

An Analysis of Product Quality Control using The Six Sigma Method at Omah Produksi Tempe Rizky Jaya, Batu City

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INDEXING	ABSTRACT
<p>Keywords: Keyword 1: Product Keyword 2: Quality control Keyword 3: Six sigma</p>	<p>This study aims to analyze product quality control using the Six Sigma method at Omah Tempe Production Rizky Jaya MSME in Batu City. The main problem faced by this MSME is the high level of defective products such as mushy textured tempeh and moldy tempeh. The Six Sigma method with the DMAIC (Define, Measure, Analyze, Improve, Control) approach is applied to identify the causes of defects, analyze the performance of the production process, and provide recommendations for improvement. The results showed an average sigma value of 3.30, indicating that the production process is still at a medium level and needs to be improved. The main factors causing defects are humans, raw materials, machines, work methods, and the environment. Recommendations for improvement include workforce training, improved sanitation, and standardization of production procedures.</p>

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INTRODUCTION

Product quality is one of the key factors in winning market competition. Customers tend to choose the best quality products that provide maximum satisfaction. However, in the MSME sector, especially food production such as tempeh, challenges in maintaining product quality are often faced due to limited resources and an unoptimized control system. Omah Tempe Production Rizky Jaya, an MSME located in Batu City, experiences defective product problems such as the texture of tempeh that is mushy or too hard and the appearance of black spots due to non-optimal fermentation. Therefore, this study applies the Six Sigma method as a systematic quality control strategy to reduce product defects and improve overall production quality.

The Six Sigma approach emphasizes reducing variability in production processes by identifying root causes of defects and implementing corrective actions. Six Sigma begins with the Define-Measure-Analyze-Improve-Control (DMAIC) cycle. At the Define stage, the main problems are clearly identified, such as inconsistent fermentation results and the presence of black spots (Monday, 2022). During the Measure stage, data is collected regarding defect frequency, production volume, and environmental factors such as temperature and humidity. This data provides a baseline for evaluating the current quality level.

By adopting Six Sigma, Omah Tempe Rizky Jaya not only aims to reduce defective products but also to enhance customer satisfaction and strengthen competitiveness in the local market. Moreover, the systematic approach encourages a culture of continuous improvement, empowering MSMEs to overcome resource limitations through structured problem-solving. Ultimately, this method contributes to higher efficiency, reduced waste, and sustainable growth for small-scale food producers.

Based on the background, this study aims to analyze product quality control using the Six Sigma method at Omah Tempe Production Rizky Jaya MSME in Batu City. The main problem faced by this MSME is the high level of defective products such as mushy textured tempeh and moldy tempeh.

LITERATURE REVIEW

Product Quality

Product quality is an essential measure in determining consumer satisfaction. Good quality includes performance, reliability, durability, aesthetics, and conformity to specifications. Quality products can increase customer loyalty and business competitiveness. In the context of Micro, Small, and Medium Enterprises (MSMEs), maintaining consistent product quality becomes both a challenge and an opportunity. Limited resources, lack of advanced technology, and minimal quality control systems often hinder MSMEs from achieving optimal standards. However, by focusing on continuous improvement, adopting structured methods such as Six Sigma, and emphasizing customer feedback, MSMEs can gradually enhance their product quality. Superior quality not only reduces defects and production costs but also builds trust and strengthens brand reputation. Ultimately, quality becomes a strategic asset that drives sustainable growth and long-term competitiveness in dynamic markets. (Putri & Suharto, 2023).

Six Sigma

Six Sigma is a quality management method that aims to reduce production defects to 3.4 per million opportunities (Gaspersz, 2007). This approach emphasizes continuous and data-driven process improvement. In the *Analyze* stage, statistical tools are used to determine the most significant factors contributing to defects. For example, variations in soybean preparation, inoculum distribution, and fermentation conditions may be identified as critical variables. Once the causes are understood, the *Improve* stage focuses on implementing solutions such as standardizing raw material selection, optimizing inoculum dosage, and maintaining consistent fermentation environments. Finally, the *Control* stage ensures that improvements are sustained through continuous monitoring, employee training, and the establishment of standard operating procedures, as well as described by Omisola *et al* (2020), and Ghelani, 2023).

RESEARCH METHOD

DMAIC is the five main stages in Six Sigma: Define (determining the problem), Measure (measuring data), Analyze (analyzing causes), Improve (making improvements), and Control (controlling against recurrence). This approach has proven effective in quality control in various industrial sectors. can reduce variability, enhance efficiency, and establish reliable quality standards (Uluskan, 2016). The steps are :

1. Define : Identify the dominant types of defects and their leading causes through interviews and observations.
2. Measure : Collecting product defect data during April 2025, calculating DPU and DPMO, and converting them to sigma values.
3. Analyze : Using a cause-and-effect diagram (Fishbone) to identify the factors causing defects.
4. Improve : Provide improvement proposals to reduce the defect rate.
5. Control : Establish continuous control so that quality improvement is maintained. Data was collected through direct observation, interviews with business owners, and documentation of daily production reports.

