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Department
for Environment
Food & Rural Affairs

Process Guidance Note 4/01(13)

Statutory guidance for processes and installations for the surface treatment of metals

Revised: July 2013

Llywodraeth Cymru
Welsh Government

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the Environment
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The Scottish
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Defra would like to acknowledge the work of the Environment Agency's Local Authority Unit in the drafting of this guidance note.

Revision of the guidance

The electronic version of this publication is updated from time to time with new or amended guidance. **Table 0.1** is an index to the latest changes (minor amendments are generally not listed).

Table 0.1 - Revision of the guidance

Date of change	Section/ paragraph where change can be found	Nature of change - what paragraphs have been inserted, deleted or amended - what subject matter is covered by the change
July 2013	Throughout	Addition of colour coding to tables

Contents

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1. Introduction

Legal basis

1.1 This note applies to the whole of the UK. It is issued by the Secretary of State, the Welsh Government, the Scottish Government and the Department of the Environment in Northern Ireland (DoE NI) to give guidance on the conditions appropriate for the control of emissions into the air from processes and installations for the surface treatment of metals. It is published only in electronic form and can be found on the Defra website. It supersedes PG4/01(06) and NIPG 4/01(06).

1.2 This guidance document is compliant with the Code of Practice on Guidance on Regulation page 6 of which contains the "golden rules of good guidance". If you feel this guidance breaches the code or you notice any inaccuracies within the guidance, please contact us.

1.3 This is one of a series of statutory notes giving guidance on the Best Available Techniques (BAT). The notes are all aimed at providing a strong framework for consistent and transparent regulation of installations regulated under the statutory Local Air Pollution Prevention and Control (LAPPC) regime in England and Wales, Scotland and Northern Ireland. The note will be treated as one of the material considerations when determining any appeals against a decision made under this legislation. Further guidance on the meaning of BAT can be found for England and Wales (in chapter 12 of the General Guidance Manual), Scotland, and Northern Ireland, (in chapter 9).

1.4 In general terms, what are BAT for one installation in a sector are likely to be BAT for a comparable installation. Consistency is important where circumstances are the same. However, in each case it is, in practice, for regulators (subject to appeal) to decide what are BAT for each individual installation, taking into account variable factors such as the configuration, size and other individual characteristics of the installation, as well as the locality (e.g. proximity to particularly sensitive receptors).

1.5 The note also, where appropriate, gives details of any mandatory requirements affecting air emissions which are in force at the time of publication, such as those contained in Regulations or in Directions from the Government. In the case of this note, at the time of publication there were no such mandatory requirements.

1.6 In **Section 4** and **Section 5**, arrows are used to indicate the matters which should be considered for inclusion as permit conditions. It is important to note, however, that this should not be taken as a short cut for regulators to a proper determination of BAT or to disregard the explanatory material which accompanies the arrows. In individual cases it may be justified to:

- include additional conditions;
- include different conditions;
- not include conditions relating to some of the matters indicated.

In addition, conditions will need to be derived from other parts of the note, in particular to specify emission limits, compliance deadlines and mandatory requirements arising from directions or other legislation.

Who is the guidance for?

1.7 This guidance is for:

Regulators

- local authorities in England and Wales, who must have regard to this statutory guidance when determining applications for permits and reviewing extant permits;
- the Scottish Environment Protection Agency (SEPA) in Scotland, and district councils or the Northern Ireland Environment Agency (NIEA), in Northern Ireland for whom this is statutory guidance;

Operators who are best advised also to have regard to it when making applications and in the subsequent operation of their installation;

Members of the public who may be interested to know what the Government considers, in accordance with the legislation, amounts to appropriate conditions for controlling air emissions for the generality of installations in this particular industry sector.

Updating the guidance

1.8 The guidance is based on the state of knowledge and understanding, at the time of writing, of what constitute BAT for this sector. The note may be amended from time to time to keep up with developments in BAT, including improvements in techniques, changes to the economic parameters, and new understanding of environmental impacts and risks. The updated version will replace the previous version on the Defra website and will include an index to the amendments.

1.9 Reasonable steps will be taken to keep the guidance up-to-date to ensure that those who need to know about changes to the guidance are informed of any published revisions. However, because there can be rapid changes to matters referred to in the guidance – for example to legislation – it should not be assumed that the most recent version of this note reflects the very latest legal requirements; these requirements apply.

Consultation

1.10 This note has been produced in consultation with relevant trade bodies, representatives of regulators including members of the Industrial Pollution Liaison Committee and other potentially-interested organisations.

Policy and procedures

1.11 General guidance explaining LAPPC and setting out the policy and procedures is contained in separate documents for England and Wales, Scotland and Northern Ireland.

