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EFMA TASK FORCE ON BEST AVAILABLE TECHNIQUES FOR POLLUTION PREVENTION AND CONTROL IN THE FERTILIZER INDUSTRY

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RESUME

L'Association Européenne des Fabricants d'Engrais (EFMA) a créé un groupe de travail pour préparer huit brochures décrivant les Meilleures Techniques Disponibles (BAT) sur la prévention et le contrôle de la pollution pour l'industrie européenne des engrais. Ces brochures décriront les émissions et la consommation d'énergie pour la production de 1) l'ammoniac, 2) l'acide nitrique, 3) l'acide sulfurique, 4) l'acide phosphorique, 5) l'urée et UAN, 6) AN et CAN, 7) nitrophosphates NPK et 8) les engrais NPK à base de mélanges d'acides. Les recommandations de l'industrie pour les valeurs BAT d'émission sont données pour:

- *les unités existantes où la prévention de la pollution est obtenue d'abord par des réhabilitations et des solutions en fin de ligne, et*
- *les nouvelles unités où la prévention de la pollution est intégrée dès la conception du procédé.*

Ces brochures fournissent le fin du fin des conditions opératoires actuelles en Europe occidentale. Elles décrivent les meilleurs procédés de fabrication disponibles, des données d'émission dans l'environnement, ainsi que les coûts pour réaliser le BAT.

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1. INTRODUCTION

In response to a number of regulatory initiatives on pollution prevention and control, and specifically to the recent draft IPPC directive of the European Commission, the European Fertilizer Manufacturers Association (EFMA) has established a Task Force to describe the Best Available Techniques (BAT) for the European fertilizer processes and proposing emission limits for existing and new production plants.

This paper describes the work of the Task Force.

2. REGULATORY INITIATIVES

Last year the Commission of the European Union published a **draft directive on integrated pollution prevention and control** (IPPC directive) [1], which proposes far-reaching measures for an integrated approach to the control of air, water and land pollution from large industrial plants.

New industries would be expected to introduce the latest technology to reduce pollution, while older plants would have until 2005 to clean up and comply.

The new directive is intended to allow the European Union to take an integrated approach, rather than tackle each pollutant separately. A licensing procedure is proposed based on admissible levels of pollutants for several industrial sectors, including the fertilizer industry. Emission limit values will have to be set by the competent authority of each Member State, **based on best available techniques** (BAT).

If a defined environmental quality standard is being met by lower emission requirements than those achievable by the use of BAT, the competent authority **may allow more emissions than would have resulted from the application of BAT** on the condition that:

- only a negligible increase in pollution is likely to result, and
- no contribution to transboundary and/or global pollution is likely to occur.

Where no environmental quality standard has been set for a particular substance, emission limit values shall have to be based on BAT.

The Member States shall ensure that the competent authority follows or is informed of developments in BAT for preventing or minimizing emissions into the environment as a whole. The European Commission is responsible for exchanging information on BAT with the Member States. It is expected that a number of technical notes or standards will be issued on BAT, building further on the BATNEEC notes issued by by the European Commission some years ago [2].

The Member States shall take the necessary measures to ensure that the conditions of a permit are complied with. The draft directive also provides for the public to scrutinize Member States' control measures.

It is anticipated that the draft directive will be adopted during 1994, and will have to be incorporated into national law by the middle of 1995. It will replace a number of existing EU directives. The proposals of the IPPC directive are very similar to the integrated pollution control system in UK, as prescribed by the UK Environmental Protection Act 1990. The Chief Inspector of the UK Inspectorate of Pollution has already issued several guidance notes to his inspectors, covering amongst other the production of ammonia, nitric acid and fertilizers, and bulk storage installations [3].

On a wider international scale it should be noted that the United Nations Industrial Development Organization (UNIDO) and the World Bank shortly will be publishing a 50-page booklet on "Pollution Prevention and Abatement Guidelines for the Fertilizer Industry" [4]. These guidelines are intended to be used as a reference in the design and evaluation of projects in developing countries. They contain information on pollution problems and on process and treatment technologies associated with the manufacturing of mineral fertilizers, and suggest target emission values for a number of production processes.

