

ENVIRONMENT AND HERITAGE SERVICE

**GUIDANCE FOR PROCESSES PRESCRIBED FOR
AIR POLLUTION CONTROL
BY THE CHIEF INDUSTRIAL POLLUTION INSPECTOR**

**CHIEF INSPECTOR'S GUIDANCE
TO INSPECTORS
(PART B PROCESSES)**

**PROCESSES FOR THE SURFACE TREATMENT
OF METALS**

B PROCESS GUIDANCE NOTE - GNB 4/1 VERSION 1

DATE OF ISSUE:

MARCH 1997

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1. INTRODUCTION

This Note is issued by the Chief Industrial Pollution Inspector as one of a series providing guidance for processes prescribed for Air Pollution Control (APC) by the Chief Inspector in Regulations made under the Industrial Pollution Control (Northern Ireland) Order 1997.

A further series of Notes is produced by the Department of the Environment (NI) for those processes prescribed for air pollution control and subject to regulation by the District Councils.

This Note provides a guide on standards and techniques to Inspectors in their assessment of an application for, or variation of, an APC authorisation under the Order.

This Note will also be of interest to operators of such processes, however it should be understood that whether an authorisation is granted, and on what conditions, will depend on the particular circumstances of each application. Parameters such as individual process characteristics and site location may influence the nature of the conditions that are included in an authorisation.

A key objective of the legislation is to ensure that, in carrying on a prescribed process, the best available techniques not entailing excessive cost (BATNEEC) will be used -

- (i) for preventing the release of prescribed substances into the air or, where that is not practicable by such means, for reducing the release of such substances to a minimum and for rendering harmless any such substances which are so released; and
- (ii) for rendering harmless any other substances which might cause harm if released into the air.

This Note comprises guidance in relation to new and existing processes and is based on an assessment of best available techniques as qualified by the requirement not to entail excessive cost. (The definition and meaning of BATNEEC is contained in the Industrial Pollution Control Part A and B processes “A Practical Guide”.)

The guidance contained in this Note is based on the current state of knowledge and understanding of these processes, their potential impact on the environment, and the available control techniques at the time of publication. The guidance will be updated regularly, (as a minimum the Note will be reviewed at not more than four yearly intervals from the date of publication), to reflect changes in knowledge and understanding. It will not always be possible to revise the Notes quickly enough to keep in absolute step with rapid changes. It is therefore recommended that operators and their advisors check with the Inspectorate as to whether there have been any changes before relying on this Note for the purpose of making an application or taking other significant action under the Order.

2. **PROCESS DEFINITION**

- 2.1 This Note applies to any process using the surface treatment of metal, which is likely to result in the release into the air of any acid-forming oxide of nitrogen as described in Schedule 1 - Section 4.3, Part B of the Industrial Pollution Control Order (Prescribed Processes and Substances) Regulations (Northern Ireland) 1998.
- 2.2 In the context of this Note “process” comprises the whole process including the treating, handling and storage of any materials used in the process as well as products and wastes produced by the process.

3. **GENERAL REQUIREMENTS**

3.1 New processes will be subject to the standards contained in this Note immediately.

3.2 It should be the aim to bring existing processes up to current standards whenever the opportunity arises. Account should be taken of the plant's technical characteristics; its rate of utilisation and the length of its remaining life; the nature and amount of polluting emissions from it and the desirability of not entailing excessive costs for the plant concerned.

3.3 As part of the first application for the authorisation of existing processes, those areas of the process that require upgrading should be identified, and the possible techniques which are to be employed with the aim of attaining achievable releases for new processes, indicated. Under normal circumstances, a detailed programme for upgrading, including timetable, should be submitted with the application.

4. **RELEASES INTO AIR**

4.1 **Reference Conditions**

All pollutant concentrations from contained releases should be expressed at reference conditions of temperature 273K (0°C) and pressure 101.3 kPa (1 atmosphere) without correction for water vapour or oxygen.

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

4.2 Emission Targets

4.2.1 The emission standard for the pollutants are as follows:

| <u>Pollutant</u> | <u>Concentration (mg/m³)</u> |
|---|---|
| Oxides of Nitrogen (expressed as nitrogen dioxide equivalent) | 400* |
| Hydrogen Fluoride | 10 |

Note * Oxides of nitrogen includes nitric acid vapour.

4.2.2 The aim should be that all emissions are free from offensive odour outside the site boundary, as perceived by the Inspectorate.

4.2.3 All releases, other than steam or water vapour, should be colourless, free from persistent mist or fume and free from droplets.

