IMPLEMENTATION OF COUNCIL DIRECTIVE CONCERNING INTEGRATED POLLUTION PREVENTION AND CONTROL (IPPC) IN POLISH METALLURGY

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Abstract

Principal objectives of European Union Integrated Pollution Prevention and Control Directive in Polish metallurgy will be presented in my report. The IPPC Directive is being introduced across Europe to improve the standard of environmental protection. The purpose of the Directive is to achieve prevention and control of pollution. Best Available Techniques (BAT) are recommended for the Iron and Steel Industry according to the requirements of EU Directive 96/61/EC. A range of techniques or their combinations recommended as Best Available Techniques for systematic reduction of harmful emission are concerned with environmental aspects of the whole iron and steel making cycle. The Iron and Steel Industry is a highly material and energy intensive industry. More than half of the mass input becomes outputs in the form of off-gases and solid wastes/by-products. The most relevant emissions are those to air. Those from sinter plants dominate the overall emissions for most of the pollutants. The most relevant environmental issues are the off-gas emissions from the sinter strand, which contains a wide range of pollutants such as dust, heavy metals, SO_2, HCl, HF, PAHs and organochlorine compounds (such as PCB and PCDD/F). Although big efforts have been made to reduce emissions, the contribution of the sector to the total emissions to air in the EU is considerable for a number of pollutants, especially for some heavy metals and PCDD/F.

Introduction

The European Union has a set of common rules on permitting for industrial installations. These rules are set out in the so-called IPPC Directive of 1996. IPPC stands for Integrated Pollution Prevention and Control. The IPPC Directive is about minimising pollution from various point sources throughout the European Union. IPPC covers a range of industrial and non-industrial sectors. In some of these sectors, for example iron and steel use is a significant proportion of the costs of the business and also a significant contributor to the environmental impact.
To prepare Poland in implementing the IPPC Directive, The Ministry of the Environment started a co-operation with the European Union Member States which offered help, and expertise in this matter.

Best Available Technigues

Reference Document on best available techniques BREF in the Iron and Steel Industry reflects an information exchange carried out according to Article 16 of Council Directive 96/61/EC. It covers the environmental aspects of iron and steel making in integrated steelworks (sinter plants, pelletisation plants, coke oven plants, blast furnaces and basic oxygen furnaces including continuous or ingot casting) and electric arc furnace steelmaking.

The term “best available techniques” is defined in Article 2 of the Directive as “the most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole.” Article 2 goes on to clarify further this definition as follows:

- “techniques” includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned;
- “available” techniques are those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator;
- “best” means most effective in achieving a high general level of protection of the environment as a whole.

Environmental relevance of the iron and steel industry

The iron and steel industry is highly intensive in both materials and energy. Important subject for action in response to environmental concerns are generally considered to relate to controlling air emissions and managing solid waste. Air pollution remains an important issue. In integrated steelworks, sinter plants dominate the overall emissions for most atmospheric pollutants, followed by coke-oven plants The first steps towards air pollution control were taken with dust collection and removal. In the eighties and nineties dust removal has become increasingly effective (especially secondary dedusting). This has reduced the directly related heavy metal emissions except in the case of those with high vapour pressure such as mercury. Efforts to minimise SO_2 and NO_x emissions have also been made. In addition the emissions of organohalogen compounds such as polychlorinated dibenzo-p-dioxins and -furans (PCDD/F), hexachlorobenzene (HCB) and polychlorinated biphenyls (PCB) together with polycyclic aromatic hydrocarbons (PAH) and monocyclic aromatic hydrocarbons, especially benzene, became increasingly important (1).