2. Timetable for compliance and reviews

Existing processes or activities

2.1 This note contains all the provisions from previous editions which have not been removed. Some have been amended. For installations in operation at the date this note is published, the regulator should have already issued or varied the permit having regard to the previous editions. If they have not done so, this should now be done.

2.2 The new provisions of this note and the dates by which compliance with these provisions is expected are listed in **Table 2.1**, together with the paragraph number where the provision is to be found. Compliance with the new provisions should normally be achieved by the dates shown. Permits should be varied as necessary, having regard to the changes and the timetable.

Table 2.1 - Compliance timetable

Guidance	Relevant paragraph/row in this note	Compliance date
There are no new provisions in this note likely of themselves to result in a need to vary existing permit conditions. For a full list of changes made by this note, excluding very minor ones, see **Table 6.1**.		

2.3 Replacement plant should normally be designed to meet the appropriate standards specified for new installations/activities.

2.4 Where provisions in the preceding guidance note have been deleted or relaxed, permits should be varied as necessary as soon as reasonably practicable.

2.5 For new activities, the permit should have regard to the full standards of this guidance from the first day of operation.

2.6 For substantially changed activities, the permit should normally have regard to the full standards of this guidance with respect to the parts of the activity that have been substantially changed and any part of the activity affected by the change, from the first day of operation.

Permit reviews

2.7 Under LAPPC, the legislation requires permits to be reviewed periodically but does not specify a frequency. It is considered for this sector that a frequency of once every eight years ought normally to be sufficient for the purposes of the appropriate Regulations. Further guidance on permit reviews is contained in the appropriate Guidance Manual for England and Wales, Scotland, Practical guide section 10 and Northern Ireland Part B Guidance page 9, Northern Ireland Part C Guidance chapter 17. Regulators should use any opportunities to determine the variations to permits necessitated by paragraph 2.2 above in conjunction with these reviews.

2.8 Conditions should also be reviewed where complaint is attributable to the operation of the process and is, in the opinion of the regulator, justified.

3. Activity description

Regulations

3.1 This note applies to LAPPC installations for the processes and installations for the surface treatment of metals. The activities for regulation are listed in **Table 3.1**.

Table 3.1 - Regulations listing activities

LAPPC	Activity	England and Wales	Scotland	Northern Ireland
		EPR Schedule 1 reference	PPC Schedule 1 reference	PPC Schedule 1 reference
Part A	Surface treatment of metals and plastics – chemical or electrolytic – treatment vats more than $30m^3$	Section 2.3 Part A2	Section 2.3 Part A	Section 2.3 Part A
Part B	Surface treatment of metal – releasing NO_x and not Part A	Section 2.3 Part B	Section 2.3, Part B	Section 2.3 Part B
Part C	Surface treatment of metal – releasing NO_x and not Part A	n/a	n/a	n/a
The links are to the original version of the Regulations. A consolidated version is not available on www.legislation.gov.uk.				

3.2 This note refers to any process for the surface treatment of metal, which is likely to result in the release into the air of any acid-forming oxide of nitrogen, and is smaller in capacity than a Part A process.

3.3 The main processes for the surface treatment of metals where nitric acid is used are those listed below:

Chemical brightening of aluminium

3.4 The process with the largest number of installations and the process with the greatest potential for air emissions is chemical brightening of aluminium. It is most commonly practiced as a pre-treatment to the anodising process but may also be a precursor to lacquering. The brightening solutions are usually proprietary blends of nitric, sulphuric and phosphoric acids, found under brand names such as Phosbrite, Permalite, or Surfos.

3.5 The aluminium articles to be brightened are lowered into the process bath. The bath temperature is at approximately 90-105°C and the metal items are retained in the bath for up to 4 minutes. The nitric acid concentration in the brightening solution is approximately 3-7%. Oxides of nitrogen and acid mist are principally generated when the work is lifted out of the solution and plunged into a water rinse. The work is often then desmutted and rinsed again before anodising.

3.6 **Anodising** itself is a surface treatment process in which the surface layer of aluminium is oxidised to impart improved corrosion resistance. Anodising solutions are most often sulphuric acid in the strength range 160-210g/l, though chromic acid at 30-50g/l may be used.

3.7 If a less reflective finish is required, a phosphoric/ sulphuric acid type solution not containing nitric acid may be used. Matt finishes are obtained using solutions based on sodium hydroxide (a caustic etch). These processes do not give rise to air emissions of oxides of nitrogen or any other significant emissions which might warrant control.

3.8 Downstream steps often include dyeing with water based dyes and sealing with boiling water or water based nickel salt solution. These processes generally give rise to no air emissions other than steam or water vapour.

