8D REPORT APPLICATION IN PRODUCTION PROCESS OF THE REAR SEAT

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The key elements of a quality management system are a systematic approach to managing non-conformances and continuous improvement. The aim of this paper is to present quality improvement in a seat manufacturing company using statistical methods and quality control techniques. First, Pareto analysis was used to dentify the problem and reveal the critical causes in the management system. Following this, the 8D methodology was applied using a structured eight-step PDCA (Plan-Do-Check-Act) approach to problem solving. The paper presents the solution with respect to a rear seat manufacturing process where customer complaints and the need to rectify defects were identified in November 2021. Using the above methods, the root cause of the problem was identified, and permanent corrective actions were planned and implemented as recommended in the 8D report to reduce the likelihood of the problem recurring and increase customer satisfaction.

KEYWORDS

quality control; complaints; 8D report; rear seat production process; problem solving; Pareto analysis

1 INTRODUCTION

The quality requirements were in the last time expanded to the point where quality in form as quality management become the decisive factor in company management. Implementing the quality standard allowed maintenance of one's position in the market, gaining a competitive advantage, and the ability to compete in the sector [Krenicky 2018, Bozek 2021, Zgirskas 2021].

The Global 8D Aikens defines as a problem-solving methodology that strives to identify and eliminate root causes of failure after the fact. The Failure Mode and Effect Analysis (FMEA) attempts to anticipate and correct problems before they occur [Ignaczova 2016, Uslu 2022]. Global 8D deals with the modes and causes of failure after the fact. Once used, Global 8D results can help improve the quality of future FMEA analysis of a product, process, or service [Aikens 2011].

Global 8D is a methodology to identify and eliminate the root causes of failure and then implement permanent corrective actions to prevent a recurrence. [Aikens 2011]. The method is typically used within the organization and its results can be presented to the customer as quality control [Andrassyova 2011, Kumar 2017]. The output of 8D method is 8D Report based on the multi-stage work of the entire team, which uses effective methods and tools for quality management or improvement [Dziuba 2021].

The primary objective of the 8D methodology is to implement and consolidate corrective actions in relation to the quality management system. It comprises eight stages that set out a procedure to follow an established pattern [Kumar 2017, Dziuba 2021, Uslu 2022]. Each of them must be recorded in a document called 8D Report [Pacana 2020].

2 METHODOLOGY

The aim of the study is to improve quality to meet expectation of customers. For analysis, monitoring and improvement project was chosen as one of the most claimed products in November 2021. As the most appropriate method, the 8D methodology has been applied. The study was conducted in an organisation in western Slovakia dealing with seat production. The customers' requirements for quality in automotive production are very strict. The project's issue has been an improvement of seat production process by using the 8D methodology. The 8D methodology was used to analyse the problem, which allowed identifying a critical cause of the defect and helped eliminate it. The 8D methodology includes an 8D report consisting of eight steps, as shown in Figure 1:

Figure 1. 8D Problem solving approaches [whatissixsigma 2022]

The primary objective of the 8D methodology is to implement and consolidate corrective actions concerning the quality management system. It comprises eight stages that set out a procedure to follow an established pattern.

Global 8D employs a gateway step (D0) followed by eight discipline steps (D1 – D8) [Skurkova 2016, Dziuba 2021, Uslu 2022].

Gateway step discipline D0 – Prepare for Global 8D. This step confirms that the Global 8D methodology is needed. Symptoms are documented, showing that a problem has occurred, and a formal assessment is performed to justify the deployment of the resources required to perform a team-based cross-disciplinary problem solving effort [Dyadyura 2021]. Immediate damage control is taken in the form of emergency response actions to prevent further undesirable consequences.

Discipline D1 – Create a team : Put togethe a cross-functional team consisting o a core group plus a selection of subject matter experts (SMEs). Be sure to provide everything the team will need to be successful, including any training needed to properly execute the process (isixsigma.com).

