Generating Information to Improve Product Quality of Automotive Components by Russian Manufacturers

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Abstract. The application of the Taylor system at Soviet automobile plants is analyzed. Its development to the scale of the industry and the country as a whole is shown. The absence of incentives for enterprises to increase the quality and improve the production management system was noted. Managers of enterprises misunderstand the purpose of quality management system implementation, the predominance of the formal approach to certification, application of new quality control methods without being linked to domestic technical documentation. Adequate perception of ISO/TS requirements began only when foreign customers approved the production of Russian suppliers. The identified omissions of suppliers in preproduction are listed. Based on the results of work with enterprise-suppliers specialists, the main directions for the formation of effective QMS by Russian corporations are determined. Standard layouts, checklist sheets, control sheets, work instructions have been developed for suppliers. Adequate methods of quality management have also been developed. It is concluded that the real quality improvement of automotive components by Russian suppliers is a long-lasting process. Its effectiveness is determined by the effectiveness of activities on the part of suppliers, corporations and Russian government.

1. Introduction

The first automobile plants in the USSR were purchased in the early 30-s of XX century from Ford. The Taylor system was used to manage the production. It was based on appointing and controlling the performance of considerable quantity of requirements to production quality and to characteristics of production processes. Although at that time there were practically no skilled workers in the country and there was an acute shortage of specialists, it allowed quickly establishing the production of complex equipment with acceptable quality in large volumes. As the owner of all the plants was the state, the Taylor system was developed and standardized for industry-wide management. In all enterprises, production activities were managed using a number of unified specialized systems – maintenance and repair of equipment, technical preproduction, metrological support of production and others. Handing-over and acceptance of products procedures between enterprises was standardized.

The real advantage of these systems is a deeply structured content of all processes and waste workflow. Thus, in the production process, route and operational technological maps, technological control maps allow you to have all the information not only to ensure the required product quality in the operations of the production cycle, but also to normalize the consumption of resources.

Ultimately, the Taylor system was presented in the technical documentation system. Naturally, the documentation also became the basis for the training of specialists, so that they all spoke the same
technical language and knew that for the production of complex products it is necessary to establish and document all the necessary requirements in accordance with state and industry standards, and then confirm their implementation.

Unfortunately, the main indicator of the Soviet enterprise success was implementation of the monthly plan on the volume of production. Since consumers for it were appointed in advance, each plant was, in fact, a monopolist [1]. There was no need to achieve world-class quality. It was only enough to ensure compliance. Partly due to it, Taylor's documentation remained virtually unchanged until the collapse of the USSR, and in the early 90-s of the twentieth century, many large enterprises during collapse of the economy were fragmented into local production and were left to themselves. Therefore, both customers and suppliers continued to work in the old familiar scheme of requirements for the production and supply of products. Young specialists coming to the enterprises that years have already received weaker training and blindly adopted the quality management experience of many years ago.

Meanwhile, back in the 50s-60s of the twentieth century in a fierce competition for world markets, the company “Toyota” has developed a new approach to quality management – a continuous improvement. Instead of alternative control, systematic measurements of quality characteristics values have been established. In addition to the requirements, records had to be maintained and analyzed. As compared with Taylor's demands, a new information culture has come into production.

The Toyota approach was used in the ISO quality system standard. It was used by all world leading corporations.

The Russian government was also interested in improving the quality of domestic products. The development and certification of the quality system (CQS ISO) was chosen as a single tool. This work began in 1996. A certificate has become a mandatory requirement for the participation of the supplier in tenders for product supply. Specialists en masse studied new requirements of the standard, mastered the contents of new procedures. At the same time, they did not link it with the solution of urgent production tasks, nor with the content of existing domestic documents. Managers also did not need to use the CQS ISO to achieve really high quality. After all, they handed over their products according to the old requirements and therefore aimed specialists at creating additional reporting documents.

Since 2009, Russian top management of automotive factories have demanded from their suppliers to obtain a certificate for CQS ISO compliance with the requirements of the industry standard for management system [2]. It requires to use a number of specific procedures that are helpful to organize effective interaction with the consumer and to improve the stability of production processes:

- Advanced product quality planning (APQP);
- Production part approval process (PPAP);
- Failure mode and effect analysis (FMEA);
- Measurement system analysis (MSA);
- Statistical quality management (SPS).

