INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 6.078
(Volume 6, Issue 2)
Available online at: www.ijariit.com

Adapted 8Ds methodology in manufacturing industries for securing customer's need

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ABSTRACT

This paper explores the contribution that can be given by 8Ds Methodology to secure customer concerns over quality issues and miss delivery of the product which created by production problem and at the end keeping the sustainability of organizations. Specifically analyzing the application of 8Ds Methodology in manufacturing industries located in Surabaya-Indonesia. The research method carried out is through field observations, following the problem analysis, setting up the action recommended and monitoring the progress of communication and result. Empirical evidence adds to the existing literature on this problem by showing the structured approach of 8Ds Methodology and using cause and effect matrix that significantly influences organizational performance in problem-solving of fail production startup and prevent customer complaints due to late product delivery. By following the 8Ds Methodology, strong teamwork, and employee learning behavior of problem-solving, the problem of production failure can finally be resolved and the customer's interests can be saved.

Keywords— *8Ds methodology, Customer complaints, Problem-solving, Quality*

1. INTRODUCTION

8Ds problem solving is a problem-solving method which developed for approaching and resolving problems. Focused on product and process improvement, the purpose is to identify, verify, and prevent recurrence problems.

It is noteworthy that Hsiang Ru Chen & Bor Wen Cheng (2010) in topic 'A case study in solving customer complaints based on the 8Ds method and Kano model' pointed out that based on the 8Ds method and the Kano model, which provides a structured and flexible framework for customer-oriented management systems to drive increased business performance. By comparison of different histograms, paired t-tests, and Cpk estimates, a control model was created to identify what the quality level was. After completing corrective actions and excluding variations in the hardness factor of sheet metal, the defect rate decreased from 28% to 0.5%, and this increase resulted in a profit of at least 22 million New Taiwan dollars.

Wan Ahmad Najmuddin Wan Saidin, Azalan Mohamed Ibrahim, Mohd Zaidi Azir, Harlina Ngah, Noraishah Mohamad Noor and M.H Norhidayah (2014) in topic '8D Methodology: An Effective Approach for Problem Solving in Automotive Assembly Line' pointed out that on the application of 8D for a defective product named as left-hand side (LHS) mirror gap at the trim assembly line in an automotive company. Throughout the paper, the problem was defined, the causes of failure were analyzed, and the countermeasures were constructed as well as improvements were determined until the performance level was reached. Apart from that, this applicable approach can be extended to other main processes at the assembly line to overcome major issues as well as making substantial improvements in meeting quality products and processes.

P. S. Atigre, A. P. Shah, V. R. Patil (2017) in topic 'Application of 8D Methodology for Minimizing the Defects in Manufacturing Process: A Case Study' pointed out that to apply the 8D methodology and to analyze its effectiveness a case study was conducted in a small scale manufacturing industry (ISO 9001:2000 certified). The results of the case study show that the 8D methodology is effective. After applying 8D methodology the total rejection for the coupling disc part was reduced to 6.57% from 37.95 %.

All the above research in principles shows that 8Ds methodology give benefits in solving complex problems that occur in the product or processes which can prevent bad effect on customers. In this paper, we present a case of comprehensive 8Ds application at manufacturing industries which located in Surabaya, through the illustration of an overall 8Ds implementation and a successful problem solving, to furnish an insight into the potential impact of 8Ds in the manufacturing industries about resolving production problem to avoid the customer complains in future. The paper is organized as follows. Section 2 presents the overall 8Ds

implementation of Company P and illustration of how 8Ds are used to solve an important problem in what is referred to Company P. Section 3 presents the benefits of the project. Section 4 consists of a discussion of the key factors of successful problem solving with 8Ds methodology; the last section presents the major conclusion of the paper.

2. 8Ds IMPLEMENTATION AT 'COMPANY P'

2.1 8Ds step

8Ds is a rigorous process tool for solving a complex problem. A structured way of thinking about problems and prevention through fact-based on data-driven and commitment to solving the source of the problem. 8Ds is a common problem-solving approach with shared vocabulary to communicate progress and facilitate information flow. 8Ds consists of 8 steps; form a team, define the problem rigorously, verify & take containment actions, verify corrective actions, define & verify root cause, implement permanent corrective actions, prevent a recurrence, and congratulate the team.

2.2 Research Method

The type of research used is descriptive qualitative research where the 8Ds method used as the basis in this study. The step of 8Ds methodology are as follow:

(a) D1 (Establish the team): Establish a cross-function team to investigate and resolve the problem, consist of 4-10 people with expertise of both process and content knowledge. The team member must have allocated time to fully support the effort. Membership may change as more information about the problem is gathered. The team must agree on goals, roles, and procedures.

(b) D2 (describe the problem): State the problem with a brief statement of problem object and defect and continue asking 'why' to the lowest definition possible. Describe the problem through Identify the boundaries of a problem on what object(s) is the defect, wherein the processor and where on the object does it occur, when was it observed, other time has seen, size of the defect, population of defective parts, cost of impact, etc.

