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THE IMPORTANCE AND BENEFITS OF IMPLEMENTING THE TQM CONCEPT IN AN AEROSPACE INDUSTRY ORGANIZATION

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***Abstract:** This paper addresses the concept of Total Quality Management in an organization with the field of activity in the aerospace industry. The purpose of the paper is to identify the aspects that will have to be taken into account regarding the improvement of the organization, from the point of view of the application of the Total Quality Management. During this paper are addressed issues such as: SWOT analysis, setting quality objectives, activities, responsibilities and resources required; the issue of quality strategies and last but not least, aspects regarding the FMEA analysis. The last part presents the conclusions drawn from the study as well as their own views on the topic, along with the importance and benefits of implementing the concept of total quality in an organization in the aerospace industry.*

***Key words:** organization, TQM, aerospace industry, quality, strategy, continuous improvement.*

1. INTRODUCTION TO THE ANALYZED ORGANIZATION

The organization that is the subject of the study in this paper was founded in 1959, starting from a tool and die shop. In 1961, the first small extrusion presses started operating. In April 2009, the organization expanded to Europe. This extension was made in an effort to support Airbus programs within the European Union. This expansion allows the organization to support major aircraft manufacturers around the world. The organization takes seriously its commitment to being at a very high level of excellence. That is why a very high and advanced level of quality control and monitoring has been established, the organization committing itself to produce the best possible products on the aerospace market.

The testing and verification capabilities of the organization are physical, mechanical, chemical and ultrasonic. In addition to these capabilities, the organization also has a research and development department that has its own metallurgical laboratory to make testing and research faster than the main competitors.

The organization is recognized worldwide for extremely high strength aluminum alloy extrusions with the tightest dimensional

tolerances possible. Also, the clients trust in the precision of the mechanical processing, the assembly of the highest quality and of the superior surface treatments.

The organization provides aircraft manufacturers and their subcontractors around the world with 2000 and 7000 series aluminum alloy extrusions, with a wide variety of temperers that can be used in their specific applications for major aircraft manufacturers such as: Boeing, Airbus, Gulfstream, Bombardier, Pilatus, Embraer, & c.

It has an accreditation according to the international standard AS9100 and Part 21 of the organization's approval for the production of parts that can be mounted directly on aircraft without additional inspections before the final assembly on the aircraft. It also holds accreditation from the NADCAP body for heat treatment of aluminum alloys, non-destructive testing by ultrasonic waves and non-destructive testing by penetrating liquids, laboratory testing and chemical processing.

2. SWOT ANALISYS

SWOT analysis is the most important managerial technique for understanding the strategic position of an organization.

Strengths:

- Production plants on three continents (North America, Europe, Asia);
- Integrated manufacturing process (Foundry-Foundry - Extrusion - Machining - Surface treatments - Assembly).

Weaknesses:

- Lack of qualified staff;
- Limited factory development space.

Opportunities:

- The context of European funds for the sustainable development of large companies;
- Grabbing new customers / new contracts due to competitive prices.

Threats:

- Political instability;
- Increasing salaries within companies in the area.

The strengths are clear and do not require detailed explanations, but the weaknesses have been analyzed in detail and actions have been defined for them to become strengths in the future.

The following actions were taken against "Lack of qualified personnel":

- A professional school with the profile of Mechanical Processing was created;
- A new section was created within a technical high school dedicated to the organization;
- In collaboration with the university environment, a master's program was created;
- A Training Center was created within the organization, in order to qualify new employees at work.

Related to the weak point "Limited space for factory development", the action taken was the purchase of land in another area, but not at a great distance from the current location.

3. QUALITY OBJECTIVES IN THE ORGANIZATION

The major objective of the quality management policy is to satisfy the customer's requirements by offering quality products and services, at a convenient price, which is in accordance with

the regulations in force and with the safety and environmental norms.

The Quality Management System guarantees that the processes and activities carried out are planned, controlled and continuously improved, in order to provide customers with confidence and satisfaction that the organization's products constantly meet the quality requirements [1], [2]. In the Quality Policy of the organization, the following objectives have been established:

- Customer delivery performance: $\geq 99\%$;
- Customer complaints: ≤ 200 ppm;
- Product according to the first pass: $\geq 99\%$;
- Supplier delivery performance: $\geq 99\%$;
- Complaints to suppliers: ≤ 150 ppm.