Main polluting substances to air to be taken into account if they are relevant for fixing emission limit values (2):

1. Sulphur dioxide and other sulphur compounds
2. Oxides of nitrogen and other nitrogen compounds
3. Carbon monoxide
4. Volatile organic compounds
5. Metals and their compounds
6. Dust
7. Asbestos (suspended particulates, fibres)
8. Chlorine and its compounds
9. Fluorine and its compounds
10. Arsenic and its compounds
11. Cyanides
12. Substances and preparations which have been proved to possess carcinogenic or mutagenic properties or properties which may affect reproduction via the air
13. Polychlorinated dibenzodioxins and polychlorinated dibenzofurans

The most important environmental issues of iron and steelmaking relate to emissions to air and to solid wastes/by-products. Wastewater emissions from coke oven plants, blast furnaces and basic oxygen furnaces are the most relevant emissions to water in this sector.
More than half of the mass input becomes outputs in the form of off-gases and solid wastes/by-products. The most relevant emissions are those to air. Those from sinter plants dominate the overall emissions for most of the pollutants. Although big efforts have been made to reduce emissions, the contribution of the sector to the total emissions to air in the EU is considerable for a number of pollutants, especially for some heavy metals and PCDD/F. The rate of reuse and recycling of solid wastes/by-products has been increased dramatically in the past but considerable amounts are still disposed to landfills.

Best Available Techniques for sinter plants

Sintering installations are industrial activities referred to in article of Directive IPPC.
Sinter, as a product of an agglomeration process of iron-containing materials, represents a major part of the burden of blast furnaces. The most relevant environmental issues are the off-gas emissions from the sinter strand, which contains a wide range of pollutants such as dust, heavy metals, SO_2, HCl, HF, PAHs and organochlorine compounds (such as PCB and PCDD/F). Thus most of the described techniques to consider in the determination of BAT refer to the reduction of emissions to air. The most important parameters are dust and PCDD/F.

In European Union are consider the following pollutions to air in sinter plant: dust, Cd, Cr, Cu, Hg, Mn, Ni, Pb , Tl, V, Zn, HCl, HF, NO_x, SO_2, CO, CO_2, VOC, PAH, PCDD/F and PCB.
In Poland Hg, Tl , V, VOC, PAH, PCDD/F and PCB are not analysis in sinter plants (3,4,5)

The following process-integrated techniques are known in European Union to be use at sinter plants (1, 6,7):
PI.1 Process optimisation for minimisation of PCDD/F emissions
PI.2 Recycling of iron-containing waste into the sinter plant
PI.3 Lowering the content of volatile hydrocarbons in the sinter feed
PI.4 Lowering the sulphur content of the sinter feed
PI.5 Heat recovery from sintering and sinter cooling
PI.6 Top-layer-sintering
PI.7 Waste gas recirculation e.g. Emission Optimised Sintering (EOS)
PI.8 Sectional waste gas recirculation

The following end-of-pipe techniques are known in European Union to be in use at sinter plants:
EP.1 Electrostatic precipitator (ESP)
EP.2 Fabric filter system
EP.3 Cyclone
EP.4 Fine wet scrubber, e.g. Airfine
EP.5 Desulphurisation
EP.6 Regenerative activated carbon (RAC)
EP.7 Selective catalytic reduction (SCR)

The emission factors are stated per tonne of liquid steel (LS) in order to simplify addition of emissions from the various production steps. On figure 1 and 2 are shown the emission factors from sinter plants in EU.

Figure 1 : The emission factors of dust NO_x and SO_x from five sinter plants in four different EU Member States (Austria, Belgium, Germany and Netherlands)