3. DEFINITION OF BEST AVAILABLE TECHNIQUES (BAT)

The draft IPPC directive gives the following definitions:

The term **Best Available Techniques** (BAT) signifies the latest state of development of activities, processes and their methods of operation which indicate the practical suitability of particular techniques as the basis of emission limit values for preventing or, where that is not practicable, minimizing emissions to the environment as a whole, without predetermining any specific technology or other techniques.

Techniques include both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned. The techniques must be industrially feasible from a technical and economic point of view.

Available techniques mean those developed on a scale which allows implementation under economically viable conditions, 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.

For licensing purposes BAT will be used in association with **Environmental Quality Standards** (EQS). An EQS is the set of requirements which must be fulfilled at a given time by a given environment or particular part thereof, as set out in Community legislation, or as derived from recommendations issued by the World Health Organization.

4. EFMA'S TASK FORCE ON BAT

4.1. Scope of Work

The European Fertilizer Manufacturers Association (EFMA) has established a Task Force with experts from the member companies, for describing best available techniques and proposing emission limits for the European fertilizer industry. Eight 30-page BAT-booklets are being prepared, **see Figure 1**. They cover the production processes of the following products:

No. 1: Ammonia
No. 2: Nitric Acid
No. 3: Sulphuric Acid
No. 4: Phosphoric Acid
No. 5: Urea and Urea-Ammonium Nitrate (UAN)
No. 6: Ammonium Nitrate (AN) and Calcium Ammonium Nitrate (CAN)
No. 7: NPK Compound Fertilizers by the Nitrophosphate Route
No. 8: NPK Compound Fertilizers by the Mixed Acid Route.

The booklets will also give due consideration to product storage and handling, environmental data and monitoring practices, major hazards, occupational health and safety, and costs associated with achieving the proposed emission limits. The standard contents list of each of the booklets are shown in **Table 1**.

The booklets provide the state-of-art for today's operating conditions in West Europe. They are being prepared in order to share knowledge about BAT between the fertilizer manufacturers, as well as with the regulatory authorities.

The booklets focus primarily on best available **technology**, and less on the **operational practices** to be followed. The industry recognizes, however, that good operational practices are vital for effective environmental management and for eliminating emission peaks, **see Figure 2**. The principles of Responsible Care should be adhered to by all companies in the fertilizer business. **Table 2** shows a typical commitment statement.

4.2. Organization of the Work

The preparation of the BAT-booklets is shared between the EFMA members, with each company taking a "lead" role and/or a "consulting" role, as shown below. Norsk Hydro is the Task Force leader.

N°	PROCESS	LEAD COMPANY	CONSULTING COMPANIES
1	Ammonia	Hydro	Kemira, Grande Paroisse (GP), CIN Greece, ICI, BASF
2	Nitric acid	GP	Kemira, CIN Greece, Fertiberia, ICI, Hydro, BASF
3	Sulphuric acid	CIN Greece	Kemira, GP, Fertiberia, BASF
4	Phosacid	Fertiberia	Kemira, GP, Hydro
5	Urea/UAN	IFI	Kemira, GP, Fertiberia, EniChem, Hydro, BASF
6	AN/CAN	ICI	Kemira, GP, CIN Greece, Hydro, IFI, Enichem, BASF
7	NPK nitrophos	BASF	Hydro
8	NPK mix acid	Kemira	GP, Fertiberia, EniChem, IFI, BASF

The Lead Company is responsible for writing the BAT-booklet (on the selected production process). The Consulting Company is responsible for commenting on the drafts written by the Lead Company and for adding descriptions of other techniques which can be considered as BAT, but not covered by the Lead Company.

The Task Force leader is informing the DG XI of the European Commission (responsible for the IPPC directive) about the progress of the work, for obtaining guidance on the contents of the booklets.

The booklets are scheduled to be printed by the end of 1994.

4.3 EFMA's BAT Emission Limits

The BAT emission limits proposed by EFMA, are based on industry standards which member companies recognize as feasible. The actual emission levels will, however, vary from plant to plant depending on the type of product being made, the age and type of technology and processing controls, the energy source being utilized, the composition of the raw materials applied, the operator's capabilities, how well the plant is operated, etc.

