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EDITORIAL

Failure Analysis, Quality Assurance, and Business Excellence

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The aim of this editorial is to present some thoughts highlighting the holistic and continuous improvement aspects of failure analysis. Failure analysis is often regarded as a diagnostic post-mortem activity. The benefits incurred as outcomes of the realization of failure analysis, as a learning process, are not very often highly appreciated, and sometimes are ignored or neglected. Failure analysis process constitutes a structured approach and stands as an effective tool for quality improvement toward business excellence.

The scope of failure analysis not only spreads in a multidisciplinary area in technology and industrial applications, including aspects, e.g., from various engineering fields but also organizational and management aspects. Philosophical and psychological aspects, which may also be involved, form a significantly complex structure.

Management systems provide the foundations for the development and implementation of processes designed to sustain the enterprises in a continuously evolved business environment. Change management is necessary to understand and analyze new market demands and stimulate innovation toward society progress and prosperity.

New ISO 9000 series of quality management standards are clearly focusing on process and system approach, which should cover all the business activities that are most critical to quality. The modern quality systems are based on the following eight management principles:

1. Customer focus.
2. Leadership.
3. Process approach.
4. System approach
5. Involvement of people (team approach).
6. Continuous improvement.
7. Factual decision making.
8. Mutual beneficial supplier–customer relationships.

All the above disciplines are emerging in the entire net of quality management system (QMS) within a company or an organization. A quality system as a series of interconnected processes is characterized by a holistic approach, where each process step aims to deliver the "best result" to the following one, in terms of efficiency and effectiveness, rendering the outcome of the entire system exceptional for the interested parties involved, i.e., company, customers, employees, society. Minimizing waste and achieving maximum control to enhance process stability are key components of quality assurance. The adoption of computer-integrated technology, modern manufacturing systems, production automation, utilization of modern quality tools and techniques, discipline to the quality procedures, and diffusion of quality mentality to every section/division of the company constitute major catalysts toward the business improvement and sustainability.

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The QMS set a framework of the basic and general rules that could be adapted to a wide range of service and product companies. An essential requirement of all the QMSs applied in industry is continuous improvement. The clause 8 of the ISO 9001 standard entitled as "Measurement, Analysis and Improvement" contains the basic processes that have to be followed as drivers for continuous improvement. Improvement covered a broad context of the organization activities: customer satisfaction (including society and employees), management systems, products, and processes. Failure to meet preset objectives in all the above areas entails the activation of a thorough analysis process to discover the sources and causes of the nonconformities.

Quality standards worldwide cover a wide range of techniques to measure, analyze, and finally understand and improve processes and products performance. New quality movements are now based on process and system dynamics to optimize performance and achieve sustainability. There is a broad variety of quality tools and techniques, which are available to analyze and improve quality and performance at various levels of the organization. The implementation of preventive actions process standing as one standard requirement aims to extinct the causes of potential nonconformities. The understanding of statistical nature of quality and the critical-to-quality processes in an industrial environment may lead to better and tighter control through the utilization of statistical tools and techniques, such as statistical process control, design of experiments, etc., which have been introduced in industry many years ago. Proposed tools for implementation involve also failure mode and effect analysis which is used as a structured and prognostic approach for minimization of failure risks and enhancement of reliability [1]. In a direct failure analysis procedure, the sequence of events of the investigation involves a series of stages, as presented in the following generic scheme:

Failure analysis → determination of the failure mechanism → root-cause analysis → corrective/preventive actions → follow-up and confirmation of the action effectiveness → improvement.

The above chain of stages is devoted to a learning process and continuous improvement. A process commonly found in industry that is based on the above mentioned structure concerns the handling of customer complaints. For example, the fracture of a brass valve inducing a leakage of a hydraulic system or a steel shaft failure of a high power motor leading to process line shutdown launches a thorough investigation procedure within the organization in the frame of supplier–customer relationships and it is required for the achievement of quality goals of the company and/or conformance to quality standard. The purpose of such investigation is through incident review, material testing and characterization to reveal and provide sufficient understanding of the failure mechanism(s) (e.g., stress corrosion cracking, fatigue, etc.) and the principal cause(s) (e.g., overstressing, metallurgical flaws, machining faults, etc.) of the failure among the interested parties, to assign responsibilities (technical and/or financial), recommend corrective/preventive action plan and monitor the effectiveness of the suggested actions. This procedure forms a loop, as it involves a revision or modification stage, provided that the implemented actions do not bring the expected results or value. The design of such process is principally ruled by the above mentioned eight quality disciplines, and the end result should drive to improvement, in terms of customer satisfaction, long term profitability, sustainability and society benefit. The investigation team which is responsible for the accomplishment should exhibit quality mentality, profound knowledge of the processes, and analysis techniques. This example could be transferred and adapted also to different areas of the organization aiming to effective problem solving and continuous improvement.

The structure of learning organization is built on strong foundations of management culture that implements the right management systems to establish deep knowledge through leadership and employee professional development, which ensure business survival and growth through quality focus and excellence. This should be harmonized with society benefit, embracing also environmental protection and resources management toward sustainable development.

Reference

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