

DESIGN AND MAINTENANCE PROCESS MANAGEMENT

DRAGASTAN Elena-Iulia, GEORGESCU Mihaela and LECU Denis-Marian

Faculty: Industrial and Robotics Engineering, Specialization: Engineering and quality management, Year of study: III, e-mail:elena.iulia33@yahoo.com

Coordinator Prof. dr. eng. Irina Severin

This study aims to highlight the design and maintenance issues found in cars.
The methodology used to conduct this study involved the collection of relevant data and information through a process of documentary research to identify design issues.
The identified issues were presented in a structured way, separated into general implementation issues and specific issues, as well as into subcategories depending on the internal or external factors to which they relate.
Based on this survey, an analysis was made of consumers' perceptions of vehicle life and the most common failures.

KEY WORDS: design, maintenance, marketing

1. Introduction

This study aims to highlight the design and maintenance issues found in cars. The objectives of this study are design and maintenance, marketing and its influence on production lines, maintenance vs. perception of car owners (survey), highlighting the main design and maintenance issues and conclusions drawn in this case.

2. Status

To begin with, design, as Richard Feilden puts it, involves the use of scientific principles, technical information, and imagination to define mechanical structures, machines, and systems with pre-specified functions, with maximum economy and efficiency (Richard Feilden 1963 - engineer and architect).

As can be seen, Figure 1.1 shows the systematic representation of the design:

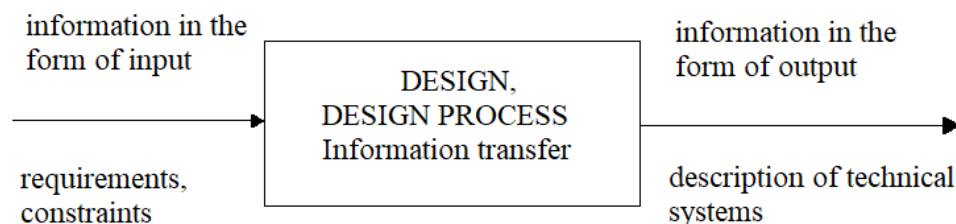


Fig.1.1 Systemic representation of the design

The purpose of the design (Mostow, 1985) is built on a structure of the form:

- Satisfaction of given functional specifications;
- Complies with environmental limitations;
- Implies implicitly or explicitly performance requirements - time, space, power, cost, etc. - and structure - style, clarity, etc.

- Satisfaction of restrictions imposed by the design process itself

As we all know, any product needs maintenance. But what does this term mean? Well, "maintenance" involves the choice of means of prevention, correction or renovation in order to monitor the wear of the equipment in order to reduce costs, in which case it can be considered that maintenance means "supervision" of the machine.

Despite the fact that we bring out engineers in the industrial field, the quality branch, the longevity of today's cars is strongly affected by marketing. In other words, the target of the manufacturers is no longer the reliability of the cars but rather the profit, which in a considerable percentage is obtained from the sale of car parts.

Consumer society encourages us to consume as much as possible, and to consume as much as possible, it automatically decreases the quality of products. Thus, the expected lifespan for the respective product has decreased, the technology, manufacturing and maintenance being modified so as to satisfy the consumer's requirements. From the manufacturer's point of view, the life cycle of a product can be approached in two aspects: one that refers to the actual production, and the other that refers to the marketing activity.

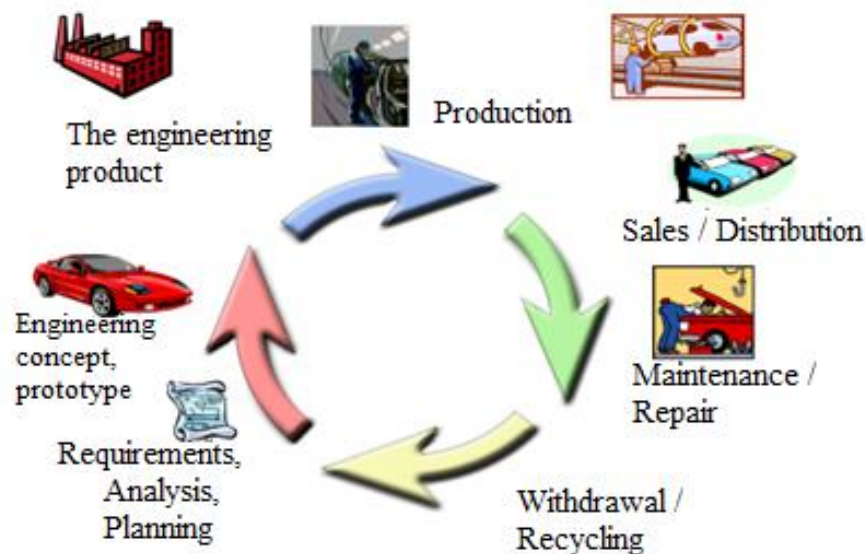


Fig.1.2 Management of the Lifespan of a Product

For the customer, the life cycle of a product has three main stages:

- product purchase
- its operation / use and execution of maintenance / upkeep operations (if applicable);
- disposal and / or replacement of the product when required or when the beneficiary so wishes for various reasons.

Taking into account all these aspects, a survey was conducted in which data were collected both about the owner and the technical data of the owned car, the purpose being to identify the technical problems they encountered after a certain number of km traveled since the purchase of the car. , as well as an image of a so-called "ideal" car and the expectations they have from it.