3.9 **Desmutting** is an adjunct to the anodising process. It is also known as deoxidation and its purpose is to remove surface contamination after chemical brightening or alkali etching prior to anodising. Desmutting is undertaken at room temperature with solutions commonly with a concentration of 20-30% nitric acid. There is no release to air of oxides of nitrogen or any other substances.

Bright dipping of copper

3.10 The bright dipping or chemical polishing of copper alloys often takes place on a smaller scale often using less than 100 litres of acid at a time. The dipping acid is usually aqua fortis, which comprises 50% sulphuric acid, 10% nitric acid and a trace of hydrochloric acid.

3.11 The process comprises three stages, each dipping the work into a container. The first step is to dip into spent acid to remove heavy contamination. The second is dipping in fresh acid for the bright finish and the third is a water rinse. The process is exothermic.

3.12 As with aluminium treatments the heaviest emissions occur when the work is being lifted out of the acid and first plunged into the water rinse, though the reaction with copper alloys is much more vigorous. Bright dips based on phosphoric and nitric acids are less vigorous in their reaction with copper alloys.

Passivation

3.13 Passivation of stainless steel may use nitric acid to build up an oxide layer on the surface of the metal to enhance corrosion resistance. Stainless steel is likely to be passivated in nitric acid at 20% at ambient temperature.

3.14 Non-ferrous metals such as zinc may be passivated in proprietary solutions, containing 1-2% nitric acid prior to chromate conversion coating.

3.15 These processes do not give rise to emissions of oxides of nitrogen or any other significant emissions which might warrant control.

Pickling of metal

3.16 This note also refers to processes for the pickling of metal where the process is not Part A.

3.17 The most common process to be encountered is that of pickling stainless steel, though other metals such as titanium may be pickled. The purpose of pickling is to remove surface scale and oxide layers. For stainless steel this may be done in a tank containing up to 20% nitric acid and 5% hydrofluoric acid. The process may take place at ambient or higher temperatures. Higher temperatures speed up the process. Emissions tend to be continuous during the metal treatment.

3.18 This process may occur at any point in the steel supply chain or at sub-contractors. The process may also be used at steel foundries, especially those investment casting, where the surface finish is of particular importance.

In-situ cleaning of surface treatment equipment

3.19 The in-situ cleaning of surface treatment equipment may also involve the use of nitric acid. An example of this is the cleaning of tanks used for electroless nickel plating. Nickel deposits build up on the surface of the tank during use. During its down-time the tank is filled with nitric acid to remove the nickel. In general such processes are unlikely to give rise to emissions in anything other than trivial quantities. Each case, however, should be considered on its merits, paying particular attention to intermittency, duration and strength of emissions.

Jig cleaning

3.20 The jigs on which work is supported during its surface treatment are also subject to a build-up of metal or other coating. One method of removing the build up so that the jigs may be re-used is by chemical stripping with a solution containing nitric acid. The stripping may be carried on as an incidental activity to the surface treatment or by a specialist jig maker/ refurbisher.

3.21 This process is carried on at ambient temperature by immersion in a tank of nitric acid at approximately 50%. The process time depends on the nature and extent of the build-up of metal or other coating.

3.22 Exemption on grounds of triviality may be appropriate for jig stripping processes. The need for control over these processes will depend principally on the frequency of use, jig surface area and extent of build up.

4. Emission limits, monitoring and other provisions

4.1 Emissions of the substances listed in **Table 4.1** should be controlled.

4.2 The emission limit values and provisions described in this section are achievable using the best available techniques described in **Section 5**. Monitoring of emissions should be carried out according to the method specified in this section or by an equivalent method agreed by the regulator. Where reference is made to a British, European, or International standard (BS, CEN or ISO) in this section, the standards referred to are correct at the date of publication. (Users of this note should bear in mind that the standards are periodically amended, updated or replaced.) The latest information regarding the monitoring standards applicable can be found at the Source Testing Association website. Further information on monitoring can be found in Environment Agency publications, M1 and M2.

4.3 All activities should comply with the emission limits and provisions with regard to releases in **Table 4.1**.

The reference conditions for limits in **Section 4** are: 273.1K, 101.3kPa, the oxygen and water references should be that which correspond to the normal operating conditions in the process concerned.

Table 4.1 should be considered in conjunction with the monitoring paragraphs found later in this section.

Table 4.1 - Emission limits, monitoring and other provisions					
Row	**Substance**	**Source**	**Emission limits/provisions**	**Type of monitoring**	**Monitoring frequency**
1	Oxides of nitrogen including nitric acid (expressed as nitrogen dioxide)	Surface treatment baths	200 mg/m^3 expressed as a 30 minute mean emission concentration (see Note a)	Manual extractive test.	Annual
2	Fluoride (expressed as hydrogen fluoride)	Processes using fluoride salts or hydrofluoric acid	5 mg/m^3	Manual extractive test where there is any likelihood of an emission containing this substance	Annual
Note a) the monitoring technique should be specifically suitable for nitric acid vapour as well as nitrogen dioxide and nitric oxide.					

