

# An Analysis of Product Dimensions Out of Specification as Quality Claim Improvement Activity : Application of 8D Method in the Injection Plastic Industry

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## Abstrak

Setiap perusahaan berusaha mencari cara untuk mempertahankan posisi pasarnya dalam lingkungan bisnis yang semakin kompetitif. Untuk menjadi sukses, perusahaan perlu mencapai tujuan dan sasaran untuk mewujudkan visi dan misinya. Laporan klaim perusahaan dalam beberapa tahun terakhir masih belum terpecahkan. Keluhan tersebut penting karena kepuasan pelanggan hanya dapat ditingkatkan jika akar penyebab masalah diidentifikasi dengan jelas. Dalam industri plastik yang memproduksi suku cadang untuk industri otomotif, metode sistematis bernama 8D digunakan untuk menganalisis kesesuaian produk dengan spesifikasinya. Metode 8D terdiri dari sembilan disiplin pemecahan masalah. Tujuan awal dari metode 8D adalah untuk menghilangkan cacat yang menyebabkan masalah, sehingga mengembalikan kepuasan pelanggan dan meningkatkan kualitas produk yang dihasilkan perusahaan. Penelitian ini menetapkan kesesuaian 8D untuk penyelesaian keluhan pelanggan. 8D melibatkan kerja tim untuk memecahkan masalah dan menggunakan pendekatan struktural 9 langkah. Dengan studi kasus ini total klaim pelanggan pada akhir tahun lalu hingga tahun ini Des 2020 berjumlah nol (0) dan cacat produk dari proses produksi untuk dimensi yang salah berkurang dari 0,07% menjadi 0,01%.

**Kata kunci:** 8D; Klaim Pelanggan; Perbaikan; Pemecahan Masalah

## Abstract

*Every company tries to find ways to maintain its market position in an increasingly competitive business environment. In order to be successful, companies need to achieve their objectives and goals to make their vision a reality while adhering to their mission. Company claims report in the few years still haven't solved yet. Such complaints are significant because customer satisfaction can only be improved if the root causes of problem is clearly identified. In the plastic industry that produces parts for the automotive industry, a systematic method named 8D is used to analyze product conformity to specifications. The 8D method consists of nine disciplines problem solving. The original purpose of 8D method was to eliminate the defect causing the problem, thus restoring customer satisfaction and level up the quality level of company. This research established the suitability of the 8D for complaint settlement. 8D involves team work to solve the problem and using a 9-step structural approach. This case study resulted that the 8D is effective. The total customer claims at the end of last year until this year in Dec 2020 totaled zero (0) and process rejection for incorrect dimensions was reduced from 0.07 % to 0.01%.*

**Keywords:** 8D; Customer Claim; Improvement; Problem Solving

## 1. INTRODUCTION

The industrial revolution, and into the 20th century, a structured approach to the understanding a problem become a topic of great cognitive interest, especially in the field of psychology. Many theories has been developed in Europe and in the US on problem solving, focusing the studies in the field of business, engineering, mathematics, social, personal, design, etc. Each with its own unique approach and method, but of course there will be some common areas.

In the late 80's onwards, such structured approach slowly become more accepted in our daily work process. It also becomes a topic of study in school curriculum, especially business, social, and engineering studies. The structured approach such as 8D method is commonly used in automotive industries (naturally), manufacturing, healthcare and software. The approach such as 8D method with cross-functional teams is very important. Some of important points are making the awareness of the team members, gaining a deeper understanding and having eye-opening revelations. The 8D framework often provides a detailed awareness about problems and long-lasting solutions (Ehie and Sawhney, 2006) [1]. "Whereas Six Sigma focuses on data and process variables, the 8D-TOPS uses cross-functional teams, looks for root causes, and implements and test permanent corrections or improvements." [1] [10].

The approaches of 8D's are to define a problem, identify its true root causes, and make a long term corrective action preventing the problem from recurring. One of the steps is to make sure the customer is protected by containing all suspected material within your reach. Align your corrective actions with Poka Yoke solutions as far as possible.

