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Integrated Pollution Control Licensing

Batneec Guidance Note For The Chemical Sector

(Revision 1 - May 1996)

This document does not purport to be and should not be considered a legal interpretation of the provisions and requirements of the E.P.A. Act, 1992.

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Environmental Protection Agency

ESTABLISHED
The Environmental Protection Agency Act, 1992, was enacted on 23 April, 1992 and under this legislation the Agency was formally established on 26 July, 1993.

RESPONSIBILITIES
The Agency has a wide range of statutory duties and powers under the Act. The main responsibilities of the Agency include the following:

- the licensing and regulation of large/complex industrial and other processes with significant polluting potential, on the basis of integrated pollution control (IPC) and the application of best available technologies for this purpose;

- the monitoring of environmental quality, including the establishment of databases to which the public will have access, and the publication of periodic reports on the state of the environment;

- advising public authorities in respect of environmental functions and assisting local authorities in the performance of their environmental protection functions;

- the promotion of environmentally sound practices through, for example, the encouragement of the use of environmental audits, the establishment of an eco-labelling scheme, the setting of environmental quality objectives and the issuing of codes of practice on matters affecting the environment;

- the promotion and co-ordination of environmental research; and

- generally overseeing the performance by local authorities of their statutory environmental protection functions.

STATUS
The Agency is an independent public body. Its sponsor in Government is the Department of the Environment. Independence is assured through the selection procedures for the Director General and Directors and the freedom, as provided in the legislation, to act on its own initiative. The assignment, under the legislation, of direct responsibility for a wide range of functions underpins this independence. Under the legislation, it is a specific offence to attempt to influence the Agency, or anyone acting on its behalf, in an improper manner.

ORGANISATION
The Agency's headquarters are located in Wexford and it operates five regional inspectorates, located in Dublin, Cork, Kilkenny, Castlebar and Monaghan.

MANAGEMENT
The Agency is managed by a full-time Executive Board consisting of a Director General and four Directors. The Executive Board is appointed by the Government following detailed procedures laid down in the Act.

ADVISORY COMMITTEE
The Agency is assisted by an Advisory Committee of twelve members. The members are appointed by the Minister for the Environment and are selected mainly from those nominated by organisations with an interest in environmental and developmental matters. The Committee has been given a wide range of advisory functions under the Act, both in relation to the Agency and to the Minister.

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Contents

1. INTRODUCTION

This Guidance Note is one of a series issued by the Environmental Protection Agency and is designed to provide guidance to those applying for integrated pollution control licences under the EPA Act. It should also be read in conjunction with *Application Guidance Notes,* available under separate cover.

It should be noted at the outset, that noise is not included within the scope of this work and guidance on this parameter has been issued separately.

This Guidance Note is comprised of six main sections and appendices. Following this introduction, Section 2 contains a general note on the interpretation of BATNEEC. The industrial activity covered by the terms of this note is given in Section 3. In Section 4, the technologies to control emissions are tabulated and in Section 5 the specific emission limit values (ELVs) are given. The last section contains comments on compliance monitoring requirements.

Appendices include Appendix 1 which gives the main sources of emissions, and the principal releases from such sources; Appendix 2 which details the principal references used in drawing up this Guidance Note and Appendix 3 which gives details of other IPC publications.

All applicants for Integrated Pollution Control licences, in the sector covered by this note, should carefully examine the information laid down in this Guidance Note and should use this information to assist in the making of a satisfactory application for an Integrated Pollution Control licence to the Agency. It should be clearly understood that achieving the emission limit values does not, by itself, meet the overall requirements in relation to IPC. In addition to meeting such values the applicant will also be required to demonstrate that waste minimisation is a priority objective and to put in place particular abatement measures to reduce overall mass emissions and pollutant load where this is necessary to protect the ambient environment.

The technologies and the associated emission limit values (ELVs) identified in this Guidance Note are, at the time of writing, regarded as representing BATNEEC for new activities. BATNEEC is not a static quality and will change as technologies, environmental factors and costs alter with the passage of time. The Agency may

amend or update the guidance contained in this note should such amendments seem appropriate. The information contained in this Guidance Note is intended to be used only as a tool to assist in determining the BATNEEC for an operation in this sector and should not be taken to be a definitive authority on the BATNEEC for this sector**.** This Note should not be considered as a legal document**.**

2. INTERPRETATION OF BATNEEC

BATNEEC means *'the best available technology not entailing excessive costs'*. The technology in question should be **Best** at preventing pollution and **Available** in the sense that it is procurable by the industry concerned. **Technology** itself is taken as the techniques and the use of the techniques, including training and maintenance etc.
NEEC addresses the balance between environmental benefit and financial expense.

The objective of the Best Available Technology Not Entailing Excessive Costs (BATNEEC) Guidelines is to provide a list of technologies which will be used by the EPA to determine BATNEEC for a scheduled activity. The BATNEEC identified in this Guidance Note is used as a basis for setting emission limit values. It is intended to update these guidelines as required in order to incorporate technological advances as they occur.

In the identification of BATNEEC, emphasis is placed on pollution prevention techniques, including cleaner technologies and waste minimisation, rather than end-of-pipe treatment.

Technologies identified in the BATNEEC guidelines are considered to be current best practice for the purposes of setting emission limit values. These technologies are representative of a wide range of currently employed technologies appropriate to particular circumstances. However, the guidance issued in this note in respect of the use of any technology, technique or standard does not preclude the use of any other similar technology, technique or standard which may achieve the same emission. The entire range would not necessarily be appropriate in specific cases. The specific choice depends on a wide range of circumstances but the crucial factor is that the selected regime achieves BATNEEC. In applying BATNEEC, Environmental Quality Objectives (EQOs) must be respected where set. Measures such as in-plant changes, raw material substitution, process recycling and improved material handling and storage practices, may also be employed to effect reductions in emissions. As well as providing for the installation of equipment and the operation of procedures for the reduction of possible emissions, BATNEEC will also necessitate the adoption of an on-going programme of environmental management and control, which will focus on continuing improvements aimed at prevention, elimination and/or progressive reduction of emissions.

