

COMPREHENSIVE CLASSIFICATION OF ENVIRONMENTAL ASPECTS IN A MANUFACTURING ENTERPRISE

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This paper presents a comprehensive approach to classification of environmental aspects with a broad set of criteria which may be useful in a manufacturing enterprise in defining the relevant aspects. Additionally, the publication presents the list of key environmental aspects for metallurgical enterprise. According to standard ISO 14001:2004 process of environmental aspects identification should be planned. The paper finishes with a scheme presenting the place of the environmental aspects identification procedure in the system of environmental management.

Key words: environmental aspects, relevant aspects, environmental management

Opsežna klasifikacija okolišnih aspekata u proizvodnom procesu. Ovaj članak prikazuje opsežan pristup klasifikaciji okolišnih aspekata s velikim skupom kriterija koji mogu biti korisni u definiranju relevantnih aspekata u proizvodnom procesu. Osim toga, rad prikazuje listu ključnih okolišnih aspekata za metalurški proces. Prema normi ISO 14001:2004 trebalo bi planirati proces identifikacije okolišnih aspekata. Rad završava sa shemom koja prikazuje poziciju procesa identifikacije okolišnih aspekata u sustavu upravljanja okolišem.

Ključne riječi: okolišni aspekti, relevantni aspekti, upravljanje okolišem

INTRODUCTION

The environmental management system must be planned. Standard ISO 14001:2004 includes three elements of planning:

- 1) environmental aspects
- 2) legal conditions – law
- 3) environmental targets and tasks [1]. Planning of environmental aspects starts from identification enterprises' affects on environment.

Environmental aspects identification procedure should include the comprehensive identification in the whole production process of a given enterprise including the co-operation with various entities in the value added chain of a product. Complex approach is based on different classification and environmental aspects assessment criteria.

In subject literature and in the requirements connected with environmental management (Regulation EMAS, attachment VI, ISO 14001 Environmental Management Systems) the notions connected with environmental aspects identification are presented very generally and are treated only as guidelines for analysis and assessment of aspects. The data given there do not take into account the specifics of functioning of a given enterprise in a sector of industry and do not determine all the criteria which should be used during their assessment. Not only are the environmental criteria helpful in determining how relevant a given aspect is, but also

other issues such as economic aspects (the costs of the ecological investments), legal conditions, social sensitivity and the influence on the image of an organisation (marketing approach).

The author of this publication have put together, in a comprehensive way, all the criteria of environmental aspects classification which may be useful in an enterprise to conduct a full assessment and analysis. The content of this publication may serve as a basic compendium of knowledge for production enterprises. In reference to such knowledge the enterprises may define the relevant aspects which are the basis of construction of environmental management system. The practical part of the article presents examples of key environmental aspects in a metallurgical enterprise.

COMPREHENSIVE CLASSIFICATION OF ASPECTS

Environmental aspect is defined as the element of the enterprise which affects the environment [1]. The quoted definition allows for separation of the real aspects (the current aspects) and the perspective aspects. Additionally, in order to complete the time criterion we should also take into account the historical aspects. The influence on the environment can be positive or negative [1]. Such approach to the influence of the aspect on environment is the basis for its classification as positive or negative on the environment.

Moreover, there are aspects created in the enterprise and/or resulting from activities of many enterprises. In

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this way particular links of the value added chain may be analysed taking into account both the basic processes (supply, production and distribution) as well as auxiliary processes (marketing, service) and supporting processes (administrative and managing) in reference to their influence on the environment.

According to EMAS regulation concerning the identification of environmental aspects such aspects can be divided into direct and indirect aspects. Direct aspects are connected with those activities of the enterprise which are managed and controlled by this particular enterprise. Identified indirect aspects may refer to reduction of the amount of natural resources, waste load on the environment, contamination of the surface waters and ground waters, pollution of air and soil, noise penetrating the environment etc.

While defining the direct aspects one can order them according the places they occur in the enterprise, i.e. assembly room, manoeuvring area, storehouses. Indirect environmental aspects are those which can occur in combination with actions, products or services which are not fully controlled and supervised by the enterprise.