### 1.1 Definition of 8D

The 8D consists of 8 disciplines steps for solving problems. It is a highly disciplined approach for resolving chronic and recurring problems. This approach uses cross-functional teams to synergize with each other and provides excellent guidelines to identify the root cause of problem, containment actions implementation, develop corrective actions and preventive actions then carry out these actions in order to make the problem permanently eliminated [2]. The 8D are: isolating from underlying causes which caused the unexpected condition, identifying the contributing factors causing the problem, eliminating systemic factors that cause the problems, keeping teams from jumping straightly to the final conclusions too early, and preventing problem recurrence [5].

The 8D method can be used for solving critical problems, major problems, chronic and recurring problems. The 8D method usually used when the problem that are very complex and unable to be resolved by a single most experienced person; communication must go across company levels, other departments and/or to customers during and after problem resolution; and usually used when the customer or management requests 8-D implementation.

However, the 8D is ineffective if being used for non-recurring problems or problems which can quickly be solved by individual effort, problems with known root causes, making a decision between different alternatives solutions, and problems where the simplest and most obvious solution is likely to be the best or adequate solution [9].

Why not apply the 8D to all problems? The 8D problem solving approach will take several weeks to several months in order to solve a problem. It takes people from cross-functional teams at least from 4 different organizational areas to effectively apply the 8D team problem solving approach (production section, quality, product engineering, marketing, manufacturing section, supplier, etc.), and requires management side to support for allocated time, related resources that may be required, and the authority to make the appropriate and required changes.

### 1.2 8D Disciplines Steps

Pre 8D: Recognized the problem that will be solved, a discussion with management and all related leaders is needed to decide and prioritize existing problem to be solved.

The 8-disciplines consists of: [2] [5] [6] [7] [8]

Prepare and Plan for the 8D: Generated plan for solving the problem and determine the prerequisites.

**D1- Establishment of Team:**

Establish a team of members with experienced in project development and understand the product/process knowledge very well. Appoint a team leader and a cross-functional team of people with problem-solving skills from different divisions or departments representing the possible origin of cause.

**D2- Problem Description:**

Clearly specify the problem by identifying in terms what, who, where, when, why, how and how many (5W2H). Make sure that all team members understand the problem.

**D3- Development of Interim Corrective Actions to Prevent Damage:**

Protect the customer from further defect products by blocking and marking the inventory and what is being produced. Also, identify what is in transit and report to the customer. To continue delivery, sort/ rework may be needed. Any rework has to be submitted to and verified by the customer.

**D4- Definition and Analysis of Root Causes:**

Identify all potential root causes in all possible working area related to machine, man, method, material, measurement and environment that could explain why the problem occurred and why the problem has not been noticed at the time. Brainstorm to identify possible root causes and reasons why the problem occurred and was not detected before shipping to the customer. Verify TRUE root cause(s) based on facts.

**D5- Determination of Permanent Corrective Actions:**

Confirm that the selected corrective actions make the problem permanently eliminated and no-recurring, so customer will be safe.

**D6- Implementation and Validation of Permanent Corrective Actions:**

Define and implement the most effective corrective actions, and permanent corrective action. Check if the intended corrective actions solved the problem. Implementing and removing the corrective actions should work as a flip switch for turning on and off the problem.

**D7- Preventing the Recurrence of Problem:**

The management and operation systems need to modify, review practices and procedures to prevent recurrence of this and similar problems. Review and improve the processes which prevent the recurring issues. Use Lessons Learned concept (Yokoten).

**D8- Congratulate and Recognize the Team:**

After the team task is completed and project results meet all customer requirement, the team needs to be formally recognized for all collective efforts and thank them formally.

Need to summarize team's experience and knowledge and complete documented information for 8D report [3] [4].

**1.3 Supporting tools for analysis****a) 5W2H FORM**

5W2H is used to define and understand the extent of the problem by asking 7 questions:

- WHAT happened?
- WHY is it a problem?
- WHEN did it happen?
- WHO detected it?
- WHERE was it detected?
- HOW was it detected?
- HOW MANY?