(c) D3 (Interim Containment Action): Identify potential containment actions that will isolate customers from the effect of the problem, install and verify best interim containment actions, choose based on effect and cost but use containment action as a temporary solution only.

(d) D4 (define & verify root cause): Isolate and verify the place (Escape Point) in the process (control system) where the effect of the Root Cause should have been detected and contained. One process helps to identify root causes is developing cause and effect diagram. Use brainstorming with the whole member of the team to optimize the result.

(e) D5 (verify corrective actions): Describe the result, define and weigh the decision criteria then brainstorm solutions that would address probable root causes. The rank solution against decision criteria:

(i) Determine procedures/responsibility to verify the effectiveness of corrective actions
(ii) Test effectiveness/risk of most attractive solutions (include customer}
(iii)Choose the best corrective action

(f) D6 (Implement Permanent Corrective Actions): Plan and implement the selected Permanent Corrective Actions, define implementation plan (responsibilities assigned, timing established, required support determined).

(g) D7 (Prevent Recurrence): Review the history of the problem by identifying the systems, practices, and procedures that allowed the problem to occur, identifying changes in system and processes and review with the team champion, senior management, continue with implement changes and evaluate the result and share findings with other department, functions, etc.

(h) D8 (Congratulate the team): 8D completed, team closure, document lessons learned and share with relevant people, sincerely recognize both Team and Individual Contributions, and celebrate.

2.3 8Ds for solving production startup problem

The implementation as follows:

(a) D1- Establish the team: The team is consisting of Process Engineer, Production Engineer, Quality Engineer, Mechanical Engineer, Electrical Engineer, Production Planner, Furnace Specialist, Production Supervisor, Unit Leader, Operator.

(b) D2- Describe the Problem: After changing over the production tools of a ceramic tube (sleeve), production line 1.1 is used for various type TLE - 1.0 mm thickness, T8 - 0.6 mm thickness, T12 - 0.7 mm thickness and so far no significant problem happened. But when produce product type T8 - 0.5 mm thickness of tubing glass, there was a serious problem with broken tubing glass in the line before entering the machine. Caused the production failed then the production line had to change over to another product type. Customers are threatened not to get a supply of products because of these problems. And this is a very serious problem.

(c) D3- Interim Containment Action Activities: Inform customers about the problem to reconfirm their production planning (Resp. Prod. Planner, W19-21)

(i) Re do the production planning (Resp. Prod. Planner, W19-21)

(d) D4- Define & verify root cause: In this case using Cause & effect matrix to define and verify root causes with some rules below:

Table 1: Rating of importance

Value	Note
1	Not important
2	Not important for some customer
3	Sometimes important for some customer
4	Sometimes important for all customer
5	Important for some customer
6	Important for all customer
7	More important for some customer
8	More important for all customer

9	Most important for some customer
10	Most important for all customer

Table 2: Rating of correlation

Value	Note
1	Week correlation
3	Strong correlation
5	More strong correlation
9	Most strong correlation

Table 3: Rating of controlled

Value	Note
1	High controlled (we can control this input}
3	Controlled
9	Not controlled (e.g. geographical, etc. restriction)

Create a Cause & Effect Matrix diagram to have a value which can be used for choosing significant problems and execute the actions.

Cause & Effect Matrix

	Type Rating of Importance to Customer in this Row →	9	7	7	9	8	8	4	4	6	3			
		1	2	3	4	5	6	7	8	9	10			
	Type Outputs in this row →	Glass easy to pull	Glass on line catcher	Glass on track	Glass on olivotto	Less diameter variation	Less wallthickness variation	Low crack	No mirroring	No knot	No airline			
	Type Inputs to be prioritized in the Column below ↓	Relate the Inputs to the Outputs and enter your numerical rankings in the matrix below										Listed below are the Prioritized List of Inputs	Level of control	Control of priotity
1	Bottom Temperature	1	1	1	1	1	1	1	1	9	3	119	1	13
2	Crown temperature	1	1	1	1	1	1	1	1	9	1	113	1	13
3	Distributor temperature	1	1	1	1	1	1	1	1	1	1	65	1	7
4	Feeder S1 temp	9	9	9	9	5	3	1	1	1	3	375	1	42
5	Feeder S2 temp	9	9	9	9	5	3	1	1	1	3	375	1	42
6	Feeder S3 temp	5	5	5	5	3	3	1	1	1	3	231	1	26
7	Entrance tem	9	9	9	9	5	5	1	3	1	3	399	1	44
8	Spout temp	9	9	9	9	5	3	1	3	1	3	383	1	43
9	Jet temp	9	5	5	5	5	3	3	3	1	3	299	1	33
10	Middle temp	9	5	5	5	5	3	3	9	1	3	323	1	36
11	Nose temp	9	5	5	5	5	3	3	9	1	3	323	1	36
12	Sleeve rotation	9	9	9	9	9	3	3	5	1	3	431	1	48
13	Sleeve diameter	5	5	5	5	5	3	1	3	1	3	255	5	142
14	Sleeve angle	5	5	5	3	5	3	3	9	1	3	269	3	90
15	Sleeve position	9	9	9	9	5	5	1	3	1	1	393	1	44
16	Glass output	9	9	9	9	9	9	3	9	9	3	543	1	60
17	Line ctacher belt condition	1	9	5	3	1	1	3	1	1	1	175	3	58
18	Alignment track	3	1	5	5	3	1	1	1	1	1	163	5	91
19	Ollivoto	5	1	9	9	1	9	1	1	1	1	293	1	33
	Lower Spec													
	Target													
	Upper Spec													

