POLISH ACADEMY OF SCIENCES - COMMITTEE OF MATERIALS SCIENCE
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INSTITUTE OF ENGINEERING MATERIALS AND BIOMATERIALS
ASSOCIATION OF ALUMNI OF SILESIAN UNIVERSITY OF TECHNOLOGY

Conference Proceedings

12th INTERNATIONAL SCIENTIFIC CONFERENCE
ACHIEVEMENTS IN MECHANICAL & MATERIALS ENGINEERING

Usage of quality methods: Failure Mode and Effect Analysis (FMEA) and Statictical Process Control (SPC) as a element of continuous improvement of production process

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In this paper the select problems, relating to aplication one of the quality expert methods – FMEA (Failure Mode and Effect Analysis) and statistical methods of quality researched SPC (Statistical Process Control) used in Polish company has been presented. The possibiliteis of using quality methods have been discusced and also suitable example has been given.

1. INTRODUCTION

The base to creations and implementations of quality assurence system are norms ISO series 9000:2000, attended for norm of third generations, which are fundamental rules of mananger practise.

For an organization to function effectively should be identify and manage numerous linked activities. An activity using resources and managed in order to enable the transformation of inputs into outputs can be considered as a process.

The application system usage in organization together with the identification and interaction of the process and their management can be described as the “processing approach”.

The “processing approach” and usage of quality research methods are becoming the important step to the continuous improvement of company.

2. QUALITY CONTINUOUS IMPROVEMENT OF PRODUCTION PROCESS

The present idea of quality management, assurance and control relies first of all on change of quality approach strategy. At present special pressure puts on “prevention strategy “ which take place “detecting strategy “ [1].

This approach has influence on optimisation of production process and also reducing of costs [2].

Prognosis of market refer of more and more shorter production process series, minimalization of defect and disagreements, and also full satisfaction of customer. The next step of activities in company is aspiration to more perfect technology and new product and also to exceptionally short times of production and short times of orders realizations.

Relative to the ISO 9001:2000 exists approach that quality will not to avaible to reach be aspect of control, quality should be "made" in production process (fig.1). In area to production sphere; where previously projected quality materializes in done object, take place systems and productive processes [3].

