations, and resistance to change.

Douglas & Judge (2001) – ISO 9001 vs. TQM

They compared ISO 9001 certification and TQM, concluding that TQM fosters continuous improvement, while ISO 9001 provides a structured compliance framework.

III. OBJECTIVES OF THE STUDY PRIMARY OBJECTIVE

A Study on the Quality Management System at Anand Water Meter Mfg. Co. (P) Ltd, Kochi

SECONDARY OBJECTIVES

- To examine the existing Quality Management System at Anand Water Meter Mfg. Co. (P) Ltd, Kochi.
- To analyse the challenges and limitations within the current Quality Management System.

- To apply Six Sigma methodology and Fishbone Analysis (Cause-and-Effect Analysis) to identify root causes of quality issues and propose recommendations for improvement

IV. RESEARCH METHODOLOGY

This study adopted a descriptive approach to understand quality management system at Anand water meter Mfg.CO (P) LTD, KOCHI.

PRIMARY DATA

Primary data for this study is collected using a structured questionnaire design to obtain insights from employees and company staffs at Anand water meter Mfg.CO (P) LTD, KOCHI.

SECONDARY DATA

Secondary data is collected from company report and company website.

.

V. DATA ANALYSIS

1. Raw material inspection

Question	Responses category	frequency	percentage
1.Inconsistencies in raw material quality	Frequently	12	22.6%
	occasionally	21	39.6%
	Rarely	16	30.2%
	Never	4	7.5%
2.Impact of NABL accreditation delay	Causes frequent delay	17	32.1%
	Affects only certain suppliers	21	39.6%
	No major impact	11	20.8%
	Not applicable	4	7.5%
3.Challenges in raw material inspection	High operational costs	14	26.4%
	shortage of skilled personnel	15	28.3%
	Time - consuming process	16	30.2
	Suppliers inconsistency	8	15.1%

INTERPRETATION

According to the survey findings, 62.2% of employees reported encountering frequent or occasional inconsistencies in raw material quality. Additionally, 32.1% of respondents stated that delays in NABL accreditation frequently impact production.

2.In-process inspection

Questions	Responses category	Frequency	Percentage
6.Defomities in manufacturing	Frequently	10	18.9%
	Occasionally	18	34%
	Rarely	22	41.5%
	Never	3	5.7%
7.Kit assembly quality	Always meet requirements	19	35.8%
	Frequently defects	8	15.1%
	Occasionally minor issues	21	39.%%
	Need major improvements	5	9.4%

Interpretation

The survey results indicate that 52.9% of respondents reported encountering deformities occasionally or frequently during the manufacturing process. Additionally, 48.9% of employees stated that kit assembly often has minor or frequent defects, requiring adjustments, emphasizing the need for improved assembly precision and defect prevention measures.

STAGE 3: PACKING PROCESS

Questions	Responses category	Frequency	Percentage
13.Issues with fit finish, and rotation	Frequently	8	15.1%
	occasionally	17	32.1%
	Rarely	24	45.3%
	Never	4	7.5%
14.Causes of packing damage	Mishandling by workers	12	22.6%
	Poor packaging materials	18	34%
	Inefficient process layout	15	28.3%
	No major damage	8	15.1%

EXPECTED FREQUENCY TABLE

STAGE4:SECONDARYINSPECTION

Questions	Responsesc ategory	Frequency	Percentage
Defectsident ifiesin secondaryin spection	frequently	9	17.%
	Occasionall y	22	41.5%
	Rarely	17	32.1%
	Never	5	9.4%

INTERPRETATION

The survey results indicate that 58.5% of employees confirmed that secondary inspections help detect additional defects. The most commonly identified issues during secondary inspection were deformities in assembly and calibration errors, emphasizing the need for enhanced quality control measures in the earlier stages of production.