As described in the EPA Act of 1992, BATNEEC will be used to prevent, eliminate or, where that is not practicable, limit, abate, or reduce an emission from an activity which is listed in the first schedule to the Act. The use of BATNEEC is construed in the Act to mean the provision and proper maintenance, operation, use and supervision of facilities which are the most suitable for the purposes.

In determining BATNEEC for an activity, regard shall be had to :

- the current state of technical knowledge;

- the requirements of environmental protection;

- the application of measures for these purposes, which do not entail excessive costs, having regard to the risk of significant environmental pollution which, in the opinion of the agency, exists.

For existing facilities, additional regard shall be had to :

- the nature, extent and effect of the emission concerned;

- the nature and age of the existing facilities connected with the activity and the period during which the facilities are likely to be used or to continue in operation, and

- the costs which would be incurred in improving or replacing these existing facilities in relation to the economic situation of activities of the class concerned.

The technologies and the associated emission limit values (ELVs) identified in this Guidance Note are regarded as representing BATNEEC for a *new* activity. However, it is also generally envisaged that *existing* facilities will progress towards attainment of similar emission limit values, but the specific ELV requirements and associated time frames will be identified on a case by case basis when the licence application is being processed. Furthermore, for *all* facilities, additional and more stringent requirements may be specified on a site-specific basis whenever environmental protection so requires. Hence the BATNEEC guidelines are not the sole basis on which licence emission limit values are to be set, since information from other sources will also be considered, including site-specific environmental and technical data, plant financial data and other relevant information.

3. SECTOR COVERED BY THIS GUIDANCE NOTE

This Guidance Note covers SECTOR 5 of the activities specified in the First Schedule to the EPA Act,1992. These are:

5.1 The manufacture of chemicals in an integrated chemical installation .

5.2 The manufacture of olefins and their derivatives or of monomers and polymers, including styrene and vinyl chloride.

5.3 The manufacture, by way of chemical reaction processes, of organic or organo-metallic chemical products other than those specified at 5.2.

5.4 The manufacture of inorganic chemicals.

5.5 The manufacture of artificial fertilisers.

5.6 The manufacture of pesticides, pharmaceutical or veterinary products and their intermediates.

5.7 The manufacture of paints, varnishes, resins, inks, dyes, pigments or elastomers where the production capacity exceeds 1,000 litres per week.

5.8 The formulation of pesticides.

5.9 The chemical manufacture of glues, bonding agents and adhesives.

5.10 The manufacture of vitamins involving the use of heavy metals.

5.11 The storage, in quantities exceeding the values shown, of any one or more of the following chemicals (other than as part of any other activity)—

methyl acrylate (20 tonnes); acrylonitrile (20 tonnes);
toluene di-isocyanate (20 tonnes); anhydrous ammonia (100 tonnes);
anhydrous hydrogen fluoride (1 tonne) .

4. CONTROL TECHNOLOGIES

4.1 Introduction

As explained in Section 2, this Guidance Note identifies BATNEEC, but obviously does so in the absence of site-specific information. Accordingly, it represents the requirements expected of any new activity covered by the Note, but does not exclude additional requirements which may form part of the granting of a licence for a specific site.

The approach to be used in selecting BATNEEC is based on the following hierarchy:

- Process design / redesign changes to **eliminate** emissions and wastes that might pose environmental problems.

- **Substitution** of materials / solvents etc. by environmentally less harmful ones.

- Demonstration of waste **minimisation** by means of process control, inventory control and end-of-pipe technologies etc.

The existing, or possible measures for reduction and control of emissions are described in this section. These range from relatively simple containment measures to sophisticated recovery and end-of-pipe technologies and include:

(i) Load Minimisation
(ii) Containment
(iii) Recovery/recycle
(iv) Emission reduction
(v) Waste treatment & disposal.

The technical feasibility of the measures listed below has been demonstrated by various sources. Used singly or in combination, these measures represent BATNEEC solutions when implemented in the appropriate circumstances. The circumstances depend on plant scale, chemicals used, nature of the products made, number of different products produced, degree of plant integration etc. A summary of the treatments for various emissions is given at the end of this section. Note that, where flammable / explosive dusts or vapours are handled, safety procedures (acceptable to HSA) should be adopted and nothing in this note should be construed as advice to the contrary.

4.2 Technologies for load minimisation :

(No priority ranking is intended, and the appropriate selection in a particular case will depend on the specifics of the process concerned and on site constraints)

- Improved phase separation in the process.
- Optimisation of vacuum condensation efficiency.
- Additions of reagents to reactors via sluice valves.
- Optimised separation of product and solvent in the filtration or centrifugation step prior to final drying.
- Inventory control.
- Optimisation of water usage.
- Countercurrent product rinsing.
- Mother liquor treatment (recuperation, oxidation).
- Dry equipment cleaning and dry vacuum systems, where feasible.
- Separation of cooling water, storm water and process effluents of different origin in order to permit appropriate treatment options.

