

B. GAJDIK

ISSN 0543-5846

METABK 51(1) 129-132 (2012)

UDC – UDK 65.012.2:669.013.5.004.8/65.01:669.013.5.009.04.502.5=111

## THE ECOLOGICAL VALUE OF METALLURGICAL ENTERPRISE AFTER PRIVATIZATION AND RESTRUCTURING

Received – Prispjelo: 2011-02-10

Accepted – Prihvaćeno: 2011-04-20

Review Paper – Pregledni rad

The aim of the article was the presentation of the ecological effects achieved in the metallurgical company in Poland after privatization and overall, thorough restructuring. For the need to conduct privatization of the state-owned enterprises and their restructuring resulted from the transformation of the national economy. The market system forced the introduction of the changes in the functioning of all the enterprises, among them also the metallurgical enterprises. On the basis of the metallurgical company Ferrum SA (joint-stock company), the producer of the pipes, the road of the company towards the competitiveness is presented. The bases for the comparisons were various ecological aspects. Data from the environment reports of the metallurgical company Ferrum SA were used in order to conduct the analysis.

*Key words:* ecological effects, metallurgical enterprise, restructuring process, cleaner production

**Ekološka procjena metalurških tvrtki nakon privatizacije i restrukturiranja.** Cilj rada bio je predstavljanje i provedba ekoloških djelovanja u metalurškoj tvrtki u Poljskoj nakon privatizacije i temeljitog restrukturiranja. Provođenje privatizacije državnih poduzeća proizlazi iz transformacije nacionalne ekonomije. Tržišni sustav uvodi prisilne promjene u funkcioniranje svih poduzeća, među njima i metalurških poduzeća. Na osnovi metalurške tvrtke Ferrum SA (dioničko društvo), proizvođača cijevi, prikazan je put kompanije prema kompetitivnosti. Osnove za usporedbu su različiti ekološki aspekti. Podaci iz ekoloških izvješća metalurške tvrtke Ferrum SA koristili su se za provedbu analize.

*Ključne riječi:* ekološki efekt, metalurška tvrtka, procesi restrukturiranja, čista proizvodnja

### INTRODUCTION

In 1989 Poland began the transformation of national economy. A process of thorough and universal changes began in the whole system of economy, that is in all its branches, regions, local economies and particular enterprises. A whole range of actions was taken in order to save, maintain or improve the business activity of the economic entities [1].

The processes of adjustment of the enterprises to the requirements of the market economy were based on the private ownerships and complex restructuring. The recovery processes in metallurgy sector in Poland began in 1992. The repair restructuring was conducted to avoid the winding-up (the insolvencies) of the companies and to restore the financial liquidity of the enterprises [2].

The repair processes were conducted together with proprietary, legal and organisational changes. Privatisation processes of the steelworks in Poland were realised through liquidation procedures, direct privatisation, commercialisation, program of National Investment Funds (in Polish: NFI) and equity method, most frequently with the participation of the foreign investors. New economic

entities were created, which after repair restructuring underwent development restructuring and that allowed them to compete on the global market of metallurgy products. The basis for gaining the advantage in competitiveness was the construction of the enterprise value through new strategies of operation. One of those strategies was the strategy of Cleaner Production (CP) which allowed for the creation of ecological values category for metallurgical enterprises [3]. A metallurgical enterprise Ferrum SA was a case study here, due to the fact that it implements the assumptions of the CP strategy and achieves the measurable ecological effects.

### THE ROAD OF THE METALLURGICAL ENTERPRISE TOWARDS OBTAINING THE CLEANER PRODUCTION CERTIFICATE

Ferrum enterprise had been functioning on the market as Ferrum steelworks up to the year 1995. In 1995 the privatisation process of the steelworks within the National Investment Funds (NFI) was completed. Two economic entities were created, Ferrum SA (joint-stock company) and Ferrum Welding Structures Plant (dependent limited liability company), both on the basis of the old enterprise assets. The enterprise Ferrum SA, the national leader in the production of the steel pipes used for gas

B. Gajdik, The Silesian University of Technology, Faculty of Materials Science and Metallurgy, Katowice, Poland

pipelines, water, sewage and many other substances transportation, was analysed in this paper. The enterprise produces also metal constructions as well as performs inner and outer pipe insulations. The company produces welded steel pipes, welded tubes with the use of high-frequency current, spiral and longitudinal welded pipes. The biggest part of the steelwork's products are steel welded pipes (about 50 % of production) and spiral welded pipes (about 30 %). Longitudinally welded pipes constitute 5-10 % of the whole production. The rest of the production are closed steel sections and large-size containers and cisterns. In the whole pipe industry in Poland this company possesses 40 % share in the market.

