

ENVIRONMENTAL MANAGEMENT IN THE ENERGY SECTOR ON THE EXAMPLE OF POWER PLANT IN BELCHATOW

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Abstract: *The environment is the area which includes forests, fields, lakes, rivers, ponds, mountains, hills and valleys. In Poland, the environment is visible from all sides, as opposed to fully urbanized areas, such as occurring in China, bigger parts of our country has not yet been destroyed by human activities. And, for a few years, awareness of environmental protection gradually increases in both, private individuals and large companies. This article shows how the power plant in Belchatow, one of the biggest polluters and the units responsible for environmental degradation, can cope with the problem of what is the impact of its activities on the environment. In this article will be presented all the activities of power plant in order to minimize its negative impact on the surrounding environment.*

Key words: *environmental management, power plant, energy sector*

JEL Classification: *D0, H1, L11.*

1. INTRODUCTION

The concept of "environmental protection" is not a new concept. This definition has been known from the beginning of the civilization. At the beginning, in ancient Rome, the issue of urban waste water which caused pollution of the Tiber was recognized. In modern times the cause of many negative occurrence which disturbing agreement between the man and the environment was a constant technological progress. Many people are familiar with a short video showing the new marvel of technology as it was at that time a car capable of breakneck speeds 20km/h and producing huge quantities of gas. In general, the twentieth century is a symbol of rapid growth with the simultaneous degradation of the environment. At the time, concern for environmental protection was neglected topic because everyone aspired above all to achieve the greatest profits without paying attention to costs, whether it was

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appropriate treatment for a worker, or just the environment. The effects of some of these activities are still visible today, and many of them will affect our environment, for a few or for a several dozen years.

Today, the idea of environmental protection is gaining wider acceptance in our society. It is almost fashionable to be "organic" - sort the garbage, save water, energy and gas, have solar panels and drive a car with a hybrid engine. Eco -Fashion has reached to a many large companies, which are now willing to implement pro-ecological solutions, trying on all fronts of its business to reduce its negative effects on the environment. Almost all companies, both small and large, make tools, procedures and regulations which can be described as the environmental management

2. ENVIRONMENTAL MANAGEMENT

Environmental management is the management of company's operations that have, had or may have an impact on the environment. The aim environmental management is to preserve the natural resources and environmental and occupational health and employee's and population's protection (Szydłowski, et al., 2005).

Throughout the 1990s and the beginning of XXI century, most of the companies in America and Europe became more aware that environmental issues and regulations required a new approach. It was recognized that environmental laws are products of ideas and social forces (most of them) whose time had come. Companies saw that enforcement of these laws is very important as a matter of public policy and the companies who ignore that law can be no longer more competitive to the others. In addition, the recognized that public (customers in other words) with the environment, together, cannot be asked to take all the risks associated with scientific uncertainty. And the industry must accept controls before all the evidences of science become conclusive. It is because, the public is their customers and the main companies' policy is to satisfy the public even they are wrong. Acceptance of the reality of environmental costs, liability, and risks led to the development and increasing importance of the field of environmental management. Until 1998, there were no environmental management courses in business schools. Now many business schools incorporate "environmental business" courses into their curricula, as well as consider other social impact issues (Friedman, 2006).

Today, most of the companies are working to make environmental issues effectively-cost and spend the money in a right way; the reason of this is the costs of various environmental programs are very high. Sometimes, the companies and government agencies are working together to make sure that the money are well spent. Companies can also use many management techniques to improve their environmental performance and control costs. These techniques can include: Total Quality Management, careful, Life-cycle analysis, sustainable manufacturing and full cost accounting. Now, environmental management has grown and achieved the international level, and many various companies (now eco-friendly) have developed lots of programs and initiatives in purpose to help managers and businesses in making changes and, more important, identifying opportunities to make further improvement in environmental management field.

There are many definitions, terms and concepts in such a wide field which is environmental management, the short descriptions a few of them can be very helpful to gain a general understanding what is environmental management (Wilson & Sasseville, 2008):

- **Life Cycle Assessment** - the main definition of LCA is that life-cycle assessment is a technique to assessing the environmental aspects and potential impacts associated with a product, by compiling an inventory of relevant inputs and outputs of a product system, evaluating the potential environmental impacts associated with those inputs and outputs and interpreting the results of the inventory analysis and impact assessment phases in relation to the objectives of the study (ISO 14040).