**b) ISHIKAWA (FISH BONE GRAPH)**

The way to gather all possible causes to a problem we are used this structure:

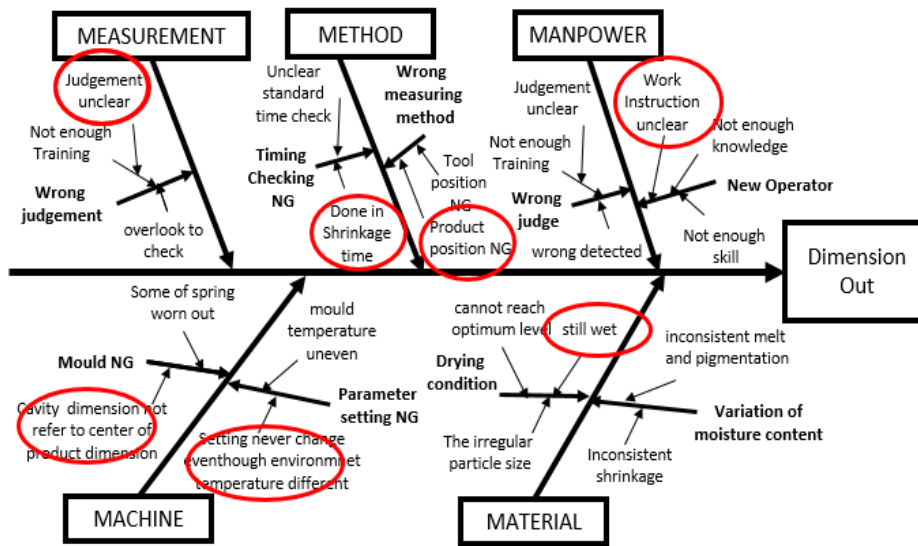


Figure 1.1 Dimension out fishbone graph

c) 5WHY FORM

This question-asking technique is used to find sequential causes for the failure and identify the failure path.

Table 1.1 Drum core missing 5 why form

Why	1	2	3	4	5
	Why did the problem occur?	Why?	Why?	Why?	Why?
Occurrence	Nozzle suction failed to pick up drum core	Suction dirty from foreign material	Some of adhesive suck by suction when drum core missing	<ul style="list-style-type: none"> <li>Machine cannot stop when drum core missing</li> <li>Cleaning perform at suction surface only</li> </ul>	No sensor for detect drum core missing
		drum core not enter at slider	drum core dimension at high limit	Material issue	NA
Leak out	Why wasn't the problem detected?	Why?	Why?	Why?	Why?
	Taping operator failed to detect stamping wrong direction	Sequence checking is not standard	Sequence checking does not include in process control items	Sequence checking is not clearly highlighted into operation instruction	Sequence checking does not include in FMEA study

## 2. METHOD OF RESEARCH

A series of phases that are used in this research is 8D with supporting tools for analysis:

Table 2.1 Customer Claim Report

No.	Claim	2018	2018	2020
1	Dimension Out	1	2	2
2	Silver Mark	1	0	0

Table 2.2 In-proses dimension out defect (Jul - Sept 2020)