Two sets of BAT emission limits are being proposed by EFMA, as shown in **Figure 3**:

(1) for **existing** production units where pollution prevention is usually obtained by revamps or end-of-pipe solutions, and

(2) for **new** plants where pollution prevention is integrated in the process design.

The limits will be given as:

- concentration values (ppm, mg/m^3, l/m^3)
- total load (kg/hour)
- relative figures versus production (kg/tonne of product).

All values are related to a typical size plant and to a typical product range (in the case of NPK).

The proposed limits apply to stand-alone units. Often the fertilizer industry operates integrated plants, which may give lower energy consumption and emissions per tonne of production. The degree of integration, however, is usually determined by market demands for the different products.

The proposed emission limits refer to emissions during normal operations. Higher emissions can occur in start-up and shut-down operations, and in emergencies.

Noise as a pollutant is not covered in the booklets since uniform European regulations exist on this. Neither are heat emissions nor visual impacts addressed in the booklets.

5. APPLYING BAT FOR LICENSING PURPOSES

The BAT emission limits should be considered as a **reference level** for the establishment of environmental permits, allowing for deviations as governed by:

- the **local environmental requirements**, given that the global and interregional environment are not adversely affected, and

- the **practicalities and costs** of achieving BAT,

- **production constraints** given by the product range, energy source and availability of raw materials.

An operator unable to meet the BAT emission limit should, in collaboration with the local authority, document the reasons for allowing the deviation.

It is of critical importance that the monitoring practices and the analytical methods are well defined. This calls for international standardization.

Furthermore, there ought to be a shift away from licensing governed by concentration values on single point emission sources. It would be better to define maximum allowable load values from an entire operation, e.g. from a total site area. This will enable plant management to find the most cost-effective environmental solutions, thus taking much more "ownership" of environmental affairs. And the regulatory authorities' job will change from simply measuring point sources to the auditing of the plant's total environmental management **system**. Several North European countries have used the auditing approach with great success for many years, to the benefit of both the operator and the authorities, **and to the environment**.

6. TRADE AND THE ENVIRONMENT

The trading of fertilizer products is an international business with products manufactured in one country ending up with customers all over the world. Therefore, the fertilizer industry is a very competitive industry sensitive to differences in the local legislative requirements and operating conditions. Differences in environmental standards have become an issue in the discussion of fair trade, e.g. in the discussion on imports into the West European countries. If the imports originate from industry with lower environmental standards, this can be considered as "eco"-dumping. Plants are now being closed in West Europe, allowing "dirtier" plants to take over.

For instance, the **energy consumption** for ammonia production, and hence the **emission of** CO_2, is on average 40-50% higher in East Europe. This does not improve the **global** environment and is hence of concern to all of us.

The West European industry has reached far in environmental management, but further improvements will come. Especially since there is a strong link between good environmental practices and cost-efficient production.

In the interest of our common future it is desirable to obtain improvements in environmental standards throughout the fertilizer industry. A transfer of western environmental management practices to others would be a good start. Likewise, the licensing of industrial plants should be harmonized using the European BAT-principle. This development should be supported in international trade regulations, and **followed up** accordingly.

7. SOME CONCLUSIONS AND FINAL REMARKS

Several initiatives are being taken for regulating the emissions from industry, based on the use of best available techniques (BAT). These initiatives will enable international harmonization of regulatory measures. The fertilizer industry should have a pro-active approach in support of this development.

BAT comprise both the technology being applied and the operational practices employed. The industry must focus on both of these; for control of **continuous emissions** the focus would be primarily on technology, and for reducing the **incidental emissions** better operational practices should be employed.

BAT emission limits should be used for licensing purposes, allowing for reasonable deviations in case of operational constraints or severe cost of compliance, but only if acceptable to the environment. This principle should be harmonized in legislation for the fertilizer industry world-wide.

There is also a need for harmonization of the monitoring practices and the analytical methods applied in emission control. This calls for international standardization.