The process of privatisation was conducted together with reconstructive activities, such as legal and organisational changes (creation of the commercial company), relating to property (the division of the dependent limited liability company - Ferrum Welding Structures Plant) and financial (debt reduction and recapitalisation of the enterprise). The restructuring of the employment was an important part of the restructuring changes and was conducted on the basis of Ministry of Economy Regulation concerning the grant for financing the employment restructuring in Iron and Steel Industry- the so-called Steelworks Social Package and due to the company's assignment to newly formed dependent company. At present, the enterprise employs about 400 workers. Next stage of the changes was operational restructuring. It meant changes in the production technologies, in the range of the produced products, the initiated marketing activities and the application of new organizational-managerial methods and techniques.

In the analysed enterprise the process of thermal cutting in the production of welded constructions (the manual operations of laying, laying out and making structure elements were replaced with sheet cutting with the use of micro-computer controlled automatic devices) and the assembly line for welding pipes with the use of high-frequency current were modernised (the assortment of products on offer was modified and the pipe expander, which was the source of toxicity category 2 waste i.e. scale, was removed). Besides those investments the company has also completed other projects allowing for the achievement of the ecological effects, for example, the post-mining gas was used in the local boiler-room (saving of coal of up to 50 %), the system of water circulation was modified (90 % savings of water). The ecological and economic effects were a result of Cleaner Production (CP) strategy application. The CP certificate was obtained by Ferrum SA in 1996.

## ECOLOGICAL VALUE OF THE METALLURGICAL ENTERPRISE

Assuming that the "restructuring is a growth strategy of enterprise value, which is understood either as assets value or as a value of the possibilities created by those assets [4] the ecological effects were calculated for the

technological investments realised in Ferrum SA and those are one of the constituents of the enterprise value.

It was assumed in this paper that the value of enterprise comprises of values of particular streams, which are generated by the enterprise in the whole period of its relationships with the surroundings. The modern understanding of the components of value category is very complex. The category of the enterprise value is the creation of the environment in which it functions [5]. Such value is the combination of market aspect (the value perceived by the client) [6], financial aspect (the value perceived by investors, stock holders and owners) [7], logistics aspect (the value of the supply chain) [8] and ecological aspect (dynamic model of the environmental protection). The list of the streams has an open character and results from the complex relations of the enterprise and the surroundings. The higher the value of particular value streams, the higher the value of the enterprise.

The concept of ecological value of the manufacturing enterprise was created as a result of Cleaner Production strategy implementation. According to this concept, the companies are motivated by the reduction of the negative influence on the environment (lower levels of pollution emissions) and through the rational resource management (saving energy – electricity, thermal energy, water, gas etc.) [9]. With the above mentioned assumptions, the analysis of the ecological value of the metallurgical enterprise Ferrum was conducted. It was chosen due to the fact that it was the first enterprises which initiated the realization of the assumptions of CP strategy. The range of analysis was the period between the years 1990-2009.

The basis of the research was assumed as the levels of influence of the enterprise influence on the environment in the year 1990, which was before privatisation and restructuring of the company. In order to assess the value category, the data published in environment reports of the enterprise were used [10]. All the influence values of the enterprise on the environment were recalculated for 1 ton of averaged production. Particular values were referred to the reference year. The values of the reference year were presented on the diagram as 100 %. The ecological effects were calculated from the formula:

$$W_e = \frac{C_m \times 100 \%}{B_{t_0}} - 100 \%$$

where:

$W_e$  – ecological effectiveness index

$C_m$  – ecological effects in the period  $t_n$  ( $n$  – the following years included in the analysis)

$B_{t_0}$  – reference year ( $t_0$  – year 1990).

The calculated ecological effectiveness indexes in case of pollution emission inform: by what percent value the emission dropped in a tested year, and in case of the use of environment resources: how is the use smaller in the analysed year in comparison to the reference year.

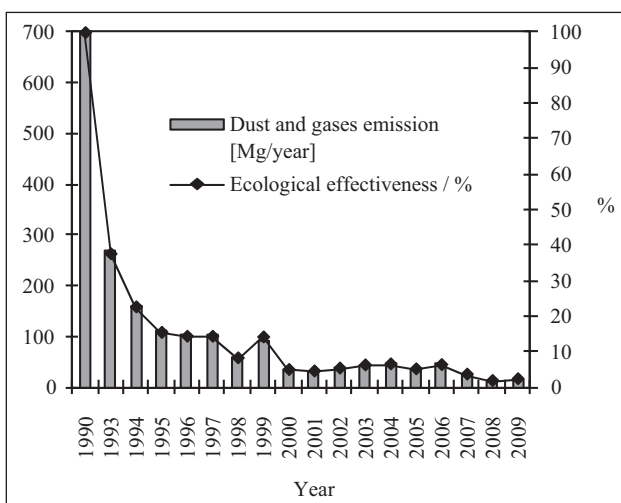


Figure 1 The indexes of the ecological effectiveness in the category of dust and gases emission (without CO<sub>2</sub>)