4. QUALITY STRATEGIES

A first strategy developed considers the orientation towards customer requirements. In this sense, the manufacturer will meet the wishes of customers, trying to quantify in technical (economic) terms these requirements.

- In the short term: Elaboration of a program to intensify the use of existing production capacities (intensive use of unused capacity, automation of manufacturing and control processes, intensification of individual work by ensuring a flexible wage system);
- In the medium term: attracting customers through products and services of clearly higher quality, by ensuring a "service" for warranty and post-warranty periods; selling by attractive methods (attractive prices, leasing, monthly installments, ancillary services)
- In the long term: implementation of products in growing market segments, up to the limit of maximum market absorption, multiplication of distribution channels, improvement of product distribution processes.

Another strategy is focused on focusing on own possibilities to ensure products / services that comply with the requirements.

- In the short term: providing the market with quality products that ensure the maximum impact in the market segment, in the shortest possible time.

- In the medium term: ensuring an information system through which the quality-marketing connection can be made continuously.
- Long-term: customer loyalty, endowment with high-performance manufacturing and control equipment; ensuring the "service" for all products on the market, increasing the reliability indicators for the purchased products!
- Promoting values, attitudes and behaviors that stimulate improvement
- Establish clear quality improvement objectives
- Encourage real communication and teamwork
- Recognizing successes and achievements
- Training and education in the spirit of improvement.

The proposed objective implies a certain realistic result, which can be obtained in a certain field of activity, and which can serve as a reference base for a future activity.

Conditions imposed:

- Quantitative expression;
- To allow a further comparison with effective indicators;
- To possess the capacity to stimulate, to direct the actions at the level of the organization;
- To ensure a unification, a uniformity of the way of thinking of those integrated in the work process.

5. TOTAL QUALITY IN THE ORGANIZATION

Improving Quality means improving the performance of all processes and the results of these processes, in order to ensure better satisfaction of customer needs, in conditions of efficiency [3], [4].

The purpose of the improvement activities is to obtain a higher level of quality than planned, respectively that provided in the standard or specifications [5]. The realization of such a desideratum is conditioned by the proper development of the activities of planning, organization, training, control and quality assurance [6].

It is recommended that the organization implement such a quality system, which promotes the continuous improvement of the quality of processes and their results. To this end, the organization may consider the following elements [7]:

- Encouraging and maintaining a management style conducive to improvement

Regarding the concept of Total Quality and the Zero Defects strategy, the following exist and are implemented within the organization.:

- Code of ethics;
- Awareness of employees about the importance of quality work;
- Monthly quality bulletin;
- APQP elements;
- Quality Policy, Quality Manual;
- The concept of self-inspection at operation level, documented by internal documents;
- A "Visual Management System", which includes the use of visual aids, instructions for working with images, information panels.

Within the analyzed organization, the approach is:

- To actively pursue the continuous improvement of the quality management system;
- To continuously promote the awareness of each employee regarding the importance of quality;
- To promote team problem solving so as to highlight the knowledge and experience of all employees;
- To make decisions based on objective data;
- Promoting continuous improvement;
- The search for solutions is not for the guilty.

All these approaches are documented in the Quality Policy, Quality Manual, procedures and other internal documents.

6. THE CONCEPT OF PREVENTION IN THE ORGANIZATION

In the analyzed organization, the management at the highest level demonstrates a spirit of leadership and commitment through:

- Ensuring that applicable customer, legal and regulatory requirements are established, understood and consistently met;
- Promoting the continuous improvement of the quality of processes and products;
- Ensuring that risks and opportunities that may affect the compliance of products and services and the ability to increase customer satisfaction are established and addressed;
- Ensuring a training process that meets the requirements;
- Promoting a value system, in which quality prevails;
- Quantification of results, in order to evaluate the progress made.

Opportunities for continuous improvement and prevention come from operational implementation plans, internal audits, 8D reports, lessons learned [10], [11].

In order to ensure customer satisfaction, the organization has adhered to the principles of the APQP methodology - to produce, promote and continuously improve safe and reliable products that meet or exceed the requirements of the customer and regulators.

The purpose of the APQP is to ensure that new products meet the needs and requirements of the customer, including product quality, but also in terms of timely execution of project activities and deliveries [12], [13].

The implementation of the APQP methodology has the effect of preventing non-quality at the level of all departments / divisions within the organization [14].

