

## World Class Manufacturing – characteristics and implementation in an automotive enterprise

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### Abstract

The article outlines the characteristics of the WCM system, which is more and more frequently used to support enterprise management. Currently in Poland the WCM system is most often applied in automotive plants due to special quality requirements in this branch. By signalling the effects achieved by an organisation owing to WCM implementation, the author of the article wishes to make automotive plants managers interested in it, as this system might be a subsequent stage of quality improvement in a company, following the standards of ISO 9000 series.

### Introduction

The notion of quality accompanies man in everyday life. When thinking about quality, the consumer has in mind a number of product quality attributes, such as: the comfort of use, functionality, durability, aesthetics, cost-effectiveness, safety and more and more frequently – product ecology. Depending on personal features and preferences, consumers seek for various products and services which will meet their individual requirements. For this reason, contemporary enterprises wishing to beat strong competitors on the global market must offer services and goods which fulfil their customers' quality requirements. Such an approach to enterprise management makes quality a priority for a modern, developing enterprise with long-term strategies. Both the financial and development aspects force companies of the 21<sup>st</sup> century to adopt a „quality” approach at each level of activity, starting with the managerial level and finishing with the production one [1, 2, 3, 4, 5, 6]. In order to ensure a high standard of products and services, companies can make use of appropriate methods worked out by authorities in this field. Apart from TQM, KAIZEN, one of such management instruments is the WCM (World Class Manufacturing) system, which is an enterprise renewal programme based on

the continuous improvement standard both, in logistics and in production. This system consists of five pillars and employs a number of methods and tools which are necessary in the complicated process of product quality improvement and in the even more difficult activity related to quality maintenance on the already achieved level [7].

In most cases the applied methods are well-known tools for improving quality in an enterprise, such as: FMEA, QFD, 5S, Brain Storming. The article presents selected tools of the Quality Control pillar, which are not very popular in organisations and allow the existing irregularities to be quickly eliminated. These methods include: Poka-Yoke, 5G, 5Why, 5W+H1, OPL [8].

### Characteristics of World Class Manufacturing (WCM)

WCM (World Class Manufacturing) is a programme of enterprise renewal based on the continuous improvement standard both, in logistics and in production [9]. It rests upon foundations of the achieved performance and methods used by leading global companies. When gathering experience for many years, these companies created World Class Manufacturing definitions, referring them to the following concepts [9, 10, 11]:

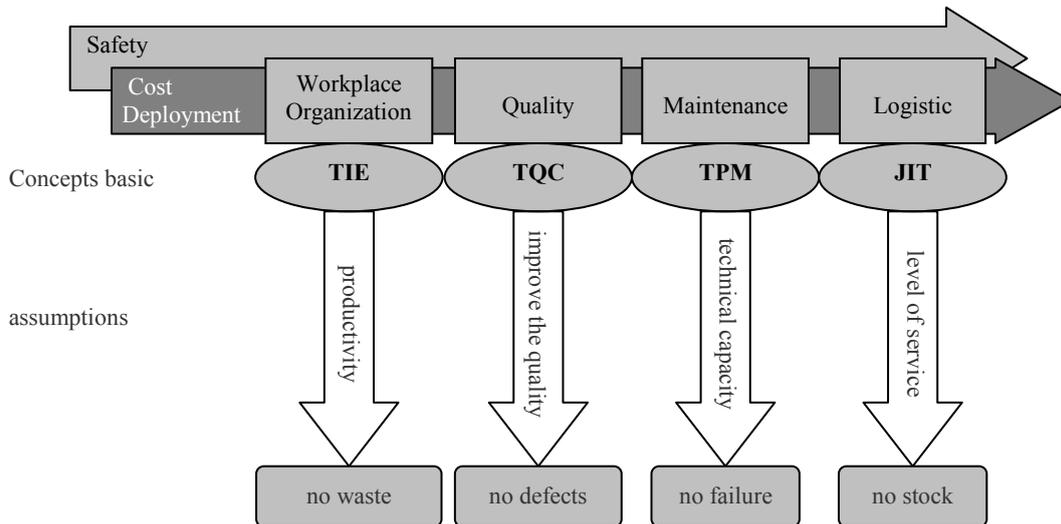


Fig. 1. WCM concepts [9]

- Total Quality Control (TQC);
- Total Productive Maintenance (TPM);
- Total Industrial Engineering (TIE);
- Just In Time (JIT).

Figure 1 presents the WCM system with assumptions to be fulfilled by a particular concept included in this programme.

WCM detects and eliminates losses and the resulting costs. Waste is analysed, evaluated and attributed to particular processes. The result of a conducted analysis shows the manner of intervention. In order to achieve an appropriate level of World Class, WCM influences all the production and logistics processes by supporting them with an audit system and measuring them with relevant indicators.

