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**INTEGRATED POLLUTION PREVENTION
AND CONTROL AND ENTERPRISES
IN THE CHEMICAL INDUSTRY**

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Enterprises are becoming increasingly active in their approach to protection of the environment. In the 80's and 90's of the 20th century, the strategy of prevention became increasingly important in Europe. These trends were reflected in the European Commission mainly through the Directive on Integrated Pollution Prevention and Control (IPPC), which has been binding for all operators in the European Union countries since 1999. This paper is concerned with the integrated prevention process in the Czech Republic (CR). It concentrates mainly on the progress of this process in enterprises in the chemical industry and generalizes this information.

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Introduction

Stricter laws and the increasing, very intense pressure on internalization of externalities in the microeconomic sphere, which followed from adoption of the State Environmental Policy in the Czech Republic, led to substantial changes at the beginning of the 1990's in the behaviour of economic entities (enterprises) in relation to the environment. The business sector was in a very difficult and complex situation in the period of transition to a market economy. It was necessary that the behaviour of enterprises and their attitude to the environment rapidly approach those in developed countries, while these changes had to occur with concurrent resolution of basic macroeconomic and microeconomic problems (privatisation and transformation). These facts caused a number of difficulties connected particularly with the degree of internalization of externalities in the economics of enterprises. Enterprises gradually changed from a passive to an active attitude in their approach to the environment. Some of the representatives of the business sphere began to implement a proactive approach, where the enterprise attempted to actively utilize new technologies in the area of environmental protection, make forecasts of future developments and adapt their company strategy to this [1].

Enterprises and the Environment

In the last few years, the attitude of enterprises to the environment has become an important aspect for achieving business success and competitiveness. The environmental impacts of company activities, products and services and information on the economic consequences of the environmental impact of the company are of interest not only to the company management, but also to other interested parties (e.g. customers, suppliers, competing companies, the state authorities and the public).

As a consequence of the new environmental protection acts in CR (adopted in the 1990's), it has been possible to substantially reduce air pollution, improve the purity of surface waters and reduce uncontrolled waste landfilling. The state of the environment has improved mainly through broad implementation of a strategy of control and management, which forced enterprises - polluters - to invest into expensive measures for protection of the environment (termed end-of-the-pipe technology).

The strategy of control and management has been replaced in the past few years by the strategy of prevention. This is a strategy of environmental protection that prevents the generation of pollution during production, especially through improved utilization of raw materials and energy and the use of the best available technology. Industrial enterprises introduced broad use of the strategy of

prevention in reaction to the expensiveness of end-of-the-pipe technologies. These procedures have been employed in Europe by modern industrial enterprises roughly since the end of the 1980's. These trends were gradually reflected in the legislation of a number of countries of the European Union. These trends were reflected in the European Commission, e.g., in the priorities of its 5th action program and in issuing of Directive 96/61/EC of September 24, 1996 on integrated pollution prevention and control — the IPPC Directive [2].

Integrated pollution prevention and control (hereinafter IPPC) represented a turning point in protection of the environment as a whole. The impacts of activities on the individual components of the environment are not evaluated separately; rather, it is necessary to search for the best resolution of the potential impacts of the activity on the quality of the environment and human health. In implementing integrated environmental protection, it is necessary to monitor not only the pollution produced, but also to identify the causes of its generation and, to the maximum possible degree, to prevent pollution directly in the production process. Basically, all waste flows constitute input materials that it was not possible to convert into the required output in the production process. Consequently, integrated environmental protection entails a significant shift from emphasis on undesirable production outputs (pollution) to emphasis on inputs into production and the effectiveness of their utilization. Consequently, knowledge of the environmental impact of pollution and information on measures to reduce this in the individual components of the environment (end-of-the-pipe technologies) is not sufficient, but rather it is necessary to analyse the production process itself.

The range of installations that fall under the competence of the IPPC Directive is listed in Annex 1 to this Directive. These consist in installations in the area of energy production, metallurgy, mineral processing, chemical production, waste management, intensive rearing of pigs and poultry, the food industry and other industry. Since 1999, the IPPC Directive has been binding for all operators of these installations in the countries of the European Union. In order for an installation to remain in operation, it must have obtained an "integrated permit" for operation by October 30, 2007 at the latest. An installation may not be operated after this date without a permit.