4.3 Containment of Emissions :

(No priority ranking is intended, and the appropriate selection in a particular case will depend on the specifics of the process concerned and on site constraints)

- Enclosure of materials (excluding bulk liquids), storage, handling, processing and transfer within a suitable building.
- Minimisation of tank filling losses by, e.g., vapour return systems.
- Secondary containment of relief valve or bursting disk discharges from reactors.
- Low loss vacuum pumps, e.g., dry vacuum pumps, once-through oil pumps, cryogenic solvent as pump seal liquid.
- Covered basins in WWTP to contain VOC losses.
- Vent collection and ducting from tank farms to central abatement systems.
- Vent collection and ducting from reactors to central abatement systems.
- Closed transfer systems from reactors to centrifuges to filters to dryers.
- Bunding of tanks.
- Single controlled emission point for all large dedicated plants.
- Minimisation of tank breathing losses by pressure vacuum valves, isolation and/or tanks painted white.
- Overground pipelines and transfer lines.
- Floating roofs on bulk storage tanks.
- Storage of delivered materials pending detailed analysis.
- Check system to avoid mixing incompatible materials.
- Bunding of all stored materials with separate bunding for incompatibles
- Overfilling protection on bulk storage tanks.
- Prevention of rain ingress, wind entrainment etc. for stored materials.

4.4 Technologies for recovery and recycling:

(No priority ranking is intended, and the appropriate selection in a particular case will depend on the specifics of the process concerned and on site constraints)

- Waste air streams with relatively high solvent loads, especially those after drying, distillation/condensation or vacuum filtration should be subjected to an effective treatment, primarily aimed at recovery.
- Separate organic and aqueous phase drains from process buildings .
- Interceptor tanks at each process building.
- On-site solvent recovery plants.
- Off-site solvent recovery.
- Water condensers on reactor overheads.
- Refrigerated condensers on reactor overheads.
- Cryogenic condensation on reactor overheads.
- Carbon adsorption/desorption on vapour streams containing organics.
- Organic liquid absorption/desorption on vapour streams containing organics.
- Polymer adsorption/desorption on vapour streams containing organics.
- Aqueous scrubbing with solvent recovery.
- Optimisation of condensation capacity after distillation resulting in at least 95% efficiency for all solvents in multi-purpose plants and at least 99% for dedicated plants.
- Reuse in another industry.

4.5 Technologies for treating air emissions:

(No priority ranking is intended, and the appropriate selection in a particular case will depend on the specifics of the process concerned and on site constraints)
References in brackets are explained in Table 4.5.1

- Biofilters as final air treatment.(T1)
- Selective chemical reaction scrubbers, e.g., hypochlorite scrubbers for odour control of mercaptans, NaOH scrubbers for acid removal.(T2)
- Aqueous scrubbing of soluble VOCs for liquid phase biodegradation in WWTP.(T3)
- Cyclones for removal of fermenter aerosol.(T4)
- Steam sterilisation of fermenter exhausts.(T5)
- HEPA and bag filters.(T6)
- Wet electrostatic precipitators.(T7)
- Vapour incineration - thermal.(T8)
- Vapour incineration - catalytic and regenerative (for non-chlorinated solvent streams).(T9)
- Flares. (T10)

Table 4.5.1. **Summary of Technologies for Treating Air Emissions.**

Emission Type	**Technologies**
VOCs/Organics	T2, T3, T8, T9, T10.
Odours	T1, T2, T8, T9.
Organisms	T5, T6.
Halogens & compounds	T2
Sulphur & compounds	T2
Phosphorus & compounds	T2
Nitrogen & compounds	T2, T10
Carbon oxides	--
Particulates, metals, metalloids and compounds	T4, T6, T7
Acid gases	T2

4.6 Technologies for treating water emissions:

(No priority ranking is intended, and appropriate selection in a particular case will depend on the specifics of the process concerned and on site constraints.)

4.6.1 Pre-Treatment:

- Air stripping of effluents for recovery or treatment.(VOCs)
- Steam stripping of effluents for recovery or treatment.(Organics)
- Steam or air stripping for removal of organohalogens and aromatic hydrocarbons prior to WWTP. (These streams should be treated as close to the source as possible and should not be transported in open sewer systems on site. The air or steam used should be subject to recovery)
- Precipitation. (Heavy metals)
- Oxidation .(Cyanides)

4.6.2 Primary Treatment:

- pH Correction / neutralisation. (acids and alkalis)
- Coagulation / flocculation / precipitation. (dissolved and colloidal solids)
- Sedimentation / filtration / floatation. (solids removal)

4.6.3 Secondary Treatment:

- Biofilters. (organic treatment for BOD removal)
- Anaerobic treatment. (organic treatment for BOD removal)
- Wet air oxidation. (organic treatment for BOD removal)
- Activated sludge / aeration lagoons. (organic treatment for BOD removal)

- Extended aeration. (organic treatment for BOD removal)
- Nitrification / denitrification. (treatment of nitrogen compounds)

4.6.4 Tertiary Treatment:

- Filtration, coagulation, precipitation. (solids and phosphate removal)
- Ozonation/Oxidation. (trace organics)
- Activated Carbon polishing.(trace organics)
- Resin beds. (dissolved solids)

4.6.5 Sludge Treatment:

- Gravity thickening.
- Dissolved air floatation.
- Filtration.
- Centrifugation.
- Sludge digestion.
- Drying.

4.7 Technologies for the treatment and disposal of wastes:

(No priority ranking is intended, and appropriate selection in a particular case will depend on the specifics of the process concerned and on site constraints.).

- Incineration. (Incinerator emissions are the subject of a separate note)
- Waste encapsulation.
- Vitrification of waste.
- Engineered landfill of wastes.

5. EMISSION LIMIT VALUES

5.1 Reference Conditions

The reference conditions for concentrations of substances in emissions to air from contained sources are:

For non-combustion gases :

Temperature 273 K; Pressure 101.3 kPa; no correction for water vapour content.

For combustion gases:

Temperature 273 K; Pressure 101.3 kPa; dry gas.
Oxygen content 3% (dry) for liquid and gaseous fuels, 6% (dry) for solid fuels.