Discipline D2 – Define the problem. The team might describe the problem as specific as possible, including such details. (Who suffers if the problem goes unsolved; What is the cost of not solving the problem; when was the problem discovered, how was it found, where was it found, and by whom; a description of the failure mode and rate; and any metrics and measures

relevant to the problem situation.) [Skurkova 2016, Dziuba 2021, Uslu 2022].

Discipline D3 - Handle the problem. Medium-term measures to contain the problem will be developed and implemented. The measures are intended to protect customers from the problem until permanent corrective action is taken. (For example, production potentially affected by the problem must be isolated for control. Orders that have been shipped may have to be withdrawn from the market). The team must verify the effectiveness of these measures.

Discipline D4 - Identify Root Causes and Leak Points. the team identifies all potential causes and gathers as much evidence as possible to reliably test each potential cause against the problem data. Once the cause and effect relationship is established, a detailed description of how the cause led to the failure is formulated. At this point, the escape point at which the control mechanism broke down and allowed the problem to go undetected is identified. Tools such as the Ishikawa diagram, the 5 Whys, brainstorming... are used.

Discipline D5 – Develop permanent corrective actions (PCAs). Discipline D5 is concerned with choosing permanent corrective actions and documenting the rationale for each. The team confirms that the recommended PCAs will solve the problem and will not produce any negative consequences. The implementation of PCAs can require a preliminary evaluation and, in some cases, a small pilot study. During this step, PCAs must also address control issues posed by the escape point.

Discipline D6 - Implement permanent corrective actions. the team implements the PCAs identified in Discipline Five. Data is collected demonstrating that corrective actions are effective in preventing recurrence of the root cause. This includes demonstrating how the leak point control mechanism's ability to detect the root cause in a timely manner has improved.

Discipline D7 – Prevent recurrence. Preventing recurrence of the problem requires expanding the scope of the PCAs and controls to apply to other similar products, processes, or services. The standardisation and deployment of corrective actions across all products or services that might be subject to the same or similar problem leverage the problem-solving effort, becoming a preventative and proactive measure across the production facility.

Discipline D8 – Give the team credit. The last step of the Global 8D process is formally recognising the collective efforts of the problem-solving team and formally approving its report. Achievements should be widely publicised, and the acquired knowledge and learning should be freely shared.

3 RESULTS

The study was conducted in a company producing seats for automotive. As mentioned above, the quality requirements of automotive production customers are very strict. The monitored product is the rear seat.

D0 - team building. The team consisted of a quality manager, a customer quality and process quality manager, a logistics manager, a production manager, a supervisor in production and a gap leader from production.

D1 – problem description. Complaint from an automotive manufacturing organization consists of a clip indentation on the back seat on the materials of the heartbeat - faux leather/leather. This clip is important when attaching the cover to the foam as it holds the cover taut on the foam. First for analysis are used statistical methods of quality control with descriptive characteristics as relative and absolute frequencies for implementation of the Pareto principle to identify critical failures (Figure 2).

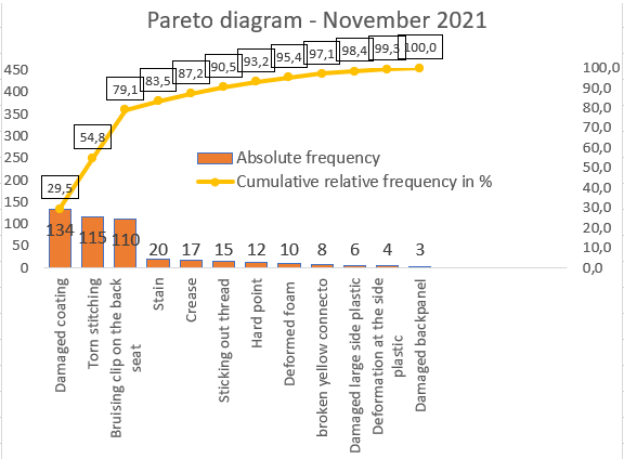

Figure 2. Pareto analysis [Vyskoc 2022]

D2 - risks for similar products

This step is used in the organization to prevent a similar error from occurring on other parts. The analysis found that for the month of November 2021, the indentation on the heartbeat materials occurred in 97.2% of the cases.