- **Cleaner Production** - involves the application which continuously integrates preventive environmental strategy to products, services and processes in purpose to increase efficiency together with risks minimalisation. Cleaner production also includes the conservation of raw materials and energy, reduction of quantity and toxicity of all emissions and wastes.

- **Design for Environment (DfE)** - it is a technique which can be used to incorporate environmental considerations into the process', products' and services' design. By assessing environmental impacts over the whole life cycle at the development stage, firm can practice DfE to reduce material and energy intensity as well as emissions and waste. DfE also provides a framework through which to undertake eco-efficiency, pollution prevention, cleaner production (Fiksel, 2009).

- **Eco-Efficiency** - this term describes the goods and products with the price and service that satisfy human needs and bring quality of life. In addition these goods and products progressively reduce ecological impacts. At the beginning the Eco-Efficiency term contains two elements: economics and ecology. To be fulfilled, companies must take other steps to add the third element which is social progress.

- **Pollution Prevention** - this term is close to "cleaner production" and is often used to describe the strategy of continuously reducing pollution into environment, i.e. eliminating waste during the process. EPA defines "pollution prevention" in terms of source reduction, i.e., preventing or reducing waste where it originates, at the source, including practiced that conserve natural resources by reducing or eliminating pollutants through increased efficiency in the use of raw materials, energy, water and land (Collin, 2006).

- **Industrial Ecology** - it is a field of science that checks global, regional and local flows of materials and energy in products, processes, economies and industrial sectors. It focuses on the industry's role in reducing environmental burdens through the products life cycle - beginning from the raw materials, production process, use those goods till the end of its life (products'). Industrial Ecology's aim is to achieve closed loop system, in which wastes from one product can be reused or become raw materials for other goods.

- **Supply Chain Environmental Management** - this definitions contains a wide range of activities, such as screening suppliers, working collaboratively with them on a green design initiatives or providing training to build environmental management capacity for the suppliers. It involves a co-working with the suppliers from the top of the supply chain and with the consumers and distributors from the

bottom of the supply chain. This definition is also being applied to promote sustainability development.

- **Environmental Management Systems (EMS)** - it is a part of business' overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintain environmental policy (Cortes & Poch, 2009).

- **Total Quality Environmental Management (TQEM)** - this definition describes the process to approach a constantly improvement the quality of products', processes' and services'. This field has a few primary key elements: a very high level of management commitment, a strong customer, employee involvement, teamwork and a long term focus. According to Global Environmental Management Initiative (GEMI), in TQEM four basic elements assure right guidelines for planning in business: customers' identification, continuously improvement, eliminating environmental problems before they occur and looking at each environmental part as a system.

3. ISO 1400 SERIES

ISO 14000 is a series (Piper, et al., 2003) of standards which can be very helpful with establishing and maintaining a structured and systematic environmental effort to improve companies' performance at an environmental field. These standards are using tested and internationally methods to provide the most accurate guidelines to the companies. ISO (International Organization for Standardization) 14000 series is divided between organization and production parts. Organizations' part includes the following (Johnson, 2007): environmental management systems and communication (ISO 14001, ISO 14004 and ISO 14063; environmental auditing (ISO 14010 and ISO 19011; environmental performance (ISO 14030) and productions' part includes: environmental labels and environmental declarations (ISO 14020); Life Cycle Assessment (ISO 14040); environmental aspects (ISO guide 64 and ISO/TR 14062).