These units and reference conditions may not be suitable for continuous monitoring methods and may, by agreement with the Agency, be converted for day-to-day control purposes into values more suitable for the available instrumentation.

5.2 Interpretation of Compliance

Unless otherwise detailed in the license, the following interpretation of compliance with limit values should apply.
(Achievement of ELV concentrations by the introduction of dilution air is not permitted.).

5.2.1 Air emissions

For **continuously monitored** emissions, the following will be required for compliance with measurements based on 30 minute mean values (unless otherwise stated):

(i) 97% of all 30 minute mean measurements shall be below 1.2 times the emission limit.

(ii) No 30 minute mean measurement shall exceed 2.0 times the emission limit.

(iii) All daily mean values shall be less than the emission limit.

Where **periodic monitoring** is used to check compliance, all samples should meet the consent conditions.

5.2.2 Emissions to waters

The limit values for discharges to water are based on 24 hour flow proportional composite samples, unless otherwise specified.

5.3 Releases to Air

Emission Limit Values representing BATNEEC are given in Tables 5.1.-5.7 below. Where a substance appears in more than one table, the values in Tables 5.1 - 5.3 take precedence over the specific material values in Table 5.4. Table 5.5 applies only for substances not listed in the earlier table.

Table 5.1 - Emission Limit Values for Fertiliser Production

Process	Source	Emission Limit Value (mg/m^3)
Ammonium nitrate production	Prill towers	
	- Particulate	15
	- Ammonia	10
Ammonium nitrate production	Neutralisers/reactors/coolers/driers	
	- Particulate	30
	- Ammonia	50
Ammonium nitrate production	Evaporators	
	- Particulate	15
	- Ammonia	50
Ammonium phosphate production	- Particulate	15
	- Ammonia	10
Other fertiliser production	- Particulate	50
	- Sulphur oxides (as SO_2)	200
	- Nitrogen oxides (as NO_2)	200
	- Ammonia	50
	- Fluorides (as HF)	10

Note : Achievement of ELV concentration by the introduction of dilution air is not permitted

Table 5.2 - Emission Limit Values for Sulphuric Acid Production

Process	Minimum Conversion Rate (SO_2 to SO_3)
New process	Steady state: 99.7%
	Start up (hourly ave. for first 5 hours): 98%

Note : Achievement of ELV concentration by the introduction of dilution air is not permitted

Table 5.3 - Emission Limit Values for Ammonia Production

Source	Emission	Emission Limit Value (mg/m^3)
Steam Reforming Plants	Nitrogen oxides (as NO_2 at 3% O_2)	450
	Sulphur dioxide(Natural Gas fuelled)	2
	Carbon monoxide	10
	Diffuse emissions	1 t/a
	Nitrogen oxides (Non-continuous emissions as NO_2)	20 kg/h
	Purge Gas Scrubber	40 g NH_3/t NH_3 produced
Partial Oxidation Plants - auxiliary boiler flue gas	Sulphur dioxide	1700
	Nitrogen oxides (as NO_2)	700
	Carbon monoxide (Hourly maximum) (Daily average)	175 10
	Particulates (Hourly maximum) (active ingredient) (Daily average)	50 10
Partial Oxidation Plants - steam superheater flue gas	Nitrogen oxides (as NO_2)	450
	Sulphur dioxide (Natural Gas fuelled)	2
	Carbon monoxide	30
	Hydrogen sulphide	0.3
	Methanol	100

Note : Achievement of ELV concentration by the introduction of dilution air is not permitted

Table 5.4 - Emission Limit Values for Specific Materials (Not already covered by Tables 5.1-5.3)

PARAMETER	mg/m^3	Mass Flow Threshold for ELVs (Note 1)
Cadmium	0.1	>1 g/hr
Chlorides (as HCl)	10	>0.3 kg/hr
Iodides (as HI)	5	>50 g/hr
Carbon disulphide	5	>0.1 kg/hr
Hydrogen cyanide	2	>50 g/hr
Mercaptans	2	>0.1 kg/hr
Amines (total)	10	>0.1 kg/hr
Trimethylamine	2	>0.1 kg/hr
Phenols & cresols & xylols	10	>0.1 kg/hr
1,2 - Dichloroethane	5	>0.1 kg/hr
Dust - pesticide contaminated[1]	0.15	>1 g/hr
Dust - pharmaceutical[1]	0.15	>1 g/hr
Bromine	10	>50 g/hr
Chlorine	10	>50 g/hr
Iodine	10	>50 g/hr
Mercury	0.1	>1 g/hr
Total Heavy Metals	1.5	>5 g/hr
Nitrogen oxides (as NO_2)	300	>3 kg/hr
Sulphur oxides (as SO_2)	300	>3 kg/hr
Particulates - general	20	>0.5 kg/hr
Ethylene dichloride (1,1,dichloroethylene)	5	>0.1 kg/hr
Acrylonitrile	20	>0.1 kg/hr
Toluene di-isocyanate	1	>0.1 kg/hr
Ethyl acrylate	1	Note 2
Isobutyl acrylate	1	Note 2
Methyl acrylate	5	Note 2
n-Butyl acrylate	5	Note 2
t-Butyl and higher acrylate esters	20	Note 2

[1] Dust - as active ingredient.

Note 1: Achievement of ELV concentration by the introduction of dilution air is not permitted

Note 2: Only applicable to vents from bulk storage (> 20 tonnes)

Table 5.5- Emission Limit Values for General Emissions to Air (excluding incinerator emissions) for materials not already covered by Tables 5.1-5.4

(Note: The emission limit values contained in Tables 5.1 - 5.4 take precedence over those below.)