Furthermore, there ought to be a shift away from licensing governed by concentration values on single point emission sources, towards the use of maximum allowable load values from an entire operation. This will better focus on the environmental impacts of an operation and will "force" the operator to implement a professional environmental management system. This will benefit both the operator and the authorities, **as well as the environment**.

EFMA's BAT-booklets do not examine the production processes from a fertilizer "life cycle" perspective. This would bring together the environmental implications of the total chain from mining of raw materials through production, storage and transport to the end use of fertilizers and harvesting of crops. This is obviously a formidable task, but an important one in setting priorities for future regulatory work. EFMA hopes the BAT-booklets will contribute to this end.

8. REFERENCES

[1] Commission of the European Union:
"Proposal for a Council Directive on integrated pollution prevention and control" (93/C 311/06) COM(93) 423 final, submitted by the Commission 30.09.1993.

[2] Commission of the European Union:
"Technical Note on Best Available Technologies not Entailing Excessive Cost for Ammonia Production", Report EUR 13002 EN, issued in 1990.

"Technical Note on Best Available Technologies not Entailing Excessive Cost for Nitric Acid Production", Report EUR 13004 EN, issued in 1990.

"Technical Note on Best Available Technologies not Entailing Excessive Cost for Sulphuric Acid Production", Report EUR 13006 EN, issued in 1990.

[3] UK Inspectorate of Pollution (HMIP):
Chief Inspector's Guidance Notes to Inspectors issued in 1993.

[4] United Nations Industrial Development Organization:
"Pollution Prevention and Abatement Guidelines for the Fertilizer Industry", prepared in 1993 by Norsk Hydro a.s for UNIDO in project US/GLO/91/202.

TABLE 1: STANDARD CONTENTS LIST OF EFMA's BAT BOOKLETS

1. **INTRODUCTION**
   Brief description of the booklet, with assumptions on plant size, battery limits, etc.

2. **DESCRIPTION OF PRODUCTION PROCESSES**
   Overview of European production processes.
   Description of BAT production processes, with process flowsheets.

3. **DESCRIPTION OF STORAGE AND TRANSFER EQUIPMENT**
   Description of storage and transfer of hazardous substances associated with the process, with process flowsheets.

4. **ENVIRONMENTAL DATA**
   Typical data for:
   - use of raw materials, additives, water
   - energy requirements; sources and consumption
   - production; type of products and quantity per year
   - energy production for export (steam, electricity)
   - emissions to air and water
   - liquids and solids to waste disposal.

   Brief account of the environmental hazards, with identification of:
   - whether the hazards may have local or global effects
   - typical exposure limit values
   - regulatory permit values in West European countries.

5. **EMISSION MONITORING**
   Description of analytical methods and typical frequency of monitoring.

6. **MAJOR HAZARDS**
   Identification of major hazard events and how they are dealt with.

7. **OCCUPATIONAL HEALTH AND SAFETY**
   Description of occupational health and safety issues, and precautions taken.

8. **SUMMARY OF BAT EMISSION LEVELS**
   Proposal on standards for new and existing processes, and associated costs.

9. **REFERENCES**

TABLE 2: COMMITMENT STATEMENT ON RESPONSIBLE CARE

We pledge to manage our business according to the following principles:

- To recognize and respond to community concerns about chemicals and our operations.
- To develop and produce chemicals that can be manufactured, transported, used and disposed of safely.
- To make health, safety and environmental considerations a priority in our planning for all existing and new products and processes.
- To report promptly to officials, employees, customers and the public, information on chemical-related health or environmental hazards and to recommend protective measures.
- To counsel customers on the safe use, transportation and disposal of chemical products.
- To operate our plants and facilities in a manner that protects the environment and the health and safety of our employees and the public.
- To extend our knowledge by conducting or supporting research on the health, safety and environmental effects of our products, processes and waste materials.
- To work with others to resolve problems created by past handling and disposal of hazardous substances.
- To participate with government and others in creating responsible laws, regulations and standards to safeguard the community, workplace and environment.
- To promote the principles and practices of Responsible Care by sharing experiences and offering assistance to others who produce, handle, use, transport or dispose of chemicals.

