IMPROVING THE QUALITY OF LAVABO PRODUCTS AT THIEN THANH BATHWARE COMPANY LIMITED

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DOI: 10.37550/tdmu.EJS/2025.03.675

Article Info

Volume: 7
Issue: 3
Sep: 2025
Received: Aug. 12th, 2025
Accepted: Sep. 25th, 2025
Page No: 763-770

Abstract

This study focuses on improving the quality of lavabo basin products at Thien Thanh Bathware Company Limited. by applying quality analysis tools such as process flowcharts, check sheets, Pareto charts, and cause-and-effect diagrams. The analysis identified two major defects affecting product quality: impurities and firing cracks. Based on root cause analysis, the study proposes three groups of solutions: (1) cross-training and standardized operation models to enhance workers' skills; (2) periodic maintenance plans for the vibrating screen to ensure stable equipment performance; and (3) regular mold maintenance to detect early wear or damage. These solutions aim to improve product quality, reduce defect rates, and increase production efficiency.

Keywords: cross-training, ceramic manufacturing, defect reduction

1. Introduction

In today's increasingly competitive market, product quality plays a crucial role in building brand reputation and ensuring sustainable business growth. In the sanitary ware manufacturing industry, especially for lavabo basins, quality requirements are becoming more stringent-not only from domestic customers but also from international markets.

Thien Thanh Bathware Company Limited. is a reputable manufacturer of sanitary ceramic products in Vietnam. However, during the production process, the company continues to face quality issues, particularly defects such as impurities and firing cracks. Specifically, in 2024, the number of defective parts is 5,149 and the damage cost is over 66 million VND. These defects increase the rate of defective products, waste raw materials and production costs, and negatively impact customer satisfaction and the company's competitiveness.

In response to this situation, this study aims to analyze the root causes of common defects in the production of lavabo basins by applying quality management tools. Based on the analysis results, the study proposes practical solutions to improve the production process, minimize defects, and enhance output quality. These solutions focus on three key factors: human, machinery, and materials-elements that directly affect product quality in the company's actual production environment.

2. Scientific research and research establishments

According to Nguyen (2012), a flowchart is a form of representing all the necessary activities of a product manufacturing process or a service delivery process using block diagrams and specific symbols. The starting point of each process is represented by a circle. Each step in the process is shown as a rectangle, indicating an activity. The end of the process is represented by an oval shape. A decision point—where the process branches into multiple paths—is shown as a diamond shape. Arrows connecting the symbols indicate the direction of the process flow.

According to Spanbauer (1995), a check sheet is an important quality control tool commonly used in the production and delivery of products. It is a critical document that helps monitor and evaluate both the production process and the quality of the final product. A check sheet is not merely a record of information—it is a management tool that organizations use to ensure their products or services meet quality standards and customer requirements. Typically, a check sheet includes items such as the production date, batch number, technical specifications, and specific quality criteria. Operators or inspectors record the results for each factor and assess whether the product meets quality requirements. If a defect is detected, the check sheet also assists in identifying the root cause and suggesting appropriate corrective actions.

According to Nguyen (2010), a Pareto chart is a bar graph that illustrates part of the cause-and-effect relationship of the issues under study. The data used to construct this chart is typically collected from check sheets or other sources. Once the Pareto chart is created, it allows us to identify which problems should be addressed first among the various primary and secondary issues that contribute to process variation.

According to Ta (2010), a cause-and-effect diagram is a tool used to infer and present the relationship between a result and its potential causes, which can be grouped into main causes and sub-causes, typically illustrated in the form of a fishbone diagram.

Research methods

Primary data collection method: On-site surveys and collection of information related to the production process and quality management process at Thien Thanh Bathware Company Limited. Secondary data collection method: Using academic materials such as books, textbooks, scientific articles, and related studies as the theoretical basis for analysis.