No.	Type of Defect	Jul	Aug	Sept
1	Dimension Out	0.02%	0.09%	0.07%

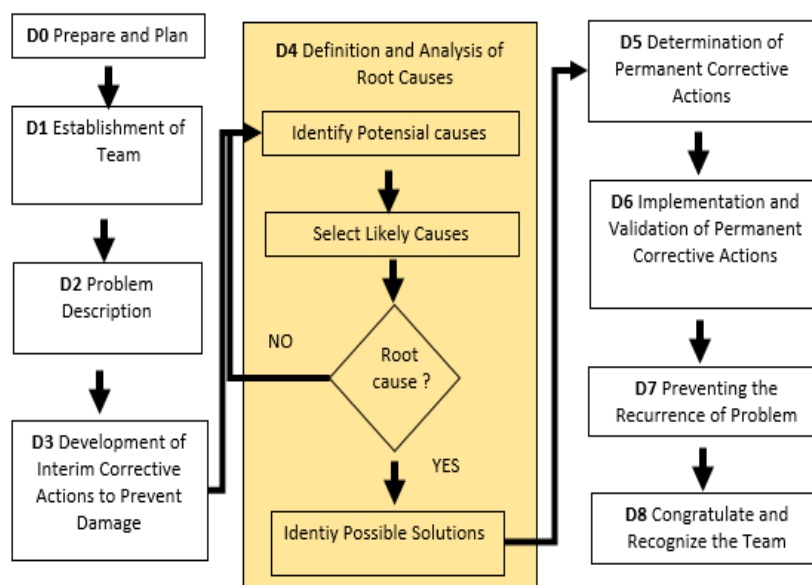


Figure 2.1 8D Procedure

## 3. RESULTS AND DISCUSSION

This research tries to explore various reasons & find solution of repeating dimension product out of spec customer claim in automotive injection plastic supplier. For the conduct of research, detailed steps were applying the 8D Method which each stage are:

### Step D0: Prepare and Plan for the 8D

First step for analysis purpose, we collected in the past three months rejection data for dimension product out of specification. Dimensional variation product (dimension product out of specification) is a defect produced by the molded which part dimension varying from batch to batch or from shot to shot while the machine settings and molded remain the same. To identify process defect, Pareto analysis has been carried out. The purpose of this step was to focus on the major issue. The following table shows the procedure for collecting necessary data:

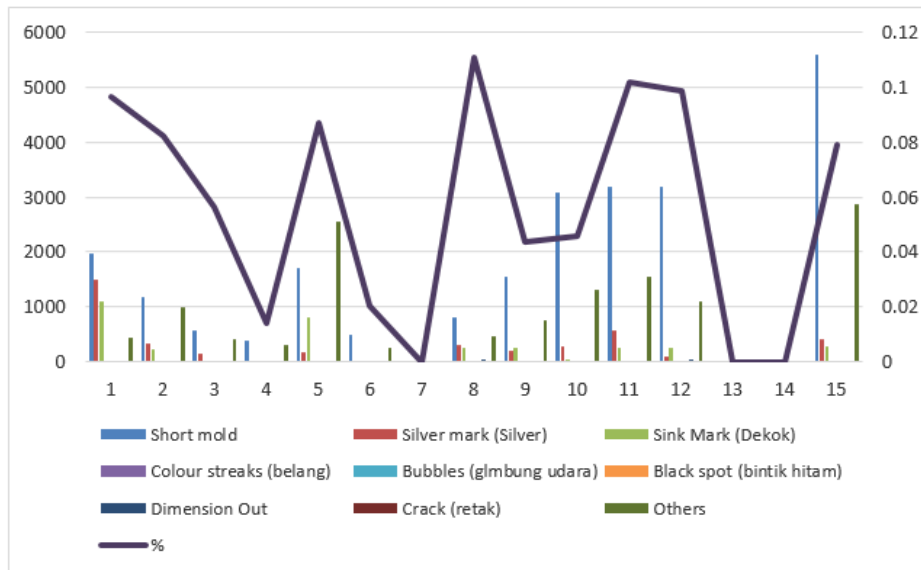


Figure 3.1 Defective breakdown by machine and defect type (Jul-Sept' 20)

**Step D1: Establishment of Team**

Cross functional team was formed to solve the major issue. Team leader appointed from whom the ones with problem-solving skills from different divisions or departments representing the possible origin of cause. Selected members have adequate knowledge about the process and product. They know about where the problem occurred, why the problem happened, and they have experience to solve the problem by technical disciplines skill and improve these condition by implementing several alternative solutions.

Table 3.1 D1 Team members

Department	Name	Title
Quality	Ely R	Quality Inspector
Quality	Sri Anik	Quality Supervisor
Production	Arifin	Production Manager
Maintenance	Imam S	Maintenance Supervisor
Production Engineer	Aditya S	Product Engineer
Production	Sukardi K	Production Supervisor
Purchasing/Warehouse	Irawati S	Purchasing Supervisor

**Step D2: Problem Description**

This step is one of the most important steps and it is crucial for solving the problem. Problem in details and clearly identified will be solved using this step, and this problem is specified in detail by quantifiable parameters. We are usage 5W2H tools analysis, which the form is given in table 5 below.