STAGE5-SYSTEMATICCHALLENGESIN QMS

Questions	Responsescatego ry	Frequency	Percentage
21.Adequacyof trainingforquality inspections	VeryComprehen sive	14	26.4%
	Somewhatsuffici ent	24	45.3%
	Needimproveme nt	10	18.9%
	Insufficient	5	9.4
23.Efficiency of technologyinquali ty tracking	Veryefficient	16	30.2%
	Somewhatsuppor tive	22	41.5%
	Requiresimprove ment	11	20.8%
	Noteffective	4	7.5%

INTERPRATATION

The survey findings show that 45.3% of employees consider the current training to be somewhat sufficient but in need of improvement. Additionally, 41.5% of respondents stated that the existing technology is somewhat supportive but requires enhancements, highlighting the need for better training programs and technological upgrades to strengthen the quality management system

SIX-SIGMA CALCULATION

Step 1: Define Key Variables

- Total Units Produced Per Day = 700 Classic Water Meters
- Total Defects Identified (from survey findings) = Summation of defect rates from different stages
    1. Raw Material Issues = 62.2% (assumed defects in input materials)
    2. In-Process Deformities = 52.9% (manufacturing defects)
    3. Packing Defects = 47.2% (packing errors)
    4. Secondary Inspection Detected Defects = 58.5% (missed defects found later) we take an average defect rate from these categories.

Estimated Overall Defect Rate = (62.2 + 52.9 + 47.2 + 58.5) / 4 = 55.2% defects per unit produced.

- Opportunities for Defect per Unit (Each meter undergoes 5 key inspection points - Raw Material, In-Process, Packing, Secondary, and Final Review)

I. Estimated opportunities per unit = 5

Step 2: Calculate Defects Per Million Opportunities (DPMO)

DPMO = (Total Defects/ Total Units Opportunities per Unit) × 1,000,000 DPMO =(55.2%×700)/(700×5) × 1,000,000
DPMO= (386.4)/ (3500) × 1,000,000
DPMO = 110,400

Step 3: Convert DPMO to Sigma Level

Using a Six Sigma Conversion Table

110,400 DPMO corresponds to approximately a 2.7 Sigma Level. Step4.Interpretation

- The company currently operates at **2.7** Sigma, indicating high defect levels.
- The goal for world-class manufacturing is Six Sigma **(3.4 DPMO, ~99.9997% defect-free rate).**
- To improve, Anand Water Meter Manufacturing Company must focus on supplier quality, automation in inspection, improved packaging materials and employee training

SIX SIGMA CALCULATION TABLE FOR QMS DEFECTS

STAGE	**DEFECT PERCENTAGE**	**TOTAL UNITS PRODUCED (700/DAY)**	**DEFECT PER STAGE**
Raw material inspection	**62.2%**	700	435
In-process inspection	**52.9%**	700	370
Packing process	**47.2%**	700	330
Secondary inspection	**58.5%**	700	409

VI. CONCLUSION

The analysis of the quality management system at Anand Water Meter Manufacturing Company, Kochi, highlights significant challenges in raw material quality, in-process inspections, packing, and secondary quality control. The high defect rate of 55.2% and a Sigma Level of 2.7 indicate that the company's current quality control measures are insufficient to meet Six Sigma standards. Key issues such as delays in NABL-accredited inspections, deformities in kit assembly, packaging defects, and limited technological support hinder overall efficiency. Additionally, gaps in employee training and reliance on manual inspections contribute to inconsistencies in productionquality.

REFERENCES

[1] Antony, J. (2006). Six Sigma for service processes. Business Process Management Journal, 12(2), 234–248.
[2] Desai, T. N., & Shrivastava, R. L. (2008). Six Sigma – A new direction to quality and productivity management. Proceedings of the World Congress on Engineering and Computer Science.
[3] George, M. L. (2002). Lean Six Sigma: Combining Six Sigma quality with Lean speed. McGraw-Hill.
[4] Snee, R. D. (2004). Six-Sigma: The evolution of 100 years of business improvement methodology. International Journal of Six Sigma and Competitive Advantage, 1(1), 4–20.
[5] https://www.anandgroupindia.com
[6] https://www.isixsigma.com
[7] https://www.researchgate.net