The main goals of WCM include [9, 8]:

1. Maximisation of production system results within the framework of logistics programmes and in accordance with the assumed quality goals.
2. Strengthening of competitiveness through continuous evolution of the production system so as to eliminate losses in all the processes. The scope of „No losses” includes:
  - no accidents;
  - no defects;
  - no failures.
3. Continuous improvement of skills, competences and knowledge of employees, which is necessary to solve problems by means of WCM methods and tools.

Ambitious goals that WCM sets for an enterprise require a thorough change not only to the very functioning of the plant, but also to the way of work and the manner of production processes manage-

ment. Figure 2 presents WCM goals in a graphic form. Another important issue in the process of goals fulfilment is related to employees’ awareness of the changes which must take place, so that the WCM system can fulfil its function in an organisation. The development of this awareness must go through subsequent stages of the employees’ way of thinking and acting.

Employees’ awareness can be classified on five basic levels [7]:

- LEVEL 1: Employees do not see any problems or question their existence.
- LEVEL 2: Employees admit that they have noticed a problem, but they find excuses claiming the problem is beyond their skills.
- LEVEL 3: Employees admit that problems do exist in their company, but they do not know how to solve them.
- LEVEL 4: Employees perceive problems, can identify them and select a solution using an appropriate method.

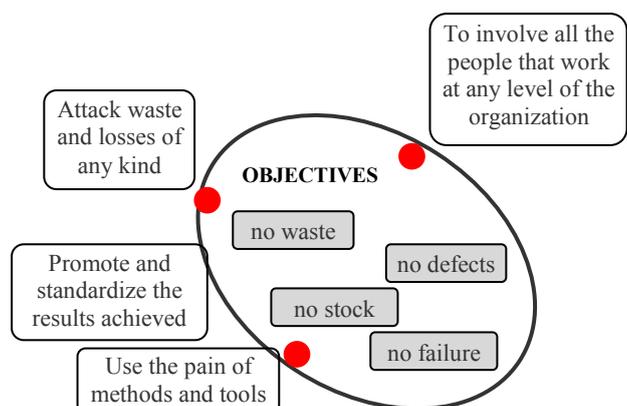


Fig. 2. Goals in WCM (the Author’s own study on the basis of [12])

LEVEL 5: Employees know the kind of problems and appropriate methods to solve them. They can also get other persons engaged so as to eliminate the problems.

Continuous improvement within the framework of WCE is aimed at achieving the fifth level of employees' awareness.

The following elements are necessary for WCM to be implemented in a company:

- Knowledge necessary to improve processes and to eliminate losses.
- The commitment of employees who make use of their full potential to „attack” and eliminate problems.
- WCM theory must be processed and used in practical actions.

Appropriate selection of people capable of cooperating in a team is crucial for the set goals' fulfilment.

WCM is implemented by means of the cascade process. It starts with implementing a model in a select group and gradually makes more and more people involved. Throughout the process of changes the employee must realize that his/her attitude is being observed. It is not quantitative aspects of work that are important, but his/her more organised and orderly activity. WCM introduces the following changes in the functioning of an enterprise:

1. The 360° approach – encompasses the activities of the whole plant.
2. Based on Cost Deployment – explores the existing losses and allows appropriate corrective measures to be taken.
3. WCM methodology becomes an objective tool for measuring the effectiveness of the undertaken solutions.
4. Common language enables implementation and maintenance of certain standards in different plants.
5. Best Practices – the use of other enterprises' experience.
6. WCM as a method of determining the budget for the years to come.

World Class Manufacturing is based on ten pillars (Fig. 3) [7, 8, 9]:

- Safety;
- Cost Deployment;
- Focused Improvement;
- Quality Control;
- Workplace Organization;
- Professional Maintenance;
- Logistics / Customer Service;
- Early Equipment Management;
- People Development;
- Environment.