Constituent Group * or Parameter	Class	Mass Flow Threshold for ELV (Note 1)	Emission Limit Value (mg/m^3)
Carcinogenic Substances	T.A. Luft I T.A. Luft II T.A. Luft III Substances (other than those above) with R45 designation	> 0.5 g/hr >5.0 g/hr >25.0 g/hr >0.5 kg/hr	0.1 1.0 5.0 5.0
Inorganic Dust Particles	T.A. Luft I T.A. Luft II T.A. Luft III	>1 g/hr >5 g/hr >25 g/hr	0.2 1.0 5.0
Vaporous or Gaseous Inorganic Substances	T.A. Luft I T.A. Luft II T.A. Luft III T.A. Luft IV	>10 g/hr >50 g/hr >0.3 kg/hr >5.0 kg/hr	1 5 30 500
Organic Substances with Photochemical Ozone Potential - POCP	U.K. AEA 1 U.K. AEA 2	>0.5 kg/hr >2.0 kg/hr	20 50
Organic Substances (Note 2)	T.A. Luft I T.A. Luft II T.A. Luft III	>0.1 kg/hr >2.0 kg/hr >3.0 kg/hr	20 100 150
General Dusts		<0.5 kg/hr >0.5 kg/hr	150 20
Pharmaceutical and Pesticide Dust - as active ingredient		>1g/hr	0.15
Fugitive Emissions			(Note 3)

* Where a substance falls into more than one category in Table 5.5, the lower emission limit value applies.

Note : Achievement of ELV concentration by the introduction of dilution air is not permitted

Notes for Tables 5.4 and 5.5:

1. The Mass Flow is calculated in kg/hr for the *raw* gas and is determined at the point before any gas cleaning or abatement plant, but after any devices inherent in the process (e.g. after reactor overhead condensers; after product cyclones etc.). Mass Flow is the maximum emission which can occur over any one hour period of plant operation, from the entire site.

   Where the Mass Flow exceeds the mass threshold given in the Guidance Note, then abatement will be required down to the appropriate emission limit value (ELV), unless the concentration of the *raw* gas is already below the ELV, in which case no further abatement is required. (In other words, if the *raw* gas concentration is below the ELV, the mass flow is not relevant)

2. Where organic substances of several classes are present, in addition to the above limit, the sum of Classes 1 & 2 shall not exceed the Class 2 limit and the sum of Classes 1, 2 & 3 shall not exceed the Class 3 limit etc.

3. Fugtive solvent emissions should comply with the requirements of proposed E.C. Solvent Directive or licence as appropriate.

4. It should be noted that emissions which fall below the Mass Emission threshold may still be considered at the time of licensing in order to minimise these as much as possible.

5.4 Releases to water

Effluent load should be minimised by recovery of materials wherever practicable. The use of lower quality water may be possible for some parts of the process rather than fresh water.

Excluding uncontaminated stormwaters, all releases to waters are subject to a licence from the Agency. However, any discharge to a sewer will require the consent of the local authority or sewerage undertaker. BATNEEC to minimise the release of substances will generally include minimisation at source and either specific treatment of contaminated waste streams to remove particular substances or co-treatment of combined effluent streams or both. The Emission Limit Values for effluent discharges to waters are set out in Table 5.6.

Table 5.6 - Emission Limit Values for Discharges to Water*

All values shown apply prior to dilution of effluent by uncontaminated streams, e.g. stormwaters, cooling waters, etc.

Constituent Group or Parameter	**Limit Value**	**Notes**
pH	6 - 9	5
Number of Toxicity Units	10	2,5
Total Nitrogen (mg/1 as N)	See Table 5.7.	5
Total Phosphorus (mg/1 as P)	See Table 5.7.	5
Total Ammonia (mg/1 as N)	10	5
Oils, Fats & Grease (mg/1)	10	5
Organohalogens (mg/l)	0.1 (monthly mean)	4,5
Phenols (mg/l)	1.0	5
Cyanide (mg/l as CN)	0.2	5
Mercury (mg/1)[1]	0.05	5 ,7
Tin (mg/l)	2.0	5 ,7
Lead (mg/l)[3]	0.5	5 ,7
Chromium (mg/l as Cr VI)	0.1	5 ,7
Chromium (mg/l as total Cr)[3]	0.5	5 ,7
Cadmium (mg/l)[2]	0.05	5 ,7
Zinc (mg/l)[3]	0.5	5 ,7
Copper (mg/l)[3]	0.5	5 ,7
Mineral Oil (mg/l) Interceptors	20	5
Mineral Oil (mg/l) Biological treatment	1.0	5
EC. List 1	As per 76/464/EC & amendments	
Benzene & Toluene & Xylene (mg/l combined)	0.1 (monthly mean)	
Genetically Modified Organisms	As per 90/219/EEC and S.I. No. 345 of 1994	

* All values refer to daily averages, except where otherwise stated to the contrary, and except for pH which refers to continuous values.

Parameter	Minimum % Total Removal	Notes
BOD	91	1
COD	75	1,6

Parameter	Limit value	Notes
Fish Tainting	No Tainting	3

[1] Also compliance with Dir 82/176/EEC & 84/156/EEC ,amendments and S.I. No. 55 of 1986.
[2] Also compliance with Dir 83/513/EEC , amendments and S.I. No. 294 of 1985.
[3] Where the sum of the loads of these metals is <200 g/day prior to treatment, the respective emissions limit value may be increased four fold - in justified cases.

Notes for Table 5.6:

1. The daily raw waste load for BOD/COD is defined as the average daily mass arising for treatment over any three month period.

   Calculation of the removal rates for BOD/COD should be based on the differences between the waste loads arising for disposal and those discharges to the receiving waters. The amounts removed by treatment (physical, chemical, biological) may be included in the calculation.

