Application of QC Story to Solve Problem in the Process of the Lumber Production

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Abstract.

This participatory action research applied the QC Story technique to solve problems in lumber production at Sutraland Company Ltd. A factory manager and foremen were involved in introductory interviews and observations. The analysis revealed that cracked lumber in the final production stage significantly impacted productivity. Data regarding defects and errors was collected over three months. The root cause was then analyzed using Why-Why analysis and brainstorming. Three main causes were found: (1) the lack of a work instruction manual for the wood drying process, (2) the lack of standards for wood grading and defect identification, and (3) inadequate training for employees. A solution plan was established using the 5W1H technique, which included creating work instructions for the wood drying process and specifying procedures, responsibilities, and performance standards for all eight process steps. Two work standards were proposed for defect identification and wood grading. Employees were trained, and the documentation was made available at the workplace. After implementing the plan, data showed that the number of cracked lumber decreased from an average of 11 pieces per month to 3 pieces per month, a reduction of 72.72%

Keywords: lumber production, problem-solving, QC story

1. Introduction

Lumber refers to wood processed from logs by sawing or hewing. This processed wood can be used in construction, to make tools, or for other purposes. Lumber production typically goes through similar processing steps. The wood is processed from long sections of logs, treated with chemicals to protect against pests and fungi, and then dried to reduce moisture content. The quality of the lumber is assessed based on visible defects (Thai Industrial Standards Institute, 1984).

In addition to defects that naturally occur in the lumber, which reduce its quality, issues in the production process can arise from the four production factors: Man, Material, Machine, and Method (4 M's), as well as from environmental factors. Production issues or mistakes affect production efficiency, product quality, and the company's performance. Reducing these problems can improve production efficiency, lower costs, minimize waste, and meet customer demands (Chinpaisan, 2015).

Sutraland Company Ltd. produces lumber for furniture factories and pallet manufacturers. The company processes about 100 containers of rubberwood lumber per month, supplying domestic and international furniture manufacturers. However, problems have been identified in the workforce and machinery during production.

Various techniques and tools can be used to solve production issues, such as the PDCA (Plan-Do-Check-Act) (Boonsean, 2017; Khanthasat, 2017; Suwannaphak, 2020) or combining PDCA with the ECRS (Eliminate-Combine-Rearrange-Simplify) (Yuyen et al., 2021). Additionally, various quality control tools can be used to improve processes, solve problems, and enhance production efficiency. These tools include check sheets, Pareto diagrams, Why-Why analysis, brainstorming, and the 5W1H technique (Niyomrath, 2016).

Due to the significance of solving problems that directly benefit the company and build customer trust, this study applied the QC Story technique and quality control tools to enhance efficiency and improve work processes in lumber production. The aim was to solve issues in lumber production, leading to increased production, reduced waste, and lower expenses (e.g., labor and transportation costs).

2. Objective

To apply the QC Story technique to solve problems in lumber production at Sutraland Company Ltd.

3. Methods

3.1 Key Informant Groups

Two informant groups were involved in this study. A factory manager provided information on the lumber production process. Ten foremen provided information on production steps, methods, and problems in the lumber production process.

3.2 Research Instrument

The instruments used were (1) Fishbone diagram, (2) Brainstorming, (3) 5W1H, (4) Check sheets, (5) Graphs, and (6) Work instructions and work standards.

3.3 Research Procedures

3.3.1 Problem Identification: Problem identification was based on interviews with the factory manager and foremen, along with observation and photographic recordings.

3.3.2 Problem Analysis and Selection: The most impactful problem was selected for analysis after identifying the issues.

3.3.3 Data Collection on Problem Incidence: Data on the occurrence of the identified problems were collected by a check sheet filled out by the foremen.

3.3.4 Root Cause Analysis: The root causes of the problem were analyzed using Why-Why analysis and brainstorming.

3.3.5 Target Setting and Problem-Solving Plan: The target was set, and a plan to address the root causes was developed using the 5W1H technique, with the participation of the factory manager and foremen.

3.3.6 Implementation: The plan was implemented in the production process. The factory manager and foremen oversaw the implementation with the relevant employees.

3.3.7 Data Collection: Data on the problem occurrences, including the date, number of errors, nature, and causes, were collected again using a check sheet filled out by the foremen.

3.3.8 Data Analysis: The data was analyzed by comparing the frequency and percentage of the problem occurrences before and after the corrective actions using graphs.

3.3.9 Work Standard Creation: Work instructions and work standards were developed.

4. Results

4.1 Problem Identification

The problems found in the lumber production process were classified into two main categories. Management problems included incorrect wood grading, insufficient heat in the boiler, broken oven motors, defective packaging, and incorrect or excessive amounts of packaged wood. Product problems included incorrect wood dimensions, chipped wood, cracked lumber, and moldy wood.

4.2 Problem Analysis and Selection

After studying the problems to identify their causes and solutions, the issue of cracked lumber in the final stages of wood stacking and packaging was selected. This problem was significant because it occurred at the end of the production process, potentially affecting the company's profitability and customer trust.

