LICENSING AND PERMITTING OF DISCHARGES

A. K.Karavanas, M.N. Christolis and **N.C. Markatos**
National Technical University of Athens, Chemical Engineering Dept. Computational Fluid Dynamics Unit,Greece

Keywords: Emissions, Wastes, Emission Limit Values (ELV), Environmental Quality Objectives (EQO), Best Available Techniques (BAT), Pollution Prevention, Environmental Permits, Environmental or Permit or Discharge Conditions, Permitting and Licensing Procedure.

Contents

Summary

The permitting system is at the core of the implementation of a regulatory framework for the protection of the environment against pollution caused by emissions, discharges or disposal of wastes from a certain activity. In recent years, legislation on environmental permits has not only been implemented generally, but increasingly a more integrated approach in which environmental impacts are viewed as a whole is being implemented. Consequently, the relevant permits increasingly refer to all environmental impacts produced. Furthermore, public participation and consultation among different competent and relevant authorities are important stages of the permitting procedure. Moreover, after the permit is granted and the environmental conditions enforced, monitoring follows and additional measures are taken if required. Finally, the use of Best Available Technologies and consideration of the links of the

permitting system to other policy instruments are becoming increasingly more important.

1. Environmental permitting and licensing systems

Many of the countries have adopted an environmental licensing process whereby industrial plants and other enterprises or activities must apply for government permission (in the form of permits granted by government, national regional, or local agencies) to initiate and/or to continue their operation. The purpose of this process is to ensure an environmentally-sound operation of the facilities or activities.

Large releases of harmful substances and accidents (e.g. Seveso (Italy) and Bhopal (India)) have demonstrated that the existence of a permitting system and enforcement of regulations are necessary to enhance the protection of both public health and the environment. Moreover, the amounts of pollutants have increased in many of the countries in parallel with their economic growth, and this has brought about new environmental issues and problems with implications for their socio-economic as well as industrial sustainability.

As pointed out in the Agenda 21, to a large extent the ability of a country to follow the path of sustainable development is determined by the ability of its people and its institutions, as well as by its ecological and geographical conditions. And so Agenda 21 calls for building and strengthening national capacities for developing and implementing policies and strategies for the achievement of sustainable development.

For the establishment of an effective licensing or permitting system, the countries must first develop a legislative framework, as well as a constant follow-up of the implementation of those laws.

Any activity that generates emissions, discharges, wastes and other types of pollution, like radiation or noise, as well as possible reversible impacts it creates, may be submitted to a permitting procedure. Such activities may stem from industrial facilities, infrastructure works, any kind of transport activity, and, of course, management and disposal of discharges or wastes.

The permitting process has evolved through many phases. In the beginning, authorities used to issue general permits for averting or preventing 'end-of-pipe' environmental damage mainly through dispersion. Nowadays, permitting for different environmental media (e.g. air permits, waste water discharge permits, etc) is often through separate permits, as the trend in permitting programs emphasises pollution prevention at source through cleaner process technology and waste minimisation efforts, and ultimately through a more integrated approach. Modern permitting procedures allow for several different licensing, disclosure and legal issues to be integrated into a single procedure. It also provides a forum for environmental agencies and facility operators to exchange experience and ideas with the regulating bodies and to discuss modifications of procedures, potential risks, and new technical solutions.

Serving a wide range of indispensable functions in this way, permits act as valuable tools both for the facility operators and the public at large. However, with increasing globalisation, many of these achievements are likely to be outstripped by the rapid economic growth expected in the next decades. By 2010, world economic output is expected nearly to double, while output in non-OECD countries is expected to more than triple. Even at the pollution rates common in the developed world today, this growth is expected to create vast increases in environmental pollution. Fastest growth is expected to occur in areas where environmental performance is generally poor or very poor and where regulations are often untested, fragmentary or even non-existent. Consequently, the need for new, dynamic efforts to control, and in particular, to prevent pollution and enable enforcement of more effective permitting systems is obvious.

2. Basic principles of environmental permitting

In recent years permitting strategies and legislation have been based on internationally accepted principles that are of great importance to sustainable development. These principles are summarised below:

The precautionary principle: according to this principle, relevant authorities should 'take preventive measures when there is reason to assume that substances, pollutants or energy introduced into the environment may create hazards to human health, harm to living resources and ecosystems, damage amenities or interfere with other legitimate uses even when there is no conclusive evidence of a causal relationship between inputs and their alleged effects'. Its implementation has helped give the concept of Best Available Techniques (BAT) its current importance in pollution prevention and control strategies.

The principle of pollution prevention: at present 'pollution prevention at source' is central to environmental policy. Also, the concept of resource productivity is increasingly being used in both environmental policy and activities, thus providing a common ground for policy-making and demonstrating the importance of the economy-ecology relationship.

The ecosystem approach: current trends include efforts to develop new models for combining the structural and functional integrity of ecosystem communities into the regulatory process. More broadly, in many countries ecosystem approaches are increasingly being translated into long-term perspectives, strategic goal-setting, and the development of integrated assessment methods.