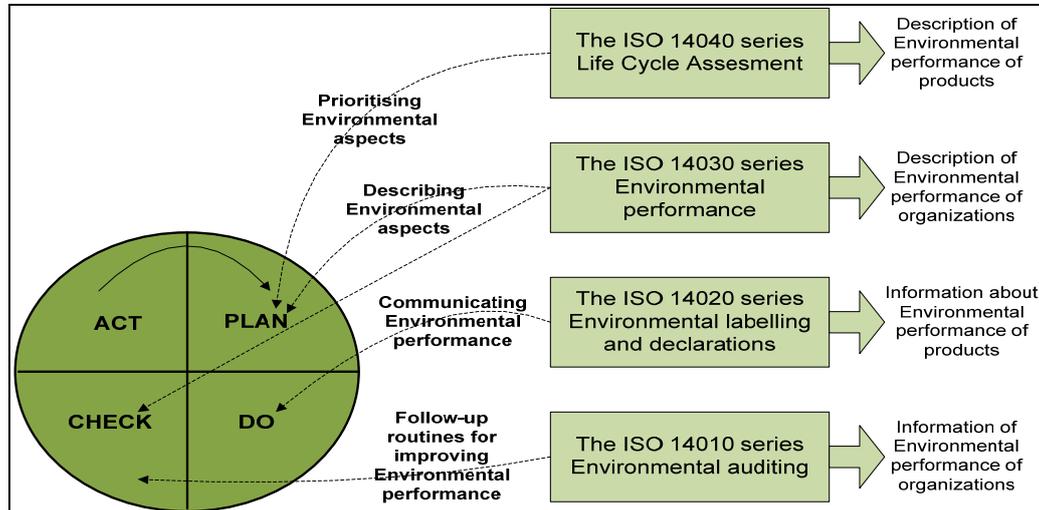
All these standards have been developed in the way that they can be used together or independently and they constitute a rational flow of activities which is presented in figure 1.

As the environmental management and Life Cycle Assessment were presented in the first part of this article, below are shortly presented the following standards. *Environmental performance* provides a way of describing and expressing a company's environmental aspect which are significant for it. These forms or "key-terms" can be very helpful when it comes to recognizing and judging the relevance of the environmental work as a whole, separate part.

Environmental labelling and environmental declarations provide many different tools that company can use during the communication between various parties about the products' and services' impact on the environment. These tools also are clearly related to other tools in the ISO 14000 series.

Environmental review is very close to environmental management. The review gives the company a guideline for following-up and checking the result if their

environmental work agree with the starting points. The reviews should compare, regularly, the results of the company's environmental work in many various areas.



Source: Author's elaboration based on Marcus P. A., Willig J. T., *Moving ahead with ISO 14000. Improving Environmental Management and Advancing Sustainable Development*.

Figure 1. The ISO 14000 Family

4. BELCHATOW POWER PLANT ACTIVITY AND ITS IMPACT ON THE ENVIRONMENT

The government decision to build a team of Mining and Energy Station was taken in 1971 on the basis of discovered in the 60's brown coal's large deposits in those surroundings. Start of construction of the plant occurred in 1975. After carrying out research on plant location, the resort decided on Rogowiec, placed 1.5 km from the northern slope pit. The plant has a power of 4,320 MW and consists of 12 power units of 360 MW each. Since the 90s the plant provides heat in the amount of power needed and the entire city estates. It is the largest both in Poland and Europe, coal-fired power plants. Its annual consumption of coal is approximately 28 billion kWh and due to its favourable location, modern technology and the size scale, Belchatow power plant produces the cheapest electricity in Poland.

Negative aspect of Power Plant is its negative impact on the environment, both at the local level and, also, national as well as the entire continent. The losses which arise in the environment under the influence of power can be classified as follows:

1. Depletion of non-renewable resources - a process which is due to overexploitation of resources during the wastage of raw materials are associated with major raw material extraction, mining activities also significantly affects the degradation of the surface;

2. Air pollution - is caused by burning fossil fuels (coal and lignite) as a result of penetration into the atmosphere of large quantities of dust and gases: sulfur oxides, nitrogen compounds and carbon monoxide.
3. Pollution of water - they are associated with atmospheric pollution and soil. This phenomenon is extremely dangerous for the sake of fundamental importance of water in sustaining life processes and the important role it plays in many industries. Power by discharges of waste heat changes affects the habitat and the aquatic environment biocenosis, leaving one organisms killed with new organisms appearing instead.
4. Contamination of soil - the destruction of soil structure changes its water retention, which is very important in terms of flora and fauna. Excessive soil chemization brings catastrophic consequences, resulting in the soil is excluded from crop production. To restore the original condition of the soil time, money and experience is needed;
5. Negative changes in the flora - as a result of diminished power of communities of bogs and meadow vegetation, have increased the derelict former agricultural areas;
6. Lowering the standard of living - all these negative aspects of power significantly contributes to the deterioration of living conditions in its close neighborhood.