Table 3.2 D2 Problem Definition

Customer Name	Containment Action
PT XYZ Tbk	NG (scrap or reject)
Customer Location	Lot No.
Gresik Indonesia	LQ4012-10-A2020
Customer Contact	Claim Status
Yoshima Kaneguchi	Recurrent
Supplier Part No	Detail Photo
SLO 0350041365	
Part Name	
SLCR 30	
Failure Rate or Quantity	
400 pcs	
Defect Category	
Major	
Manufacturing Date	
26.10.2020	
Problem Description	
Diameter product out spec :	
STD : 310 ± 2	
ACT: 307.52 - 307.58 mm	

**Step D3: Development of Interim Corrective Actions to Prevent Damage**

The ultimate aim of this step is controlling the process in order to non-compliance product is not sent to the customer. This step is only as immediate protective action and often has no connection with the causes of the problem.

Table 3.3 D3 Development of Interim Corrective Actions to Prevent Damage

<b>SPECIFIC CONTAINMENT ACTION (describe):</b> Quality Alert was posted at production floor in order to let all section in-charges understand and know the customer quality issue.				
Temporary actions to contain the problem and "fix" until permanent corrective action is in place (validate that the actions taken work)				
Quality Alert in Place	Yes	x	No	
Material In Process (Qty)	Good	NA	Bad	0 pcs
Material In Warehouse (Qty)	Good	NA	Bad	0 pcs
In Transit (Qty)	Good	NA	Bad	0 pcs
Customer Warehouse(Qty)	Good	NA	Bad	0 pcs
Certification Marks On Parts/ Boxes	Yes	x	No	0 pcs
Conforming Material Expected Date :		11	5	2020
		mm	dd	yyy
Marking Method	<div style="border: 1px solid black; padding: 5px; display: inline-block;">Red Marking Passed</div>			

**Step D4: Definition and Analysis of Root Causes**

1. Technical root cause analysis

Analyze all the potential root causes of the issue carried out by engineering team and QC team. Root causes analysis is defined by one or more of the following tools 5Why, Brainstorming or fish bone diagram as below:

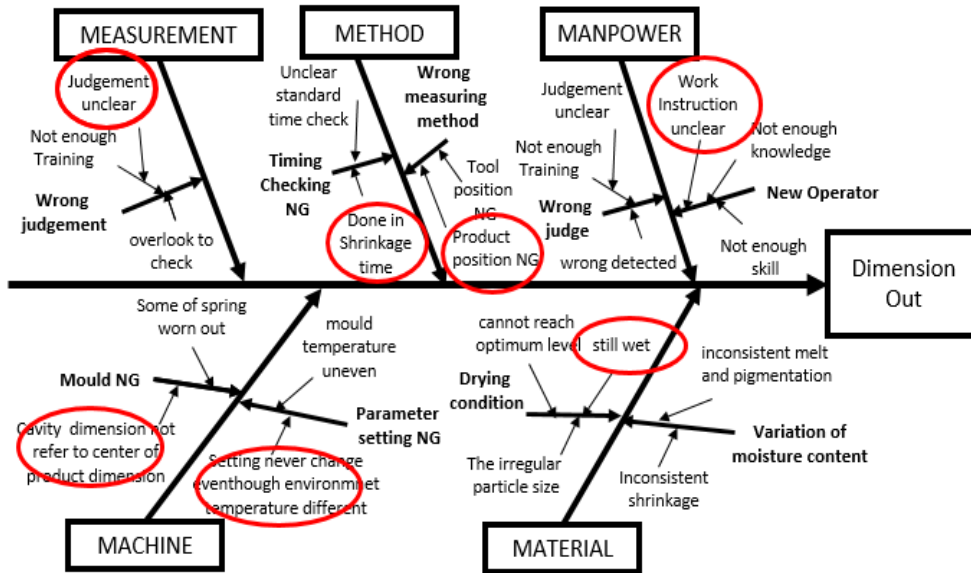


Figure 3.2 Dimension out fishbone graph

2. Leak out 5Why root cause analysis

Failure mode was identified. Mold was found as a root cause to produce variation of dimension product because its design was the problem due to cavity design problem. Dimension out of specification were detected after production process.

