

## KEY PERFORMANCE INDICATORS IN ASSESSMENT OF ENTERPRISES OF METALLURGICAL SECTOR

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### Abstract

An increased competition and customer expectations according offered products lead to the conclusion that it is essential to measure and assess very carefully business activity. This need is observed especially in metallurgical sector, where production is more and more often made in make-to-order systems. As research indicated, there are many differences in management of make-to-order systems. It is especially important when an increased number of make-to-order systems is observed.

In the paper the proposition of the system of Key Performance Indicators to assess enterprises belonging to metallurgical sector is presented. The proposed solution leads to improve efficiency of the main strategic objectives realization and helps to significantly improve monitoring and control of strategy realization in enterprises of metallurgical sector.

**Keywords:** Key Performance Indicators (KPI's), metallurgical production, make-to-order system

### 1. INTRODUCTION

Nowadays enterprises operate in highly turbulent and variable market conditions. One of the most important task of contemporary enterprise is a continuous search for opportunities to gain a competitive advantage in the market and rapidly response to them. This requires a complete change of priorities in the management of modern enterprise.

Strong competition in the market and the need to constantly seek competitive advantages is forcing companies to manufacture products in accordance with the individual needs and requirements of customers. Organizations are moving away from standardization in favor of diversity and flexibility [8], [9]. Standard production of identical products is being replaced by the production of short and medium-sized series of products made to individual customer orders which requires use new method of production planning [14]. The life cycle of products and technology is now radically reduced. The risk of economic activity increases [1]. A need of sustainable development is highlighted [5].

In metallurgical sector a rapid development of small and medium enterprises (SME's) manufacturing their products in the make-to-order sector (MTO), which form a long supply chains are observed. Make-to-order production means the production of bespoke and customized products to particular customer specifications but not repeated on a regular basis or in a predictable manner [3].

Constantly improving information technologies allow quick, easy and affordable access to information and knowledge resources, which has not only significantly increased the pace of technological changes, but has

also become the basis for increased efficiency and productivity [4]. The most significant changes in company management include [7]:

- departure from the strategy for growth in favour of a strategy of increasing value for shareholders,
- changing the orientation of the product to focus on the customer and his needs,
- replacement of measures based on earnings with measures of value added and cash flows,
- departure from the ratio of market share to shares in migration values.

Enterprises need implementation and improvement of innovative management systems. Comprehensive measurement and assessment of enterprise activity play a significant role in these conditions.

Companies involved in make-to-order manufacturing are designed not only to fulfil production orders according to customer requirements, but also to take care of their own development. To stay in business, they must be flexible and able to quickly identify and respond to emerging opportunities and threats, which mean frequent change of strategy [13].

An increased competition and customer expectations according offered products lead to the conclusion that it is essential to measure and assess very carefully business activity. This need is observed especially in metallurgical production, where the most part of production is made in make-to-order systems. As the result of research indicated, there are many differences in management of make-to-order systems. It is especially important when an increased number of enterprises which are make-to-order system is observed [13].

In the paper the proposition of Key Performance Indicators to assess enterprises which use metallurgical production is presented. The proposed solution leads to improve efficiency of the main strategic objectives realization and helps to significantly improve monitoring and control of strategy realization.

## **2. SPECIFICITY OF A METALLURGICAL INDUSTRY SECTOR**

The metallurgical industry is closely linked with the condition of the main sectors of production such as: automotive, mechanical engineering, shipbuilding and aviation. Despite the restructuring process aimed at reducing costs and improving labour productivity and significant innovation in the development of new applications industry position is weakened in global competition. The competitiveness of the sector has been declining to a significant increase in gas and energy prices. The production process in the metallurgical industry is very energy consuming and energy falls generally from 10 to 37% of the cost of production. Metallurgical industry as a major source of CO<sub>2</sub> emissions is also burdened with the high cost of ecology [12], [16].

Extremely important for this sector is the issue of access to non-energy minerals, which is heavily dependent on imports of ores and concentrates from third countries. This dependency is however reduced due to recycling by reducing energy consumption. The use of scrap has increased significantly and still responsible for 40 to 60% of the metal in the EU. Economic development in many emerging markets, however, increase demand and contribute to higher prices of metals and metallurgical products and to unprecedented pressure on prices and supply of raw materials [16].

Economic Policy of the European Union and the situation in the global market causes that [16]:

- small and medium-sized enterprises (SMEs) are developed which means enterprises with fewer than 250 employees whose turnover or balance sheet total does not exceed, respectively, of the ceilings of EUR 50 million or EUR 43 million (Recommendation 2003/361 / EC);
- competitiveness is increased, which means the capacity of enterprises to quickly adapt to change, exploit their innovation potential and develop high-quality products and leads to a need of higher enterprise flexibility;

- innovation is developed and manifested the renewal and extension of the range of products and services, implementation of new methods of design, production, and distribution of supply chains, changes in the management and organization of enterprise and work conditions of skilled workers;
- the eco-efficiency and eco-innovation is developed, which means any form of innovation aiming at achieving the objectives of sustainable development with respect for the environment by reducing the impact on the environment or more efficient and more responsible use of natural resources, especially energy [2].

Therefore, it is a need to monitor and control the realization of main aspects of strategy in enterprises. For this reason it is strong pressure to implement solutions which help measure the level of the realization of significant strategic objectives and lead to the sustainable development [10].

A critical literature analysis, conducted research and observation in metallurgical enterprises allows the following significant strategic objectives in enterprises of the metallurgical sector connected with main aspects of strategy, which should be monitored and controlled, to be identified:

- a) energy saving;
- b) customer satisfaction increasing;
- c) flexibility developing [8];
- d) efficiency increasing [11], [15];
- e) shortening costs connected with ecology [2].