D3 – immediate corrective action. A 100% inspection of all covers that go on the line has been implemented, especially those that have a heartbeat in the central part of the fabric. This inspection was provided by an external organisation. The second immediate action was the introduction of a quality wall, which is located on the line immediately after the final inspection and checks the entire seat, with emphasis on the central part of the rear seat.

D4, D5 – root cause, root cause occurrence. The search for the root cause was carried out using the Ishikawa diagram. The root causes were determined as:

- Material - sub-cause: material conformity
- Methods - sub-causes: storage in a box, transport to the production line, transport to the factory,
- Machines - sub-causes: pulse shearing machine, pulse stitching machine,
- People - sub-causes: human in training, polyvalence, ignorance of standard/untrained operators,
- Management - sub-causes: process standard, packaging standard, OK/NOK seat pattern,
- Environment - sub causes: fault detection lighting, production, temperature, environment

By successive elimination of the causes, the standard of packaging was identified as the most likely error. The 4Why method was used because after the 4th question the answer was already found.

1. Why?

Why storage in the box is not correct?

Because bruises occur already in the box.

2. Why?

Why bruises occur already in the box?

Because the clip presses on the cover in the package during the transport time.

3. Why?

Why the clip presses on the cover during transport?

Because the packaging and transport standard is so defined.

4. Why?

Why is the standard so defined?

Because it is wrong and needs to be changed.

D6 – defining corrective actions

Once the root causes were identified, the following corrective measures were proposed:

a) Reducing the number of covers in the box. Originally there were 6 pieces in the box, we have reduced this number to 5 pieces. However, this measure was not effective as the indentation continued to occur on the materials. Subsequently, the number of pieces was reduced to 4, but the above error continued to occur.
b) As a second corrective measure, the addition of industrial paper to the packaging/box was introduced, which is economically inexpensive, environmentally friendly and readily available. Figure 3 shows the packaging without paper and Figure 4 shows the proposed packaging with paper.

Figure 3. Packaging without industrial paper [Vyskoc 2022]

D7 – Verification and effectiveness of corrective actions. The external organization performed a 100% check of the paper inserted between the covers. If the paper was missing, the box was returned to the supplier as a complaint. Subsequently, the indentations were checked - the paper was removed from the cover and the central part was checked. Once it had been verified that there were no such indentations through the paper, the paper could be put back in and the cover put into production.

Figure 4. Packaging with added industrial paper [Vyskoc 2022]

Such control was ongoing for a week. Subsequently, the packaging standard was updated as the effectiveness of this solution was demonstrated. The check revealed that for the month of March 2022 only 3 pieces were defective, whereas in November 2021 there were 110.

D8 – Lessons learned/prevention

In this step, preventive measures are established. As a first measure, the seat pattern (Figure 5) was updated with the possible defects located on the line with the simulated indentation. In case the operator cannot determine if it is an error or not, he pulls out the seat pattern and compares the detected error with this indentation.

Figure 5. Coating sample with simulated error [Vyskoc 2022]

4 CONCLUSION

This paper discusses the application of the 8D method in an organization focused on the production of automotive seats. The subject of the customer complaint was a clip indentation, and the customer would not tolerate any defect on the seat back materials. By applying various auxiliary tools such as Pareto analysis, Ishikawa diagram, 4Why, brainstorming... it was found that the main cause of the blistering was the packaging standard. Adding industrial paper to the box was chosen as a remedial measure, which subsequently proved to be an effective solution to the problem encountered after verification of the solution.

This corrective measure brought the organisation a reduction in the number of errors on the line, relieved the operators from the time-consuming operation of the error and last but not least led to the satisfaction of the customer who was guaranteed by this measure that the organisation was doing everything to keep them satisfied.

Organisation XY is a leading manufacturer of components in the automotive industry. In order to maintain this position, it is necessary that their components are of the highest quality and that their approach to the customer is responsible and reliable.

The correct application of industrial engineering or quality management methods effectively helps to achieve these objectives.

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