



POLISH ACADEMY OF SCIENCES - COMMITTEE OF MATERIALS SCIENCE
SILESIAN UNIVERSITY OF TECHNOLOGY OF GLIWICE
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

QFD analysis as a manner of quality assurance in the technological process

D. Szewieczek, S. Tkaczyk, T. Karkoszka

Division of Quality Management, Institute of Engineering Materials and Biomaterials,
Silesian University of Technology of Gliwice
ul. Konarskiego 18a, 44-100 Gliwice, Poland

In the elaboration the possibility of making use of QFD matrix analysis in indication of parameters of technological process of fire zincing has been briefly introduced. Not only high-quality intentional product, but also an influence of the technological process on surrounding environment has been taken into consideration.

Some connections between indicated parameters have been described, what permitted to realize the customers' expectations not only in the meaning of the final shape of the product but also taking into account an environmental aspect.

1. INTRODUCTION

Scientifically – technical progress and increasing requirements of receivers of products of technological processes force producers to produce articles about more and more higher quality. Quality of these products is, to a large degree, dependent on basic activity of every organization, contained in realizing productive processes.

New technologies, products of which are often characterized as „the newest successes of technology", often determine serious threat for surrounding environment; undesirable products, and being with incidental result of technological process, accompany proper intentional products.

It follows that any of the processes cannot take place in any facultative manner, but has to be driven in definite temporary, spatial and organizing conditions.

In the study the possibility of making use of Quality Function Deployment (QFD) in quality assurance to zinc-plated elements with regard of environmental aspects has been shown.

2. TECHNOLOGICAL PROCESS AND QFD ANALYSIS AS A MANNER OF QUALITY ASSURANCE

Basic activity of organization has in view customers' satisfaction realized in the frames of productive system - figure 1 [1].



Figure 1. Basic activity of organization [1]

The system is organized guided arrangement of material, energy and information elements and dependences between them and it permits transforming entry factors (IN) in exit factors (OUT) in accordance with founded rules. In frames of the system one can separate [2, 3]:

- entry vector – material, energy and inquiry indispensable components of production (production factors),
- exit vector – material, energy and inquiry effects of productive process,
- productive process – well ordered course of activities transforming entry factors in exit factors,
- process of system management,
- feedback.

Coming back to definition of technological process taking into account proper intentional products, offered to customers, as well as unintentional and undesirable for environment products, and coming into being during productive process of given technology, as exit of process (OUT) (figure 2), one should take high efficiency of technological process; not only in aspect of the final shape of the product, but also in environmental aspect into consideration [4, 5].

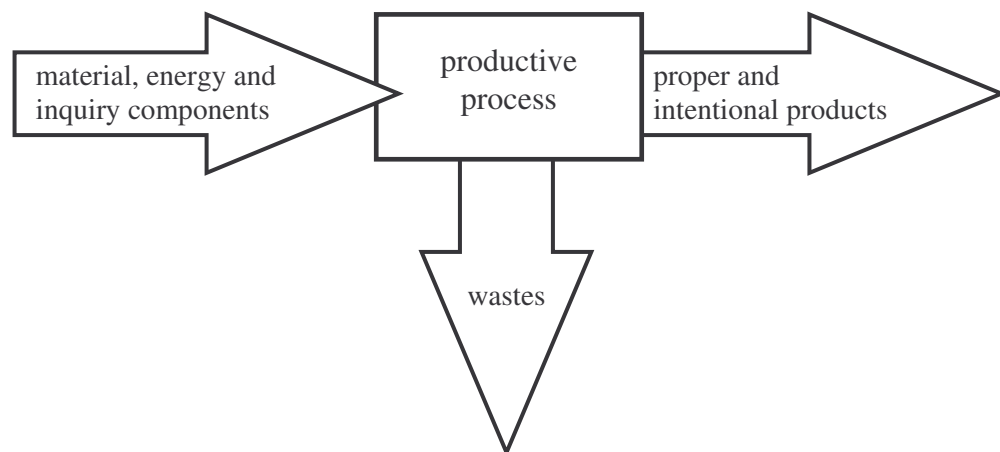


Figure 2. Productive process with accompanying streams [4]

„Total quality”, determining not only the advantage of final products and services, but also creating no threats for environment, requires in practice of research such a solution, which permits on reconciliation of contradictory interests of organization with legal regulations and with internal requirements of environmental protection [6]. Such a solution determines QFD –

Quality Function Deployment method. QFD is a form of optimization of quality with regard of needs and expectations of customers, starting from forming the characterization of article, realized with all of the accessible technical and technological means [7, 8].

