

WORLD CLASS MANUFACTURING IN METALLURGICAL ENTERPRISE

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World Class Manufacturing (WCM) assumes increase of efficiency of the company by elimination of all the losses, wastage and dangers of safety. In ArcelorMittal the concept of WCM is implemented in particular enterprises within the capital group. In this publication the activities conducted in some of those enterprises are described.

Key words: WCM – World Class Manufacturing, metallurgical enterprise, TPM - Total Productive Maintenance, cost, safety

INTRODUCTION

A competitive advantage is a consequence of low costs and high work efficiency. The main condition of market success of an enterprise is continuous improvement of both production processes and the methods of management. The main assumption of WCM is optimisation of the processes through elimination of all losses and wastage. An enterprise which minimises the costs of its activities is considered a benchmark in a given sector. In the attempt to reach the competitive advantage other enterprises use the achievements of the world leaders of technological progress in the area of operational and marketing activities [1]. One of those world class producers in metallurgical sector is ArcelorMittal. The enterprise concentrates on the main areas of business activity improvement in an attempt to reach World Class Manufacturing. Particular areas in the enterprise called the pillars of WCM are presented further in this publication.

PILLARS OF WCM IN METALLURGICAL ENTERPRISE

WCM is a kind of problem solving philosophy in manufacturing enterprise. Initially, the concept functioned in big corporations on the territory of the USA and Japan. It was implemented mainly by automotive concerns. At present, the WCM system functions in many sectors of industry. *World Class Manufacturing* is based on the one hand on the management of the enterprise and on the other on the reduction of costs of conducted activities [2]. Integration of those aims requires continuous improvement of functioning of the enterprise. The result of implementation of WCM is the in-

crease of efficiency in various areas of functioning in the enterprise. In the subject literature a lot ways of improving the enterprise are described. The ones worth mentioning are for example the publications presenting the market success of Toyota [3]. In business practice each company has to work out its own way to reach WCM. Metallurgical concern ArcelorMittal established 10 main pillars which, after their implementation, should provide the position of benchmark in the world metallurgical sector (Figure1). The main pillars are typical for World Class Manufacturing but the way to reach them is individual.

First pillar of the WCM is the care about the work safety and the health of the workers. The enterprise

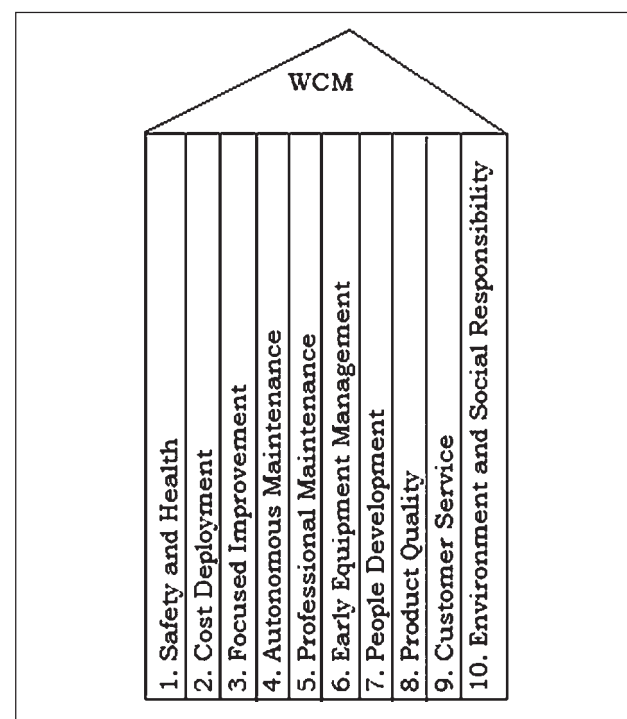


Figure 1 Pillars of World Class Manufacturing in ArcelorMittal [4]

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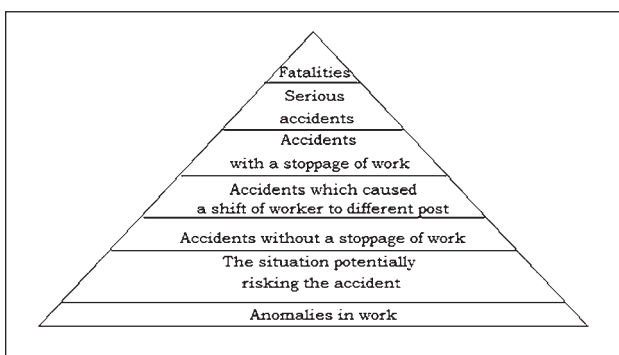


Figure 2 Pyramid of safety in ArcelorMittal

strives at the no-accident manufacturing. ArcelorMittal plans to keep the accident frequency rate at a level of less than 1. The rate between 0,5 to 0,3 is achieved in the best companies in the world and is a form of benchmark for the enterprise. In ArcelorMittal Poland this rate equalled 0,8 (the number of accidents per the number of man-hours in 2011) [5]. For the purpose of reaching the goal the standards of safe work and the pyramid of safety were created (Figure 2). The main task of the workers is the elimination of all the accident anomalies. Anomalies are all the irregularities in the work place which are instantly eliminated by the worker who identified them.