TABLE 1. Frequency table of washbasin surface defects in 2024

No.	Error name	Frequency	Rate per error	Cumulative percentage
1	Impurities	2872	55,78%	55,78%
2	Burnt crack	1398	27,15%	82,93%
3	Glaze defects	295	5,73%	88,66%
4	Moth hole	187	3,63%	92,29%
5	Stamped	124	2,41%	94,70%
6	Wood grain	98	1,90%	96,60%
7	Needle insertion	76	1,48%	98,08%
8	Cold crack	56	1,09%	99,16%
9	Deformation	43	0,84%	100,00%
	Total	5149	100,00%	

Quality control tools used: Flowcharts, check sheets, Pareto charts, and cause-and-effect diagrams to identify the main causes affecting product quality at Thien Thanh Bathware Company Limited.Through the process of collecting on-site data at the production workshop, as well as reviewing periodic reports from the quality control department, the author has compiled and identified 9 common surface defects of lavabo basins, which significantly affect the output product quality of the company. Details are presented in Table 1 and figure 1

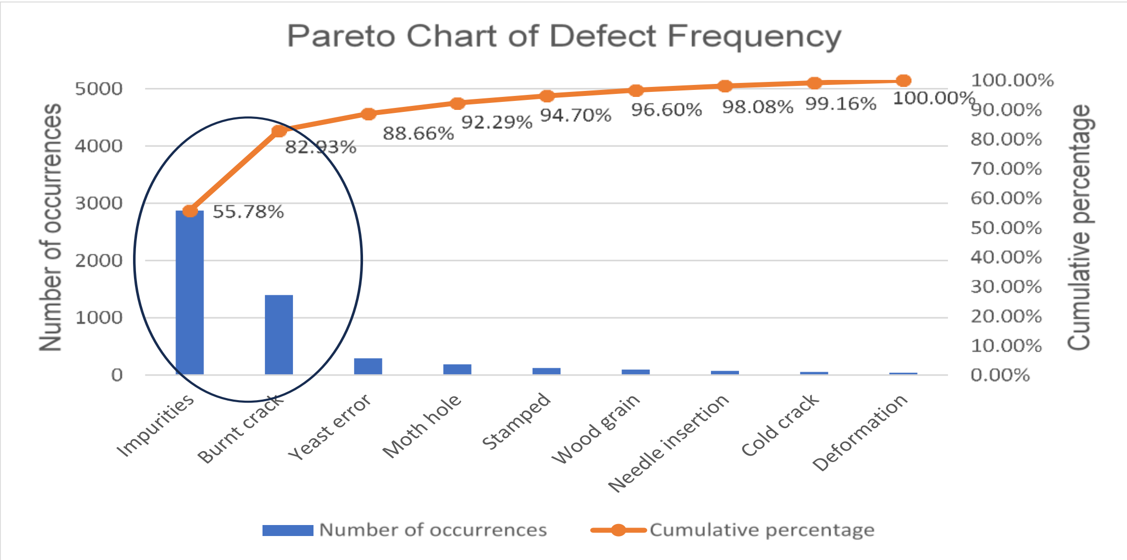

Fig 1. Pareto Chart of Lavabo Surface Defects

Comment: Applying the 80/20 principle of the Pareto chart, the author analyzed and identified two major defects that significantly impact the quality of lavabo basins at the company. Impurity defects account for 55.78%, making them the most common issue, primarily caused by inadequate raw materials and insufficient filtering processes. Firing cracks rank second at 27.15%, often related to improper firing settings and substandard material handling. Together, these two defects represent a cumulative percentage of 82.93%, indicating that focusing improvement efforts on these key issues could significantly enhance product quality.

TABLE 2. Data Analysis Table on Defective Product Cost

No.	Error Name	Total Cost (VND)	Rate per error (%)	Cumulative percentage (%)
1	Burnt crack	33.444.354	50,52%	50,52%
2	Impurities	17.700.136	26,74%	77,26%
3	Cold crack	5.796.000	8,76%	86,02%
4	Deformation	4.450.500	6,72%	92,74%
5	Glaze defects	1.818.085	2,75%	95,48%
6	Moth hole	1.152.481	1,74%	97,23%
7	Stamped	764.212	1,15%	98,38%
8	Wood grain	603.974	0,91%	99,29%
9	Needle insertion	468.388	0,71%	100,00%
	Total	66.198.130	100,00%	