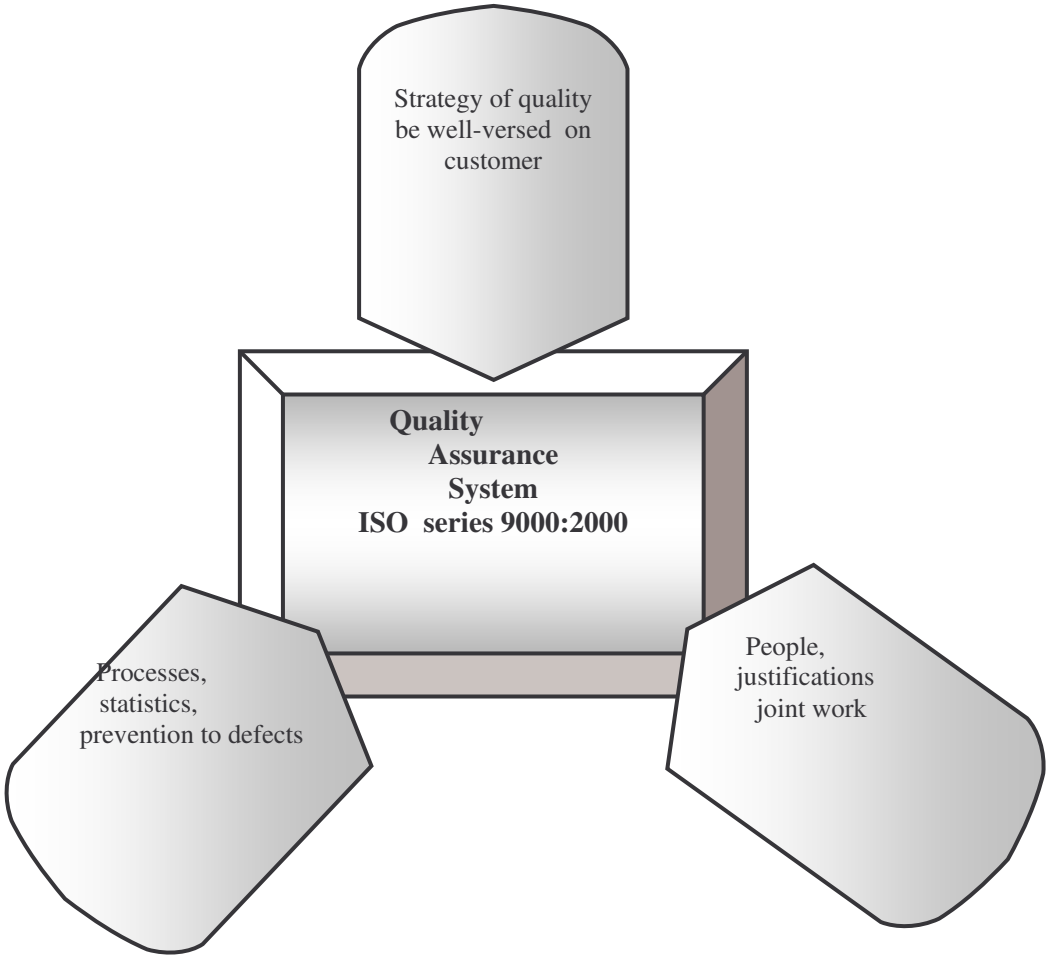

Figure 1. Strategic spheres on Quality Management System on "processing approach"

During where responsibility for production comes productive department, responsibility for success suitable qualities in production process also has to be considered in frames of realization production responsi-bility[3-4].

Modern system of quality assurance and monitoring consist of three elements: philosophy, quality tools and implementation. One of the stapes is finding the most effective quality improvement methods which help to realisation and constructing system using optimisation activities.

The present quality monitoring system uses expert and statistical methods as a base tools "process approach" and "continuous improvement" in quality.

3. THE PRACTISE APPROACH TO USAGE SOME OF QUALITY METHODS

In practice of quality engineering exists possibility presentation of range quality researching and estimation methods on background of life cycle product. In this kind of system this methods are divided on [5]:

- Preparations of production methods: Quality Function Deployment, Failure Mode and Effect Analysis (FMEA), The old and new quality tools, Benchmarking.
- Quality control and inspection methods uses in production process: Statistical Process Control, Failure Mode and Effect Analysis, Shainin Method, Taguchi Method, AQL Method

Among these groups of method exists and works information system which is connected with realization of quality intentional activities.

Among replaced quality researching methods we favour expert methods, one of them uses more and more often - FMEA method in polish company.

This method is especially instructed at working and production of product, because makes possible recognition of potential defect with such advance, so that we can eliminate them across usage of preventive centres yet before beginning of production. FMEA method can be use not only to analysing of reasons of defects formation already ascertained, but also in aim of prevention to defect, which potentially can step out in new product [6].

FMEA is realized in three principle stages: preparations, execution of proper analysis and also introductions and superintending of preventive activities [7].

Behind help created of FMEA sheet we can execute estimation of activity, persistence, safeties, reliabilities and describe possibility reparability in existing circumstances of leadership process. Evidencing all of researches and estimation, which are showed in FMEA sheets, contributes to realizations format condition of project reviews. Evidencing all of researches and estimations, which are showed in FMEA sheets, contributes to realizations formal condition of project reviews [7-8].

In the same time when we use in our company FMEA method we can estimate quality capability of process and creating control chart type X-R. This kind of activities name Statistical Process Control. SPC involves using statistical techniques to measure and analyse the variation of process. Most often used for manufacturing processes, the intent of SPC is to monitor product quality and maintain processes to fixed target[4-5].

Statistical quality control refers to using statistical techniques for measuring and improving the quality of processes and includes SPC in addition to other techniques, such as sampling plans, experimental design, variation reduction, process capability analysis and process improvement plans. SPC is used to monitor the consistency of processes used to manufacture a product designed. It aims to get and keep process under control [5, 6].

Due to usage SPC we can say, that process is stable controllability, when variability in process is exclusively result of chnace causes because in process step out systematic causes of variability [7-9].

Industrial experiences of implementations statistical regulations of processes show, that later advantages from usage of method SPC in decisive degree depend on thorough preparations.

SPC can't be implement to production in such manner in which one begins exploitations new devices measuring.

SPC is method and because demand deeply well-thought-out, stage preparations, per-intended by management methods of with projects just like FMEA.

Using those methods in Polish industry introduced on example of own researches of select production process of mechanical industry.

FMEA without SPC has been presented on example the make of blade to steam turbines. The analysis embraced to operation in case of more often defects in this steps process. It was milling of rotor notches, polishing on smoothness. This analyse has been presented on algorithm (fig. 2).