Monitoring, investigating and reporting

4.4 The operator should monitor emissions, make tests and inspections of the activity. The need for and scope of testing (including the frequency and time of sampling) will depend on local circumstances.

- The operator should keep records of inspections, tests and monitoring, including all non-continuous monitoring, inspections and visual assessments. Records should be:
  - kept on site;
  - kept by the operator for at least two years; **and**
  - made available for the regulator to examine.
- If any records are kept off-site they should be made available for inspection within one working week of any request by the regulator.

Information required by the regulator

4.5 The regulator needs to be informed of monitoring to be carried out and the results. The results should include process conditions at the time of monitoring.

- The operator should notify the regulator at least 7 days before any periodic monitoring exercise to determine compliance with emission limit values. The operator should state the provisional time and date of monitoring, pollutants to be tested and the methods to be used.
- The results of non-continuous emission testing should be forwarded to the regulator within 8 weeks of completion of the sampling.
- Adverse results from any monitoring activity (both continuous and non-continuous) should be investigated by the operator as soon as the monitoring data has been obtained. The operator should:
  - identify the cause and take corrective action;
  - clearly record as much detail as possible regarding the cause and extent of the problem, and the remedial action taken;
  - re-test to demonstrate compliance as soon as possible; **and** inform the regulator of the steps taken and the re-test results.

4.6 This paragraph applies where a wet scrubber is used to abate emissions. Wet scrubbers may be used to abate emissions from the surface treatment bath and may also be used to control acidic emissions from pickling areas, in which case the pH value of the scrubbing solution would be of relevance.

- Commissioning or proving tests should be undertaken to determine the lowest concentrations of alkaline scrubbing media and the maximum density of scrubber liquor which are consistent with meeting the emission limits in **Table 4.1**.

- In all cases 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. Where hydrogen peroxide is used as the basis of a scrubbing medium instead of alkali, similar monitoring should take place for hydrogen peroxide concentrations.

- If the process is continuously in operation on a day to day basis the liquor pH value should be continuously monitored as the efficiency of the scrubber unit relies on this pH value.

- Scrubber liquor flow should be continuously monitored, for example by a variable orifice flow meter, triggering an alarm or stand-by pump in the event of pump failure.

- A visual inspection of the scrubber system equipment should be made at least once a week to ensure correct functioning including adequate liquor circulation. This includes ensuring that the spray heads are all spraying fully and evenly; depending upon the design of the system, checking that the scrubber packing is not blocked or that baffles are intact and in place; checking seals for signs of perishing and checking that the mist eliminator is intact and in place. The liquor should be checked for signs of caustic crystallisation and fouling. The results of the inspection should be recorded.

4.7 On some processes, particularly large-scale pickling processes, hydrogen peroxide may be injected into the acid bath itself to reduce emissions. In such cases:

- Hydrogen peroxide dosing flow should be continuously monitored, triggering an alarm or stand-by pump in the event of failure.

- Dilution air should be permissible to alleviate a visible emission where the emission concentration limits in **Table 4.1** are already being met.

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

4.8 Where wet alkaline scrubbing systems are used for arrestment of acid emissions, pH value and scrubber liquor density monitoring is required to demonstrate correct functioning of the arrestment equipment. In this context it is not appropriate that reduced monitoring be applied.

Visible emissions

4.9 The aim should be to prevent any visible airborne emission from any part of the process. This aim includes all sites regardless of location. Monitoring to identify the origin of a visible emission should be undertaken and a variety of indicative techniques are available.

- where ambient monitoring is carried out it may also be appropriate for the regulator to specify recording of wind direction and strength;
- where combustion units are in use for dryers then the combustion process should be controlled and equipment maintained as appropriate.

4.10 Emissions from combustion processes in normal operation should be free from visible smoke. During start up and shut down the emissions should not exceed the equivalent of Ringelmann Shade 1 as described in British Standard BS 2742.

- All other releases to air, other than condensed water vapour, should be free from persistent visible emissions.
- All emissions to air should be free from droplets.

Where there are problems that, in the opinion of the regulator, may be attributable to the installation, such as local complaints of visual emissions or where dust from the installation is being detected beyond the site boundary, the operator should investigate in order to find out which part of their operation(s) is the cause.

If this inspection does not lead to correction of the problem then the operator should inform the regulator who will determine whether ambient air monitoring is necessary. Ambient monitoring may either be by a British Standard method or by a method agreed with the regulator.