During the identification of the indirect aspects one can use an interview with contractors, subcontractors and customers and the analysis of the use of materials, the activities of subcontractors and co-operating companies in the supply chain [2]. Examples of indirect aspects are leftovers of packaging, most commonly included into the category of municipal waste by the recipient of the final products. Indirect aspects arise in the surrounding of the enterprise and not directly in the enterprise.

The basis of the aspects assessment is to find among them the relevant aspects which are especially neglected areas and to create a register of them which would serve as a helpful tool for further actions connected with them. The aspects which are considered relevant are those which burden the environment the most. Their opposites are the aspects which have the least negative influence on the environment or its components.

The relevant aspects are also defined as essential, basic or foreground. The remaining aspects should be monitored because they may, as a result of various changes in techniques or technologies, become the relevant aspects. In a given moment of the analysis the other aspects are considered irrelevant, side-aspects or peripheral aspects [3].

Both the quoted definitions of aspects and the classifications resulting from systems of environmental management do not cover the range of possibilities of their further ordering for the purpose of their comprehensive identification and analysis. The author of this publication suggest the completion of the list with additional criteria presented in Figure 1.

For the purpose of this publication the criteria were named general and the starting point for their classification became the division of aspects into internal (arising in the enterprise) and external (arising in the surround-

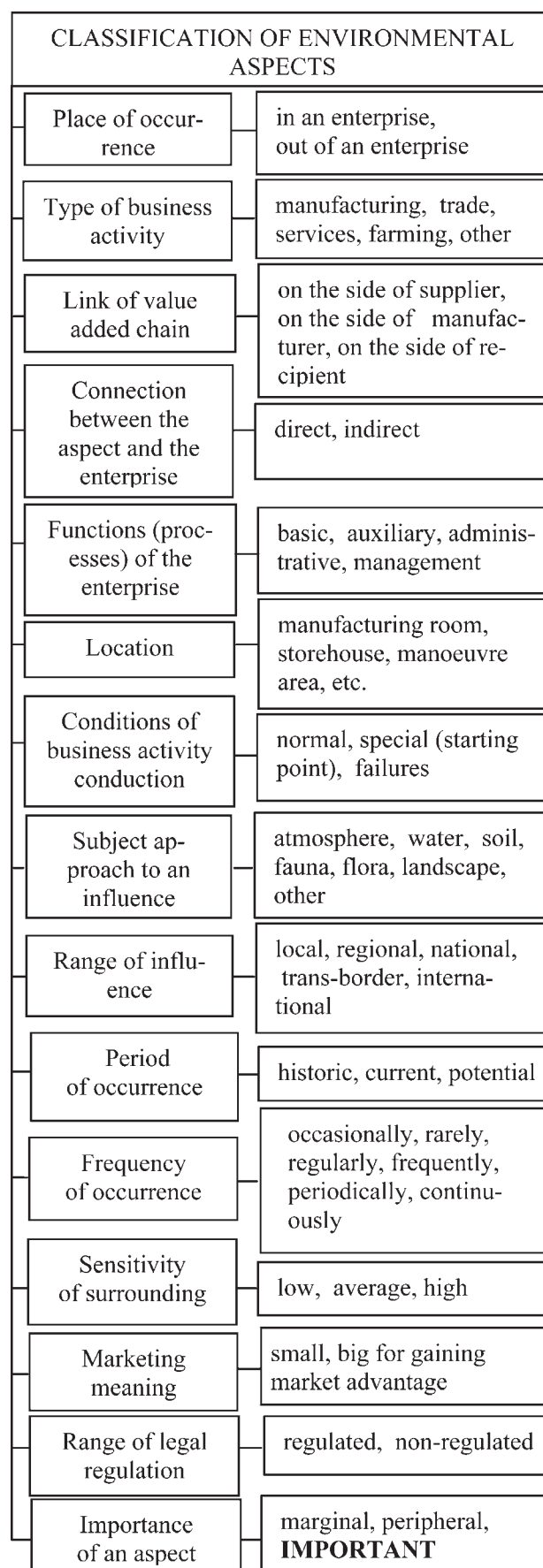


Figure 1 Classification of environmental aspects

ing of the enterprise). An example of the internal aspect is production waste. The external aspects may form in transport of materials, for example products dangerous

for the environment (explosives, combustible, toxic materials). This criterion of aspect classification should be taken into account together with previously mentioned division into direct and indirect aspects and with the analysis of the added value chain links.