The concept of ecologically-limited carrying capacity: environmental 'carrying capacity' is a vital concept in environmental management. This scientific approach provides better tools for regional-scale risk evaluation, and for solving cost-effectiveness issues.

Full cost accounting and best practical environmental options: the negative cost-benefit ratio of rigid applications of this approach and its impact on technological innovation continue to be advanced. Sustainable, closed-cycle forms of production is contributing to the development of environmentally-oriented economic policy instruments and data resources.

Integrated multi-media permitting approaches. growing recognition of the highly interrelated, systemic character of the environment has recently become a driving force for institutional changeover to multi-media permitting approaches and practices.

Public participation and disclosure: an effective permitting system must be based on a comprehensive strategy for public participation and involvement. It must also involve democratic processes to ensure that decisions are based on transparent, predictable and justifiable reasoning.

3. Permitting policy and legislation

Permits need to take into account the nature of technological change. They also need to encourage plant operators and enterprises to go beyond compliance, and to apply innovative, environmentally-sound processes, technologies and management.

In the early 1970s a regulatory shift occurred in some countries, quickly followed by many others, that substituted the prevailing technology-based strategies and standards by the predominant use of the carrying capacity approach for regulating pollutant releases. This policy shift resulted partly from the disappointing results of the application of the 'dilute and disperse' principle and partly from the perceived absence of reliable and indisputable models for tracing the effects of pollutants in different media.

Typically, in many countries regulatory approaches for permitting have been based on a sector or media-oriented approach, where each component of the biosphere (i.e. air, water and land) is addressed by separate laws. Recently, many of the countries have been moving towards the integrated permitting approach in order to achieve a more comprehensive and uniform regime for environmental releases.

3.1 Best Available Techniques (BAT) and Environmental Quality Objectives (EQOs)

Two basic complementary approaches are taken into consideration while planning a permitting system, although the legislation may not make any specific reference to them:

Pollution prevention at source: best results are obtained when emissions are prevented at source, not at the end-of-pipe (end of manufacturing procedure), and BATs are to contribute to this approach.

Specific environmental characteristics: these refer to each recipient that must be protected.

In most cases these two approaches are given the same weight while setting new environmental laws or permit systems. In addition to these approaches, policy instruments such as Environmental Impact Assessments (EIAs) and Life Cycle Assessment (LCA) are stipulated in permits to make them more effective. In the European Union and the USA, consideration of these approaches tends to be normal practice.

An examination of the relevant issues, and of the experience and approaches of different countries to technology-based and environmentally-based considerations for setting efficient permitting requirements, leads to the following observations:

- Guidelines for setting BAT-based ELVs and general EQOs, as well as a general framework should be available at the national level, including methodologies used for defining the requirements (e.g. determination of risk, risk limits, stack height, diffusion models, mixing zones).
- Where the EQSs are exceeded in spite of BAT requirements, further reduction of polluting releases must be achieved over and beyond BAT, so that a particular source or a group of sources operating in that particular area will not contribute to a breach of environmental quality. If necessary, these requirements may lead to forced shut-down of some existing sources, or to denied authorisation for new sources, process expansion or modification.
- Plans for future (economic) expansion of facilities should be ecologically-sound. The question of whether or not to grant an EQS which leaves room for expected growth should be addressed in advance. While setting total emission levels, a margin of safety can be included and standards can be reviewed regularly.
- Both technology-based and environmentally-based instruments should be used within the framework of a comprehensive plan set at the national level. They should clearly articulate policy objectives and translate them into sectoral targets that provide a predictable framework for industry, information for permit writers, and the public. The public needs to be closely involved in the decision-making process at the earliest stage possible and must be fully informed of the negotiated requirements.

-
-
-

Bibliography

EC (1996): *The IPPC Directive; COUNCIL DIRECTIVE 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control.* [This is the European Community's directive on the prevention and control of pollution in an integrated fashion].

EC Publications (2000), Handbook for Implementation of EU Environmental Legislation. http://europa.eu.int/comm /environment/enlarg/handbook/handbook.pdf [This site contains a wealth of valuable information on the implementation of EU environmental legislation].

IMPEL network (1998), European Union Network for the Implementation and Enforcement of Environmental Law, *Interrelationship between IPPC, EIA, the SEVESO Directives and EMAS Regulation*. [With particular reference to the implementation and enforcement of environmental law in force, this text explores the inter-relationships and overlaps between IPPC, EIA, the SEVESO Directives and EMAS regulations].

NPCA (1995), *Pollution from industrial enterprises. Guidelines for applications for discharge permits*, Norwegian Pollution Control Authority (NPCA), Oslo, Norway. [This document gives and explains both general and specific environmental conditions that a given industrial facility in Norway must satisfy before it could be given a permit to operate].

OECD (1996), Pollutant release and transfer registers (PRTRS). *A Tool for Environmental Policy and Sustainable Development guidance manual for governments*, OECD, Paris. [This is an authoritative document on policies to be implemented to achieve at least a degree of sustainability. Although it is primarily directed at national governments, the wealth of information given would be much useful to environmental professionals too].