Base of the method is, to a large extent, preparing matrix called House of Quality. The matrix is being build of cells, in which are qualified: consumers' requirements, importance degree of every requirement in comparison with competitive firms, product technical (project, technological) features, costumers' needs related to technical features, relative estimation of every technical feature, correlation between features of technological process, technical comparative estimation.

The solution is fully well-founded; the idea of quality and environment management, created on the basis on philosophy of quality, E. W. Deming authorship, is identical in both of mentioned above management systems, and her basis is to prevent formation of defects and threats and suitable economic and ecological strategies by common policy, planning, initiation and working, checking and correcting activities, review, and thus - continuous improvement in both aspects [6].

3. INVESTIGATIONS

To indicate parameters of technological process of fire zincing deciding not only about quality of proper intentional products, but also having influence on surrounding environment was subject of investigations as well as finding connections between indicated parameters. In investigations matrix QFD analysis, which permitted to specify customers' requirements and transform them into technical possibilities, had been used.

The investigation seems to have foundation in guidelines that the main factor deciding about quality of every product is quality of technological process, in which this product comes into being. That is why the quality of zinc-plated elements is dependent directly on quality of zincing process, where main parameters are: quality of surface and chemical composition of entry material, chemical composition, temperature, time of duration and movement of fat-removing bath, time and temperature of digestion, chemical composition and concentration of pickler, flow intensity of rinsing water, chemical composition, temperature, time of duration and movement of zinc - bath, speed of extraction from bath [9, 10].

Factors mentioned above determine basic cells of matrix „House of quality" – technological parameters directly or indirectly deciding about final qualities of zinc-plated elements. However parameters assuring quality to intentional product of technological process, and not taking into account environmental influences of this process, are not the only determinants of quality of the process any longer. For this reason technological parameters analyzed in environmental aspect should be also treated as essential elements of QFD matrix. In the process of fire-zincing it is proper to take notice of: waste of water and energy, quantity of solid and liquid wastes, quantity of gas fumes.

In practice optimization of mentioned above parameters typical of environmental protection can include: usage of covers over a zinc bath, heating fat-removing bath with waste-warmth from zinc stoves, usage of extractors and blowers over digestion baths, decreasing the quantity of rinsing water by her regeneration in closed circulation, usage of chemicals softening water and causing reduction of solid waste and extension of usage time of fat-removing bath, regeneration of digestion bath by usage of settlers, usage of utilized acid from chemical institutions in digestion process [9].

4. CONCLUSIONS

Summing up one can state, that realization customers' requirements and expectations not only in the meaning of the final shape of the product but also taking into account the range of environmental influence of technological processes, in which these products come into being is of great importance. That is why the environmental undertakings in frames of productive system have such an essential meaning.

To indicate parameters of technological process of fire zincing deciding not only about quality of proper intentional products, but also having influence on surrounding environment and to find connections between indicated parameters matrix QFD analysis can be used.

The analysis emphasizes the entire lack of direct influence of environmental parameters of technological process on quality of wanted products. It follows that minimization of negative influences of incidental and undesirable products of technological process on environment not only doesn't make worse expected quality of products, but on the contrary - leads to lowering of technological costs.

REFERENCES

1. Muhlemann A.P., Oakland J.S., Lockyer K.G., Zarządzanie. Produkcja i usługi, PWN, Warszawa 1995.
2. Durlik I., Organizacja i zarządzanie produkcją, PWE, Warszawa 1992.
3. Durlik I., Inżynieria zarządzania, Placet, Warszawa 1999.
4. Doniec A., Koncepcja rozwoju zrównoważonego wyzwaniem dla techniki, Mat. Seminarium nt.: „Technika przyjazna środowisku”, Łódź 1995.
5. Wasilewski L., Podstawy zarządzania jakością, Wyd. Wyższej Szkoły Przedsiębiorczości i Zarządzania, Warszawa 1998.
6. Tkaczyk S., Bąk G., System zarządzania środowiskowego w przedsiębiorstwie a zrównoważony rozwój, Mat. Konf. Międz. Forum Zarządzania Środowiskowego ISO 14000, Warszawa 1999.
7. Skrzypek E., Metody i narzędzia doskonalenia zarządzania przedsiębiorstwem, Wyd. UMCS, Lublin 2000.
8. <http://www.wizard.ae.krakow.pl>
9. Tkaczyk S., Powłoki ochronne, Wyd. Pol. Śl., Gliwice 1994.
10. Peißker P., Maaß P., Cynkowanie ogniowe, Placet, Warszawa 1998.