   Calculation of the raw waste loads of BOD/COD shall exclude any waste load associated with microbial cell biomass removal and solvent recovery. However, residual amounts remaining after these practices may be included in the raw waste load calculation.

   For certain specific effluents where the % BOD/COD removal rates are unattainable, a concentration limit may be more appropriate. This will be a matter for inclusion in a licence.

2. Toxicity unit (TU) = 100/x hour E(L)C 50 in percentage vol/vol, where x is defined by the test procedure. The toxicity of the process effluent to at least two appropriate aquatic species shall be determined.

3. No substance shall be discharged in a manner, or at a concentration which, following initial dilution, causes tainting of fish or shellfish, interferes with normal patterns of fish migration or accumulates in sediments or biological tissues to the detriment of fish, wildlife or their predators.

4. Within 6 months of the commencement of production (or as may be relevent on a campaign basis), the effluent should be screened for a priority pollutant list (such as CLP 40, US EPA volatile and/or semi-volatile).

5. Consent conditions for these parameters for discharge to municipal treatment plants can be established with the Licencing Authority, and different values may apply.

6. This limit applies only to:

   5.1 *The manufacture of chemicals in an integrated chemical installation .*

   5.2 *The manufacture of olefins and their derivatives or of monomers and polymers, including styrene and vinyl chloride.*

   5.3 *The manufacture, by way of chemical reaction processes, of organic or organo-metallic chemical products other than those specified at 5.2.*

5.6 The manufacture of pesticides, pharmaceutical or veterinary products and their intermediates.

7. Where the metallic content of the effluent arises as an unavoidable contaminant of raw materials, then these limits may not apply.

Table 5.7. Discharges to waters subject to eutrophication

(One or both of the limits below may apply,depending on the sensitivity of the receiving waterbody.)

Parameter	Limit value mg/l
Total Nitrogen[1]	>80% removal[2], **or** 15 mg/l
Total Phosphorus	>80% removal[2], **or** 2 mg/l

[1] Total nitrogen means the sum of Kjeldahl Nitrogen, Nitrate N and Nitrite N.
[2] Reduction in relation to influent load.

6. COMPLIANCE MONITORING

The methods proposed for monitoring the emissions from these sectors are set out below.

6.1 Air Emissions

1. Monitoring solvent use by annual material balance reports. Fugitive emissions may be calculated by difference.

2. Continuous monitoring on main emission points where technically feasible (e.g. TOC, HCl, Particulates, CO, SO_2, NOx)

3. Periodic stack sampling as required by licence, taking account of the nature, magnitude and variability of the emission, and the reliability of the control technologies.

6.2 Waste water Discharges:

1. Establish existing conditions prior to start-up, of key emission constituents and salient flora and fauna.

2. Daily monitoring of flow and volume, continuous monitoring of pH. Monitoring of other relevant parameters as deemed by the Agency taking account of the nature, magnitude and variability of the emission, and the reliability of the control technologies.

3. Monitoring of influent and effluent from the waste water treatment plant to establish % BOD and COD reduction and early warning of any difficulties in waste water treatment plant, or unusual loads.

4. Periodic fish tainting and toxicity tests where appropriate taking account of the nature, magnitude and variability of the emission, and the reliability of the control technologies.

5. Periodic biodegradability checks where appropriate on effluents to municipal waste treatment plants, both prior to start-up and thereafter.

6.3 Solid Waste Monitoring:

1. The recording in a register of the types, quantities, date and manner of disposal of all wastes.

2. Leachate testing of sludges and other material, as appropriate, being sent for landfilling.

3. Annual waste minimisation report showing efforts made to reduce specific consumption together with material balance and fate of all waste materials.

Appendix 1.

SOURCES AND EMISSIONS

1. Introduction:

In this section, the major sources of emissions to air and water are identified, as are the principal sources of waste from the sector. It should be borne in mind that the identified list of sources is not all encompassing, nor will every plant falling within an individual sector have every one of the emissions which are associated with the sector as a whole.

It should also be noted that incineration can be a selected technology in certain cases, but its environmental aspects (including air, water and waste) are covered in a separate Guidance Note.

For each subsector, emissions are considered under three headings; fugitive emissions, unscheduled emissions and specific process emissions. Some of the latter are considered to have little potential environmental significance (and hence no emission limit value) and these are designated as minor (m). However, obviously there could be specific plants where these designations may not be correct. Such emissions must then be examined on a one-off basis.

2. Sources of Emission to Air from:

(Symbols refer to Table A1)

2.1 Fugitive Emissions and Unscheduled Emissions:

- Vapour losses during storage, filling and emptying of bulk solvent tanks and drums. (including hose decoupling)
- Stripping of VOCs and odourous compounds from open tanks in waste water treatment plants (WWTP) resulting in releases to air and/or odour problems.
- Venting of storage tank blanket gases.
- Fugitive emissions of particulate matter from open storage, loading and unloading of solid materials.
- Bursting disks and relief valves discharges.
- Leakages from flanges, pumps, seals, valve glands etc.

- Building losses (through door, window, etc.).