Integrated Pollution Prevention and Control in CR

Work was commenced in the Czech Republic on implementation of the IPPC Directive in 1999. The Czech Environmental Institute began to prepare a list of installations falling under the competence of the Directive. In February 2001, a meeting was held between representatives of the state administration and the operators of installations and, in connection with this, negotiations were held on the need for individual transition periods. As a result of these negotiations, the

Czech Republic did not request any transition period for implementation of the IPPC Directive. The operators of installations that lie within the competence of the Directive must thus also have obtained a permit for operation by October 30, 2007. Because of the complexity of this task, in June 2002, the Ministry of Industry and Trade (hereinafter MIT) established the web site www.IPPC.cz as a source of information on integrated prevention and the best available technologies. In cooperation with professional federations, training and educational events were held with emphasis on the aspect of implementation of IPPC.

The IPPC Directive was transposed into the Czech legislation through Act No. 76/2002 Coll., on integrated pollution prevention and control, the integrated pollution register and amending some acts (hereinafter the Act) [3]. This Act came into force on January 1, 2003. On December 16, 2002, Ministry of the Environment Decree No. 554/2002 Coll., laying down the form of application for issue of an integrated permit and the scope and manner of filling-out thereof, was promulgated. It follows from the progress of the process that the operators of installations who wish to operate their installations after October 30, 2007 should have submitted an application for an integrated permit by December 31, 2006 at the latest.

On the basis of current information, 1348 installations in 749 enterprises lie within the competence of the Act [4]. Table I describes the progress of the IPPC process in CR from the viewpoint of the individual categories that lie within the competence of the Act.

Table I Progress of the process of implementation of IPPC in CR

Category	Number of installations within the competence of the Act	Applications submitted		Decision	
		as of December 31, 2003	as of July 31, 2004	as of December 31, 2003	as of July 31, 2004
1. Energy production	172	13	21	2	10
2. Production and processing of metals	198	40	44	2	24
3. Processing of minerals	80	17	21	1	8
4. Chemical industry	175	38	49	10	31
5. Waste management	187	67	88	17	65
6. Other installations					
- agriculture and the food industry	463	50	77	4	49
- other industry	73	10	10	1	6
TOTAL	1348	235	310	37	193

It is apparent from Table I that the process of implementation of IPPC is progressing in all types of installations (categories). The process is proceeding

more rapidly in the category of installations for waste management and most slowly in the category of installations for energy production. Enterprises operating chemical production approach the IPPC process responsibly and are second place in the number of submitted applications. The first application for an integrated permit was submitted on January 8, 2003 for an installation for biotechnological production (category 4) by the LONZA BIOTEC Kouřim company.

As operators in the Czech Republic have only half the time for obtaining an integrated permit (compared to the old EU countries), the state provides specific assistance for this process. In 2003, in accordance with the Act (§ 5 of the Act), the Integrated Prevention Agency was established to provide professional assistance for execution of the state administration in the area of integrated prevention. A total of 43 legal persons have been entered in the list of professionally qualified persons (§ 6 of the Act). On the basis of § 27 of the Act, a System of exchange of information on best available technologies was established, for the functioning of which MIT is responsible, in cooperation with the Ministry of the Environment, Ministry of Agriculture and Integrated Prevention Agency [5].

The System of information exchange on best available technologies was constructed similarly at the EU - level. Its cornerstones consist in technical working groups associated with the European IPPC Office in Seville (which prepare reference documents on best available technologies — BREF) and the functioning web site, with information on best available technologies and the IPPC process and the European Pollutant Emission Register (EPER) which, from 2004, contains information on almost 10 000 installations subject to IPPC. This whole system is culminated by an International Forum for Exchange of Information on IPPC, where representatives of the European Commission regularly meet with representatives from the individual member states, with representatives of European business organizations and with other NGOs.