Considering the position of the enterprise in the value added chain the aspects may be set in reference to the suppliers, producers and distributors of the products and other companies co-operating with the manufacturing enterprise.

In conditions of market economy it seems necessary to introduce marketing criteria of aspect classification into those which are essential in gaining the competitive advantage of the enterprise over others, for example the ecological packaging of products; and into those aspects which are not taken into account in a given current creation of product value for a customer.

Environmental aspects occur in each business activity. However, they are most commonly connected with manufacturing products. If the criterion of the frequency of their occurrence is applied in enterprises, one may enumerate those which occur occasionally, rarely, frequently and very often. But when the type of functions (actions) conducted in an enterprise is taken into account, one may refer to identified aspects in reference to basic functions (internal logistics, production, external logistics, marketing and sales, pre-sale services) and back-up (supporting) aspects including the administrative and management aspects as well as organisational and technical aspects. It is also necessary to define aspects referring to unusual situations in a functioning enterprise, for example in case of a failure. Additionally, the enterprises should analyse aspects taking into account the multitude of action options and possible scenarios of events (pessimistic, optimistic, surprising and most probable).

Once a criterion of the influence of aspects on the environment is applied, an assessment of the range of the aspect can be conducted with division into local, regional, national, trans-border and international range. In reference to particular categories of aspect influence, the manufacturing enterprises co-operate with proper public powers and institutions responsible for protection of environment, for example local (council) authorities, proper ministries and their organisational units. The assessment of aspect influence on the environment must also include subject range of its influence on particular environment components, for example water, air, soil, landscape, fauna or flora. Certain aspects are regulated by law, for example types of waste and certain aspects are not regulated for example a bothersome smell (at present in Poland certain works are being conducted on the level of local authorities which should regulate the legal issues connected with the notion of bothersome smell). The level of social sensitivity to the influence of a given aspect on the environment also varies, for example in the tourist areas the sensitivity to influence on environment is bigger than in the areas

which are highly industrialised [4]. The mentioned classification criteria of environmental aspects do not limit the other possibilities in this matter but treat the most commonly applied categories of their identification in a complex way. The process of environmental aspects assessment must be based on many issues and should include, among other issues, the analysis of legal requirements, non-regulated streams of polluted air, sewage and waste (non-regulated aspects), selection of aspects connected with, i.e. non-effective use of materials and resources, defects of parts, defects of products and waste from packaging as well as logistics and the product wear [5].

The identification of aspects should be conducted systematically because then there is a smaller risk of the unexpected, additional burdens on the environment. The right choice of relevant aspects is the main tool of environmental management system, shows the direction for actions concerning the protection of the environment [6,7].

The identification of aspects should be realized according to input and output system (black box) –Figure 2. On the base of system the first list of environmental aspects is constructed [8,9].

Moreover enterprises can use benchmark values analyses. The European Council's Environment Committee (in December 2010) agreed upon benchmark value CO_2/t including those for key steel products (i.e. coke 0,286, sintered ore 0,171, hot metal 1,328, EAF carbon steel 0,283, EAF high alloy steel 0,352 [10]. Such benchmark values can help enterprises to estimate the key environmental aspects.

For exemplified metallurgical enterprises the list includes such aspects:

- exploitation of natural resources (iron ore, coal, flux, electricity use, water consumption),
- solid waste arising within the steel industry are divided into: generated in the applied production process (i.e. steelmaking slag, rolling scale) and generated in the environmental protection process (i.e.