FIGURE 1
EFMA's BOOKLETS ON BEST AVAILABLE TECHNIQUES

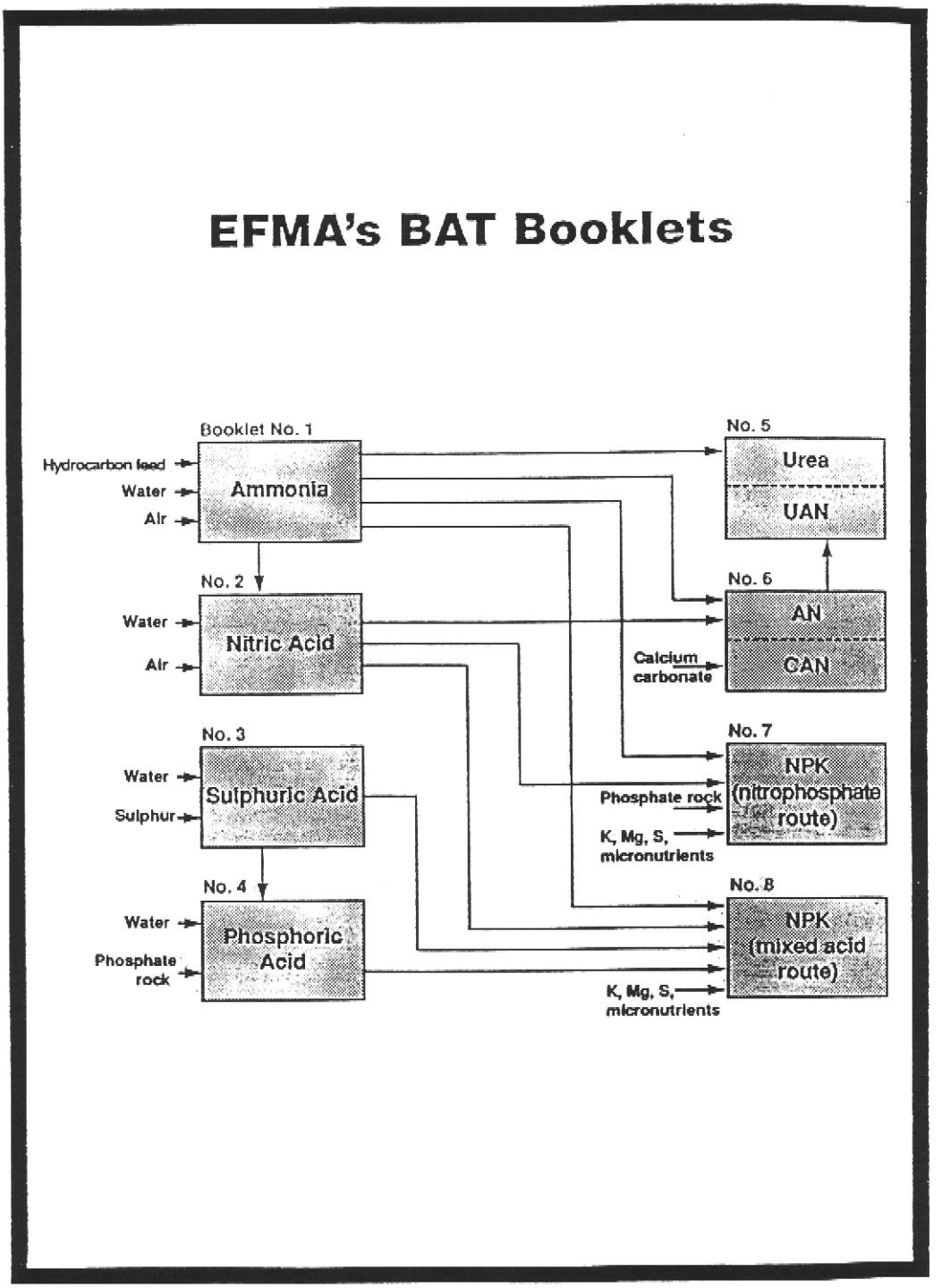

FIGURE 2