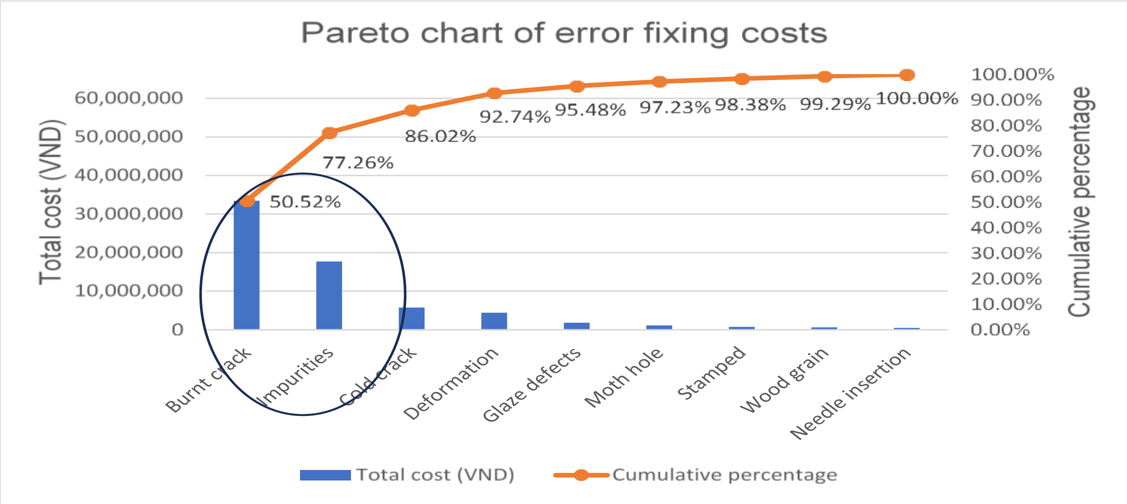

Fig2. Pareto chart of error fixing costs

Comment: According to the 80/20 principle, the author identifies two major defects that need to be addressed: firing cracks, which account for 50.52% of the total defects and result in a loss of 33,444,354 VND; followed by impurity defects, which make up 26.74% and cause a loss of 17,770,136 VND.

Evaluation of the Analysis Results from the Two Pareto Charts on Frequency and Cost

Analysis of the two Pareto charts indicates that the two defects that should be prioritized for improvement are firing cracks and impurities. Although impurity defects occur more frequently, firing cracks result in significantly higher economic losses, as affected products often need to be completely discarded. Specifically, firing cracks account for 27.15% of total defects but contribute to 50.52% of the total damage cost, whereas impurity defects make up 55.78% of total defects but only 26.74% of the total cost. This highlights that prioritizing defects for improvement should consider not only frequency but also the severity of financial impact. Therefore, improving the production process to reduce these two types of defects will enhance product quality, optimize costs, and increase manufacturing efficiency for the company.

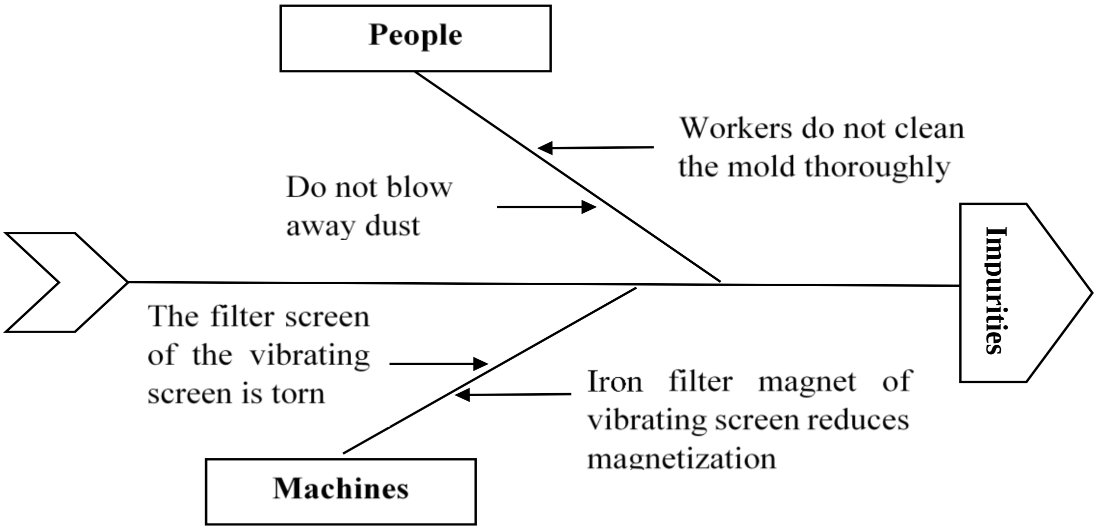

Fig 3. Fishbone diagram of impurity defect

Human factor:

Impurity defects caused by human factors mainly stem from carelessness and non-compliance with mold cleaning procedures during production. Specifically, if workers fail to thoroughly clean the mold before casting, leftover dust and debris can stick to the mold surface and imprint onto the product. Additionally, after trimming the seams, if workers do not blow off the dust on the product's surface, fine particles may remain and turn into impurities after firing, negatively affecting both the appearance and quality of the final product.