Whilst problems are ongoing, a visual check should also be made at least once per day/shift, by the operator, when an installation is being operated. The time, location and result of these checks, along with weather conditions such as indicative wind direction and strength, should be recorded. Once the source of the emission is known, corrective action should be taken without delay and where appropriate the regulator may want to vary the permit in order to add a condition requiring the particular measure(s) to be undertaken.

Emissions of odour

4.11 The overall aim should be that all emissions are free from offensive odour outside the site boundary, as perceived by the regulator. However, the location of the installation will influence the assessment of the potential for odour impact as local meteorological conditions may lead to poor dispersion conditions. Where the site has a low odour impact due to its remoteness from sensitive receptors, the escape of offensive odour beyond the installation would be unlikely to cause harm.

4.12 Where there are problems that, in the opinion of the regulator, may be attributable to the installation, such as local complaints of odour or where odour from the installation is being detected beyond the site boundary, the operator should investigate in order to find out which part of their operation(s) is the cause.

4.13 Whilst problems are ongoing, a boundary check should also be made at least once per day/shift, by the operator, when an installation is being operated. The time, location and result of these checks, along with weather conditions such as indicative wind direction and strength, should be recorded. Once the source of the emission is known, corrective action should be taken without delay and where appropriate the regulator may want to vary the permit in order to add a condition requiring the particular measure(s) to be undertaken.

Abnormal events

4.14 The operator should respond to problems which may have an adverse effect on emissions to air.

- In the case of abnormal emissions, malfunction or breakdown leading to abnormal emissions the operator should:
  - investigate and undertake remedial action immediately;
  - adjust the process or activity to minimise those emissions; **and**
  - promptly record the events and actions taken.
- The regulator should be informed without delay, whether or not there is related monitoring showing an adverse result:
  - if there is an emission that is likely to have an effect on the local community; **or**
  - in the event of the failure of key arrestment plant, for example, bag filtration plant or scrubber units.
- The operator should provide a list of key arrestment plant and should have a written procedure for dealing with its failure, in order to minimise any adverse effects.

Continuous monitoring

4.15 Continuous monitoring can be either ‘quantitative’ or ‘indicative’. With quantitative monitoring the discharge of the pollutant(s) of concern is measured and recorded numerically. For pollution control this measurement is normally expressed in milligrams per cubic metre of air (mg/m^3). Where discharge of the pollutant concerned is controlled by measuring an alternative parameter (the ‘surrogate’ measurement), this surrogate is also expressed numerically.

4.16 Continuous indicative monitoring is where a permanent device is fitted, for example, to detect leaks in a bag filter, but the output, whether expressed numerically or not, does not show the true value of the discharge. When connected to a continuous recorder it will show that emissions are gradually (or rapidly) increasing, and therefore maintenance is required. Alternatively it can trigger an alarm when there is a sudden increase in emissions, such as when arrestment plant has failed.

4.17 Where continuous indicative monitoring has been specified, the information provided should be used as a management tool. Where used, the monitor should be set up to provide a baseline output when the plant is known to be operating under the best possible conditions and emissions are complying with the requirements of the permit. Where used to trigger alarms, the instrument manufacturer should be able to set an output level which corresponds to around 75% of the emission limit. Thus the alarms are activated in response to this significant increase in pollutant loading above the baseline, so that warning of the changed state is given before an unacceptable emission occurs. The regulator may wish to agree the alarm trigger level.

4.18 Where continuous monitoring is required, it should be carried out as follows:

- All continuous monitoring readings should be on display to appropriately trained operating staff.
- Instruments should be fitted with audible and visual alarms, situated appropriately to warn the operator of arrestment plant failure or malfunction.
- The activation of alarms should be automatically recorded.
- All continuous monitors should be operated, maintained and calibrated (or referenced, in the case of indicative monitors) in accordance with the manufacturers’ instructions, which should be made available for inspection by the regulator.
- The relevant maintenance and calibration (or referencing, in the case of indicative monitors) should be recorded.

- Emission concentrations may be reported as zero when the plant is off and there is no flow from the stack. If required a competent person should confirm that zero is more appropriate than the measured stack concentration if there is no flow.

- Any continuous monitor used should provide reliable data >95% of the operating time, (i.e. availability >95%). A manual or automatic procedure should be in place to detect instrument malfunction and to monitor instrument availability.

Calibration and compliance monitoring

4.19 Compliance monitoring can be carried out either by use of a continuous emissions monitor (CEM), or by a specific extractive test carried out at a frequency agreed with the regulator.

4.20 Where a CEM is used for compliance purposes it must be periodically checked, (calibrated), to ensure the readings being reported are correct. This calibration is normally done by carrying out a parallel stand-alone extractive test and comparing the results with those provided by the CEM.