Fig. 1: Cause and Effect Matrix

Table 4: Prioritization Matrix

Input	Sensitifity	Control of Priority	Rank
Glass output	**543**	**60**	**1**
Sleeve rotation	431	48	2
Entrance tem	399	44	3
Sleeve position	393	44	4
Spout temp	383	43	5
Feeder S1 temp	375	42	6
Feeder S2 temp	375	42	7
Middle temp	323	36	8
Nose temp	323	36	9
Jet temp	299	33	10
Ollivoto	293	33	11
Sleeve angle	269	90	12
Feeder S3 temp	231	26	13
Line ctacher belt condition	175	58	14
Alignment track	163	91	15
Bottom Temperature	119	13	16
Crown temperature	113	13	17
Distributor temperature	65	7	18
Sleeve diameter	255	142	19

To choose prioritization of cause and effect matrix ranking, start from high sensitivity. It is a combination between correlation input-output and rating of important with the low control level.

(e) D5 – Verify corrective actions

(i) Check, clean and change membrane piston olivoto to stabilize pulling glass tubing (Resp. Mech. Eng., W19-21)

(ii) Resetting feeder temperature refers to production line 1.3 and optimize setting (Resp. Process Eng., W19-21)

(iii) Resetting sleeve rotation speed refer to production line 1.3 and optimize setting (Resp. Process Eng., W19-21)
(iv) Resetting distance sleeve to flow cup refers to production line 1.3 and optimize setting (Resp. Process Eng., W19-21)
(v) Re do production planning (Resp. Prod. Planner, W19-21)

(f) D6 – Implement Permanent Corrective Actions: Fix the temperature setting for both feeder & sleeve at production line 1.1 (verification: already 2 weeks' production and the performance same as other types).
(i) Conduct 8Ds conformance cycle audit by plant auditor

(g) D7 – Prevent Recurrence: Standardize feeder temperature setting in production line 1.1 especially for T8-0.5 mm thickness and documented in standard operating practice and make awareness to operators about this new setting (Resp. Process Eng., W28).
(i) Standardize sleeve parameter setting in production line 1.1 especially for T8 -0.5 mm thickness and documented in Standard Operating Practice and make awareness to operators about this new setting (Resp. Process Eng., W28)
(ii) Review Potential Problem Analysis for the next sleeve changing (Resp. Prod. Eng., W27)

(h) D8 – Congratulate the team: Technical Team & Responsible Person. The result is success in producing product type T8 – 0.5 mm thickness at prod. line 1.1.

After solving the problem Factory Manager and Prod. The manager acknowledges good work done by the team for solving the problem.

3. BENEFIT OF THE 8Ds IMPLEMENTATION

(a) Customers are more trusting because production is more reliable
(b) Improve understanding of structured problem-solving technique
(c) The lowest level in the organization have better ownership for driving adjustments
(d) Increased sustainable results through behavior changes in processes, management systems, and people.
(e) Prevent recurrence problem

4. DISCUSSION

The key factors of successful problem solving with 8Ds method mainly are:

(a) 8Ds Methodology: 8Ds methodology is one of the key elements to solve complex problems. Its purpose is to identify, correct and eliminate recurring problems, and it is useful in product and process improvement. The cause of a problem is unknown; the resolution of the problem is beyond the capabilities of one person, the symptoms are sufficiently complex to warrant a team effort.

(b) Team Work: The role of the team members is to provide technical input in the form of information, knowledge, and ideas. The team members may vary throughout the life of the investigation. The team's goals and membership role been clarified. An individual has special skills or experience which will the team requires to function effectively.

(c) Well-established action problem solving-learning: The uniqueness of 8Ds methodology implementation is based on a structural approach to problem-solving. In the review meeting, the commitment to the recommendations for corrective actions is the result of a problem-solving approach and very good for the learning process of the team. The number of heading above the conclusion. This is also a paragraph so all font styling described above for a paragraph will be applicable here.

5. CONCLUSION

The Eight Disciplines Problem Solving (8D) is a methodology used to approach and to resolve problems. Its purpose is to identify, correct and eliminate recurring problems, and it is useful in product and process improvement. Although it originally comprised eight stages, or 'disciplines', it was later augmented by an initial planning stage. In this paper shows the 8Ds methodology in solving the problem of production failure on the production line, by following the eight stages and strong teamwork, the problem of production failure can finally be resolved and the customer's interests can be saved.

6. ACKNOWLEDGMENT

The authors wish to thank the management of manufacturing companies in Surabaya. This work was supported in part by a grant from the Mahardhika School of Economics

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