Machine factor:

In lavabo basin production, machinery plays a key role in causing surface impurity defects, especially due to issues with the vibrating screening machine. Two main problems are: (1) the magnet loses magnetic strength over time, allowing ferromagnetic particles to remain in the mix; (2) a torn or damaged mesh screen lets oversized particles through. These impurities lead to surface defects like black spots or roughness. Both issues directly impact product quality, emphasizing the need for regular inspection and maintenance of the screening system.

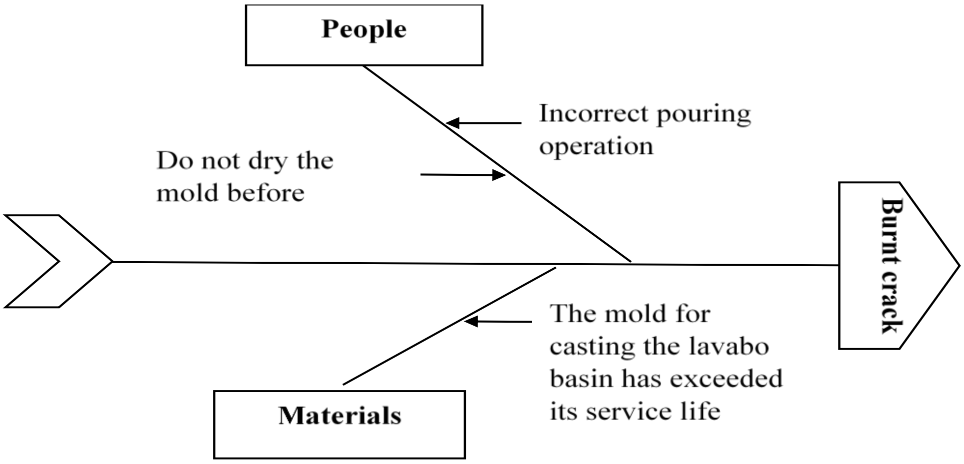

Fig 4. Fishbone diagram of Burnt crack defect

Human factor: Cracking defects caused by human factors mainly stem from improper casting techniques and the failure to dry molds before use. Inconsistent casting speed and timing lead to insufficient slurry retention in the mold, creating internal stress that causes cracking during firing. Additionally, if the mold retains moisture, rapid steam generation at high temperatures can create internal pressure, resulting in thermal shock and cracks. These issues are primarily due to non-compliance with technical procedures and a lack of operational awareness, highlighting the need to improve workers' skills and awareness to minimize this type of defect.

Material factor: In the production of lavabo basins, molds are a critical material that shapes the product and directly affects its final quality. The molds used are made of plaster, and after approximately 100 casting cycles, their performance-especially their ability to absorb water from the slurry-begins to deteriorate. When molds exceed their recommended lifespan, their reduced moisture absorption leads to excessive water retention in the cast product. As a result, the product enters the kiln with high moisture content, making it prone to firing cracks due to uneven expansion during heating. Therefore, using overaged molds not only decreases production efficiency but also becomes a significant cause of quality defects.

3. Results and discussions

TABLE 3. Propose to develop a training plan for new employees at the pouring stage in the form of cross-training

No.	Training Content	Trainer (Senior Worker)	Trainee (New Worker)	Training Duration	Training Method
1	Mold Cleaning	Worker A	New Worker 1	2 hours	Direct Practice
2	Mold Assembly	Worker A	New Worker 1	2 hours	Demonstration + Practice
3	Casting	Worker B	New Worker 2	3 hours	Guided Practice
4	Slip Filling in Mold & Excess Slip Removal	Worker B	New Worker 2	2 hours	Observation + Practice
5	Mold Storage	Worker C	New Worker 3	1 hours	Guided Practice
6	Demolding	Worker C	New Worker 3	2 hours	Demonstration + Practice
7	Greenware Storage for Drying	Worker D	New Worker 4	1 hours	Guided Practice
8	Deburring & Dust Blowing	Worker D	New Worker 4	2 hours	Practice with Evaluation

Cross-training in the enterprise allows each experienced worker to instruct two specific tasks to new employees. Once the new employees master these tasks, they move on to learn two additional tasks under the guidance of a different instructor. This training takes place daily over the course of one month, after which the management team evaluates their performance and assigns appropriate roles.