RESULT AND DISCUSSION

Quality Measurement

Table 1. Result of Quality Measurement

Date	Total of Production	Total Defects	DPU	DPMO	Six Sigma Value
1	200	14	0,07	0,700000	2,9
2	204	10	0,049	0,49019	3,08
3	210	9	0,042	0,42857	3,12
4	205	15	0,073	0,73170	2,89
5	202	9	0,044	0,44554	3,8
6	200	15	0,075	0,75000	2,89
7	205	10	0,048	0,48780	3,09
8	200	5	0,025	0,25000	3,37
9	209	8	0,038	0,38277	3,16
10	250	18	0,072	0,86124	2,9
11	205	4	0,019	0,19512	3,53
12	200	5	0,025	0,25000	3,37
13	204	4	0,019	0,19607	3,54
14	200	8	0,04	0,40000	3,24
15	205	11	0,053	0,53658	2,95
16	205	12	0,058	0,58536	2,88
17	200	5	0,025	0,25000	3,37
18	200	6	0,03	0,30000	3,27
19	210	7	0,033	0,33000	3,20
20	201	8	0,039	0,3800	3,18
21	207	3	0,014	0,14492	3,65
22	200	7	0,035	0,35000	3,19
23	201	12	0,059	0,59701	2,87
24	209	8	0,038	0,38277	3,22
25	210	5	0,024	0,23809	3,41
26	200	2	0,01	0,10000	3,79
27	201	4	0,019	0,19900	3,54
28	200	4	0,02	0,20000	3,53
29	200	2	0,01	0,10000	3,79
30	200	4	0,02	0,20000	3,53
Total	6,143	234			99,25
Average			0,039993	36,120,2	3,30

Source: Data processing 2025

During 30 days of production, an average defect rate of 3.99% was found, with a DPMO value of 36,120 and an average sigma value of 3.30. The most common types of defects are:

1. Tempeh texture is too complicated or mushy
2. Black spots or foreign mold appear

From the human aspect, the lack of adequate training among workers often leads to mistakes in the fermentation process and improper equipment sanitization. These errors directly affect the consistency and safety of the final product. In terms of raw materials, the quality of yeast and soybeans used is sometimes suboptimal, which reduces the effectiveness of fermentation and impacts the texture and appearance of tempeh. The machinery factor also plays a role, as manual equipment is not regularly maintained, resulting in inefficiencies and potential contamination risks. Furthermore, the methods applied in production are not standardized; the absence of written Standard Operating Procedures (SOPs) and non-uniform work practices create variability in outcomes. Lastly, the environmental conditions of the production room are unstable,

with fluctuating temperatures and poor ventilation, both of which hinder optimal fermentation and increase the likelihood of defects. Overall, these interconnected causes highlight the need for a comprehensive quality improvement strategy that addresses human resources, raw material selection, equipment maintenance, standardized methods, and environmental control. By systematically managing these factors, tempeh producers can reduce defects, enhance product quality, and strengthen competitiveness in the market.

To improve production quality and reduce defects, several strategic recommendations can be implemented. First, the establishment and enforcement of Standard Operating Procedures (SOPs) across all stages of production will ensure consistency and minimize variability in outcomes. In addition, periodic training for workers is essential to enhance their skills, reduce errors in fermentation, and strengthen awareness of hygiene practices. Regular maintenance of machinery and equipment must also be prioritized to prevent inefficiencies and contamination risks. Finally, improving air circulation and maintaining stable room temperature will create a more controlled environment, supporting consistent fermentation and reducing the likelihood of defects. Collectively, these measures provide a comprehensive framework for sustainable quality improvement in tempeh production.

CONCLUSION

The Six Sigma method has proven effective for analyzing and controlling product quality at Omah Rizky Jaya Tempe Production UMKM. With an average sigma value of 3.30, the production process is still classified as medium and needs to be improved. The leading causes of defects can be reduced through improvements in human resources, raw materials, work methods, and the production environment. The research shows that tempeh production in Omah Rizky Jaya MSMEs still produces defective products, such as moldy tempeh and inappropriate textures. The leading causes are work processes, raw materials, tools, methods, and environments that are not yet optimal. The Six Sigma analysis results show a sigma value of 3.30, which means that quality still needs to be improved to approach zero defects.

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