Technical working groups are active in the Czech Republic, together with the www.IPPC.cz web site and a Forum for exchange of information on best available technologies. Government Resolution No. 3682003 Coll., on the integrated pollution register, laid down the basic rules for reporting information on operators in the Czech Republic to the European Pollutant Emission Register.² Of the 27 technical working groups, 20 groups were established by MIT, 4 by the Ministry of the Environment and 3 by the Ministry of Agriculture. The activities of the individual groups are greatly influenced by the progress in preparation of European documents on best available technologies (16 documents have been approved and 17 documents are being prepared). These groups form a base for 17 representatives of the Czech Republic in working groups at the European IPPC

² The first data for this register will be reported for 2004 (data must be submitted by February 15, 2005).

Office in Seville and carry out authorized translations of these documents into Czech. All the approved BREFs are translated into Czech and substantial parts of the drafts of these documents are regularly translated. The diverse activities of the technical groups could not be carried out without substantial assistance from the employees of the members of the technical working groups. Favourable experience has also been gained in participation of university teachers in the technical working groups and the use of BREFs in teaching at universities.

The importance of the integrated permit process does not lie only in the fact that this replaces permits for operation of the installations issued according to the individual components of the environment. IPPC means a transition from construction of end-of-the-pipe technologies to comparison of the operated production process with the best available technologies and to evaluation of material flows and the energy efficiency in the production. A very important benefit from the Act lies in the gradual change in the manner of communication between the operators of installations, the state authorities and the public. The "crime and punishment" approach was typical for protection of the environment according to components; this consisted in outlining specific tasks to reduce discharge of pollution and failure to achieve these limits was followed by severe punishment in the form of fines. Integrated prevention is based on communication, a professional approach, openness and negotiations within the region in which the installation (operation) is located. Implementation of the Act can assist in eliminating one of the important inadequacies of contemporary society, which was formulated during preparation of the strategy of sustainable development as follows: partnership and dialogue are lacking in dealing with the subject of the environment; radicalization and polarization of opinions on the relationship between the economy and protection of the environment is one of the basic unbalanced features in further development of society [6].

IPPC in Enterprises in the Chemical Industry

The branch of the chemical industry encompasses three aggregations, i.e.:

- refinery processing of petroleum,
- the chemical and pharmaceutical industry,
- the rubber and plastics industry.

Chemical production has always been perceived by the public as hazardous production. The usefulness of chemical products for human life has led entrepreneurs and managers to accept these risks. The need to minimize the risks associated with chemical production has led to the introduction of procedures for preventing emergencies and has led to evaluation of the harmfulness of the substances produced for human health and the environment.

Enterprises in the chemical industry participate very actively in voluntary activities for protection of the environment. In the second half of the 1990's, the incorporation of aspects of environmental protection into the contents of managerial activities became a very important instrument in changing the attitude of the business sphere to the environment - environmental management systems (EMS) began to be implemented. Enterprises employ EMS, not only as an important instrument for reducing the impact of their activities on the environment, but are also very well aware of the effects in the commercial sphere. Ownership of an ISO 14001 certificate or registration in the EMAS program extends potential in the export sphere, in the area of public tenders and in relation to support for businesses [7]. By December 31, 2002, a total of 36 enterprises in the chemical industry had introduced an environmental management system according to ISO 14001 and one enterprise had introduced a system according to EMAS [8]. Enterprises in the chemical industry participate actively in international activity in the branch under the name Responsible Care. As of December 31, 2002, 53 companies were participating in the Responsible Care program - members of the Association of the Chemical Industry of CR. A certificate and the right to use the logo of the program had been awarded to 23 companies [8]. All these activities facilitate compliance with the new obligations following from the Act on integrated prevention by enterprises in the chemical industry.

All chemical productions without regard to the size of the production capacity lie within the scope of the Act. On the basis of information of MIT and of the Ministry of the Environment [9,10], it is possible to determine a range of enterprises in the chemical industry that should obtain an integrated permit for operation of their installations within the set period of time. These consist in 67 enterprises in the chemical industry, of which 36 enterprises have already gained experience in the IPPC process (as of July 31, 2004). These companies have submitted an application for an integrated permit for selected installations, or have obtained an integrated permit. The activities of the Association of the Chemical Industry described above have a favourable effect here. The IPPC process is progressing at a favourable rate especially in refineries. Of the four refineries, 3 enterprises have gained experience in the IPPC process (only KORAMO Kolín has not yet submitted an application for an integrated permit). However, the number of companies operating chemical production is not final, where the current list does not include at least 14 chemical enterprises and the situation is not clear for enterprises in other branches that could operate chemical production. It can be expected that the final number of enterprises operating chemical production will equal about ninety. It is apparent from the state of implementation of the IPPC process in enterprises operating chemical production that some of the operators of these installations are not yet actively participating in this process. This state of affairs could be affected to a certain degree by the fact that the classification of some installations is not clear in a number of cases. This is true, for example of

