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RISK MANAGEMENT SYSTEM IN METALLURGICAL PRODUCTION

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The main aim of the paper is to characterize the proposed model of risk management system. Threats identification and risk assessment of the systemic character result in taking action directed on risk elimination, minimization or financing. Concept of the risk management system includes the following anti-risk activities concerning: knowledge, operating, experience and improvement. Those risk actions guarantee effective manner of risk management, which is of particular meaning due to the difficult situation of the European Union's steel industry facing geopolitical, economic and environmental challenges. The model in question can be treated as a guidelines for proceeding in case of prevention and response to the potential, both strategic and operational, metallurgical risk.

Keywords: metallurgy, production, management system, risk management

INTRODUCTION

Based on the reports concerning the risk ranking, it can be said that the companies with metallurgical production and especially steel mills, takes one of the top positions.

Therefore, it is of high importance to implement the solutions aiming at taking risk, however, these solutions are just one of the risk management's links. Taking up the decision on the way of risk management is not an easy task. The risk at the steel mill is of the interdisciplinary character and the activities connected with the risk are usually realized in a various way as well as by various organizational units – depending on the category and the scope of the risk [1,2].

Meanwhile, the effective risk management should be complex one and treated as the "systemic, statistically based, and holistic process that builds on formal risk assessment and management [3]".

The EU steel manufacturers are confronted with the risk of losing control and global market share, even for quality products. The lack of balance within the raw material supply strongly affects the EU industry being highly dependent on raw material imports. As a result of rising prices of energy and CO_2 emission permissions, the steel industry faces a rising production costs and a loss of competitiveness [4].

The steel products have a key meaning for the functioning and development of each society, therefore, it is indispensable to implement such solutions, which just at a minimal level could limit the risk involved in the metallurgical production.

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METHODOLOGY

Basic aim of the carried out research was to identify the risk at the steel plant as well as to develop the algorithm of managing the risk mentioned together with taking into consideration the possibility of systemic solutions implementation.

The undertaken actions were directed at risk categorization, defining its sources and answering the ques-

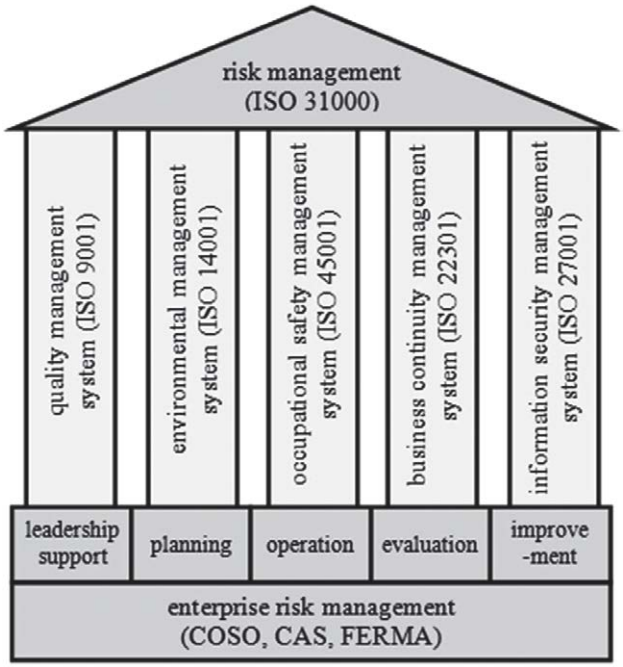

Figure 1 Scheme of dependences between risk management in different normalized and informal management systems; developed on the basis of [5-13].

tion if it is possible to apply one algorithm for risk management regardless of its category and scope.

The foundation of the research was analysis of (see Figure 1) [5-13]:

- requirements of normalized management systems timing at ensuring the following targets: quality – ISO 9001, environmental – ISO 14001, information safety – ISO 27001, workplace safety – ISO 45001, continuity of activity of the business processes – ISO 22301,
- guidelines of informal management manners of corporation risk of strategic, financial and operational character – COSO, CAS, FERMA.

One has taken the trial of verification if the standards regulating in a systemic way the organisation's management – in various scope – still remain effective in the context of the standardized requirements of risk management, which could be a kind of replacement.

The algorithm is dedicated to those organizations which want to unify the manner of risk management independently of its character, also to the metallurgical plants.

RESULTS IN METALLURGICAL PRODUCTION

The base for the complex risk management idea is the assumption that the risk can be managed regardless of its character and in the standardized systemic way (see: Figure 2).

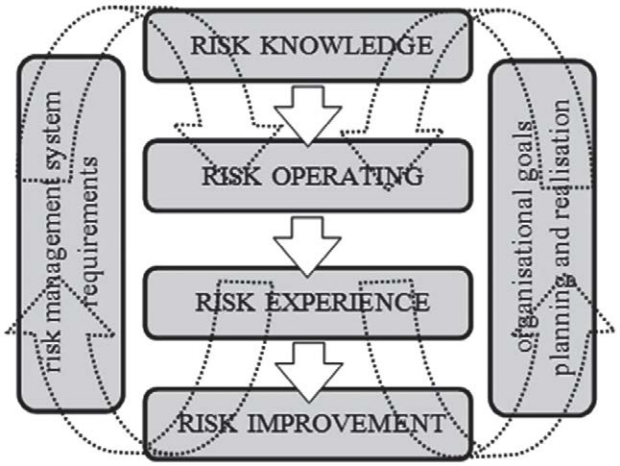

Figure 2 Scheme of risk management for strategic, operational and system-wide processes.

