

Quality Management Information in Automotive Stamping Process

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Abstract Although the automobile is a commonly used product, it is an extremely complex and technologically sophisticated one. Technology has increasingly altered the manufacturing process for motor vehicles. While cars produced at faster rates, automakers must continue to balance increased productivity and efficiency with quality and innovation. To improve product quality and efficiency in production, automakers rely heavily on research and technological innovation. Due to global competition, companies have indeed emphasized that quality should have to be put in place, integrated into all aspects of products and services within their management system. Therefore, quality management is essential role in all the manufacturing production. This paper discusses the basic concept of the quality management information, the stamping process in automotive manufacturing and quality information flow of the stamping process in automobile production. The processes flows of the diagrams are also provided.

Keywords: quality management, stamping process, inspection, auto manufacturing

1. Introduction

The automotive industry is involved in the design, development, manufacture, marketing, and sale of motor vehicles. In the automotive production process, one of the processes in production is stamping. Metal stamping processes use dies and punches to cut the metal into the required shape [1]. In making automotive, many steps should be operating; the first step in car production is stamping process, which is the process that succeeds the shape designing of the part. Metal stamping is a process employed in manufacturing metal parts with a specific design. Stamping (also known as pressing) includes a variety of sheet-metal forming manufacturing processes, such as punching using a machine press or stamping press, blanking, embossing, bending, flanging, and coining [2]. Stamping workshop mainly is responsible for processing parts of vehicle body, such as: the door, surrounded by outside, roof, etc. For all these processes, quality is the most important role. During the past decade, quality improvement has become one of the most important organizational strategies for achieving competitive advantage [3]. Improving with the quality with which an organization can deliver its products and services is critical for competing in an expanding global market.

2. The Basic Concept of Quality Management Information

The term quality management has a specific meaning within many business sectors. This specific definition, which does not aim to assure good quality by the more general definition, but rather to ensure that an organization or product is consistent, can be considered to have four main component: quality planning, quality control, quality assurance and quality improvement [4]. Quality process management is the application of the knowledge, skill, tools, techniques and systems to define, visualize, measure, control, report and improve processes with the goal to meet customer requirements profitably [5].

Quality management focused on not only product and service quality, but also the means to achieve it. It uses quality assurance and control of processes as well as products to achieve quality that is more consistent. Quality information is particularly important when the customer pay more attention to the quality. It is an important measure in quality decision-making, quality control, quality plan; it will directly affect the quality of product, so it is an important resource.

The vehicle manufacturing industry's quality information forms in the process of quality formation and quality assurance. For a car manufacturing enterprise, manufacturing management of the process quality information is an important link of the quality control in the process. It is an important role for the timely discovery in the process of manufacturing defects and deviation; ensure the process quality control effectively. The quality of manufacturing engineering refers to the manufacturing process quality and it points to the design requirements through the production process manufacturing and actually reached physical quality. It is a comprehensive product for operating workers, technology, equipment,

raw material, process, test method and the environment of the factors in the making process.

From that, the main manufacturing engineering qualities reflect to the production of the work quality. In the manufacturing process, there have six main factors of quality processes. These are the operator (Man), machine and equipment (Machine), raw materials (Material), process (Processing), detecting methods (Method), environment (Milieu) [6]. The above factors can be classified into 5M 1P, managing the work quality in the manufacturing process is to control the several factors to ensure the quality of products. This process flow is shown in Figure 1.

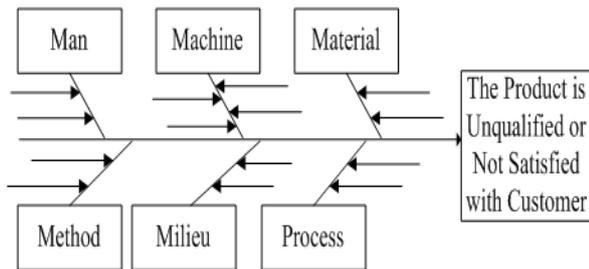


Figure 1. Quality management chart

3. Automotive Stamping Process in Auto Manufacturing

Stamping is a forming process performed on sheet metal by a series of stamping stations. The stamping process used to produce mass quantities of finished products [7]. The stamping of sheet metals can be defined as the process of changing the shape of the sheet metal blank into a useful shape in the plastic deformation state, using a die and a mechanical press; stamping is considered a net shaping process. Generally, the automotive stamping focuses on two modes of stamping: deep drawing and stretch forming. The deep drawing mode is when the sheet metal is formed (drawn) from the binder by the punch. The stretch forming mode is when the clamping pressure of the holding down ring is very high, such that the friction forces in the flange are high enough to allow the material to flow in. The formability of sheet metal can be further analyzed from the metal flow patterns within the die cavity [8]. In stamping, there are three main patterns of metal flow: elastic flow, plastic flow, and rigid movement.