### **3. IMPLEMENTATION OF KEY PERFORMANCE INDICATORS TO ASSESS AN ENTERPRISE OF METALLURGICAL SECTOR**

To prosper and survival on the global market enterprises have to quickly introduce and realize often changed strategy. The efficient implementation strategy is possible when the realization of strategy is continuously monitored and controlled. There is needed a measurement system which allows a level of achievement of significant strategic objectives to be checked and analyzed [13]. Very helpful seems to be the Balanced Scorecard approach (BSC). BSC is used mainly for supporting the strategy for the development and growth of enterprises, but is also used in the process of improvement and development restructuring. BSC can be used to gain competitive advantage, increase the company's market value and monitor performance of intangible goodwill and communication strategies to improve the system in the organization. The management strategy based on the concept of the BSC has many advantages. The most significant are [6]:

- focus on enterprise-wide implementation of the strategy;
- collection of many seemingly disparate elements of a company's competitive agenda into a single report;
- a holistic approach to performance measures;
- only a limited number of measures or performance indicators need to be checked at any one time;
- serves as a bridge between different fields - financial and non-financial;
- flexibility and adaptability to fit to each specific enterprise;
- the systematic translation of strategy into operational activities;
- strong focus on customer and market;
- mobilizing companies to change through clear leadership management;

- motivation to change the behaviour of employees - strategy becomes their daily work;
- the creation of an ongoing process of improvement strategies;
- improving the management of information in an enterprise.

In proposed solution using Key Performance Indicators to manage of the main aspects of strategy is proposed. Therefore, the system of Key Performance Indicators for the highlighted areas in point 2. is designed, which helps to monitor and control the main aspects of strategy realization. This system is dedicated for make-to-order systems of small and medium enterprises of metallurgical sector (Tables 1-5 for each area).

**Table 1.** The proposition of Key Performance Indicator system for enterprise of metallurgical sector for the area energy saving

Criterion	Strategic objective	Key Performance Indicator
Energy saving	Reduction of energy consumption	KPI <sub>1</sub> – electricity consumption
		KPI <sub>2</sub> – fuel consumption
		KPI <sub>3</sub> – gas consumption
		KPI <sub>4</sub> - amount of expenditure for energy saving machines per unit of time
		KPI <sub>5</sub> - amount of expenditure for energy saving solutions per unit of time

**Table 2.** The proposition of Key Performance Indicator system for enterprise of metallurgical sector for the area customer satisfaction (make-to-order systems)

Criterion	Strategic objective	Key Performance Indicator
Manufacture products according to customer requirements, specified in the order	Reduction of incompatibilities with customer requirements	KPI <sub>6</sub> – percentage of products manufactured correctly due to customer requirements
		KPI <sub>7</sub> - percentage of measured products
Short time of order realization	Shorten time of order realization	KPI <sub>8</sub> - percentage of time of order preparation to manufacture and expectations
Reliable planning deadline for completion	Improvement of reliable due date	KPI <sub>9</sub> - percentage of orders with the same planned and actual due date
Reliable estimation of the order cost	Improvement of reliable cost estimation	KPI <sub>10</sub> - percentage of orders with the same planned and actual cost
Short answer to the question about the possibility of customer inquiry and terms of order	Shorten duration of decision-making process	KPI <sub>11</sub> - percentage of planning time of an order

**Table 3.** The proposition of Key Performance Indicator system for enterprise of metallurgical sector for the area enterprise flexibility

Criterion	Strategic objective	Key Performance Indicator
Enterprise flexibility	Increasing the ability to change the order of the processes	KPI <sub>12</sub> - percentage of orders for which an order can be changed
	Increasing the flexibility of employees	KPI <sub>13</sub> - percentage of employees who can operate more than one workstation

**Table 4.** The proposition of Key Performance Indicator system for enterprise of metallurgical sector for the area efficiency increasing

Criterion	Strategic objective	Key Performance Indicator
Efficiency increasing	Increase of efficiency	KPI <sub>14</sub> – profitability of products
		KPI <sub>15</sub> – efficiency of processes
		KPI <sub>16</sub> – efficiency of employees
		KPI <sub>17</sub> - efficiency of machines

**Table 5.** The proposition of Key Performance Indicator system for enterprise of metallurgical sector for the area costs connected with ecology

Criterion	Strategic objective	Key Performance Indicator
Shorten costs connected with ecology	Shorten costs connected with ecology	KPI <sub>18</sub> – cost of the introduction of gases or dust into the air
		KPI <sub>19</sub> – cost of sewage into waters or land
		KPI <sub>20</sub> – cost of waste storage
		KPI <sub>21</sub> - amount of expenditure for machines and solutions which reduce gas emission per unit of time
		KPI <sub>22</sub> - amount of expenditure for machines and solutions which reduce sewage per unit of time
		KPI <sub>23</sub> - amount of expenditure for machines and solutions which use and/or reduce waste per unit of time

#### 4. CONCLUSION

To prosper and survival on the market enterprises must quickly realize topic aspects of strategy. Such an approach require to identify the main areas which should be measured, monitored and controlled. The conducted research shows that are five following areas for metallurgical sector: energy saving, customer satisfaction increasing, flexibility developing, efficiency increasing and shortening costs connected with ecology. These areas can be measured using Key Performance Indicators.

In the paper is presented a new and original system of Key Performance Indicators which allows a significant area of enterprise strategy to be monitored and controlled. This system consists of 23 Key Performance Indicators which measure a level of realization topic strategic objectives of metallurgical sector. It helps to monitor and control the main aspects of strategy realization in small and medium enterprises of make-to-order systems.

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