4.21 For extractive testing the sampling should meet the following requirements:

- For batch processes, where the production operation is complete within, say, 2 hours, then the extractive sampling should take place over a complete cycle of the activity.

4.22 Should the activity either be continuous, or have a batch cycle that is not compatible with the time available for sampling, then the data required should be obtained over a minimum period of 2 hours in total.

- For demonstration of compliance where a CEM is used no daily mean of all 15-minute mean emission concentrations should exceed the specified emission concentration limits during normal operation (excluding start-up and shut-down); **and**

- No 15-minute mean emission concentration should exceed twice the specified emission concentration limits during normal operation (excluding start-up and shut-down).

- For extractive testing, no result of monitoring should exceed the emission limit concentrations specified.

4.23 Exhaust flow rates should be consistent with efficient capture of emissions, good operating practice and meeting the requirements of the legislation relating to the workplace environment.

- The introduction of dilution air to achieve emission concentration limits should not be permitted.

Dilution air may be added for waste gas cooling or improved dispersion where this is shown to be necessary because of the operational requirements of the plant, but this additional air should be discounted when determining the mass concentration of the pollutant in the waste gases.

Varying of monitoring frequency

4.24 Where non-continuous quantitative monitoring is required, the frequency may be varied. Where there is consistent compliance with emission limits, regulators may consider reducing the frequency. However, any significant process changes that might have affected the monitored emission should be taken into account in making the decision.

4.25 When determining "consistent compliance" the following are cases which might not qualify for a reduction in monitoring:

a) variability of results: cases where monitoring results vary widely and include results in the range 30-45mg/m^3 (when the emission limit is 50mg/m^3)

b) the margin between the results and the emission limit: cases where results over a period are 45mg/m^3 or more (when the emission limit is 50mg/m^3).

Consistent compliance should be demonstrated using the results from at least;

- three or more consecutive annual monitoring campaigns; **or**
- two or more consecutive annual monitoring campaigns supported by continuous monitoring.

Where a new or substantially changed process is being commissioned, or where emission levels are near to or approach the emission concentration limits, regulators should consider increasing the frequency of testing.

4.26 A reduction in monitoring frequency should not be permitted where continuous quantitative or indicative monitoring is required. These types of monitoring are needed to demonstrate at all times when the plant is operating, that either the emission limits are being complied with or that the arrestment equipment is functioning correctly.

Monitoring of unabated releases

4.27 Where emission limit values are consistently met without the use of abatement equipment, the monitoring requirement for those pollutants should be dispensed with subject to the “Varying of monitoring frequency” paragraphs above.

Where monitoring is not in accordance with the main procedural requirements of the relevant standard, deviations should be reported as well as an estimation of any error invoked.

Representative sampling

4.28 Whether sampling on a continuous or non-continuous basis, care is needed in the design and location of sampling systems, in order to obtain representative samples for all release points.

- Sampling points on new plant should be designed to comply with the British or equivalent standards (see **paragraph 4.2).**
- The operator should ensure that relevant stacks or ducts are fitted with facilities for sampling which allow compliance with the sampling standards.

5. Control techniques

Summary of best available techniques

5.1 **Table 5.1** provides a summary of the best available techniques that can be used to control the process in order to meet the emission limits and provisions in **Section 4**. Provided that it is demonstrated to the satisfaction of the regulator that an equivalent level of control will be achieved, then other techniques may be used.

Table 5.1 - Summary of control techniques

Release source	Substance	Control techniques
Exothermic reactions in treatment bath (e.g. when pickling titanium)	Depends upon chemicals being used	Control temperature of treatment baths
Treatment bath	Nitrogen oxides	Extraction and arrestment using an alkaline scrubbing medium
Treatment bath	Hydrogen chloride / fluoride	Extraction and arrestment using an alkaline scrubbing medium

Techniques to control emissions from contained sources

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

5.3 On some processes, particularly large scale pickling processes, **hydrogen peroxide** may be injected into the acid bath itself to reduce emissions. Most commonly used arrestment equipment for surface treatment processes addressed by this note consists of wet alkaline scrubbing systems in conjunction with mist eliminators.

5.4 Emissions of the oxides of nitrogen or hydrogen fluoride from process vessels should be adequately contained and vented.

Techniques to control fugitive emissions

Fugitive emissions

5.5 Fugitive emissions should be prevented whenever practicable. When this is not practicable arrestment should be used, or emissions should be controlled at source by measures agreed between the regulator and the operator.

5.6 Adequate provision should be made for the containment of liquid and solid spillages. All spillages should be cleared as soon as possible and in the case of solid materials this should be achieved by the use of vacuum cleaning, wet methods, or other appropriate techniques. Dry sweeping of dusty spillages should not be permitted.