Metal stamping is the manufacturing of metallic components by applying an extreme amount of pressure to blank pieces or sheets of metal. The purpose of this metal stamping process is to be able to produce formations of any shape and size desired out of the metal sheet. It has strongly associated with the automobile industry because each car has many parts that are made from steel. Outer car panels, like hoods and fenders, are common examples of parts made using metal stamping processes. Sheet metal stamping presses act as carriages to carry other machines. Dies are fairly simple machines that fit inside and fastened to a press [9]. The steel sheet cuts according to the size of the part and is bent and cut in a stamping machine to make parts such as car doors, roofs, and hoods [3]. In automobile manufacturing process, 60% to 70% of the

metal parts are processed by the plastic forming, and a metal forming completes stamping process, such as a variety of car body panels, car parts support, engine exhaust pipe and muffler, hollow camshaft, oil pan, engine cradles, frameworks, structures horizontal beam, etc., are all positive by the precision metal forming technology. Stamping process is the so-called means of stamping parts of the adaptation process that designed in size stampings, precision and base size, structure, and shape with the pressing requirements of processing technology [10]. A car body may contain more than 1500 stampings, in addition to large-scale panel also includes the door, cover, chassis, floor and so on.

4. Quality Information Flow of Stamping Workshop

Stamping workshop mainly is responsible for processing parts of vehicle body, such as: the door, surrounded by outside, roof, etc. In the quality information flow of stamping workshop, generally there have two quality information processes. These are external and internal quality information. These quality information flows of stamping workshop established in the base of understanding the stamping workshop, specific work process, the existing quality control mode, and the grade of stamping workshop quality information.

4.1. The External Quality Information Flow of the Stamping Process

In the external quality information flow of the stamping workshop, the first link of the four craft workshop contact closely with suppliers, body workshop, coating workshop, assembly workshop, the quality department and manufacturing. Each department has different information interaction.

The quality information of sheet is the main information interaction by stamping workshop and suppliers. Suppliers provide quality information of sheet to stamping workshop to smooth production, but at the stamping workshop stage, if the information is not clearly stated, the inspection section will return the suspicious materials to suppliers in the production process.

The metal sheets that pass the inspection section will be sent to the manufacturing process/ stamping section to make stamping pieces. The quality departments have a SIP (standard inspection process) confirm stand in the last section in stamping shop. This section examines stamping parts before been stored in the warehouse. If quality defects are found, they would determine responsibility area and repair. If the products do not pass from 3x2 inspections, they will become waste. The products that pass the SIP inspection will be kept in the warehouse. The process procedure of the external quality information of the stamping process is shown in Figure 2.

4.2. The Internal Quality Information of the Stamping Process

In the internal process, stamping workshop contains opening the material, deep drawing, scrap edge, punching and reshaping processes. The products from stamping

workshop need to pass the workshop inspection and confirm with SIP. The products that pass the qualified inspection will be sent to welding workshop but the

unqualified must be repaired and re-checked until they are qualified (see in Figure 3)

