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Qualitative analyses in the quality assurance system for manufacturing processes - a case study for the elements of the car's mechanism movement

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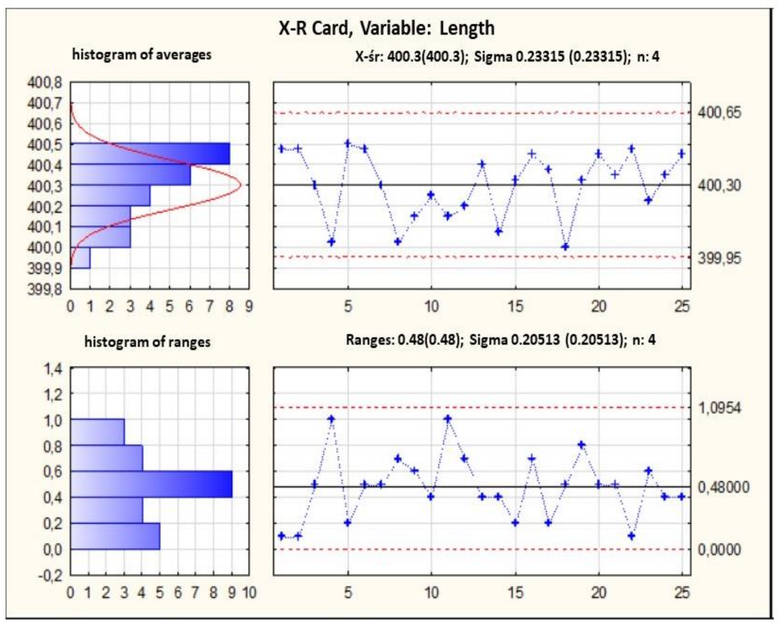
INTRODUCTION

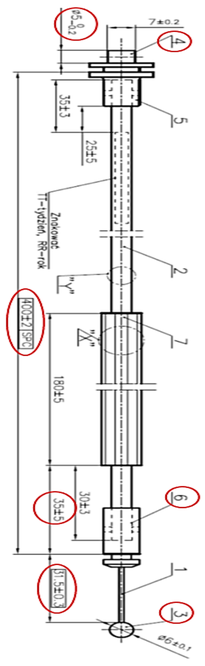
The article presents selected aspects of the quality assurance system for production in the Automotive system. The structure of quality assurance elements in continuous production is presented, indicating the stages of quality supervision. An analysis of quality in the production of a car cable is made - based on the control plan and process risk analysis. The procedure for statistical analysis of quality for a selected element is presented. And guidelines for these analyses in the continuous quality monitoring system are presented. The quality monitoring system is an element of the complaint supervision program used in the analysis of the **8d report**. The article is an analysis of quality requirements for manufacturing processes. It is a case study analysis regarding the fulfillment of quality requirements, which result from the guidelines of the standards. It is a verification of the fulfillment of requirements for the analyzed process, which will also be implemented for all other processes in the future. The presented analyses contain the structure of collecting data, their processing and use in each production stage, which is carried out in the enterprise. The importance of collecting statistical data and their use in critical points of the production process is indicated. The purpose of this article is to present the topic of quality requirements in the automotive industry and to show a wide range of methods and tools used by companies to meet them.

MAPPING OF SUPERVISION PROCESSES IN THE ENTERPRISE - PROCESS RISK

In the management of the company, a process approach is used, which takes into account personnel management and is focused on team activities and continuous improvement of employees' qualifications As a result of the process analysis, a process map is created, and thanks to it, process diagrams are created, which illustrate the activities carried out within a given process, show the process owners, input and output information and the way they are related together with the flowing documents. The resulting diagrams allow for a better interpretation of the process, compared to complicated verbal descriptions. The company has defined the criteria for assessing the effectiveness of the processes and the methods needed to supervise them

Operation	Risk Description	RISK - value	Effect	Probability	Supervision	Action	Responsibility
Recognition and supervision of the current requirements in the Quality Management System	Outdated requirements	8	4	**2**	Internal audits	Corrective actions	QMS Representative
	Not implemented required	8	4	**2**	Internal audits	Corrective actions	QMS Representative
Control of documented information (supervision and collection)	Unattended documentation	6	3	**2**	Internal audits	Corrective actions	QMS Representative
Development and supervision of the Quality Manual	Not compliant with requirements	3	3	**1**			
Planning and supervision of internal audits	Untimely	6	3	**2**	Audit schedule	Modification of the plan	QMS Specialist and QMS Representative
	Not substantive	4	4	**1**			
	Not completed	4	4	**1**			
Supervision of corrective and improvement actions	Untimely	9	3	**3**	Corrective action register	Escalate to management	QMS Specialist and QMS Representative
	ineffective	12	4	**3**	Analysis of repeated nonconformities	Corrective Action Plan	QMS Specialist and QMS Representative
Monitoring and improving the process	Analysis of incorrect data	6	3	**2**	Analysis of metrics in monthly and annual reviews	Situation Analysis	Process Owner





SUPERVISION OF THE STATISTICAL STABILITY OF MANUFACTURING PROCESSES

The basis for continuous supervision and monitoring of the quality level in operational processes are Shewart control cards as well as C_p and C_{pk} indicators. In accordance with the system requirements, Statistical supervision is carried out in all quality processes. The graphic form of data from statistical analysis allows for the real-time presentation of the process course, taking into account its variability. This is the main tool for controlling process stability. After analyzing the drawn control chart, it can be stated that the process is statistically regulated. All the obtained results are between the control limits, and there are no non-random changes, such as jumps in the mean value or trends (on the chart). The configuration test (running pattern) did not show any other point patterns that would indicate process deregulation, because it did not reveal any characteristic patterns of subsequent points on the card. The analysis of the control card showed the stability of the tested process. The quality capability of the process is measured by the C_p and C_{pk} indices. The indices obtained were at the level of $C_p = 2.86$, and **$C_{pk} = 2.43$**. The obtained result of the **$C_p = 2.86$** index tells us that the scatter of the tested process is 2.43 times smaller than the accepted tolerance limits. It can be stated that the potential ability of the process to meet the customer's requirements is at a very good level, because $C_p > 1.67$, which is why actions to minimize the scatter of the process are not required

SUMMARY

The presented analyses show that the company meets the assumed quality objectives and implements numerous methods and tools for quality assurance. The basis for the action is the control plan, where all critical parameters have been indicated. Critical parameters are indicated each time by the customer and require documented quality analysis in a continuous system. This is implemented through analyses of the PPaP system and statistical control of production processes. Supervision and process analysis also includes strategic issues. Risk analysis for supervision processes (functioning of the QMS), which are the basis for meeting customer requirements. The achieved Cp and Cpk indicators, in the analyzed process, meet the requirements of quality standards. At the same time, they indicate a shift in the average value in relation to the nominal value. However, an indicator above the value of 2.00 allows the process to continue. This indicator shows the high quality of products, in the analyzed example. The obtained results allow for documenting quality verification in manufacturing processes. An analogous procedure, applied indicators and data collection methods, and is carried out at the required stages of the manufacturing process. The required stages of the manufacturing process are the technical parameters of the product indicated by the customer as critical parameters