

Methods of improving production processes in the metal industry

Metody usprawniania procesów produkcyjnych w branży metalowej

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In the current economic situation, enterprises which want increase your position on market, use some methods of improving production processes, the paper presents some of them for example management systems, normalization and automatization.

KEYWORDS: metal industry, improving production, management systems, production processes

Companies in the market can be assigned to specific industries and sectors. The metal industry is one of the most dynamically developing sector in Poland. Organizations operating in this industry are involved in the manufacture of metals, the manufacture of finished metal products and the manufacture of machinery and equipment. In the metal industry, companies that employ up to 9 employees are the majority - these make up about 91%. Companies employing between 10 and 49 employees account for 6% of the entities [1]. This means that small and medium-sized companies dominate within metal industry in Poland. These companies are in constant close co-operation with automotive, construction and household appliances companies. Metal industry is an important part of the economy in many countries, because natural resources such as metal ore occur in specific locations in a limited quantity. Hence the increasing share of metal production is being recycled. For example, the share of aluminum production in the total world production of this element in 1986 was 17%, in 2004 33%, but it is estimated that 40% in 2020 [2]. Based on the possibility of practically complete recovery of raw material from metal waste, a closed economy model was proposed. To fully understand the essence of metal industry, first define what metal is. One of the main distinguishing features of metals is the presence of metallic bonding [3], the consequence of which is, among others, high electrical and thermal conductivity [4]. This makes metals the foundation of the electrical, electronic and power industries [5]. Another feature of materials with this non-directional bonding is plasticity and kinkiness, making it possible to form metal products and build energy-absorbing structures [3]. Examples of the use of this metal feature can be bumpers or kinetic energy absorbing components of vehicle collisions. In general, the metal industry can be

divided into the non-ferrous metal industry and iron and its alloys (fig. 1) [6]. In the case of the iron and its alloys market, depending on the carbon content, the castings should be distinguished together with the steel, i.e. the plastified steel and the cast iron. Steel is made up of, among others, structures of buildings or their reinforcement, rails or sheets of plating for vehicles. Examples of the use of cast iron are bodies of industrial machines.

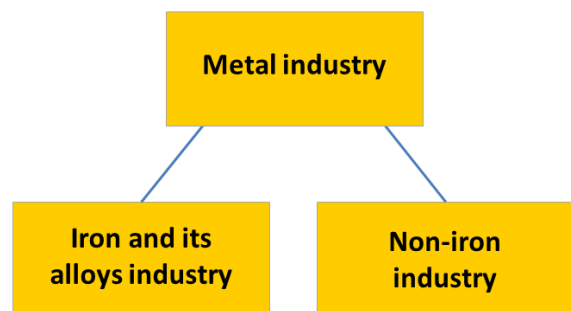


Fig 1. Metal industry division (source: own study based on: [6])

Steel market

Steel market is an important element of the metal industry. Countries with the most prosperous economies in the world dominate in the production of crude steel. In recent years, most crude steel is produced by China and Japan, indicating the dominance of Asian countries, while the third largest country is located outside of Asia, i.e. the USA [7]. Poland, on the background of these countries, is worse off, as the table shows:

Table. Summary of steel production volume in 2009-2013

Country	Production volume in thousand tons in				
	2009	2010r.	2011	2012	2013
China	577 070	638 743	701 968	731 040	821 990
Japan	87 534	109 599	107 601	107 232	110 595
Poland	7 128	7 993	8 801	8 358	7 950

Source: Own study based on: [8].

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Rationalization

All companies in the metal market strive for a state, in which they will be able to produce as many products as possible at the lowest possible cost. To achieve this, it is necessary to improve the efficiency of the process and to increase its effectiveness. As the efficiency of production is defined as the ratio of actual production volume to the achievable amount. By measuring the performance, meeting an organization's goals can be verified. Metal companies, that want to have the best resources, also measure productivity. This indicator allows to analyze how many units of resource are consumed in the production of finished product [9].

Ways to rationalize the production processes

To achieve satisfactory performance, indicators such as efficiency, effectiveness or productivity, are used by metalworking companies in a number of different ways. In this paper, however, we have presented the three most commonly used in the industry. The first one concerns the introduction of production automation in the company. In the metal industry, this is particularly important, because it counts on the precision of manufacture and the highest precision is guaranteed by machines. Automation involves the introduction of technical means for the automatic control of processes [10]. The task of automation is the elimination of direct human participation in the manufacturing process.

The second method of improving the production used in metal enterprises is the introduction of standards. Standards may apply to both the specifications of the finished product, e.g. PN-EN-1090 Construction of steel and aluminum structures, as well as they can refer to processes, e.g. ISO 3834 - Quality requirements for welding the metal materials.

The third method used to improve the production performance of metal enterprises is the introduction of management systems into the company. An increasingly important role is played by the environmental management system or the health and safety management system. The system is defined as a data processing process that determines the possibility of making changes [11], as well as identifying the organizationally separated entity in the organization's management system, consisting of a quality management system and a qualitatively managed system [12]. Currently, almost every company in the metal industry has implemented the ISO 9001 quality management system. This is evidence for contractors that they work with companies that reliably address the problems of widely understood quality.

Implementation of integrated management systems in a company by means of improving the production processes

Management systems can be implemented in companies individually, but in order to achieve synergies, they should be implemented simultaneously, resulting in a much greater positive impact on the company. Effective implementation of several management systems is called Integrated Management System. The most common are systems such as ISO 9001, Quality management system, ISO 14001, Environmental

management system, PN-N 18001, Health and safety management system and ISO/IEC 27001, The information security management system [13]. In the age of computerization, is particularly important because most important information about the functioning of a company is stored electronically and it is worthwhile to implement such a system in order to make the information secure. In the era of computerization, the information security management system is particularly important, because most important information about the functioning of the company is stored electronically and it is worthwhile to implement such a system in order to make the information secure.

ISO standard as the basic standard used in the metal industry

In the metal industry, the most commonly used management system is the quality management system. This is due to the fact that many contractors require their trading partners to have implemented the ISO 9001 standard, which guarantees the high quality of the manufactured product. Metal companies are increasingly focusing on environmental protection, and many organizations have already implemented an environmental management system. The PN-N-18001 occupational health and safety management system is being implemented more and more frequently, resulting in a continuous increase in workplace safety. Standards referring to products and processes most commonly used by metalworking companies include, but are not limited to, ISO 3834 - Quality requirements for welding of metallic materials, PN-EN-1090 Steel and aluminum construction, PN-EN 1706, Aluminum and aluminum alloys - Castings - Chemical composition and mechanical properties.

Conclusions

Manufacturing processes in the metal industry need specific ways to improve their efficiency in order to be able to function effectively. To achieve optimum production, standards-based methods are used and they produce high results. Organizations can implement both management systems and standards for specific products or processes that accompany production. Currently, there is a tendency to see the importance of automating production processes. Automated processes are management, control, business processes, also IT environment. But it is crucial to automate specific metalworking or finished product processes.

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