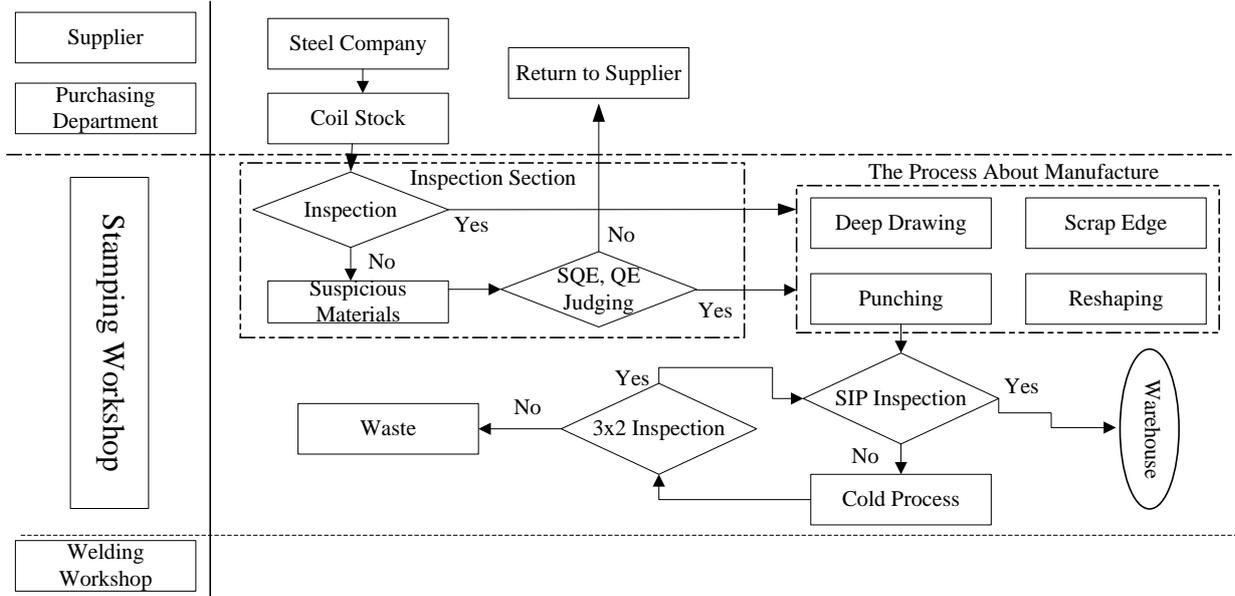


Figure 2. The external quality information of the stamping process

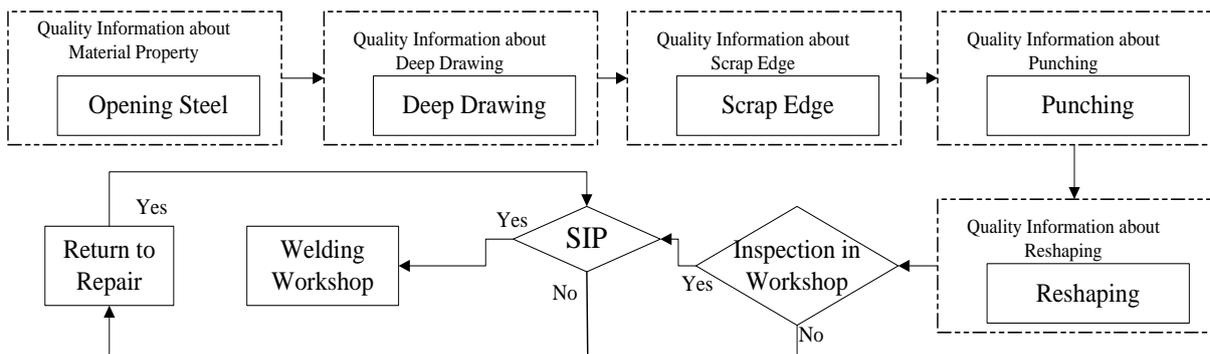


Figure 3. The internal quality information of the stamping process

Opening the material section will check each bundle open package material and observe surface to find defects. Then it will measure each batch of attached a stack of above a material aspect ratio and thickness size and fill in the results in the plate quality record card. The employees of punching production line will check the workshop equipment and record the information in the TPM (total productive maintenance) inspection table.

In the stamping workshop all quality activities, the monitors responsibility is checking information and repairing information. All these information are managed by the internal workshop, SIP check information shared by the workshop and quality department, TPM examination information shared by the workshop and manufacturing department, plate quality information shared by the supplier and workshop.

5. Stamping Workshop Information Classification

According to the basis of the internal and external information flow of the stamping plant, all quality information on the stamping plant workshop, internal

checks, external quality problems, the quality of stamping plant alarm upgrade process and other relevant quality information can be classified as the following.