Table II Degree of preparation and translation of reference documents (BREF) as of May 31, 2004

Branch of chemistry	Reference document	
	State of the original	Translation
Chemical industry, refineries		
Chloro-alkaline chemistry	BREF issued	Yes
Refineries	BREF issued	Yes
Large-volume organic chemistry	BREF issued	Yes
Large-volume gas and liquid inorganic chemistry	BREF issued	Yes
Pure organic chemicals	1 st draft issued	Being translated
Large-volume solid inorganic substances	Report TWG-07.03	No
Special inorganic substances	Report TWG-09.03	No
Production of polymers	Report TWG-01.04	No
Fields of operation in the chemical and refining industry		
Combustion of hazardous waste	No	No
Large combustion installations	2 nd draft issued	Yes
Surface treatment of metals and plastics	2 nd draft issued	Yes
Waste incineration	1 st draft issued	No
Waste management	2 nd draft issued	No
Surface treatment using solvents	1 st draft issued	Being translated
Cross-sectional BREF documents		
Cooling systems	BREF issued	Yes
Monitoring	BREF issued	Yes
Emissions from hazardous waste storage	2 nd draft issued	No
Management of waste waters and waste gases	BREF issued	Yes
Energy efficiency	No	No
Economic multi-component aspects	1 st draft issued	No

installations manufacturing coatings, solvents and colorants, liquid mixtures of solid hazardous chemical substances (such as cleaning agents and detergents,

fluids for automobiles - brake and cooling fluids, anti-freeze, auto-cosmetic products and a number of other products of "home" chemistry) and, last but not least, installations in rubber production.

Table II gives the degree of preparation of reference documents that can be used for enterprises in the chemical industry. This does not consist only of BREF for chemical production, but also of documents for energy-production installations, installations for waste management and especially cross-sectional documents. It follows from Table II that the operators of chemical production in the Czech Republic have at their disposal the same documents and information as their colleagues (operators) in the other countries of the European Union.

Conclusion

The IPPC process will lead to further opening of enterprises to the public. The operators of installations should be fully aware of the fact that documents reflecting their relationship towards the environment, the public and the region in which they are active appear on the web sites of the public administration. A summary of each application for an integrated permit is presented in electronic form; each of the interested parties has the right to peruse the application, which is available at the relevant Regional Authority. The standpoint of the professionally qualified person and the decision of the Regional Authority itself are also available. All the operators must be aware that anyone, who does not have a permit for operation of selected installations by October 30, 2007, will be requested to terminate operation of the installation in a manner that does not burden the environment.

In accordance with the Aarhus Convention, the public and other interested parties have the right to be informed. The information provided should be comprehensible and available to all interested parties. Provision of sufficient information in comprehensible form should enable public control of the procedure of the IPPC process.

It follows from the above text that information on the state of processing of the application alone is not sufficient to provide for information requirements. In accordance with the need for information on the IPPC process for all the interested parties, it is necessary to ensure:

1. Regular updating of the list of installations that are subject to the Act on integrated prevention;
2. Preparation of a means of monitoring the IPPC process according to the individual installations in the classification pursuant to Annex No. 1 of the Act (monitoring not only of the main categories 1-6, but also of the individual subcategories, 1.1 - 6.8);
3. Provision of information on permits for individual installations for the

- operators of a larger number of installations at a single site;
4. Monitoring of the participation/non-participation of the individual operators of installations (enterprises) in the individual regions and branches.

Integrated assessment of the environmental impact of production forms the basis of systematic measures, which also change the manner of communication of the operators of installations (enterprises) with their surroundings. In this context, other measures that must be simultaneously introduced should also be mentioned. These consist particularly in reporting of individual information to the Integrated Pollution Register, which will not only present information for the Czech Republic and will be used to control compliance with the binding conditions delimited in the integrated permit, but will also provide data for the European Pollutant Emission Register (EPER).

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