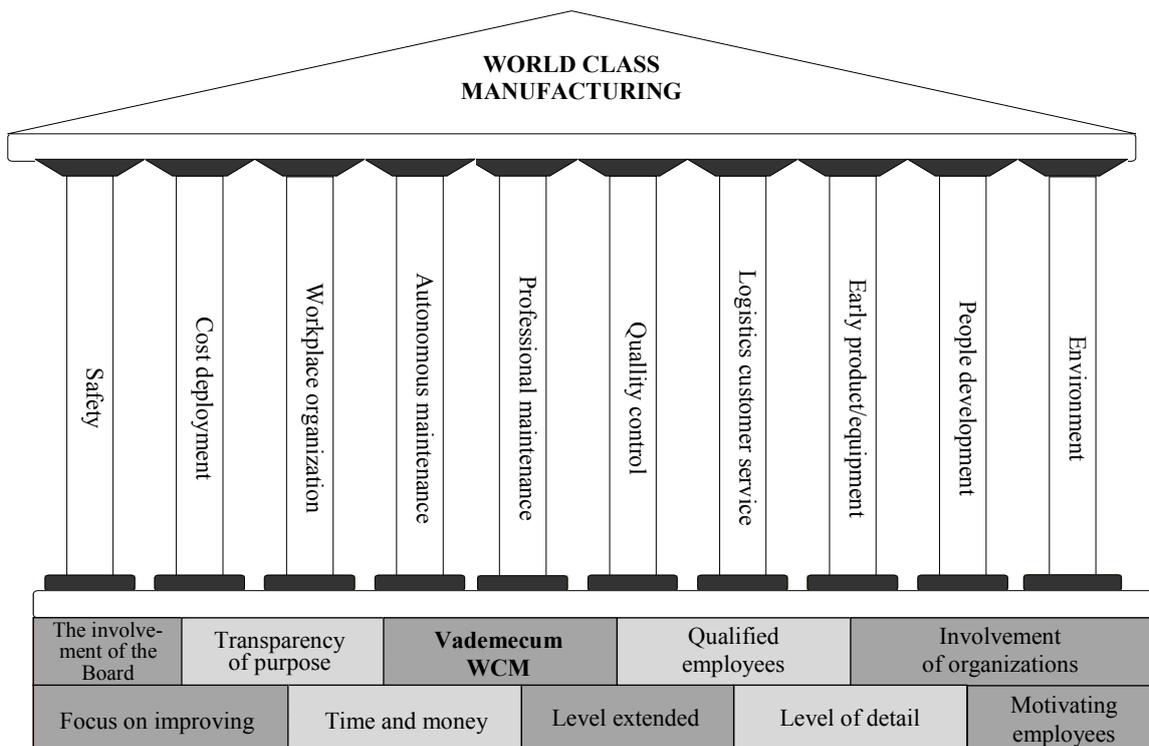


Fig. 3. Pillars and foundations of WCM [7, 9, 10, 11]

In the WCM system each methodology (Pillar) is equipped with tools necessary for continuous improvement and waste elimination. These tools are selected on the basis of real requirements of the Pillar, in real implementation conditions.

Each methodology (Pillar) has its line of implementation. It consists of seven basic steps. At the very beginning, the so-called „Entrance Step” is applied, the result of which is certified. The evaluation provides a basis for a decision regarding next steps, which are continued only when economic benefits can be demonstrated. If they are difficult to define, the fulfilment of the Pillar is withheld until the profit-loss balance becomes evidently improved.

The areas of an enterprise which are analysed and improved as part of WCM activity include all kinds of issues influencing the quality and effectiveness of the organisation's activity. It is extremely important that actions taken in all the areas presented in figure 3 finally lead to the effectiveness of operations. It is impossible to proceed to the next stage of WCM implementation if particular effects have not been achieved at the current stage.

### WCM in an automotive company

The implementation of WCM in an organisation will be presented by using an example of an automotive company focusing its activity on the design and production of suspension modules and elements for motor vehicles. The company has its head office in Turin, but the production lines are located all over the world. At the moment production is going on among others in Poland, Brazil, USA and Italy. In continuous search for improvement to the suspension systems, the activities of the corporation have been divided into three business lines [12]:

- 1) Suspensions – the line of suspension systems includes mainly such parts as: brake drums, brake discs, stub axles, trunions, hubs. The produced pieces are designed for whole modules assembly (groups of wheels). The design and testing department tailors technical parameters of the parts to the customer's requirements.
- 2) Shock absorbers – this business line includes shock absorbers, characterised by a wide range of applications in the automotive industry. This is the major element of the suspension system, so its workmanship must be perfect. This goal is achieved by testing the behaviour of shock absorbers on various tracks. Technical parameters are designed individually, depending on the make of the vehicle, the customer and the requirements.
- 3) Dynamic System – this recently established business line focuses on the development of car underframe mechatronics products. This department deals mainly with the development of shock absorbers, electronic control modules and strategies aimed at improving the comfort and dynamics. Apart from the development of particular components, Dynamic System specialises in the integration of the whole system of vehicle control.

The WCM system was implemented, so that the company based in Poland and cooperating with the concern could survive on one of the most competitive markets of the automotive branch. This innovative system not only ensures prestige, but it also allows identifying and eliminating the problems which cause losses and waste within an organisation. The WCM programme can only be developed if appropriate resources are granted for this purpose, as management of projects related to the implementation of improvements defined by targets must take into consideration: material, financial and human resources, costs, time and the enterprise's budget.