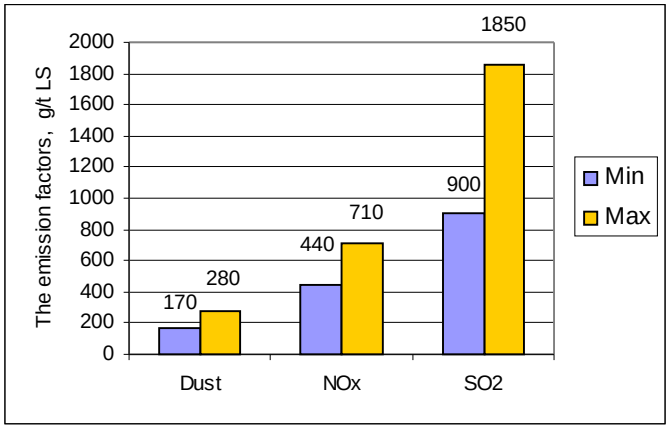
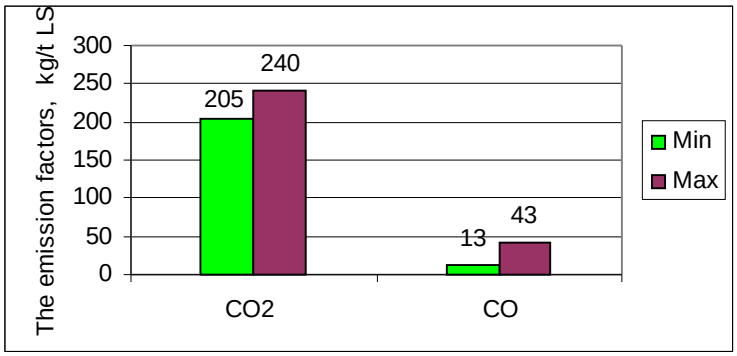
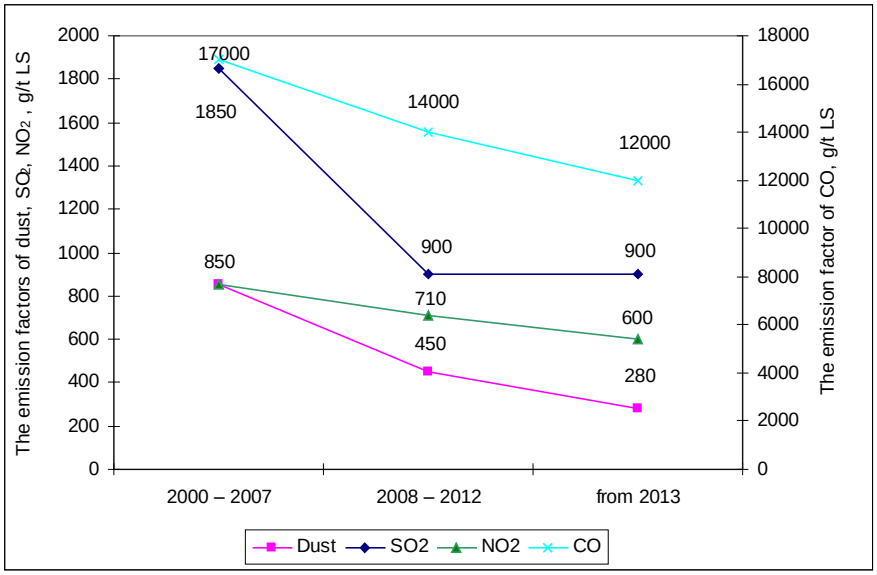


Figure 2 : The emission factors of CO_2 and CO from five sinter plants in four different EU Member States (Austria, Belgium, Germany and Netherlands)



On figure 3 are shown the emission factors in the next few years in Polish sinter plants.

Figure 3. Suggestion acceptable of the emission factors of dust NO_2 , SO_2 and CO from Polish sinter plants (3).



In Polish sinter plant the emission factors have to reduce and conformable to the requirements of European Union.

Results

As a result of Poland application for membership in European Union and the continuing accession negotiations a need was created for precise transposition of the EU regulation into the Polish legal system, as well as to prepare relevant Polish structure to implement these regulations.
One of the acts transposed into Polish legislature is the act of 27 April 2001 – Environmental Protection Law based on the Council Directive 96/61/EC on September 1996 on integrated pollution

prevention and control, introducing a system of integrated permits. The objective of integrated permits is to bring about a substantial and systematic improvement of the state of environment.
The requirement for obtaining an integrated permit refers mainly to large industrial installation, which might create substantial pollution of various elements of nature, inter alia metallurgy industry.

Conclusions

In this paper the issue air pollution from the process of iron ores sintering is presented. It refers to the requirements of European Union. Best Available Techniques (BAT) are recommended for production of iron and steel according to the requirements of article of EU Directive 96/61/EC. The directive concerns the most polluting industry sectors. The goal is to achieve a high level of protection of the environment as a whole. The applications and the permits issued must therefore use a holistic procedure – must take into consideration that the final result must be the best solution for the environment as a whole.
The emission factors in Polish sinter plant have to reduce and conformable to the requirements of European Union. Sinter plants belong to the most important dioxin sources in Europe. Due to measurement results from sinter plants the dioxin emissions are rather well known in some European countries, e. g. Germany, The Netherlands, United Kingdom. By contrast no information exists about the emissions from sinter plants located in Poland. In Polish sintering plants have to introducing IPPC in few years.

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