Another pillar of WCM is the monitoring of costs. The enterprise uses internal benchmarking by comparing the production costs per 1 Mg of ready products. Aiming at the reduction of production costs the employees take part in improving the course of the processes submitting the rationalisation ideas. The actions in one area only – in the field of order on the work stations (5S method) brought a reduction of costs by about 13,9 USD per 1Mg of ready products (data from enterprise in Saldanha, ArcelorMittal South Africa) [4].

The involvement of the working teams in the improvement of the company is the third pillar of WCM. The employees of the enterprise are treated as a team in which, no matter their grade in the hierarchy, each person can state their opinion, suggest a more efficient solution or even question the decision of the supervisor.

Fourth, fifth and sixth pillar of WCM concerns the concept of TPM (Total Productive Maintenance). The main purpose of introducing TPM is to enhance the effectiveness of the whole machinery. TPM could also be looked at in the following way [6]:

- T (Total) – the concept should apply to all employees from all company departments,
- P (Productive) – productivity is a synonym of aspiring to achieve an ‘above-average’ result in the sector,
- M (Maintenance) – could be interpreted as a company’s belief in its ability to remain on the competitive market or even gain a competitive advantage.

TPM teaches machine operators and workers how to look after the company’s equipment. The essence of the

concept is zero stoppages and zero breakdowns. Thanks to the TPM system each piece of equipment in the production line is always ready to perform its task and therefore no disruptions in the production process take place. TPM is a tool that helps to detect and reduce waste by means of three zeroes:

- zero breakdowns,
- zero defects,
- zero accidents at work[6].

In order to achieve the high efficiency of the machines and devices in ArcelorMittal, a re-organisation of work maintenance forces started. The company had to go from the intervention work system to the preventive system involving all the workers of the enterprise in the perfection of the manufacturing process by providing the reliability of the functioning of machines and devices. The basis for the creation of a new organisational structure of work maintenance forces in metallurgical enterprise was ordering the work posts into basic ones, the so-called *core* and secondary, the so-called *non-core*. Among the basic ones there are posts connected with work flow from creation of a notice concerning the need of a change to its completion [7]. The employees working on the improvements must know the device and the problems connected with it very well. They must be open to changes and have abilities to generate ideas individually. In the organisational structure of the maintenance services the costs expert is a very important post. Such employee receives a notification about each change in the course of the process. There are three types of notifying which can be performed by any worker:

- inspection and conservation,
- registration of the defects,
- registration of the standstill of a device [7].

The ideas concerning innovations proposed by the workers undergo a thorough assessment and are ordered according to a categorisation of changes and time of completion. In the analysed enterprise there are four levels of priorities for particular notifications:

- level A – unexpected works,
- level B – works for which the deadline has been set,
- level C - works for which the deadline has not been set,
- level Z– works for which the deadline has been set but has been put off (the postponement may result from the necessity to conduct additional analyses, expertise or costs calculations).

Costs expert assesses each of the notifications and decides about their transformation into projects. Besides the costs expert post in the company there are also planning experts who deal with issues concerning planning and harmonising the notifications. First of them analyses the demands defining the materials, equipment and resources necessary for conduction of each of the tasks (tools, spare parts, workers and their qualifications), second expert creates a timetable of the orders which

guarantees efficient application of the resources and reduces the standstill of an installation to the minimum. Executors of the projects are the teams (gangs) which are lead by the foreman or the ganger. In justified cases the conduction of the work is commissioned to external subcontractors. Additionally, in the organisational structure of maintenance services, a special post has been created of an expert on controlling the subcontractors. Moreover, among the additional posts there are also the production line supervisor and the expert on reliability issues. The reliability expert is a new post which did not exist in the structures of maintenance services of the enterprise in the past. Such employee serving the function of reliability expert analyses the reliability of the machines and devices, assesses the indicators of their functioning, creates a “tree” of equipment recording all the inspections, defects and breakdowns and sets the so-called critical points which undergo monitoring. Reliability expert co-operates with technological service by taking preventive measures. Simplified diagram of improvement of the functioning of machines is presented in Figure 3.

Sixth pillar of WCM is “early equipment management”, in which the time of decision-making, introduction of changes and conduction of operations (activities) really counts. In the enterprise the most modern techniques and methods of management are applied. Each of the pillars of WCM has its tools, for example in TPM the basic tool is 5S, in TQM - Six Sigma, in TBM - SMED [8].