4.2.4 The introduction of dilution air to achieve emission concentrations as detailed in par. 4.2.1 is not permitted.

4.2.5 It should be the aim that all releases will be free from offensive odour outside the process site boundary, as perceived by the Inspectorate.

5. **RELEASE ROUTES**

The principal release routes to air are as follows:-

| <u>Source</u> | <u>Pollutant</u> |
|---|--|
| The chemical brightening of aluminium | NO _x , Nitric acid, Sulphuric acid, and Phosphoric acid |
| The chemical polishing of copper alloys | NO _x , Nitric acid, Sulphuric acid, and Hydrochloric acid |
| Desmutting/deoxidation and passivation | Negligible NO _x and acid mist |
| Pickling | NO _x , Nitric acid and Hydrochloric acid |
| Vessel Cleaning | NO _x and Nitric Acid |

6. **TECHNIQUES FOR RELEASE MINIMISATION**

6.1 **Introduction**

The techniques selected need to cover releases from raw materials reception/storage, internal transportation, and from processing.

The process should be designed and operated in such a way that the substances released have the minimum impact on the environment. As a general principle the Inspectorate should be looking for evidence of the prevention, minimisation and rendering harmless of all releases of prescribed substances, and the rendering harmless of all other releases in the application, and requiring this in the authorisation.

Releases from the process may require a combination of several abatement techniques and the careful control of the process route taken in order to deal with the releases. The applicant should review all the options that are available and demonstrate that the combination of primary process and selected abatement equipment represents BATNEEC.

6.2 **Techniques**

6.2.1 Dipping or brightening solutions containing fume suppressants should be used where these are available and their use is technically feasible.

6.2.2 Emissions will depend on the strength of the acid mixture, the temperature of the process, the surface area being treated and the level of agitation, (by air or mechanical means), applied to the work. These factors should be optimised to reduce emissions to a minimum, consistent with efficient manufacturing operation.

6.2.3 Emissions of oxides of nitrogen or hydrogen fluoride from process vessels should be adequately contained and vented. Abatement equipment should be used if necessary to meet the requirements of Section 4.2.

6.2.4 **Dispersion of Contained Emissions**

6.2.4.1 The applicants will need to satisfy the Inspectorate that an appropriate assessment of vent and chimney heights has been made to provide adequate dispersion of prescribed substances, and other substances that might cause harm, which cannot be prevented and may be released. Some guidance is given in Technical Guidance Note D1 (ISBN 0-11-752794-7).

6.2.4.2 It may be necessary for dispersion modelling to be carried out which takes into account local meteorological data, local structures and topography, as well as other local releases, (for example sites with any large volume emission, significant non-

combustion sources or multiple release points and sites where there are sensitive receptors nearby.

- 6.2.4.3 Applicants should provide clear information on the parameters used and the assumptions made in their assessment, especially when using dispersion models. The assessment of background concentrations of pollutants will be particularly relevant. Statutory air quality standards and other recognised criteria should be taken into account.
- 6.2.4.4 Process upsets or equipment failure giving rise to abnormally high release levels over short periods should be assessed. Even if a very low probability of occurrence can be demonstrated by the applicant, a value for the chimney or vent height should nevertheless be set to avoid any serious damage to health in such circumstances.
- 6.2.4.5 The Operator should have procedures in place to reduce load or shut-down plant in the event of inadequate dispersion conditions.
- 6.2.4.6 Chimneys or process vents should be designed to provide efflux velocities that meet the requirements for stack aerodynamic downwash as described in Technical Guidance Note D1. Care should be taken to avoid generating positive pressure zones within the chimney unless the chimney wall is impervious or lined. Where a wet method of arrestment is used, the linear velocity within the arrestment equipment should not exceed 9 m/sec, to avoid entrainment of droplets.
- 6.2.4.7 Chimney flues, process vents and all ductwork should be leakproof. Chimney flues and ductwork leading to the chimney should be adequately insulated to minimise the cooling of waste gases and prevent liquid condensation on internal surfaces. Chimney flues and ductwork should be regularly cleaned to prevent accumulation of material.

6.2.4.8 Chimney or process vents should not be fitted with any restriction at the final opening, for example a plate, cap or cowl where it is necessary to achieve dispersion of the residual pollutants except for a cone which can be used to meet the efflux velocity requirements of par. 6.2.4.6. The discharge should be vertically upwards.

6.2.5 **General Operations**

6.2.5.1 Effective control of emissions requires the maintenance and proper use of equipment, as well prudent supervision of process operations and good housekeeping standards. Effective preventive maintenance should be employed on all plant and especially on the equipment concerned with the control of emissions to the air. Essential spares and consumables should be held or available at short notice.