OECD (1999). *Environmental requirements for industrial permit*s. A publication of the Organisation for Economic Co-operation and Development (OECD), Paris. [This text gives and explains both general and specific environmental conditions that a given industrial facility must satisfy before it could be given a permit to operate].

O'Malley, V (1999), 'The Integrated Pollution Prevention and Control IPPC Directive and its implications for the environment and industrial activities in Europe'. *Sensors and Actuators*, B 59, 78–82, Elsevier Science, The Netherlands. [This is a fairly comprehensive text which focuses on the European Community's IPPC Directive, with particular reference to the likely environmental impacts and implications of rising industrial activity in Europe. Highly recommended for those concerned with integrated pollution prevention and control].

The Dutch Ministry of Housing, Spatial Planning and Environment. (1997). *The Environmental Challenge and Small and Medium-sized Entrerprises in Europe*. KPMG Environmental Consulting for in preparation for the Informal Environment Council, Amsterdam, April 1997. [This text gives a fairly comprehensive account of the environmental challenge of small and medium-sized enterprises (SMEs) in Europe, with particular reference to the waste streams they generate].

USEPA (1996), U.S. EPA Public Information Center *Guide to Environmental Issues*., Washington, D.C. [This valuable document contains comprehensive guidance on a variety of topical environmental issues and problems. Information is given in a way that is easily understood by the non-expert].

Biographical Sketches

Mr. Alexendros Karavanas received his Diploma in Chemical Engineering from the National Technical University of Athens, Greece, in 1977, followed by a degree in Pharmacology from the University of Athens in 1991.

Currently Mr. Karavanas is working for the Ministry of Environment, Physical Planning & Public Works, Athens, responsible for Environmental Permitting which involves environmental impact study of industries, granting environmental conditions and permits, corresponding EU legislation, as well as European Community's Support Framework for the Environment. His main duties and tasks include environmental impact assessment of industrial facilities (examination, authorization, setting of environmental conditions especially for the food industries, pharmaceutical and pesticide industries, tanneries, textile industries, chemical industries etc.).

He has represented the Greek Ministry of Environment (1997-2001) on the European Community's Committee on article 19 of Directive 96/61, “Integrated Pollution Prevention and Control (IPPC)”, concerning the inventory of the IPPC industries, as well as on the European IPPC Bureau's Technical Working Group for Food and Milk, Seville, Spain. To date he has participated in several projects of the Greek Ministry of Environment concerning emission inventory of industrial sources in Greece, and implementation of the IPPC system and Best Available Techniques for industry. He has addressed several seminars organized by, among others, the National Technical University of Athens and the University of Athens on environmental issues including environmental impact statement, treatment of waste water effluents, air emissions, pollution control equipment, and impacts from the operation of food, textile, chemical industries.

Dr. Michael Christolis is a Civil Engineer specializing in environmental science and technology. Currently he is working as a research collaborator at the National Technical University of Athens (NTUA), Greece, on the mathematical modelling of environmental problems. He has so far accumulated twenty years of experience in air quality monitoring, pollutant dispersion modelling, assessment of the impacts of industrial accidents, design of emergency systems, and implementation of the Seveso Directive in Greece.

During 1983-1988 he was the Head of the Laboratory for the Air Quality Monitoring Network for the City of Athens. In 1988 he joined the Computational Fluid Dynamics Unit (CFDU) of the Chemical Engineering Department of the NTUA, working on research projects on the computational modelling of various applications focusing on environmental issues and problems.

Professor Nicholas C. Markatos obtained his Diploma in Chemical Engineering from the National Technical University of Athens, Greece, in 1967, followed by M.Sc, DIC and Ph.D degrees from the Imperial College of Science, Technology & Medicine, University of London, UK, during 1970 to 1974.

In 1983 Professor Markatos was appointed Director of the Centre for Mathematical Modelling and Process Analysis at the school of Mathematics and Scientific Computing of the University of Greenwich, London, England. At that time he was also a visiting lecturer to the Computational Fluid Dynamics Unit of Imperial College as well as working for CHAM Ltd, (Concentration Heat and Momentum, Limited), London, England. At CHAM he worked first as leader of the Aerospace Group (1976) and then, from 1977 until 1984, as Manager of the Applications Team working on various Fluid Mechanical, Thermodynamic and Transport problems.

Since 1974 he has served as technical consultant to many Research Centres, state institutions and industries.

In June 1980 he was awarded the "Certificate of Recognition" by the Inventions Council of NASA.

In 1985 Professor Markatos was elected Professor of Chemical Engineering at the National Technical University of Athens, and in 1990 he was elected Head of the Chemical Engineering Department. In 1991 he was elected Rector of that University.

Professor Markatos' main scientific interest is in the mathematical modelling of Transport Phenomena, Fluid Mechanics, Thermodynamics and Physical Processes like Fluid Flow (Laminar and especially Turbulent), Heat and Mass Transfer, Environmental Flows, Combustion, etc.

He is referee of scientific papers, reviewer of new books, as well as member of the Editorial Board of several international Scientific Journals.

He has published over 100 original scientific papers in international journals and participated and organised many international conferences, seminars and meetings all over the world. Author of two books, he has also published many articles in the popular press on Engineering Higher Education.