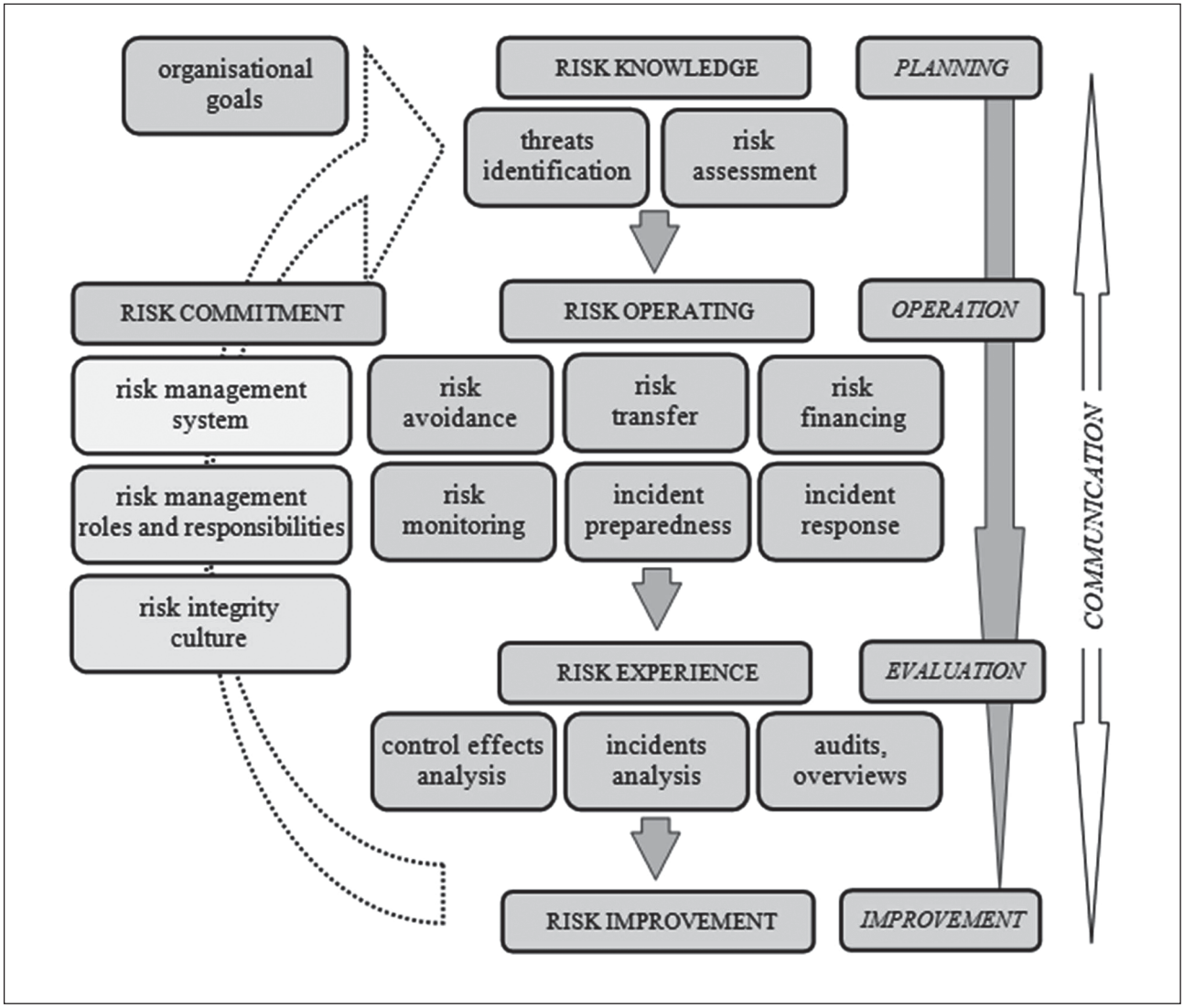

Figure 3 Concept of the risk management system.