Table 3.4 Leak Out 5Why Root Cause Analysis

	Why wasn't the problem detected?	Why?	Why?	Why?	Why?
Leak out	Dimension out of specification passed from inspection process	Product shrinkage after checked	Checking was performed during shrinkage period	Timing checking did not include in standard checking method	PFMEA was developed without considered for timing control

**Step D5: Determination of Permanent Corrective Actions**

Corrective actions clearly linked to all individual root causes analysis for both failure occurrence and failure of leak out. The purpose of fifth discipline of the 8D is to choose the best permanent corrective action to eliminate the root cause of problem and the best permanent corrective action for the location of leakage.



Table 3.5 D5 Determination of Permanent Corrective Actions

	PIC	Due date	Status
In order to minimize dimension product out specification, our team determine improvement items as below :			
Corrective Action for Occurrence Root Cause			
<ul style="list-style-type: none"> <li>● Perform daily injection parameter checking in order to confirm machine performance.</li> </ul>	Imam	20-Nov-20	Ongoing
<ul style="list-style-type: none"> <li>● Modify all mold cavity on the center limit of dimension product</li> </ul>	Imam	20-Nov-20	Ongoing
Corrective Action for Leak Out Root Cause			
<ul style="list-style-type: none"> <li>● In order to validate effectiveness of implemented corrective actions, the next new production lot orders will be 100% inspected.</li> </ul>	Arifin	11/10/2020	Ongoing
<ul style="list-style-type: none"> <li>● Review SOP dimension product inspection method to add :                             <ul style="list-style-type: none"> <li>- Cooling time product before check</li> <li>- Product laying position checking method</li> </ul> </li> </ul>	Srianik	11/10/2020	Ongoing

**Step D6: Implementation and Validation of Permanent Corrective Actions**

The aim of sixth discipline of 8D is validating effectiveness after implementing corrective action and ensuring there are no negative consequences. Important thing is effectiveness of each corrective action was properly evaluated. Ensure there is evidence that the failure mode/defect has not reoccurred. It is detected by 100% confidence and quality of process manufacturing system were updated as a result.

Table 3.6 D6 Implementation and Validation of Permanent Corrective Actions

Permanent Corrective Actions	PIC	Due Date
<ul style="list-style-type: none"> <li>● In order to validate effectiveness of implemented corrective actions, the next new production lot orders will be 100% inspected</li> </ul>	Arifin	10-Nov-20
<ul style="list-style-type: none"> <li>● Perform daily injection parameter checking in order to confirm machine performance.</li> </ul>	Imam	10-Nov-20
<ul style="list-style-type: none"> <li>● Review SOP dimension product inspection method to add :                             <ul style="list-style-type: none"> <li>- Cooling time product before check</li> <li>- Product laying position checking method</li> </ul> </li> </ul>	Srianik	12-Nov-20
<ul style="list-style-type: none"> <li>● Information regarding maintenance routine will keep into internal maintenance record</li> </ul>	Imam	9-Nov-20

**Step D7: Preventing the Recurrence of Problem**

In this step we established preventive actions to avoid occurrence comparable problems in the other production processes and products. Also,

we updated the necessary system including policies, practices and work procedure to prevent problem and similar ones (eg. control plan, work instruction, standard operation procedure, and inspection sheets) reoccurrence of this.