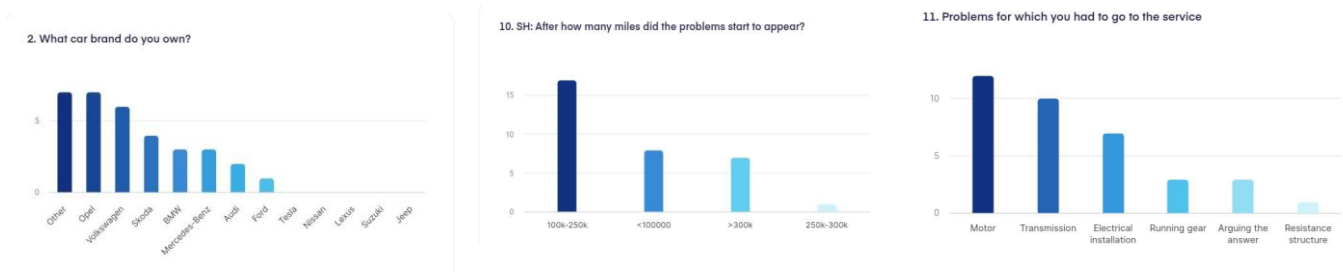


Fig 1.3 statistical results

Following the collection and filtering of the obtained data, it was found that in a percentage of approximately 33% people arrived with the cars in service due to the problems of the engine assembly of the owned vehicle, 29% of them encountered defects of the transmission system, 20% defects of electrical installation, 9% with running gear failures as well as various other problems.

As previously noted, the most common problems with a car getting into service are engine problems.

Inside the high-pressure pump on the diesel engines of the well-known Bavarian car brand known as BMW, the following problem is encountered, which considerably shortens the life of the engine. In the most unfortunate cases, the engine is no longer able to be restarted. This is a cylindrical ball bearing that reduces the friction between the camshaft and the piston of the pump, which unfortunately wears out prematurely and ends up changing its position so that the camshaft ends up grinding it. The first sign of wear of the high pressure pump is a very cumbersome hot start (after much insistence) but also very difficult to detect. In such a situation, after the diagnosis it is found as an error "low starting pressure". Low starting pressure may be due to:

- malfunction of crankshaft speed sensor that controls diesel power supply as a function of speed
- pronounced wear of the pressure regulator on the pump (solenoid valve that closes / opens the return circuit) no longer tight
- pronounced wear of the pressure regulator on the ramp; When trying to start the engine, this regulator must remain in the closed position for 3 revolutions of the crankshaft or more depending on the wear until the pressure before it reaches about 300 bar to be possible to start the engine. Due to the wear, the effort made by the solenoid valve is greater, its opening being made more and more difficult and in some cases not being possible anymore. All the problems listed above are identified with the same error code that identifies the wear and tear of the high pressure pump.

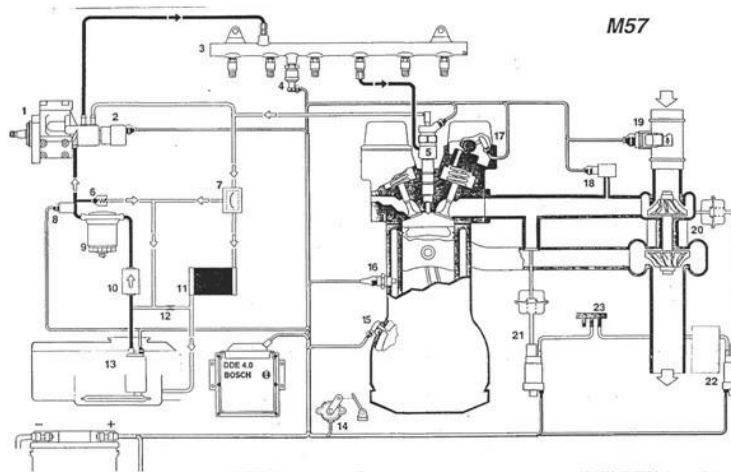


Fig.1.4 Scheme of principle

As mentioned above, after the pump has worn out, the resulting span ends up being transported to the injectors by fuel by plugging their holes or locking them in the open position which leads to melting or breaking the pistons, breaking the connecting rods, breaking the engine block, bending the valves and / or breaking hydraulic plugs. This problem arose from the tightening of pollution rules which forced the manufacturer to increase the fuel pressure in the injection ramp in order to reduce the degree of pollution and again we reach marketing where the manufacturer no longer invested in research to redesign the whole pump work which leads to premature wear and automatically decreases the significant life of the engine.

3. Conclusion

In conclusion, with the help of the survey, an image of an "ideal" car was made according to the requirements and desires of consumers and their vision of it. Thus, the car must include qualities such as reliability, safety, performance, premium quality with a low budget, minimum maintenance costs, minimum operating costs and comfort.

Bibliography

- [1] <https://doctorprocar.ro/mentenanta-autovehiculelor/>
 - [2] <https://www.scribd.com/document/404120444/Proiect-mentenanta-Alexandru-Mihai-Chirila-docx>
 - [3] https://memm.utcluj.ro/materiale_didactice/mentenanta/curs/Mentenanta_note_de_curs_1.pdf
- Questionnaire : <https://www.surveio.com/survey/d/Y2E2S5A6N0D3I0Y6A>