Table 1 **Summary of the exemplary threats and risk operating manners in different processes in the steel plant.**

Kind of risk	Exemplary threats	Exemplary threats' effects	Exemplary risk operating manner
Strategic level			
Competition risk	High competition on the steel market, especially with the cheap products manufactured out of European Union.	Limitation of production, production focused exclusively on the products which sales is economic	Passive/Incident prevention: strategy of building clients' capital based on using the competition tools
Environmental risk	Higher prices for the CO_2 emission permission and price increase of electric energy refraining from also growing emission costs	Limitation of production	Active/Risk avoidance: modernization focused on diminishing the production energy consumption and CO_2 emission
Operational level			
Occupational safety risk	Contact with: movable, immobile and sharp material factors	Injuries resulting from accidents at work (including the mortal ones)	Passive/Incident response: first medical treatment, call of emergency services, with cooperation with designed procedures
Environmental risk	Emission of: the particulate matter, the sulphur dioxide, the nitrogen dioxide, the carbon monoxide, the carbon dioxides	Pollution of the air with the nitrogen dioxide, acid rains and soil acidification	Passive/Risk monitoring: operational control of particulate matters and dioxides emissions
Technical and technological risk	Obsolescence and corrosion of installations, lack of monitoring the machines and installations, lack of technological instruction of using the installation in the normal operation	Machines and devices failures which can cause: their stoppage and material loss, fault of material, uncontrollable environment's pollution and accidents at work	Passive/Incident prevention: monitoring the machines and installations
Personal risk	Rising skills and knowledge requirements, high average age in the sector	Decreasing labour force, both in the scope of number, skills and knowledge	Passive/Incident prevention: actions covering: choice of the workers, their motivation and development – aimed at attracting and maintaining highly skilled labour
IT, safety, data protection risk	Cyber crime, malpractice from the side of dishonest, servers, computers and links' failures	Loss of access, confidentiality or integrity of the stored information	Active/Risk transfer: insurance covering the costs of claims and damage repairs and the reimbursement of lost profits
System level			
Management system risk	Lack of systemic risk management – lack of the following: organizational structure, planning, repeatability, improvement, documentation, communication and assessment	Inefficiency in risk management, and as a result – actions connected with its undertaking	Passive/Risk monitoring: risk management system audits

Considering such a assumption, within the cycle of the risk management (knowledge – operating – experience – improvement) are written in not only the processes aiming at the realization of the particular strategic and operational goals established by the enterprise but also the processes covering the risk management system of the mentioned organization. Therefore, it involves the processes aiming at both: stability of the current activity of the organization as well as these ones concerning the long-term development. It refers to these processes which threats are of various kinds as well as the ones which assessment should be realized in a standardized systemic way (see: Figure 3).

Risk knowledge covers the identification of the threats and the assessment of the planned processes risk. One should bear in mind that both: threats identification as well as the risk assessment should take into consideration regular conditions of the processes realization as well as the exceptional conditions, in which a sudden occurrence may lead to the disruption of the process continuity. Based on the risk knowledge the ways of risk operating are defined and next the choice of the most effective risk undertaking method is done.

Exemplary threats and their outcomes together with the ways of risk taking for the processes realized on various organizational levels in the steel mill have been presented in Table 1.

Risk operating can be of active or passive character. The actions of active form covers the following:

- risk avoidance, focusing on its elimination, minimization or redistribution,
- risk transfer enabling risk redistribution – partially or fully – on other entity,
- risk financing, which doesn't undergo elimination, minimization or redistribution.

The remaining risk, which hasn't been eliminated within the range of active approach undergoes control in the regular conditions as well as while the incident occurs. It is monitored due to ensuring the constant level. Moreover, the organisation undertakes the preventive actions avoiding the incidents and minimising the probability of their occurrence and in the situation of

their fruition – the organisation is prepared for eliminating the risk's outcomes and diminishing their meaning.

Risk experience is based on the analysis of the control effects and allows for developing possibilities of improving processes, which while being estimated by the risk assessment and accomplished by the outcomes confirming its effectiveness – can be used as the elements of improvement. It is reflection of the reactive monitoring.

Risk improvement concerns the following physical actions of technical, technological, and organizational character aiming at minimizing the risk or its elimination and the financial actions both: on the strategic and operational lever, including the range of risk management system itself. On the risk improvement level taking up risk can be of different character than in the scope of risk operating.

CONCLUSIONS

The European metallurgical industry is facing multiple challenges, refraining both: from the external and the internal conditions. Drop in the steel demand, imbalances in the supply and demand for iron ore, costs increase of the CO_2 emission permissions and high competitiveness on the market – on one hand, as well as the necessity of fulfilling requirements stated by various stakeholders – on the other hand, all cause that the metallurgical industry enterprises must apply the solutions allowing for the realization of the planned goals in a more effective way.

Such a panacea can be the proposed concept of organization's risk management, which requires from the enterprise implementation of the risk management system together with the proper for it organizational structure. The base of the system functioning is the assumption that the risk connected with various processes must be managed in a standardized way. At the same time, planning the strategic as well as the operational goals should be accompanied by the risk assessment, and based on its results, the ways of the risk undertaking should vary and be adjusted to the particular kind of risk.

The described risk management, covering: risk knowledge, risk operating, risk experience and risk improvement, enters into the informal risk management, and – being consistent with the guidance within the scope of planning, operation, evaluation and improvement – it fulfills the requirements of the normalized management systems.

The concept of systemic risk management is dedicated to the metallurgical industry enterprises, which want to take up risk – especially by preventing the occurrence of threats' outcomes and generating the costs connected with them. The concept in question may find the application in both: regular realization of the processes as well as after the incident which may lead to the breakage of the processes continuity, which in turn can have a meaningful importance for the enterprise's existence.

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Note: The professional translator responsible for English language is Dominika Wnukowska, Katowice, Poland.