6.2.5.2 Any malfunction or breakdown leading to abnormal emissions should be dealt with promptly and process operations adjusted until normal operations can be restored. All such malfunctions should be recorded in a log book retained by the operator for a minimum of 4 years and available for examination by the Inspectorate. If there is likely to be an effect on the local community the Inspector should be informed without delay.

6.2.5.3 Staff at all levels should receive the necessary formal training and instruction in their duties relating to control of the process and emissions to air. Particular emphasis should be given to training for start-up, shut down and abnormal conditions.

6.2.5.4 A high standard of housekeeping should be maintained.

7. COMPLIANCE MONITORING PROGRAMME

7.1 General

Conditions in the authorisation should require the results of all monitoring to be recorded. It should further distinguish between:

- compliance records;
- measurement or records for which regular formal returns to the Inspectorate are not normally required; and
- operational records made by the operator during the normal course of operating the process.

7.2 Monitoring Requirements

7.2.1 As part of proper supervision the operator should monitor emissions and make tests and inspections of the process. The need for and scope of testing and the frequency and time of sampling, will depend on local circumstances, operational practice, and the scale of operation. Testing should be undertaken under conditions of typical maximum operational loading.

7.2.2 Emissions should be tested for oxides of nitrogen at least once a year, and hydrogen fluoride at least once a year where appropriate in relation to the nature of the process and likelihood of any emission containing this substance. The onus is on the operator, that the appropriate equipment, laboratory facilities, expertise and quality control procedures are provided to ensure accurate results.

7.2.3 If extraction from other processes or sub-processes is exhausted into the same ductwork as the nitric acid process, either the sample should be taken before the common ductwork or allowance should be made for the volume of dilution air.

- 7.2.4 The results of all monitoring and inspections should be recorded in a log book retained by the operator for a minimum of 4 years and available for examination by the Inspectorate. Results may be recorded in graphical form. Adverse results should be investigated immediately and in all cases should be recorded in the log book. The operator should ensure that the cause has been identified and corrective action taken, and this action recorded in the log book.
- 7.2.5 Visual assessments of emissions should be made frequently and at least once a day and adverse results recorded in the log book. Remedial action should be taken immediately in the case of abnormal emissions and recorded in the log book.
- 7.2.6 In any case where the emission measurement exceeds the concentrations specified in par. 4.2.1 the Inspectorate should be advised without delay.
- 7.2.7 The Inspectorate should be advised at least 7 days in advance of any periodic monitoring exercise to determine compliance with emission limits, as well as the provisional time and date of monitoring, pollutants to be tested and the methods to be used. The results of all emission testing should be forwarded to the Inspectorate as soon as possible but no later than 8 weeks after the completion of the sampling.
- 7.2.8 The sampling positions for all monitoring instruments should be agreed with the Inspectorate. Care is needed in the design and location of sampling systems to obtain representative samples.
- 7.2.9 Where a wet scrubber is used to abate emissions, commissioning or proving tests should be undertaken to determine upper and lower concentrations of alkali and the maximum density of scrubber liquor which are consistent with meeting the emission standards specified in par. 4.2.1. The alkali concentration and scrubber liquor density should be tested at least once a week to demonstrate that the scrubber is working within these parameters. The test results should be recorded in the log book. Where hydrogen peroxide is used as the basis of a scrubbing medium instead of alkali, similar monitoring should take place for hydrogen peroxide concentrations.

7.2.10 Where a wet scrubber is used to abate emissions a visual inspection of the equipment should be made at least once a week to ensure correct functioning of the equipment including adequate liquor circulation. The results of the inspection should be recorded in the log book. Scrubber liquor flow should be continuously monitored, triggering an audible or visible alarm or stand-by pump in the event of pump failure or low flow. The pH level should be continuously monitored, triggering an audible or visible alarm in the event of abnormal pH levels.

7.2.11 On some processes, particularly large-scale pickling processes, hydrogen peroxide may be injected into the acid bath itself to reduce emissions. Hydrogen peroxide dosing flow should be continuously monitored, triggering an alarm or stand-by pump in the event of failure.

7.2.12 If droplet elimination is required to meet the terms of par. 4.2.3, the equipment should be visually inspected at least once a week. Depending on the scrubbing system and elimination design the inspection should encompass baffle spacing, knit mesh or baffle corrosion and caustic crystallisation and fouling. The results of the inspection should be recorded in the log book.

7.2.13 **Environmental Monitoring**

Depending on the local circumstances the Inspector may require the owner of a works to monitor the effects of their operation on the surrounding neighbourhood by means of atmospheric sampling or other measurements. Such monitoring would be of a scope and frequency sufficient only to establish the level of any local environmental impact.