However, customers tightened the requirements for the quality of automotive components only in terms of preventing the flaws. Therefore, the implementation of new procedures was again perceived by suppliers as a need for additional documents. As a rule, documents for production approval were prepared in a hurry, without careful coordination with the current documentation [3].

The introduction of international standards did not affect Russian system of technical education. Universities kept an old training methodology under Taylor management system [1]. For example, the content of traditional special subjects is still not coordinated. Still term papers were not brought to the economic evaluation; students are not taught the skills of teamwork. Training in the newly introduced subjects of “quality management” again comes down to mastering certain standardized techniques and is not aimed at practical preparation of improvements in a particular situation.

2. Problem analysis
The need for real improvements in quality management appeared only when the world's leading corporations opened their assembly plants in Russia and they needed Russian suppliers of components.
Requirements of the international quality management standard for leaders of automotive industry are only a general scheme. After all, the standard appeared as a generalization of their own experience. Each corporation during the production approval procedure by the consumer sets its own more stringent requirements for future suppliers.

At first, there were significant faults in the creation of information support for quality management:
- Impossibility of end-to-end information and data tracking on the flow of production cycle technologies;
- lack of preproduction verification procedures;
- many errors and omissions in technological documents;
- inadmissibility of the measurement processes for statistical quality management.
- absence of a key control characteristics list in the workplace that affect the values of the most important (special) characteristics of the products;
- isolation of specialists in their departments (design, technological, metrological) instead of combining them into a cross-functional project management team.

Further, there were long-standing problems in the existing production – low metrological culture in the workplace, ignoring the measurement data during decision-making, the lack of instrumental monitoring of equipment characteristics.

Only now our managers and specialists began to gradually understand that the whole secret of high quality is in the careful study of information for management during the preproduction.

But the suppliers themselves cannot afford solving most of problems. First of all, it is the responsibility of corporations that produce the final product. Like all world leaders, Russian companies have to develop their own requirements based on a standard for tracking and verification of preproduction both at main plant and at suppliers.

3. Practical implementation

The basic provisions of the new information support were developed on the basis of the author's experience with suppliers of Russian automotive plants, which would provide a high level of product quality, and certainly meet the requirements of IATF 16949:

1. The basis of the information complex should remain standardized technological documentation.
2. All additional documents for quality management should be issued as an annex to the operational process maps.
3. During the development of technologies, a full range of information should be prepared for deviation operational regulation of the special characteristics in automotive component:
   - Characteristics measurement techniques themselves;
   - lists key control characteristics of technological transitions and plans for responding to deviations;
   - diagnostic of key control equipment features;
   - monitoring sheet forms to record data measurements.
4. Procedure of production approval by the consumer [2] is desirable to add by the document content verification PPAP set with internal documentation of the supplier, and if necessary – also by a check of on workplaces documentation requirements execution.
5. The set of criteria for assessing the competence of supplier managers should include the effectiveness of their CQS ISO analysis.

A number of companies have worked out standard sets of documents, checklists, lists and record forms that provide effective information support at all stages of the project preproduction and release of a new automotive component. The criteria for evaluating the effectiveness of information on the measurement data are proposed. A new method for determining the diagnostic elements of the accuracy indicators of the machining parts [4-8], as well as the procedure for production approval [9] was developed and tested.
4. Conclusion

“Growing” the product quality of Russian main automotive enterprises and their suppliers to the world level is a rather long process. To do this, existing specialists must change their thinking to move to an adequate meticulous analysis of each assigned requirements and conditions for its implementation.

Top management of enterprises won't be able to master the skills of analyzing the effectiveness of CQS ISO. Quite a long time takes working out the activities of cross-functional teams. Creation of databases to solve problems also a work for more than one year. Finally, the development of interaction with the customer during the project should be extremely painstaking.

All this work will be possible only with the creation of an experienced consultant team in each corporation, as well as the development of a modern training system for the reserve of managers and chief specialists.

But the efforts of corporations can become useless if the Russian government does not create favorable economic conditions for the automotive industry, develop the production of modern equipment and modernize the system of training specialists for the tasks of modern production management.

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