5.7 Bunding should :

- be impervious and resistant to the substances in storage; **and**
- be capable of holding 110% of the capacity of the largest storage tank.

5.8 A high standard of housekeeping should be maintained.

Air quality

Dispersion & dilution

5.9 Pollutants that are emitted via a stack require sufficient dispersion and dilution in the atmosphere to ensure that they ground at concentrations that are deemed harmless. This is the basis upon which stack heights are calculated using HMIP Technical Guidance Note (Dispersion) D1. The stack height so obtained is adjusted to take into account local meteorological data, local topography, nearby emissions and the influence of plant structure.

The calculation procedure of D1 is usually used to calculate the required stack height but alternative dispersion models may be used in agreement with the regulator. An operator may choose to meet tighter emission limits in order to reduce the required stack height.

5.10 Where an emission consists purely of air and particulate matter, (i.e. no products of combustion or any other gaseous pollutants are emitted) the above provisions relating to stack height calculation for the purpose of dispersion and dilution should not normally be applied. Revised stack height calculations should not be required as a result of publication of this revision of the PG note, unless it is considered necessary because of a breach or serious risk of breach of an EC Directive limit value or because it is clear from the detailed review and assessment work that the permitted process itself is a significant contributor to the problem.

Ambient air quality management

5.11 In areas where air quality standards or objectives are being breached or are in serious risk of breach and it is clear from the detailed review and assessment work under Local Air Quality Management that the permitted process itself is a significant contributor to the problem, it may be necessary to impose tighter emission limits. If the standard that is in danger of being exceeded is not an EC Directive requirement, then industry is not expected to go beyond BAT to meet it. Decisions should be taken in the context of a local authority's Local Air Quality Management action plan. For example, where a permitted process is only responsible to a very small extent for an air quality problem, the authority should not unduly penalise the operator of the process by requiring disproportionate emissions reductions. Paragraph 59 of the Air Quality Strategy 2007 [Volume 1] gives the following advice:

"...In drawing up action plans, local authority environmental health/pollution teams are expected to engage local authority officers across different departments, particularly, land-use and transport planners to ensure the actions are supported by all parts of the authority. In addition, engagement with the wider panorama of relevant stakeholders, including the public, is required to ensure action plans are fit-for-purpose in addressing air quality issues. It is vital that all those organisations, groups and individuals that have an impact upon local air quality, buy-in and work towards objectives of an adopted action plan."

Stacks, vents and process exhausts

5.12 Liquid condensation on internal surfaces of stacks and exhaust ducts might lead to corrosion and ductwork failure or to droplet emission. Adequate insulation will minimise the cooling of waste gases and prevent liquid condensation by keeping the temperature of the exhaust gases above the dewpoint. A leak in a stack/vent and the associated ductwork, or a build up of material on the internal surfaces may affect dispersion:

- Flues and ductwork should be cleaned to prevent accumulation of materials, as part of the routine maintenance programme.

5.13 When dispersion of pollutants discharged from the stack (or vent) is necessary, the target exit velocity should be 15m/s under normal operating conditions, (but see paragraph below regarding wet plumes). In order to ensure dispersion is not impaired by either low exit velocity at the point of discharge, or deflection of the discharge, a cap, or other restriction, should not be used at the stack exit. However, a cone may sometimes be useful to increase the exit velocity to achieve greater dispersion.

5.14 An exception to the above is where wet arrestment is used as the abatement. Unacceptable emissions of droplets could occur from such plant where the linear velocity in the stack exceeds 9m/s.

5.15 To reduce the potential of droplet emissions a mist eliminator should be used. Where a linear velocity of 9m/s is exceeded in existing plant consideration should be given to reducing this velocity as far as practicable to ensure such droplet entrainment and fall out does not happen.

Management

Management techniques

5.16 Important elements for effective control of emissions include:

- proper management, supervision and training for process operations;
- proper use of equipment;
- effective preventative maintenance on all plant and equipment concerned with the control of emissions to the air; **and**
- ensuring that spares and consumables - in particular, those subject to continual wear – are held on site, or available at short notice from guaranteed local suppliers, so that plant breakdowns can be rectified rapidly. This is important with respect to arrestment plant and other necessary environmental controls. It is useful to have an audited list of essential items.

Appropriate management systems

5.17 Effective management is central to environmental performance; it is an important component of BAT and of achieving compliance with permit conditions. It requires a commitment to establishing objectives, setting targets, measuring progress and revising the objectives according to results. This includes managing risks under normal operating conditions and in accidents and emergencies.