5. ENVIRONMENTAL MANAGEMENT AT BELCHATOW POWER STATION

Since the inception of the Power Station has taken actions whose main purpose was to reduce its negative impact on the environment. Used in the power system of environmental protection includes: air protection; water conservation; rational management of water resources and waste; noise protection.

The system consists of research and measurement to investigate the activities of the Power Plant on the environment. From the beginning of its, power is working closely with a number of measurements and research institutions within which are conducted the following tests: environmental monitoring in the area of landfill furnace; measurement of dust around a waste landfill furnace; monitoring the environment in the storage area of the FGD gypsum which is located on the outer dumping; study of the effects of dust in storage on the environment.

The Regulations MOSZNiL of 12 February 1990 on air protection against pollution, presented of emission standards in the exhaust gas boiler has set the Power Station to the task - meet the required standards. At the beginning the power applied dry flue gas desulfurization method, but after a while it was found that this method is insufficient and must be applied highly effective method - wet and semi-dry. The choice of the wet it was decided because of the following advantages: a high desulfurization efficiency, above 90%; relatively low operating costs; high flexibility of the system; high reliability technology and equipment; availability of sorbent and its low cost; the possibility of development of gypsum as a high-quality waste; entries in the "National Program for SO₂ reduction by 2010"; the universality of this method in the world, extensive knowledge about technology.

After a decision on the method, Power signed a contract with Dutch company Hoogovens HTS to build flue gas desulphurization system - the first four were built in 1994-1996, a further four were built in 1999-2003 (by the Polish company Rafako), and in 2007 the construction of the next two installations was completed. Since the installation of FGD Plant observed a significant reduction of SO₂ in the coming years:

Table 1. SO₂ reduction, years 2000-2008

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Reduction (%)	33,6	36,8	45,8	51,0	50,8	55,9	62,6	64,0	70,0
Reduction (thousand tones)	128,4	166,8	208,3	210,9	180,0	184,4	234,3	203,3	216,3

Source: Environmental report, Power station in Belchatow 2009

As the energy sector is seen as a source of negative impacts on the environment, the Power Station shall take any action to change that opinion. To this end, the power station was implemented Environmental Management System which is based on meeting the requirements of the PN-EN ISO 14001. The purpose of this system is a comprehensive approach to action to protect the environment, meaning, the desire to reduce the negative impact of power on the surrounding environment through monitoring and continuous reduction of the contamination.

Power Station has also received PCBC and IQNet certificates in 2003 as a confirmation of the implementation and integration of the Quality Management System, Environmental, Health and Safety in the area: manufacture and sale of electricity and heat; repair, telecommunications and supply service; improving safety and health of workers.

Additional evidence of the fulfillment by the power of all these standards for the protection of the environment is to issue "Licenses Integrated" which arises from the IPPC Directive. The permit is an administrative decision and represents a sort of license to conduct the installation, under the conditions set for all components of the environment as well as meeting the technical studies identified as the best available techniques (BAT). The permit specifies the type and amount of energy used, materials and raw materials and fuels, while also assessing the methods used by the power to prevent the emission of pollutants into the environment.

6. CONCLUSION

The main purpose of this article was to present how the introduction of environmental policy to the company in the energy sector, which is the Belchatow power plant, may affect its activities in the field of environmental protection. Crew from the Power Station seems aware of this for many years, and has long been taking important, both for power and the environment, measures to minimize its negative impact on the surrounding environment. It can be safely said that the Power Station is an extremely involved in matters of care for the environment is using. Its purpose is to provide to a market a product, which is environmentally friendly and can already boast achievements. It may take great satisfaction from the activities carried out since the

effects of these activities are considered and the positive assessment by the environment, institutions and government organizations. Confirmation of this may be the next licenses obtained to operate the License Integrated and let generating electricity and heat power of not less than 300 MW and permits for a water abstraction from groundwater source through upper cretaceous level.

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