This method leverages the practical experience of long-time workers, saving both training costs and time. It also fosters teamwork and a culture of knowledge sharing. Instructors benefit by reinforcing their own skills, while new workers quickly adapt, leading to fewer mistakes and increased production efficiency.

TABLE 4. Proposed quarterly vibrating screen maintenance plan

Quarter	Tasks Performed	Responsible Person	Estimated Machine Downtime
1	- Check the magnetism status of the magnet and measuring equipment - Clean the magnet, remove dirt and adhering impurities - Check the overall condition of the filter mesh (tears, cracks, blockages) - Replace the filter mesh if minor damage is found	Maintenance Staff, Outsourced Technical Team	6 hours
2	Calibrate or replace the magnet if its magnetic strength is below standard - Conduct periodic technical maintenance of the system (motor, bolts, bearings) - Check and tighten all fixed points of the mesh	Maintenance Staff, Outsourced Technical Team	6 hours

3	- Clean the entire sieving system - Re-measure the magnetism - Compare data from previous quarters to assess the decreasing trend of magnetism - Check the filter again, replace if there are signs of looseness, stretching, or slight tearing.	Maintenance Staff, Outsourced Technical Team	6 hours
4	- Replace the entire filter mesh (according to annual cycle) - Inspect and replace the magnet if necessary - Overhaul the vibrating system - Update maintenance records annually	Maintenance Staff, Outsourced Technical Team	6 hours

TABLE 5. Estimated material cost table for implementing vibrating screen maintenance solutions

Item	Materials/Equipment	Frequency	Estimated Cost (VND)
Magnet Replacement	Permanent magnet	1 quarter/time (when needed)	1.000.000
Filter Mesh Replacement	Stainless steel filter mesh	2 quarters/time	1.500.000
Vibrating System Maintenance	Bearings, bolts, lubricating grease	2 quarters/time	1.000.000
System Overhaul	Consolidated materials	1 year/time (4th quarter)	5.000.000
Labor Cost	Hire mechanical technical team (2 people)	4 quarters	4.000.000
Total			12.500.000

Budgeting for quarterly maintenance of the vibrating screen machine is essential and brings significant benefits to the company, especially in reducing defect rates caused by demagnetized magnets or torn filter screens. Regular maintenance allows timely inspection and replacement of key components such as magnets and screening meshes, ensuring stable machine operation and consistently high impurity filtration efficiency.

As a result, this not only helps maintain consistent product quality and minimize defects, but also reduces the risk of costly repairs, improves production efficiency, and reinforces the company's reputation with customers.

4. Conclusion and Future research

The research results indicate that the quality of lavabo basin products at Thien Thanh Bathware Company Limited is significantly affected by two main factors: the lack of investment in modern machinery and technology, and the limited skills of the young workforce.

The current machinery system is outdated and frequently experiences malfunctions, which reduces both productivity and product quality. The absence of advanced technology means the company has to rely heavily on manual labor, which lacks consistency and precision. Investing in new technology is an inevitable requirement, however, to change the new production line requires a lot of time and resources.

With the current situation, the author proposed a solution to improve the quality of lavabo products as follows: propose cross-training methods for workers, propose machine maintenance planning, and estimate machine maintenance costs.

The article has analyzed and proposed methods for improving the quality of lavabo basin products in production. However, the study still has some limitations, such as insufficient discussion of business costs and a lack of precise estimation of the costs wasted due to defective products. Nevertheless, the solutions proposed by the author are simple and cost-effective, making them easy for businesses to apply in order to enhance product quality and reduce waste caused by defective items.

References

A. Ridwan, A. Sonda and A. Amelia (2013). Product Quality Control Analysis Using Six Sigma Method. *Journal Industrial Servicess*, *9*(1), 53-58. doi:10.36055/jiss.v9i1.19044.

J. d. Mast (2006). Six Sigma and competitive advantage. *Total Quality Management & Business Excellence*, *17*(4), 455-464. doi: 10.1080/14783360500528221

Nguyen (2010). *Quality Management*. Ho Chi Minh City Nationl University Publishing House

Nguyen (2012). *Quality Mnagement*. Hanoi National University Publishing House

Picarillo, A.P. (2018). Introduction to quality improvement tools for the clinician. *Journal of Perinatology*, *38*(7), 929-935.

Spanbauer & Elassy, N. (1995). The concepts of quality, quality assurance and quality enhancement. *Quality assurance in education*, *23*(3), 250-261

Ta (2010). *Quality Management*. University of Economic Ho Chi Minh City