Seventh pillar of WCM concerns the concept employees development. In the enterprise, a program of “competence management” has been introduced which assumes a skill matrix for each post as a tool for promotion and professional development of workers. For the purpose of WCM the organisational structure of the enterprise is being improved. The activities within Lean Management are implemented which allow for delegation of authorisations for as low grades of the company as possible. Besides, the whole structure of the company is aim-meeting oriented. System of motivation in the enterprise is based on *diversity* rule [9]. Diversity management is a high level step in the human resources management process. Is a good way to built well perceived image of the organization socially responsible [10]. The enterprise puts emphasis on the engagement of the employees. Currently the engagement of employees in ArcelorMittal Poland is 47 % (almost one in two workers takes part in realisation of goals of the enterprise).

Being a benchmark in metallurgy sector is not possible without the care for product quality. Organisational structure of ArcelorMittal is based on two key pillars of manufactured products: the long and the flat products. The enterprise cares for the customers and that is why it has prepared a program called “FoCuS” (*For our Customers*). It consists of four theme blocks:

- development of Lean Management strategy,
- research and development (B+R),

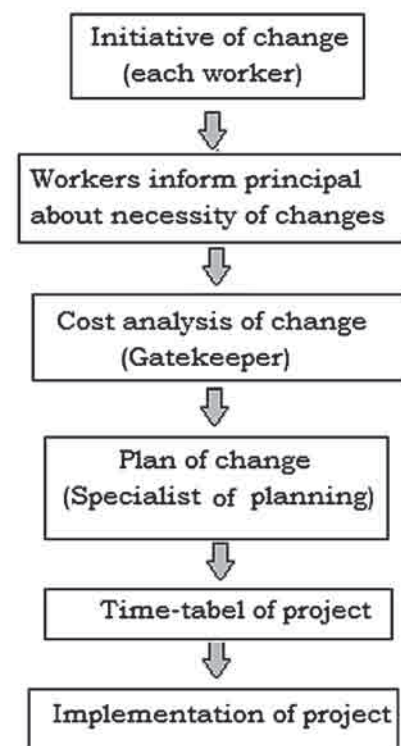


Figure 3 Diagram of improvement of the functioning of machines in ArcelorMittal

- best technology of manufacturing (BAT),
- increasing the sales results.

Providing the best quality of the products must go together with customer service system (ninth pillar of WCM). The basis for the assessment of the customer service is CSI - *Customer Satisfaction Index*. This index is calculated once a week for metallurgical products and consists of two elements: type *On Time in Full* - completion of the order on time and in accordance with expectations of the customer; and type *Old Backlog* - number of the orders completed on time. Each index is calculated separately for two segments of the market that is for *superior customers* and for *regular customers*.

The last pillar of WCM is “environment and social responsibility”. In terms of environmental management the enterprise implements programs based on 3xR rule (*Reduce, Reuse, Recycle*). Examples of such programs are: rational waste management, that is reduction of the amount of metallurgical waste (currently per 1 Mg of produced steel there is 0.600 Mg of waste, mostly slag, 70 % of which is disposed), reduction of pollution emission, particularly CO₂ - key environmental aspect of the enterprise (currently per 1 Mg of produced steel 2 Mg of CO₂ is produced). In the area of social responsibility the enterprise implements the following programs: „safety sustainable steel”, „investing in our people”, „enriching our communities” and “transparent governance”. In 2008 the enterprise published first report about social responsibility [11]. In relations with other enterprises in value chain (cooperation in supply and distribution processes) tends towards strategic alliances and treats external growth as the main strategic direc-

tion of the group. Up to now it has experienced a rapid growth by the execution of a successful consolidation-based strategy. The group made its first acquisition in 1989, leasing the Iron & Steel Company of Trinidad and Tobago [12]. It is worth adding that all the transactions are executed by the group of experienced and qualified managers who usually fill the top managers' positions in the new ventures. Gradually they move to the other steel plants being the parts of the group [13]. More recently, the group's acquisitions have been concentrated on vertical integration, i.e. acquisitions of raw material producers or production sites.

CONCLUSION

The main goal of industrial companies nowadays is to gain a competitive advantage. The changing circumstances and the growing demands on the part of the customers necessitate the implementation of new production management methods. WCM have gained popularity in the steel industry in the last few years. In the analysed enterprise ten pillars of WCM were fixed, each pillar has its owner and in each of them the working teams are being created with their leaders whose tasks are influencing the involvement of all employees in improvements of the enterprise in an attempt to reach: quality, reliability, safety, efficiency and savings.

This publication is a synthesis of the activities undertaken in ArcelorMittal in order to be granted the benchmark status among world producers of steel and metallurgical products.

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Note: The responsible translator for English language is D. Grachal, Katowice, Poland