2.2 General Organic Chemical Manufacturing Plants:

- VOC loses from wet product/cake handling/transportation. (S1)
- Vapour losses from reactors, fermenters and in process holding tanks.(S2)
- Vapour losses from open reactor manlids during loading.(S2)
- Solid intermediates and products from handling, drying, milling and packing.(S3)
- Solvent vapours from drying operations. (S1)
- Building ventilation gases. (m)
- Regeneration of catalysts etc.(S4)
- VOC from cooling towers and ejector vents.(m)
- Vapours from desolventiser exhausts.(S1)
- Distillation vents.(m)
- Material handling and storage.(S5)
- Vacuum pump discharges.(m)

2.3 Formulation Plants:

- Solvent vapour losses from tablet coating.(S1)
- Losses from material handling and processing. (S5)
- Dust from milling and granulation.(S3)

2.4 Organo-Metallic Chemical Manufacturing Plants:

- Process and blending operations. (S6)
- Sump vents.(m)
- General building extraction.(m)

- Venting of blanket gases.(m)
- Distillation vents.(m)

2.5 Inorganic Chemical Manufacturing Plants:

- Absorption column releases. (S7)
- Digesters.(S9).
- Combustion gases releases.(m)
- Reactor emissions.(S8).
- Emissions from kilns.(S8)
- Emissions from handling and storage of materials (S8).
- Emissions from dryers.(S8)
- Releases from vaporising systems.(S8)
- Emissions from dipping tanks and baths.(m)
- Particulates from shot blasting.(m)
- Hydrogenation off-gas.(m).
- Building ventilation.(m)
- Granulation and prilling plants.(S10).

2.6 Chemical Storage Installations:

- Filling (tank headspace and hose decoupling).(S11)

3. Sources of Emissions to Water from:

3.1 Spills and Diffuse Sources etc.:

- Contaminated stormwaters.
- Solvent tank leaks.
- Pipework leaks.
- Spillages.
- Bund Drains.
- Leakages from flanges, pumps, seals, valve glands etc.

3.2 General Organic Manufacturing Plants:

- Seal losses from liquid ring vacuum pumps.
- Spent process liquors.
- Wash waters.
- Scrubber, purge, and abatement system liquors.
- Aqueous phase from steam desorption of activated carbon.
- Cooling tower blowdown.
- Materials (including solvents, salts etc.) in waste water from extraction steps.
- Dehydration water.
- Laboratory effluent.
- Condensate.
- Boiler blowdown.
- D.I. and R.O. reject and regeneration water.

3.3 Formulation Plants:

- Active ingredients in wash waters.
- Contaminated stormwater.

3.4 Organo-Metallic Chemical Manufacturing Plants:

- as for 3.2.

3.5 Inorganic Chemical Manufacturing Plants:

- Absorption column vent collection.
- Spent reactor contents.
- Effluent from gas purification systems.
- Effluent from solids washing.
- Evaporation blowdown.
- Spent acids, alkalis etc.
- Condenser effluent.

3.6 Chemical Storage Installations:

- Vessel cleaning.
- Scrubber effluent.

4. Sources of Waste from:

(Symbols refer to Table A2)

4.1 General Organic Chemical Manufacturing Plants:

- Sludges from WWTP's, abatement systems and settling ponds. (W3 & W5)
- Still bottoms residue from solvent recovery plants. (W3, W4 & W6)
- Reject active materials, e.g. chemicals, pharmaceuticals, pesticides etc. (W3 & W4)
- Spent adsorbents. (W1)
- Spent biomass in fermenter broths. (W2)
- Solid reactor by-products and residues.(W1, W3, W4 & W6)
- Shake down dusts from filters. (W3 & W4)
- Plant or animal residues from extraction process. (W2)
- Contaminated drums, filters, equipment, packaging and protective clothing. (W1, W3, W4, W5 & W6)

4.2 Formulation Plants:

- Active ingredients in dust collection systems. (W2)
- Reject active materials, e.g. chemicals, pharmaceuticals, pesticides etc. (W2)
- Contaminated drums, filters, equipment, packaging and protective clothing. (W2)

4.3 Organic Metallic Chemical Manufacturing Plants:

- Sludges from effluent treatment. (W2 & W5)
- Slag from lead recovery furnaces.(W7)
- Spent oil from tetraethyl lead absorbers. (W7 & W8)
- Spent carbon from tetramethyl lead absorbers. (W7 & W8)
- Contaminated drums, packaging and protective clothing. (W7 & W8)
- Used filters and filter aid. (W7 & W8)
- Spent solvent. (W7 &W8)

4.4 Inorganic Chemical Manufacturing Plants:

- Spent adsorbents. (W1)
- Non-recoverable materials and spent reactor solids. (W9)
- Unreacted ore and residues from digestors. (W9)
- Solids from treatment and neutralisation plants. (W9)
- Solids from shot blast. (W9)
- Dusts from collection systems. (W9)
- Redundant cell linings and carbon anodes. (W9)
- Waste electrolytic solids. (W9)
- Solids from emergency absorption of spillages. (W9)
- Scrap diaphragms. (W9 & W10)
- Spent membrane cells. (W9)
- Drosses (non-recoverable). (W7)
- Off-spec material (non-reusable). (W9)

4.5 Chemical Storage Installations:

- None

5. Releases

The substances most likely to be present in the release to the environment and of principal concern in the processes covered by this note are given below. A licence applicant should identify and quantify all environmentally significant emissions (including heat discharges) from the process.

5.1 Releases to Air:

Table A1- Summary of Sources and Emissions
(Symbols refer to Section 2)

Source Type	Emission
S1	Volatile Organic Carbon compounds (VOCs)
S2	VOCs Odours Organisms Halogens and compounds Sulphur and compounds Phosphorus and compounds Nitrogen and compounds Oxides of carbon Metals, metalloids and compounds Particulates (inc. active compounds) Acid Gases.
S3	Particulates (inc. active compounds) Metals, metalloids and compounds Halogens and compounds VOC traces
S4	VOCs Metals, metalloids and compounds Sulphur and compounds Nitrogen and compounds Phosphorus and compounds Halogens and compounds
S5	VOCs Particulates (inc. active ingredients) Halogens & compounds
S6	Organic compounds Metals, metalloids and compounds Halogens and compounds Particulates
S7	Sulphur and compounds Nitrogen and compounds