Table 3.6 D7 Preventing the Recurrence of Problem

Preventing the Recurrence of Problem		PIC	Due date	Status
• Training to all related section with direct interaction will be conducted		Maulida	2-Nov-20	Done
• Implementation of corrective actions to similar process		Srianik	12-Dec-20	Ongoing
• Patrol check by QC leader by 2 hourly		Ely	10-Dec-20	Ongoing
Review All affected document/systems				
Document	PIC	Completion date	Doc .No.	
Corrective action validation	Sri anik	15-Dec-20		
Maintenance Routine	Imam	10-Oct-20		
Maintenance Routine	Imam	10-Oct-20		
Training	Ely	17-Oct-20		
Update PFMEA	Ely	13-Nov-20		
Update Control Plan	Ely	19-Oct-20		
Update SOP and WI	Ely	28-Nov-20		
Others (Define)				

**Step D8: Congratulate and Recognize the Team**

We conducted final meeting with the 8D team to review and evaluation of steps D0 thru D7. Conclusion of the problem solving with agreement of the involved persons and also customer. 8D activities related to this problem finally concluded and no open or “in-progress” action items. Recognize each team member and their contributions and also obtain customer approval to formally closed the 8D’s.

Table 3.7 D8 Congratulate and Recognize the Team

Lessons Learned		PIC	Due date	Status
• Dimension out of specification will be improved		All section related	15-Dec-20	Ongoing
• Set up meeting to review the implementation of each corrective action, and then close the 8D's report		Arifin	16-Dec-20	Ongoing
Management review and approval				
Yes/No	Tittle	Name	Date	
Yes	Quality Manager	Suyitno	20-Dec-20	
Yes	Plant manager	Hendra S	20-Dec-20	

**4. CONCLUSIONS**

After implementing permanent corrective and preventive actions and closing the 8D activity were observed in next 5 days production lots for the issue of dimension out of specification, the total rejection reduces from 0.07 % to 0.01 %. In terms of customer

complaints need to be monitoring continuously until the improvements that have been made prove effective.

## REFERENCES

- [1] Ehie, I. C. and Sawhney, R. Integrating Six Sigma and Lean Manufacturing for Process Improvement: A Case Study. In Badiru, A. B., Handbook of industrial and systems engineering. CRC Press, ch. 2006. 36:1-36:12.
- [2] Carlos A. Riesenberger and Sérgio D. Sousa. *The 8D Methodology: An Effective Way to Reduce Recurrence of Customer Complaints?*. Proceedings of the World Congress on Engineering 2010. Vol III.
- [3] Rambaud, L. 8D Structured Problem Solving: A Guide to Creating High Quality 8D Reports. Phred Solutions, Breckenridge, CO, USA. 2006.
- [4] Bosch, V.G. and Enriquez, F.T. TQM and QFD: exploiting a customer complaint management system. *International Journal of Quality & Reliability Management*. 2005, Vol. 22 No. 1.
- [5] Lalit Kumar Biban, Deepak Dhouchak, Shakti. 8D Methodology: From Concept to Application Across Manufacturing Industries. *IJSRSET*. 2017. Volume 3 Issue 6 Print ISSN: 2395-1990 Online ISSN: 2394-4099.
- [6] V. Alexa, I. Kiss. Complaint Analysis Using 8d Method Within The Companies In The Field Of Automotive. *Analecta Technica Szegedinensia review of faculty of engineering*. 2016. Vol. 10, No.1.
- [7] Keppmann, Hella 8D Report\_ Supplier Training Material. Lippstadt 2017-11-20 HCC-PU-QM
- [8] Küster, B. Eilert, B. Overmeyer L. *Automated Quality Evaluation of 8D Reports in Context of Complaint Processing*. In: Proceedings of Symposium on Automated Systems and Technologies. 2016. Vol. 3. pp. 77-80
- [9] Zahrami, A. and Benbow, D. Introduction to 8D Problem Solving: Including Practical Applications and Examples. ASQ Quality Press. Milwaukee, Wisconsin. 2017
- [10] Marcus Larsson Martin Norén. Assessment and improvement of Volvo Powertrain's problem solving process "Quality Journal" vs. "Six Sigma". Department of Technology Management and Economics Division of Quality Sciences Chalmers University of Technology Göteborg, Sweden. 2011.