4.3 Data Collection on Problem Incidence

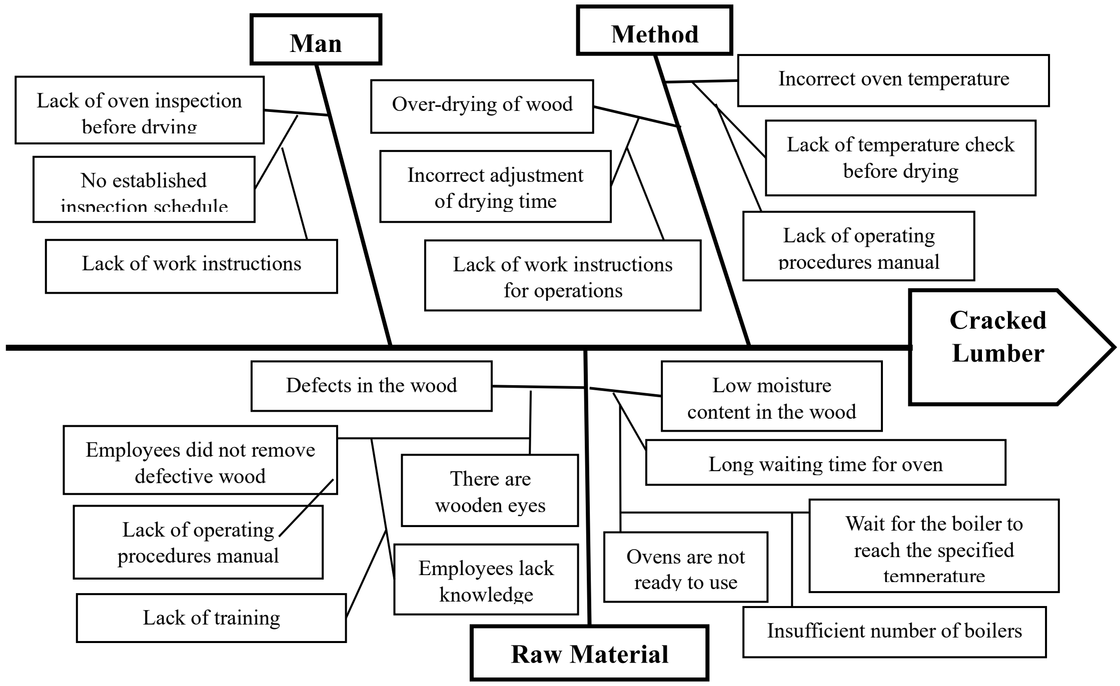
Data on the occurrence of defective lumber were collected over a 90-day period using a check sheet. A total of 32 pieces of cracked lumber were recorded, with an average of 11 pieces per month.

4.4 Root Cause Analysis

Through brainstorming sessions with the factory manager and ten foremen from Sutraland Company Ltd., the root causes of the cracked lumber problem in the final wood stacking and packaging stage were identified. The production process had three contributing factors: man, method, and raw material. Five causes were identified: (1) Incorrect oven temperature, (2) Over-drying of wood, (3) Defects in the wood, (4) Low moisture content in the wood, and (5) Lack of oven inspections before the drying process.

These root causes were illustrated using a Fishbone diagram (Why-Why analysis), as shown in Fig 1. Three primary root causes of the cracked lumber were identified: (1) Lack of work instructions for the wood drying process, (2) Lack of work standards for wood grading and defect identification, and (3) Insufficient training for employees on wood grading and defect identification.

Figure 1: Fishbone Diagram illustrating the causes of cracked lumber



4.5 Target Setting and Problem-Solving Plan

The target was set to reduce the number of cracked lumber pieces in the final wood stacking and packaging stage to fewer than 11 pieces per month. A problem-solving plan was developed using the 5W1H technique, as shown in Tab. 1.

Table 1: 5W1H Plan for Solving the Cracked lumber Problem

<table>
<tr><td rowspan="2">What
1. Create work instructions for the drying process
2. Create work standards for wood grading and defect identification
3. Train employees</td><td>Why
To ensure employees follow proper procedures</td></tr>
<tr><td>Where
Throughout the lumber production process</td></tr>
<tr><td>When
1. Upon recruiting new employees
2. Organize training when problems arise
3. Every day, by displaying work instructions and work standards at the workplace</td><td rowspan="2">How
1. Factory manager and foremen create work instructions and work standard
2. Communicate these to all employees
3. Train new employees according to the work instructions and work standard
4. Display work instructions and work standards in the work area for employees to use when they encounter problems
5. Provide additional training if defects exceed 5 pieces per week</td></tr>
<tr><td>Who
1. Factory manager
2. Foremen
3. Assigned employees</td></tr>
</table>

4.6 Implementation, Data Collection, and Data Analysis

Corrective actions were implemented, and data on the incidence of cracked lumber were collected over 3 days using check sheets. The results showed that the number of cracked lumber pieces dropped to an average of 3 pieces per month.

4.7 Work Standard Creation

Work instructions for the wood drying process were developed. Two work standards were created: one for defect identification and one for wood grading.

5. Conclusion and Future work

The study of the lumber production process identified the main problem as cracked lumber in the final wood stacking and packaging stage. The root causes of the cracked lumber were linked to three factors in the production process: man, method, and raw material. After planning and implementing corrective actions, the average number of cracked lumber pieces decreased from 11 pieces per month to 3 pieces per month, representing a 72.72% reduction, which is below the target of 11 pieces per month.

Beyond the problem of cracked lumber, future research could address other issues in the production process. This could include strategies for waste reduction, equipment maintenance, and experimental studies to determine the optimal temperature, time, and other factors for maximizing efficiency in the lumber drying process.

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