### POLLUTION EMISSION TO THE ENVIRONMENT

First category of analysis was the gas and dust emission to the environment. The results of the analysis were presented in Figure 1. In the year 2009, in the category of pollution emission to the atmosphere (gases and dust) the decline of 97,8 % was observed. The highest value of that index, that is 98,3 % was reached in 2008. The lowest value of that index – 62,5 % was observed in 1993.

The next category of analysis was the post-production waste. According to the data from 2009 in reference to the values noted in 1990 the company reduced the amount of the produced waste, reaching the reduction index of 60 %. The highest ecological effect was noted down in 1998 and 1999, which was a 96 % drop. The lowest level of the index was noted down in the year 2008 and it was 60 %. It should be pointed out here, however, that the Polish law concerning waste was subjected to changes and the range of particular categories of waste was broadened. That is why the variety of the results may be observed on Figure 2.

Next category was the created sewage (Figure 3) Also in this category of the influence on the environ-

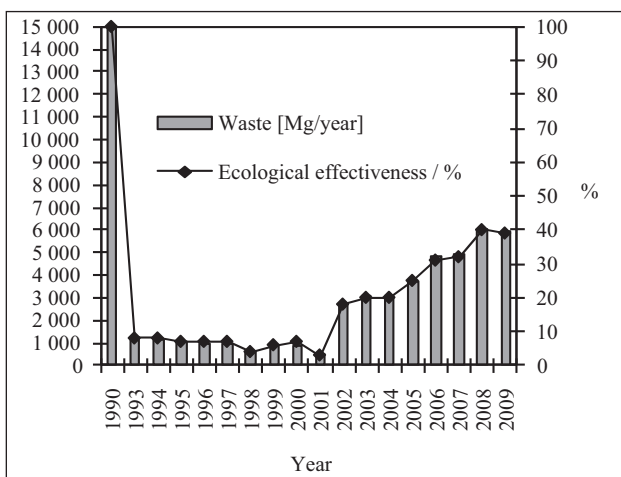


Figure 2 The indexes of ecological effectiveness in the category of waste

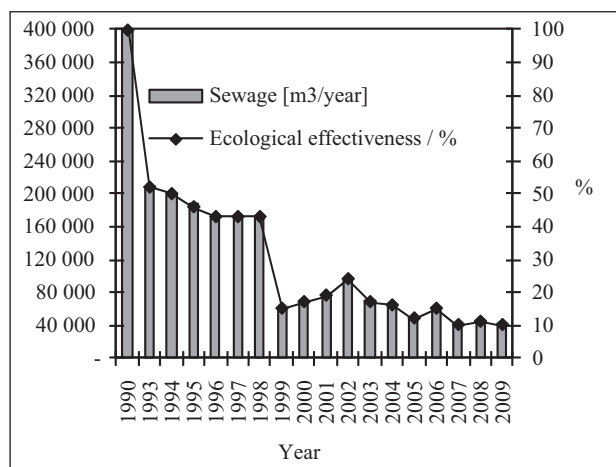


Figure 3 The indexes of ecological effectiveness in the category of sewage

ment a drop of 89,6 % was noted down. The highest effectiveness index was reached in 2007 and it was 90 %, the lowest was in 1993 and it was 48 %.

### MANAGEMENT OF THE ENVIRONMENTAL RESOURCES

In the management of the natural resources the metallurgical enterprise Ferrum SA reduced the use of water by 91 % in 2009 in reference to the data from 1990. The highest ecological effectiveness level was reached in 2007, a drop in the use by 91,5 %. The lowest level was in 1993 - 49,9 %.

Detailed data is presented in Figure 4. The completed investments allowed also for limiting the amount of the used electricity by 41,2 % in 2009 in comparison to the year 1990. The highest level of that index was noted down in 2002 and it was a drop of 58,2 %. The lowest occurred in the year 1995 – 5,4 %.

In Figure 5 the rest of the indexes is presented. Another category for the analysis was the use of thermal energy. A drop was observed also here. In 2009 78,5 % of thermal energy was saved and it was the highest index level observed. The smallest savings were made in 1993 (9,8 %). The details are presented in Figure 6.