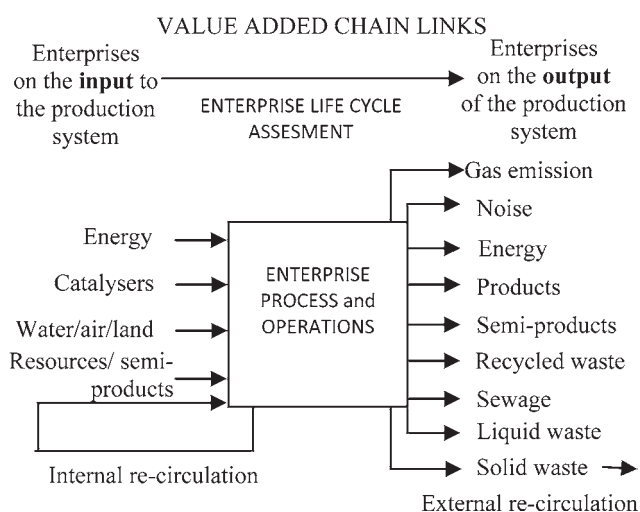


Figure 2 Diagram of material balance scheme in manufacturing enterprise

- sludge/slurry, filter dust, flue desulfurization residue etc.), hazardous waste,
- steel effluent (steel effluent is discharged exclusively to a decanter and separator system, effluent treatment in steel works is mostly by mechanical methods),
- sanitary effluent (sanitary effluent is directed to municipal treatment facilities),
- dust emissions (in 2010 the average dust emissions factor was 0,59kgs/t crude steel (average for EAF and BF/BOF router) [10]),
- gas emissions (highest share comes from CO₂ emissions (98,2 %),
- noise emission (i.e. emission of noise during the work of the railway wagon tippler, noise emission by the machines (sinter breaker), noise emission from ventilators which cool sinter, noise emission from dust extraction device), etc.

The significance of the notions presented in this publication in the environmental management system is presented as a logical sequence of events in Figure 3.

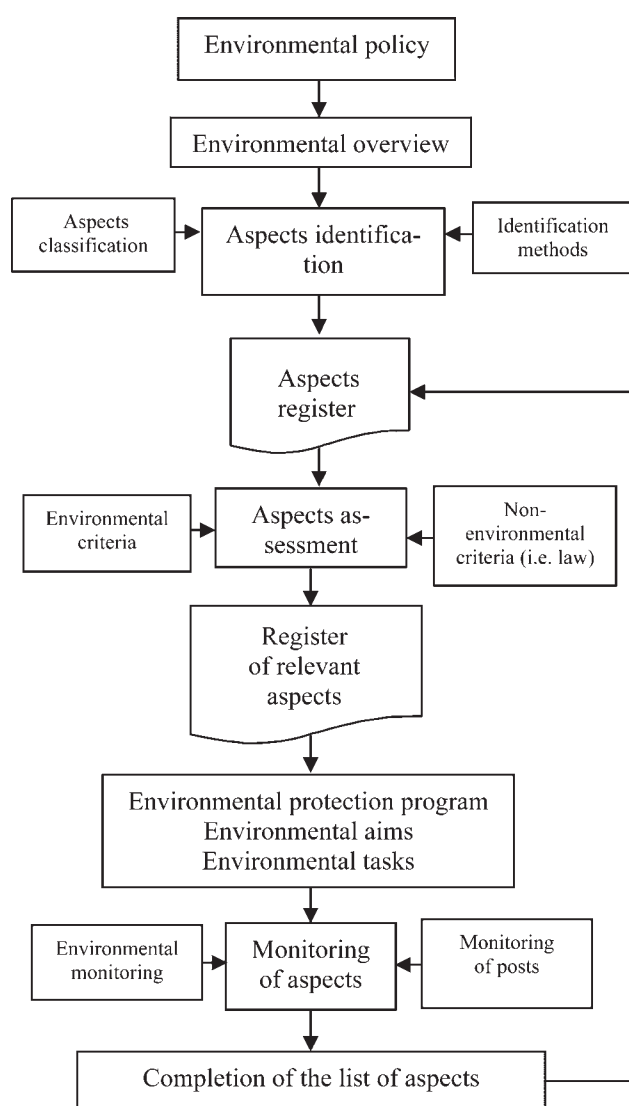


Figure 3 Identification of environmental aspects in environmental management system

CONCLUSIONS

The notions presented in the paper are a compendium of knowledge for conduction of analysis of influence of manufacturing enterprise on the environment. Identification of the environmental aspects including the selection of the key aspects is an element of environmental management system introduction in an enterprise. In case there are no ready schemes and procedures of environmental analyses, the enterprise may use: the criteria of environmental aspects prepared by the author of this publication.

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