7. FAILURE MODES AND EFFECTS ANALYSIS

This tool helps to analyze the risks for different processes, activities and projects undertaken by the organization in order to reduce them by taking actions. This tool defines the issues to be considered and analyzes the risks and criteria to be used to quantify risk scores.

The FMEA helps identify critical elements and statistically controlled features and helps

prioritize risk mitigation action plans and serves as a register of lessons learned.

An FMEA analysis can be described as a systematic group of purposeful activities:

- To identify risks related to problems;
- To correlate problems with the steps that produce them;
- To recognize and evaluate possible failures of the product or process;
- Identification when key characteristics need to be defined or measured;
- To identify actions that could eliminate or reduce the chance of possible failures;
- To document the process.

The earlier the FMEA is started in the development phase, the more likely it is to optimize different activities / designs / processes in terms of cost and time effectiveness. The cost of risk management is usually lower than the cost of managing and solving problems. An FMEA analysis will always be performed with the process owner and a multifunctional team.

The input data and the output data obtained after FMEA are presented in figure 1.

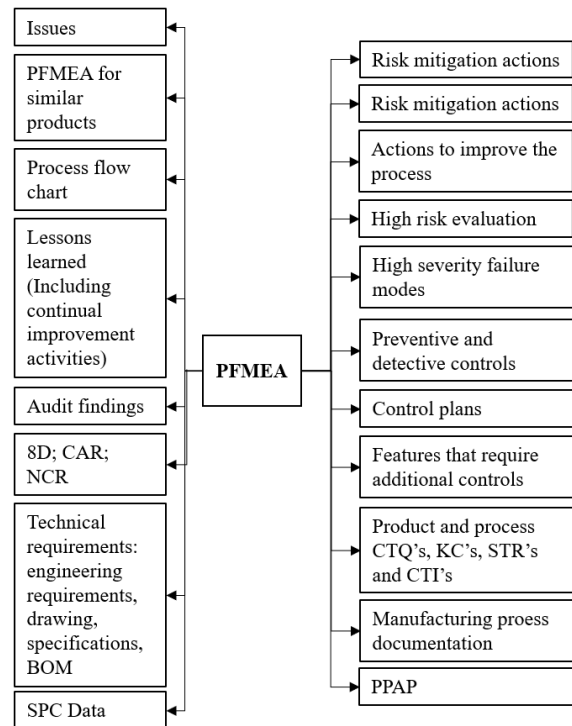


Fig. 1. Input data and output data obtained after FMEA

For each risk identified, the MFP will assign quantitative ratings to:

- The severity of the failure regarding the potential impact of the failure on the organization, on the customer and the supply chain, and on other parties involved;
- The probability (occurrence) of the cause of failure, taking into account the preventive controls in force and relevant historical data when they exist;
- Detectability of failure, taking into account current controls in force and relevant historical data when they exist.

8. CONCLUSIONS

By conducting this study, the importance and benefits of Total Quality Management and more were highlighted. All the tools provided help to:

- maintaining high quality standards;
- continuous improvement;
- keeping processes and products under control;
- it provides a much broader view of what the definition of the word quality really is.

Regarding the perspective of the analyzed organization, it can be concluded that a very robust, very well-defined Quality Management system is successfully implemented, which maintains a high level of quality.

At the same time, given the momentum with which this industry is developing and the very accelerated pace of change that always leads to new challenges and a much higher level of performance, there are always opportunities for improvement and new knowledge.

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Importanța și beneficiile implementării conceptului de TQM într-o organizație din industria aeronautică

Această lucrare abordează conceptul de Management al Calității Totale într-o organizație cu domeniul de activitate în industria aeronautică. Scopul lucrării este acela de a identifica aspectele de care va trebui ținut cont cu privire la îmbunătățirea organizației, din punct de vedere al aplicării Managementului Calității Totale. Pe parcursul acestei lucrări sunt tratate aspecte precum: analiza SWOT, stabilirea obiectivelor calității, a activităților, a responsabilităților și a resurselor necesare; problema strategiilor de calitate și nu în ultimul rând, aspecte privind analiza FMEA. Ultima parte prezintă concluziile desprinse în urma studiului precum și puncte de vedere proprii asupra subiectului abordat, alături de importanța și beneficiile pe care le aduce implementarea conceptului de calitate totală într-o organizație din industria aeronautică.

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