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8D Methodology: An Effective Approach for Problem Solving in Automotive Assembly Line

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ABSTRACT

Sustaining a business by meeting customer expectations and satisfactions, an organization must promptly response and adapt to changing conditions in a competitive market. This great challenge due to mass production to mass customization required a flexible and faster solution of any problems occurred in production especially in automotive industry. In this respect, a method of Eight Disciplines Problem Solving (8D) was deployed to overcome a major defect encountered at one of major processes of assembly line. This approach plays a vital role as a strategic tool to solve problem in the essence of defect is anonymous. 8D method is also providing a path for product improvement as well as the whole process involved. In relation, this study has been conducted on application of 8D for defective product named as left handside (LHS) mirror gap at trim assembly line in automotive company. Throughout the paper, the problem was defined, the causes of failure were analyzed, and the countermeasures were constructed as well as the improvements were determined until performance level was reached. Apart from that, this applicable approach can be extended to other main processes at assembly line to overcome major issues as well as making substantial improvement in meeting quality products and processes.

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INTRODUCTION

To date, manufacturing products are more and more complex with several technologies involve at the same time. Associated with the complicated system and operation, (Michalos *et al*., 2010) described the technological advancements, new competitors, global sourcing and industry restructuring result in great challenges for the automotive industry. In details, (Makris *et al*., 2007), mentioned the capability of offering more variants per model, and introducing new models faster, is constrained by the current technologies and the equipment of mass production operations, which are incapable of supporting product variability. According to (Chryssolouris *et al*., 2008), the transition of the automotive industry from mass production to mass customization is based on the need for more customized vehicles to be produced, providing many variants, with the use of fewer resources and materials, in the shortest time possible. As the complexity in the defined sector is intensified, it requires all-inclusive perspective of major manufacturing attributes that need to be considered when production decisions as regards to cost, time and quality are implemented. Following this, the vehicle itself as a product that characterized with high complexity via production and processes is also contributed to many emerging approaches and methodologies. Typically, different vehicles are assembled by variant processes that result to a number of quality issues in the production. Due to that fact, 8D methodology is represented in this paper as an approach in selected case at trim assembly line production.

Problem Solving Method For Quality Improvement:

The origin of 8D known as Global 8D method was popularized by Ford Motor Company in the sixties and seventies of the twentieth century. As refer to (Rambaud, 2006), the methodology was applied to military standards and was referred to as the Army Directive 1520 'Remedies and disposal of non-conforming material'. In practice, the 8D method is also referred to as a Global 8D, 8D and Ford TOPS 8D. Many industries especially

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in automotive sector consume the 8D methodology as a tool in the essence of standardizing process with an emphasis on facts. The 8 disciplines (8Ds) method is a tool of ISO/TS 16949:2009 and has been widely applied in automotive industries for service or products problem solving, including the problems with supplier qualification confirmation, manufacturing process deviations, defects, maintenance, customer complaints, returned purchases, etc. (Chen and Cheng, 2010).

Automotive companies are facing tough challenges to improve vehicle quality and reduce product development (PD) time for new product introduction (Yadav and Goel, 2008). Following this, achieving the quality of product is known as one of the key factors for success in the automotive sector. A fundamental understanding of quality is essential to compete effectively in today's international markets (Kolarik, 1995), and quality was cited as the single most important factor in determining market share (Hill, 1989). Quality measures represent the most positive step taken to date in broadening the basis of business performance measurement (Bogan and English, 1994). As a matter of fact, these situations demonstrate that a quality improvement is important for manufacturing industry in global competitive market. Additionally, (Dhafr, 2006) described the leading manufacturers and service providers alike have come to see quality as a strategic weapon in their competitive battles.

Problem solving is a systematic process of reaching a solution or solutions to a concern or difficulty (Hagemeyer *et al*., 2006). The problem solving process selected is usually determined by the level of complexity of the concern presented. In different situation, when the difficulty is simple, an informal process exists whereas the difficulty is complex, a more formalized, systematic process is followed. There is diversity of problem solving or quality processes which commonly used in large manufacturing companies consist:

- Juran on quality improvement (Juran, 1986).
- Quality improvement through defect prevention (Crosby, 1986).
- Quality improvement (Deming, 1986).
- Process improvement (Ishikawa, 1987).
- The improvement process (Harrington, 1987).
- Business process improvement (Harrington, 1991).
- Six sigma implementation and training (Institute of Industrial Engineers, 2002).

In similar, there are numerous problem solving tools from which to decide. Seven basic quality tools were the most commonly known and used in companies. These seven quality tools are cause and effect diagram, check sheet, histogram, pareto diagram, process flow diagram, scatter diagram and statistical process control chart. As such, the variety of problem solving tools at recent provide a multiple choice to the organization to overcome any issue occur especially when it is most relates to the quality of product.