5.1. Quality Inspection in the Stamping Workshop

Production line process operators check the first and the last pieces of one within one minute, to form one-minute inspection record. When one-minute check information passes, the inspectors of the material section check each tied to open the package material and observe the plate surface with or without defects. After that, they measure the length, width, and thickness of each batch of sequential stack of material above the first thing to fill in the results sheet quality record of the card. When the plate quality information passes the production line process operator check the stamping plant equipment per shift, and fill in the TPM checklist. The last framed staff of the line put the failed pieces into a box and then it fill out a substandard product identification card to pass the non-conforming product information. Figure 4 shows the different functions of operators and monitor for each department in checking their corresponding quality inspection processes.

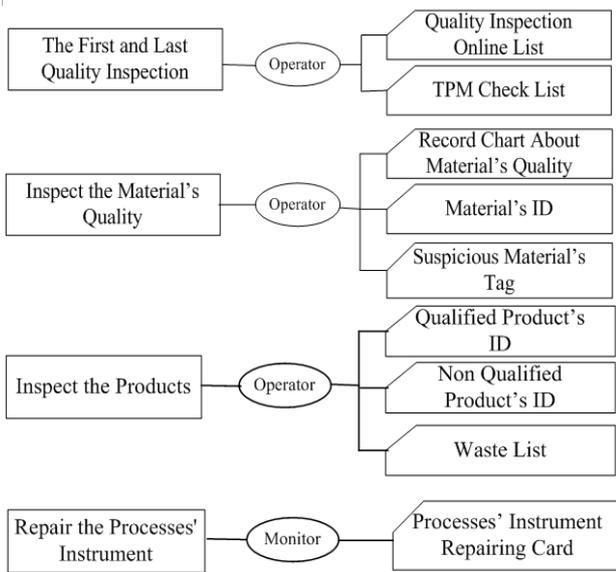


Figure 4. Inspection process in the workshop

5.2. The Information Generated by the External Quality Problems

The stamping plant SIP station check the quality problems related to the stamping plant that GCA (global customer audit) reviewed as well as stamping problem found in other workshop. The workshop engineer will feedback to the corresponding section of the stamping plant in the card of quality information or the form of PCR (product category rules) to pass the information of quality problem. The process flow of the outside quality problem is shown in Figure 5.

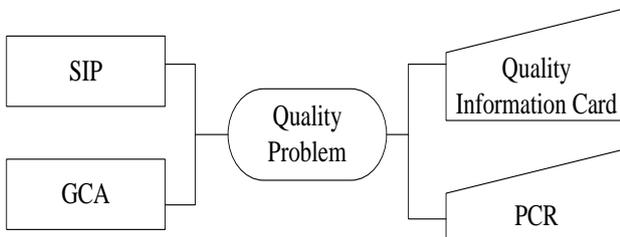


Figure 5. Quality problem process

5.3. Other Relevant Quality Information

Manufacturing engineers and quality engineers count and analyses on the operation of the plant quality objectives form the day report, week report and month. Then they make the quality cost for report. Some unqualified products pass to the change point to check their properties and then make the lists of the tracking change point. These relevant relations are shown in Figure 6.

All the quality information process has a self-test and mutual inspection process, a line check before entering the main line directly online repair not immediately repair to do offline processing when sampling twice within the inspection, the inspection process for each frequency and the corresponding records.

6. Conclusion

With the development of science and technology, the cars have already become the important component in our daily life gradually. Automotive vehicles are widely used in many countries for transportation and other purposes. Automotive technology is also a required sector to develop the country rapidly. However, quality is the main important role in all manufacturing processes. Today customer demand and expect high quality products. Therefore, the purpose of this study expresses to determine the quality information of the automobile production process. The internal and external inspection flow of the stamping workshop and information classification flow of the stamping process were also discussed. This research intends to improve product quality, accelerate the development of enterprises, and enhance the competitiveness of enterprises. This research carried out the quality inspection process in automotive stamping process. The quality inspection process provided in this research will greatly improve the quality of the automotive stamping process.

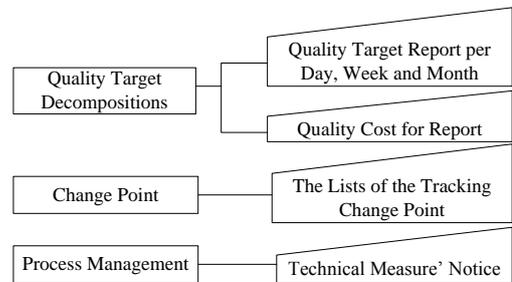


Figure 6. Other relevant quality information

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