	Halogens and compounds Organics
S8	Sulphur and compounds Nitrogen and compounds Carbon Oxides Organics Particulates Halogens and compounds Metals, metalloids and compounds
S9	Sulphur and compounds Nitrogen and compounds Halogens and compounds
S10	Particulates Sulphur and compounds Nitrogen and compounds Halogens and compounds Metals, metalloids and compounds
S11	Methyl acetate Acrylonitrile Toluene di-*iso*-cyanate Ammonia Hydrogen fluoride

5.2 Releases to Waters :

5.2.1 General Organic Chemical Manufacturing Plants:

- Mercury, cadmium and compounds.
- Reaction products.
- Solvents.
- Organics.
- Heavy metals.
- Ammonia.
- Salts, cyanides and sulfites.
- Inorganic acids and alkalis.
- Phosphates and Nitrates.

5.2.2 Formulation Plants:

- Solvents.

5.2.3 Organo-Metallic Chemical Manufacturing Plants:

- Mercury, cadmium and compounds.
- Metals.
- Tributylin and compounds.
- Triphenyl tin and compounds.

5.2.4 Inorganic Chemical Manufacturing Plants:

- Mercury, cadmium and compounds.
- Metals.
- Salts.

5.3 Other Releases:

TableA2 - Summary of Other Releases

(Symbols refer to Section 4)

Class	Description of Waste
W1	Catalysts Molecular sieves Activated carbon Filter aid, etc.
W2	Organics Halogens and compounds Phosphorus and compounds Biologically active materials
W3	Organics Organo-metallic compounds Halogens and compounds Metal carbonyls Phosphorus and compounds Metals and compounds Biologically active materials
W4	Oxidising agents.
W5	Metal sludges
W6	Polymeric residues
W7	Metals and compounds
W8	Organic Solvents Halogens and compounds Organometallic compounds
W9	Halogens and compounds Organo-metallic compounds Metals and compounds
W10	Asbestos

Appendix 2.

PRINCIPAL REFERENCES

1. Ireland

1.1 Guideline - Best Available Technology not Entailing Excessive Cost (BATNEEC) for Integrated Pollution Control in the Pharmaceutical Sector (Report for EPA by Byrne O'Cleirigh, 1993).

2. U.K. H.M.I.P. Chief Inspector's Guidance to Inspectors

2.1 Industry Sector Guidance Note IPR4
(Chemical Industry Sector).

2.2 Industry Sector Guidance Note IPR4/1
(Petrochemical processes).

2.3 Industry Sector Guidance Note IPR4/2
(Processes for the production and use of amines, nitriles, isocyanates and pyridines).

2.4 Industry Sector Guidance Note IPR4/3
(Processes for the production or use of acetylene, aldehydes etc.).

2.5 Industry Sector Guidance Note IPR4/4
(Processes for the production or use of organic sulphur compounds, and production, use or recovery of carbon disulphide).

2.6 Industry Sector Guidance Note IPR4/5
(Batch manufacture of organic chemicals in multipurpose plant).

2.7 Industry Sector Guidance Note IPR4/6
(Production and polymerisation of organic monomers).

2.8 Industry Sector Guidance Note IPR4/7
(Processes for the manufacture of organo-metallic compounds).

2.9 Industry Sector Guidance Note IPR4/8
(Pesticide processes).

2.10 Industry Sector Guidance Note IPR4/9
(Pharmaceutical processes).

2.11 Industry Sector Guidance Note IPR4/10
(Processes for the manufacture, use or release of oxides of sulphur and the manufacture, recovery, condensation or distillation of sulphuric acid or oleum).

2.12 Industry Sector Guidance Note IPR4/11
(Processes for the manufacture or recovery of nitric acid and processes involving the manufacture or release of acid-forming oxides of nitrogen).

2.13 Industry Sector Guidance Note IPR4/12
(Processes for the sulphonation or nitration of organic chemicals).

2.14 Industry Sector Guidance Note IPR4/13
(Processes for the manufacture of, or which use or release halogens, mixed halogen compounds or oxohalo compounds).

2.15 Industry Sector Guidance Note IPR4/14
(Processes for the manufacture of, or which use or release hydrogen halides or any of their acids).

2.16 Industry Sector Guidance Note IPR4/15
(Processes for the halogenation of organic chemicals).

2.17 Industry Sector Guidance Note IPR4/16
(Processes for the manufacture of chemical fertilizers or their conversion into granules)

2.18 Industry Sector Guidance Note IPR4/17
(Bulk storage installations).

3. E. C.

3.1 Technical Note on the Best Available Technologies Not Entailing Excessive Cost - Production of Nitric Acid (1990)

3.2 Technical Note on the Best Available Technologies Not Entailing Excessive Cost - Manufacture, Storage and Handling of Benzene (1990)

3.3 Technical Note on the Best Available Technologies Not Entailing Excessive Cost - Production of Sulphuric Acid (1990)

3.4 Technical Note on the Best Available Technologies Not Entailing Excessive Cost - Production of Ammonia (1990)

4. Parcom

4.1 Parcom recommendation 92/5 concerning Best Available Technology in the Pharmaceutical Industry.

5. Germany

5.1 T.A. Luft (1986)

Appendix 3

I.P.C. Licensing Information Leaflets - Published by the Environmental Protection Agency

LC1 Integrated Pollution Control Licensing - Guide to Implementation and Enforcement in Ireland

LC2 Integrated Pollution Control - Summary of Licensing Procedures

LC3 Environmental Protection Agency - Summary of its Structures, Powersand Functions

LC4 Integrated Pollution Control(IPC) Licensing Fees

LC5 Environmental Protection Agency Act, 1992 (Noise) Regulations, 1994