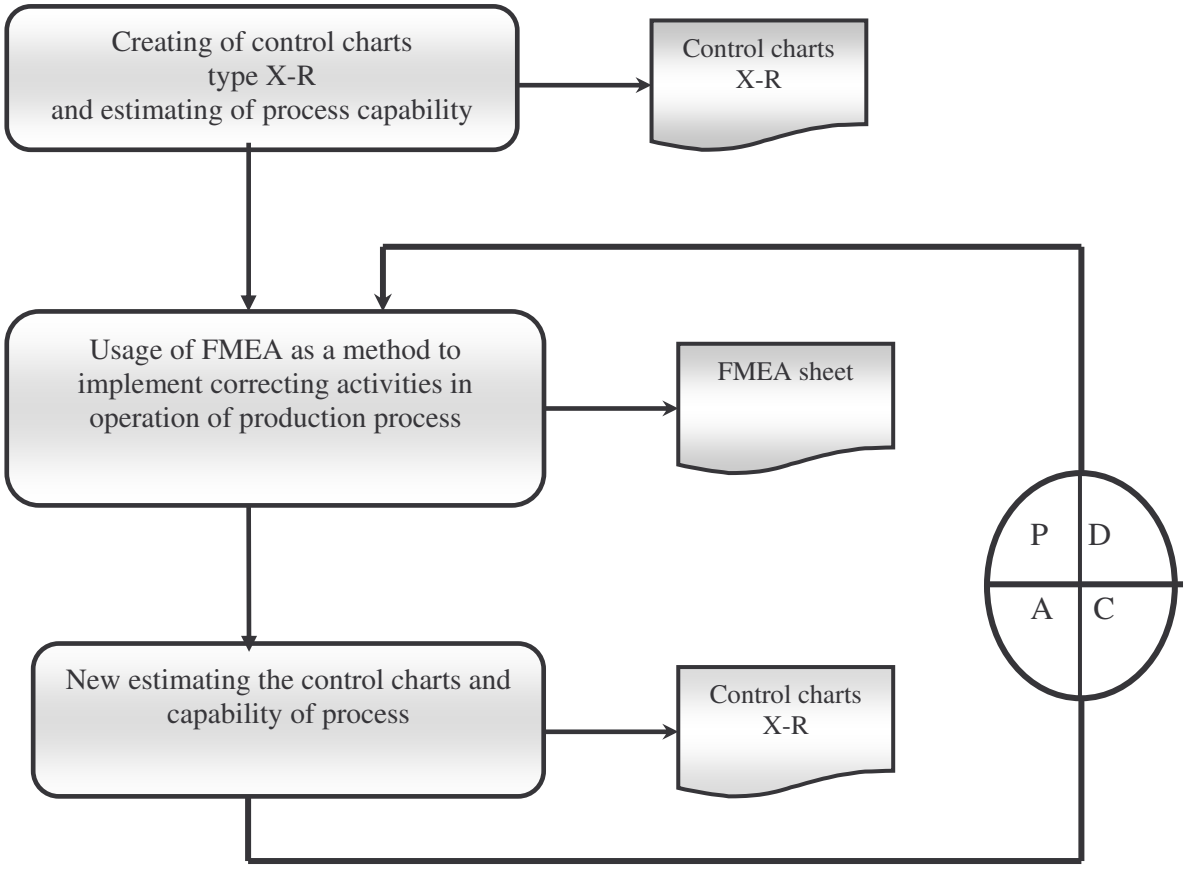

Figure 2. Algorithm of practise usage FMEA and SPC methods

Each operation of process became examined at use of statistical process control methods by means control charts type X-R, estimate capability process. The process was investigate before analysis FMEA and after it to end.

The attempts were received with frequency 100 pieces after 3 samples. Results of measumernts became written in created charts. Then was investigated counted statistical values like average, range, standard deviation.

Received value was brought on track of control charts. The next step it was implement correcting activities and new creating control charts.

The important thing on such activities is continuous improvement with usage Deming's cycle.

4. SUMMARY

Possibility of success can be able in firms where we take care for one's own constant improvement at simultaneous to realizing of requirements and satisfactions of customer.

The modern idea of quality management and using in activities of many quality researching and estimation methods, in sphere: before production, production and after production, and so on every stage of creation of final product are one of most important elements of "processing approach".

Creating control charts type X-R, estimating capability of process and using in this same time FMEA methods confirms huge usefulness for qualities produced of product. This makes possibilities to early reacting, gives orientation in size of defect and makes possible lowering of costs by using analysis of product on early stages product creation.

This methods determine also the optimising factor productivity process and what behind this goes – are chances on improvement of economic situation.

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