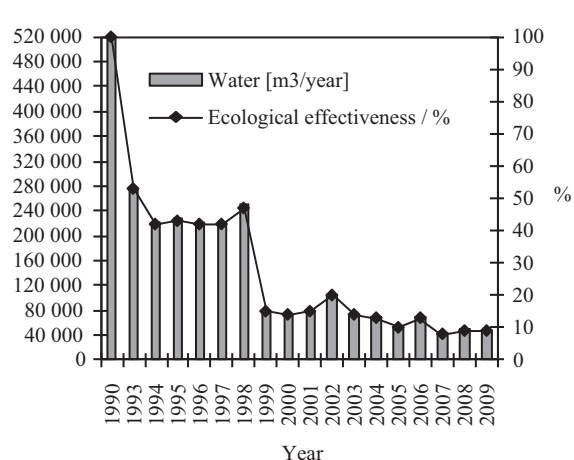
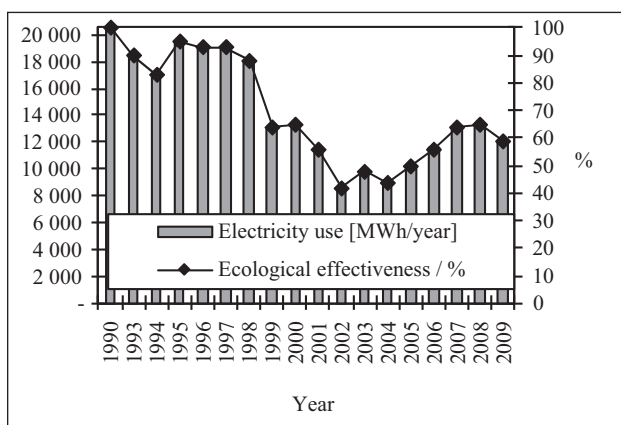


Figure 4 The indexes of ecological effectiveness in the category of water management



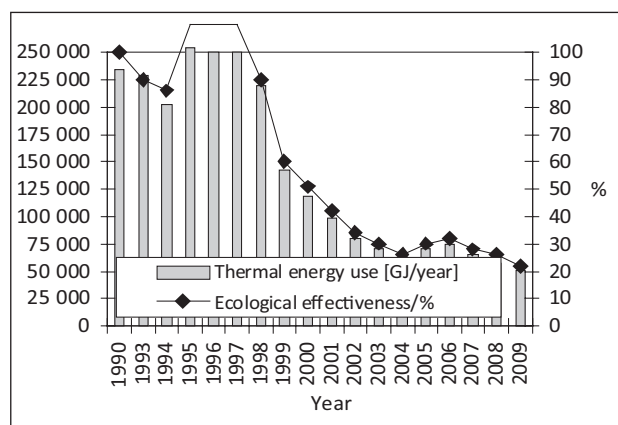
**Figure 5** The indexes of ecological effectiveness in the category of electricity use

In 1995-1997 there were not ecological effectiveness in the category of the thermal energy use. The company used more thermal energy than in 1990 (growth about 25 000 GJ per year).

The last category of analysis was the use of earth gas in the enterprise. The highest effectiveness was noted in 2009, the drop in the use of 99,4 %. In 1993 the company Ferrum SA used the post-mining gas as energy fuel. In 1993, 4 million m<sup>3</sup> of gas was used and in the following years the value was gradually bigger and up to 7,9 million m<sup>3</sup>. The application of the post-mining gas (co-operation with KWK Staszic coalmine) allowed the enterprise for the reduction of coal use for heating (local boiler-room) of about 50 %.

## CONCLUSIONS

The privatisation of Ferrum steelworks in 1995 and restructuring of the metallurgical company Ferrum SA, as well as the implementation of the Cleaner Production strategy allowed the new entity to adjust gradually to the new requirements of the market. After the analysis of the data included in the environment reports it was concluded that the company reached significant ecological effects by the reduction of pollution emission to the environment and by the reduction of energy and water resources application. The created ecological value enabled the enterprise to maintain the position of the leader in the production of steel pipes on the Polish market and to enter the foreign markets. The sales value of Ferrum SA on foreign markets rose from 8,9 % in 2004 to 37,8 % in 2006. In 2007 there was a rise up to 48 %.<sup>10</sup> It was caused mainly by gaining new clients from Latvia, Lithuania, Austria and Holland in 2007.



**Figure 6** The indexes of ecological effectiveness in the category of thermal energy use

The improvement of the position of the competitive company is a result of application of energy-saving technologies and elimination of the produced pollution at the source. The final effect of such activities are the products which comply with the requirements of the international norms.

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**Note:** The responsible translator for English language is Dorota Sidlo, Silesian University of Technology Katowice, Poland