EMISSIONS FROM TECHNICAL DESIGN AND OPERATIONAL PRACTICES

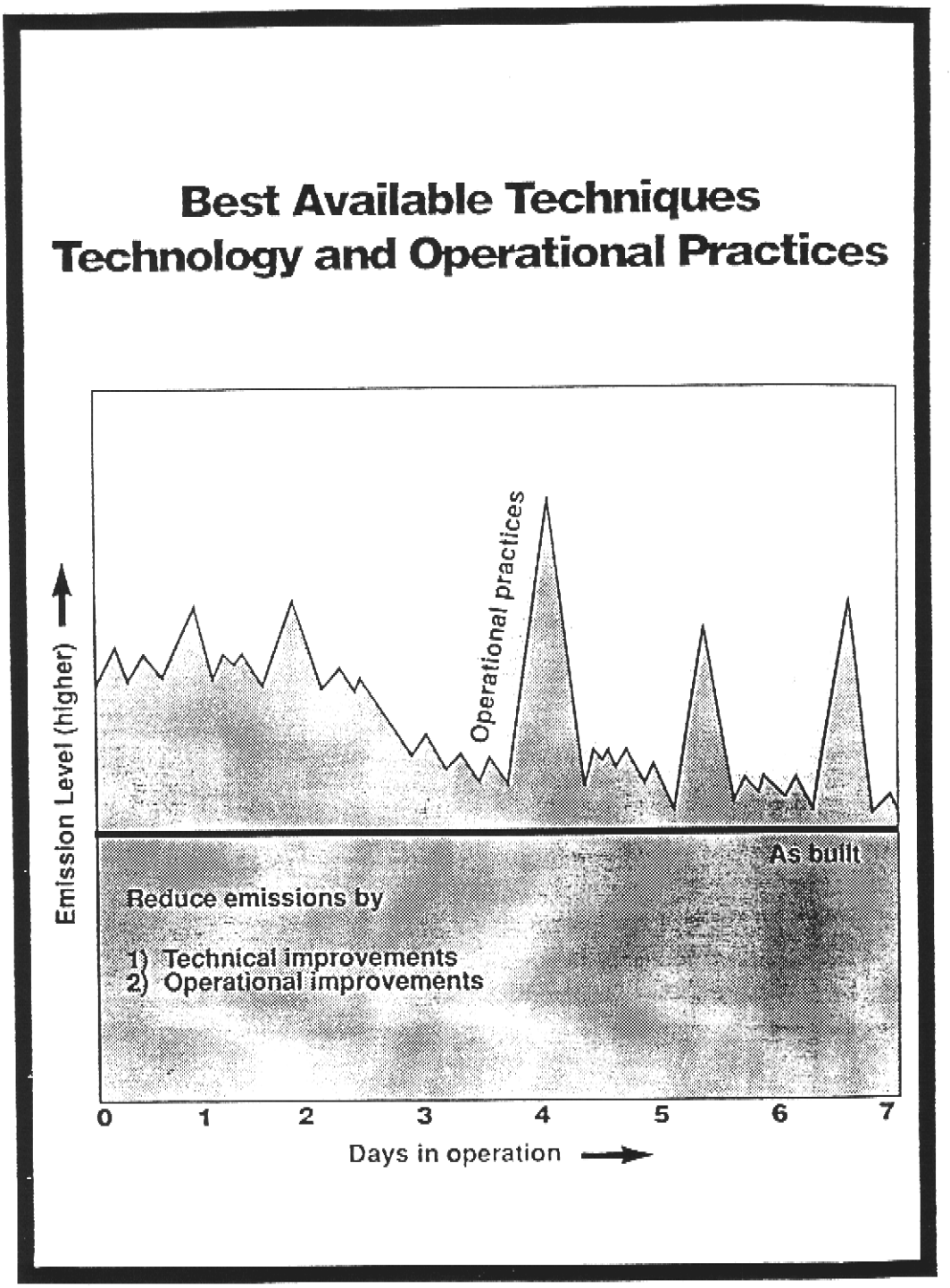

FIGURE 3
SETTING BAT EMISSION LIMITS