It is therefore desirable that installations put in place some form of structured environmental management approach, whether by adopting published standards (ISO 14001 or the EU Eco Management and Audit Scheme [EMAS]) or by setting up an environmental management system (EMS) tailored to the nature and size of the particular process. Operators may also find that an EMS will help identify business savings.

5.18 Regulators should use their discretion, in consultation with individual operators, in agreeing the appropriate level of environmental management. Simple systems which ensure that LAPPC considerations are taken account of in the day-to-day running of a process may well suffice, especially for small and medium-sized enterprises. Regulators are urged to encourage operators to have an EMS for all their activities, but it is outside the legal scope of an LAPPC permit to require an EMS for purposes other than LAPPC compliance. For further information/advice on EMS refer to the appropriate chapter of the appropriate Guidance Manual for England and Wales, Scotland and Northern Ireland.

Training

5.19 Staff at all levels need the necessary training and instruction in their duties relating to control of the process and emissions to air. In order to minimise risk of emissions, particular emphasis should be given to control procedures during start-up, shut down and abnormal conditions. Training may often sensibly be addressed in the EMS referred to above.

- All staff whose functions could impact on air emissions from the activity should receive appropriate training on those functions. This should include:
  - awareness of their responsibilities under the permit;
  - steps that are necessary to minimise emissions during start-up and shutdown;
  - actions to take when there are abnormal conditions, or accidents or spillages that could, if not controlled, result in emissions.
- The operator should maintain a statement of training requirements for each post with the above mentioned functions and keep a record of the training received by each person. These documents should be made available to the regulator on request.

Maintenance

5.20 Effective preventative maintenance plays a key part in achieving compliance with emission limits and other provisions. All aspects of the process including all plant, buildings and the equipment concerned with the control of emissions to air should be properly maintained. In particular:

- The operator should have the following available for inspection by the regulator:
  - a written maintenance programme for all pollution control equipment; **and**
  - a record of maintenance that has been undertaken.

6. Summary of changes

The main changes to this note, with the reasons for the change, are summarised in **Table 6.1**. Minor changes that will not impact on the permit conditions e.g. slight alterations to the Process Description have not been recorded.

Table 6.1 - Summary of changes

Section/ paragraph/ row	Change	Reason	Comment
Whole note	Simplification of text	Make note clearer	
	Addition of links	Change to electronic format	Removes need for extensive footnotes/references
Table 4.1 row 1	Change nitrogen oxides averaging period from 1 hour to 30 minutes	Less expensive for plants with multiple monitoring points	For hydrogen fluoride 30 minutes is usually sufficient to meet the monitoring standard

7. Further information

Sustainable consumption and production (SCP)

Both business and the environment can benefit from adopting sustainable consumption and production practices. Estimates of potential business savings include:

- £6.4 billion a year UK business savings from resource efficiency measures that cost little or nothing;
- 2% of annual profit lost through inefficient management of energy, water and waste;
- 4% of turnover is spent on waste.

When making arrangement to comply with permit conditions, operators are strongly advised to use the opportunity to look into what other steps they may be able to take. Regulators may be willing to provide assistance and ideas, although cannot be expected to act as unpaid consultants.

Health and safety

Operators of processes and installations must protect people at work as well as the environment:

- requirements of a permit should not put at risk the health, safety or welfare of people at work or those who may be harmed by the work activity;
- equally, the permit must not contain conditions whose only purpose is to secure the health of people at work. That is the job of the health and safety enforcing authorities.

Where emission limits quoted in this guidance conflict with health and safety limits, the tighter limit should prevail because:

- emission limits under the relevant environmental legislation relate to the concentration of pollutant released into the air from prescribed activities;
- exposure limits under health and safety legislation relate to the concentration of pollutant in the air breathed by workers;
- these limits may differ since they are set according to different criteria. It will normally be quite appropriate to have different standards for the same pollutant, but in some cases they may be in conflict (for example, where air discharged from a process is breathed by workers). In such cases, the tighter limit should be applied to prevent a relaxation of control.

Further advice on responding to incidents

The UK Environment Agencies have published guidance on producing an incident response plan to deal with environmental incidents. Only those aspects relating to air emissions can be subject to regulation via a Part B (Part C in NI) permit, but regulators may nonetheless wish to informally draw the attention of all appropriate operators to the guidance.

It is not envisaged that regulators will often want to include conditions, in addition to those advised in this PG note, specifying particular incident response arrangements aimed at minimising air emissions. Regulators should decide this on a case-by-case basis. In accordance with BAT, any such conditions should be proportionate to the risk, including the potential for harm from air emissions if an incident were to occur. Account should therefore be taken of matters such as the amount and type of materials held on site which might be affected by an incident, the likelihood of an incident occurring, the sensitivity of the location of the installation, and the cost of producing any plans and taking any additional measures.