8d Implementation In Assembly Line Production:

Initial process of assembly line, trimming section is selected for 8D method implementation. It shows that from the data collected, defect due to LHS side mirror gap was at the higher percentage with 35 units discovered as seen in Figure 1 [6]. In this sample, the total vehicles inspected were 1,267 units.

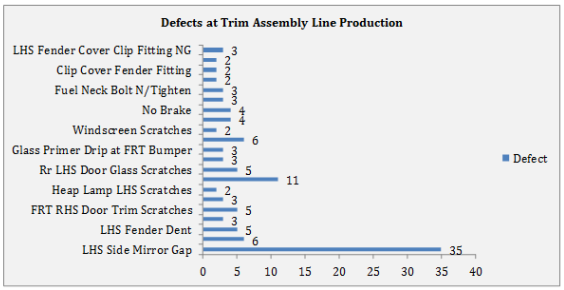

Fig. 1: Defects in Trim Assembly Line (QC TEAM, 2012).

The 8D steps and tools used are as shown in Fig. 2. These flows are described as follows:

D1 - Use Team Approach. This step establishes a small group of people with the knowledge, time, authority and skill to solve the problem and implement corrective actions. The group must select a team leader.

D2 - Describe the Problem. The purpose is to describe the problem in measurable terms. The internal or external customer problem is specified by describing it in specific terms.

D3 - Implement and Verify Short-Term Corrective Actions. This step defines and implements those intermediate actions that will protect the customer from the problem until permanent corrective action is implemented. The data of the effectiveness of these actions is verified.

D4 - Define and Verify Root Causes. The application of the step is to identify all potential causes which could explain why the problem occurred. Each of potential cause is tested against the problem description and data. Alternative corrective actions are identifying to eliminate root cause.
D5 - Verify Corrective Actions. The aim of this step is to confirm that the selected corrective actions will resolve the problem of the customer and will not deliver undesirable side effects. Other actions are defined, if necessary, based on potential severity of problem.
D6 - Implement Permanent Corrective Actions. The purpose of this step is to define and implement the permanent corrective actions needed. On-going control is chosen to assure the root cause is eliminated. Once in production, the long-term effects are monitored and additional controls are implemented as necessary.
D7 - Prevent Recurrence. This step involves modifying specifications, update training, review work flow, and improve practices and procedures in order to prevent recurrence of the given and similar problems.
D8 - Congratulate Your Team. This essence of this step is to recognize the collective efforts of the team and publicize the achievement. Share the knowledge and learning gain is shared and at same time the 8D report need to be documented.

Emphasizing the importance of quality of products, 8D method is exploited to solve the major defect encountered in the trim assembly line. The outcome of the method executed is explained in the result and discussion.

Result Analysis And Discussion:

Defects rate of product deliver a significant impact on the improvement of yield and financial of any company. The defects rate causes a direct effect on the profit margin of the product and decrease the quality cost during manufacturing of product. Associated to the highest defect exist at trim area, 8D methodology implemented and reported in the form shown in Fig. 2.

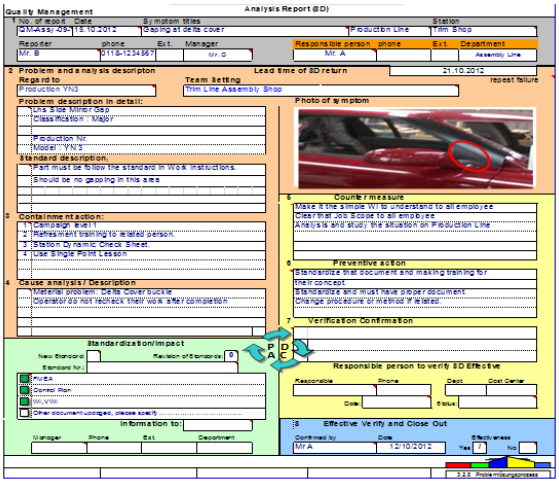

Fig. 2: Sample of 8D form (QC TEAM, 2012).

In the analysis process, the possibility of the root cause is identified. It has revealed that the defect came from material called as 'delta cover buckle' that result to inaccurate dimension of parts. Taking into account this root cause, the countermeasures is undertaken via providing new working instruction (WI) which explained on the additional job description of person in charge at the designated area by rechecking the parts involved. Observing and monitoring are deployed in order to ensure the instruction comply as well as to find out the quality assured.

Conclusions:

Appear as one of the basic problem solving methodology especially in automotive industry, 8D offers an essential solution from identifying the root cause until the implementation of preventive action. This strategic tool had succeeded to meet the expectation of the quality team by overcoming the major defect of part at trimming assembly line. This situation elaborates that the method can be a significant option to be performed in others major processes of assembly line as well so that the major quality issue involved can be resolved. Particularly, the implementation of the method will alleviate the waste of defects that result to cost deduction. Therefore, the quality of the products can be improved and fulfill the customer satisfaction in the competitive market.

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