A budget for WCM projects is established annually and allotted to different pillars according to WCM Schedule. Projects must be completed within a specified perspective, and their course should be monitored in order to adjust the time and planned costs in the event of a change. Groups responsible for the projects have to learn how to manage plans, so that the goals can be achieved fast and effectively. It is also advisable that one person in a group, preferably somebody who is the most experienced in terms of technological issues and WCM methodology, should take up the role of the project manager.

In July 2008, the top management of the company made a decision on WCM implementation. Factors which determined this step included chiefly benefits related to cost reduction, as well as an increasing prestige on the competitive automotive market. A subsequent stage on the WCM path involved trainings related to the essence of the implemented system, which were held in September and October (they concerned theoretical aspects, tools and key goals). In November, an official inauguration of the WCM system in the organisation took place, which meant a transition from theory to practice. From December 2008 to February 2009 teams (Pillars) were established, persons responsible for the Pillars were appointed, a plan of action for particular pillars was worked out and trainings for people in charge of the teams were held.

There are three main determinants regarding the progress of WCM system implementation in a company [12]:

- Bronze medal:
  - creation of basic conditions for competitive production;
  - achieving a considerable cost reduction (10–20%);
  - creation of “know-how” to attack main losses of energy;
  - any quality problems reduced three times (divided by 3);
  - twice reduced time of delivery (divided by 2);
- Silver medal:
  - achieving a considerable improvement in such areas as: Quality, Costs, Production Efficiency;
  - continuous development of “know-how” for the whole plant;
  - continuous search for energy losses and creation of “know-how” in order to systematically attack the defined losses;
  - cost reduction reaching a level of 20–40%;
  - any quality problems reduced seven times (divided by 7);
  - time of delivery reduced three times (divided by 3);
- Gold medal:
  - achieving the level of a leader in the class of products and services sold;
  - effective “know-how” philosophy in the area of loss attack;
  - carrying out “know-how” research;
  - achieving the world class in the field of products and services sold;
  - quality problems reduced ten times (divided by 10);
  - cost reduction reaching a level of 40–60%;
  - time of delivery reduced four times (divided by 4).

Currently, the presented enterprise is at the bronze medal stage. At the beginning of the system implementation the company was at point 0, which was defined by means of relevant WCM methodology. The enterprise had reached an advanced level of competitiveness and knowledge already at the stage of the system introduction [7]. At the moment the major goal for the company is to achieve the gold medal, which means:

- an increased competitiveness level;
- increased horizontal expansion (spread of the company’s influence around the sector in which it is currently operating). This is aimed at in-

creasing the shares of the manufactured products on the market;

- continuous improvement of knowledge;
- continuous strengthening of the current market position.

The achieved effects are evaluated on a regular basis through audits and by experts specially appointed for this purpose. After verifying the WCM methodology, they grant an appropriate score. Depending on the obtained score, the company’s current zone is established:

- Bronze zone:  $\geq 50$ ;
- Silver zone:  $\geq 65$ ;
- Gold zone:  $\geq 80$ .

By the end of 2012, the company is planning to have reached the gold zone. This means 40–60% cost reduction, 10-fold reduction of the number of quality problems, 4-fold reduction in delivery time as well as achieving a leader’s position in the area of products sold by the plant.

The effectiveness of WCM is high. The effects of using WCM methodology could be noticed as early as in the first year after its implementation. Cost reduction noted in the presented company in the year 2009 reached a high level of 8% [7, 12].

The WCM system is implemented in the company by means of various methods and tools used in order to identify problems, as well as to correct and improve the undertaken actions. In most cases these methods are methods and tools of quality improvement which are well known to the company, such as FMEA, QFD, 5S, Brain Storming [7].

## Conclusions

WCM (World Class Manufacturing) is a programme of an enterprise’s renewal, based on the standard of continuous improvement both, in logistics and in production. Its foundations rest upon the achieved performance and methods followed by leading global companies. When gathering their experiences for many years, these enterprises created definitions of World Class Manufacturing, referring them to the following concepts: Total Quality Control (TQC), Total Productive Maintenance (TPM), Total Industrial Engineering (TIE), Just In Time (JIT).

WCM detects and eliminates losses and the resulting costs. Waste is analysed, evaluated and assigned to relevant processes. The result of a conducted analysis points to the way of intervention. In order to achieve an appropriate World Class level, WCM influences all the production and logistic processes, supporting them with an Audit system and measuring them with relevant Indicators.

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