PROCESS GUIDANCE NOTE
JANUARY 2005

Process Guidance Note
NIPG 1/12 (Version 2)

Combustion of Fuel Manufactured From or Comprised of Solid Waste in Appliances Between 0.4 and 3MW Rated Thermal Input

ENVIRONMENT (NI) ORDER 2002
POLLUTION PREVENTION AND CONTROL REGULATIONS (NI) 2003
INDUSTRIAL POLLUTION CONTROL (NI) ORDER 1997
IPC (PRESCRIBED PROCESSES AND SUBSTANCES) REGULATIONS (1998)

GUIDANCE FOR PROCESSES PRESCRIBED FOR
AIR POLLUTION CONTROL
AND
AIR POLLUTION PREVENTION AND CONTROL
BY DISTRICT COUNCILS

Department of the
Environment
www.doeni.gov.uk

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Environment Agency

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1 Introduction

1.1 This Note is issued by the Department of the Environment to give guidance on the conditions appropriate for the control of emissions into the air from processes / installations[1] for the combustion of fuel manufactured from or comprised of solid waste in appliances between 0.4 and 3MW Rated Thermal Input. It supersedes guidance note NIPG 1/12(Version 1) that issued in March 1998.

1.2 This is one of a series of notes giving guidance on Best Available Techniques (BAT) and Best Available Techniques Not Entailing Excessive Cost (BATNEEC)[2]. The notes are all aimed at providing a strong framework for consistent and transparent regulation of processes and installations.

1.3 This note is for use under both Local Air Pollution Control (LAPC) established by the Industrial Pollution Control (NI) Order 1997, and Local Air Pollution Prevention and Control (LAPPC) established by the Environment (NI) Order 2002[3]. It constitutes statutory guidance to regulators under regulation 38 of The Pollution Prevention and Control Regulations (NI) 2003. To the extent it provides guidance on techniques, it also constitutes statutory guidance to regulators under section 7(11) of the 1997 Order, and in any event regulators are expected to have regard to it. The note will be treated as one of the material considerations when determining any appeals against a decision under either the 1997 or 2002 Orders.

1.4 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 Directions from the Department.

Nothing in this note should be taken to detract from the scope or meaning of the EU Waste Incineration Directive and its implementation through the PPC Regulations

Site specific BAT/ BATNEEC

1.5 All processes are subject to BAT/ BATNEEC. In general terms, what is BAT/ BATNEEC for one process in a sector is likely to be BAT/ BATNEEC for a comparable process; but in each case it is, in practice, for regulators (subject to appeal) to decide what is BAT/ BATNEEC for the individual process and the regulator should take into account variable factors (such as configuration, size and other individual characteristics of the process) and the locality (such as proximity of particularly sensitive receptors[4]). Ultimately, therefore, what constitutes BAT/ BATNEEC is site specific but this guidance note comprises guidance for the generality of processes in the sector and careful regard should be had to it, in order to maximise consistency of permits as appropriate.

1. The term "process(es)" is used in the remainder of the note to mean both "processes" under the Industrial Pollution Control (NI) Order and "installations" and "activities" under the Environment (NI) Order 2002.
2. BATNEEC is the formulation used in the Industrial Pollution Control (NI) Order and BAT is used in the Environment (NI) Order 2002. For the purposes of this guidance note, the two concepts are regarded as having essentially the same effect.
3. In accordance with Part 2 of Schedule 3 to the PPC (NI) Regulations, SR 2003/46: combustion processes transfer from regulation under the 1997 Order to the 2002 Order from 1 April 2004.
4. Guidance on the relationship between BAT/BATNEEC and air quality objectives is contained in the General Guidance Manual on policy and procedures for Part C installations.

Who is affected

1.6 This guidance is for:

- regulators: who must have regard to the guidance when determining applications and reviewing extant authorisations and permits
- operators: who are best advised also to have regard to it when making applications, and in the subsequent operation of their process
- 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 processes in this particular industry sector

1.7 The guidance is based on the state of knowledge and understanding at the time of writing of:

- processes for Part C Solid waste combustion with a rated thermal input over 0.4MW,
- their potential impact on the environment and
- what constitutes BAT/ BATNEEC for preventing and reducing air emissions

1.8 The note may be amended from time to time in order to keep abreast with developments in BAT/BATNEEC: including improvements in techniques, and new understanding of environmental impacts and risks. Such changes may be issued in a complete revision of this document, or in separate additional guidance notes which address specific issues. (It may not always be possible to issue amending guidance quickly enough to keep in absolute step with rapid changes, which is another circumstance where paragraph **1.5** above might apply.)

1.9 Steps will be taken to ensure that those who need to know about changes are informed. Operators (and their advisers) are, however, strongly advised to check with the regulator whether there have been any changes before relying on this note for the purposes of making an application under the 1997 or 2002 Orders or making any other decisions where BAT/ BATNEEC may be a consideration.

Consultation

1.10 This note has been produced in consultation with relevant trade bodies and representatives of regulators including members of the Industrial Pollution Liaison Committee and the NI Industrial Pollution Liaison Group.

Publication

1.11 This and other published guidance in this series are available, free of charge, via the Department at **www.doeni.gov.uk/epd**.

1.12 General guidance explaining policy and setting out LA-PPC policy and procedures is contained in the Department's "General Guidance Manual on Policy and Procedures for Part C Installations" available from **www.doeni.gov.uk/epd** and referred to in this document as the "General Guidance Manual". This is designed for operators and members of the public as well as district council regulators.

1.13 In addition to the General Guidance Manual referred to above, explanation or clarification of certain terms used in this sector guidance note can be found in a general guidance note issued under the Industrial Pollution Control (NI) Order 1997: "Interpretation of terms used in process guidance notes" that issued in March 1998 (NIGG4). Where there is any conflict between NIGG4 and the guidance issued in this note or in the General Guidance Manual, the latter two documents should prevail, as should any subsequent guidance issued in relation to LAPPC.

2 Timetable for compliance and reviews

Existing processes or activities

2.1 The previous guidance advised that upgrading to that standard should usually have been completed by 1 January 2003. Requirements still outstanding from any existing upgrading programme should be completed to the timescale of that programme.

Upgrading for this note

2.2 New provisions of this note and the dates by which compliance with these provisions is expected are listed in **Table 1** below

2.3 A review by industry of existing combustors and their emissions is underway. The emission limits in **Section 5** may be revised in the light of that review. Publication of any revised limits is expected before the end of 2004. In particular the carbon monoxide limit for pre1995 plant is being examined.

Table 1: Compliance Provisions and dates

Paragraph	Provision	Compliance Date
All provisions	E.g. monitoring methods,environmental management system, air quality interface	To be complied with as soon as practicable, which in most cases should be within 12 months of the publication of this note

Waste Incineration Directive (WID)

2.4 The Waste Incineration Directive (WID) will catch some processes that currently use this guidance. The operators of those plant will need to decide whether

- **To comply with the WID requirements,**which is likely to be very much more expensive than NIPG1/12 compliance. Currently, very few if any activities covered NIPG1/12 are thought likely to opt for compliance with WID
- **Or not to burn material that requires compliance with WID.**

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

Relaxation of conditions

2.6 Where provisions in the preceding guidance note have been deleted or relaxed, authorisations should be varied as necessary as soon as reasonably practicable. **Section 7** provides a summary of all changes.

New processes or activities

2.7 For new processes or activities, the authorisation/permit should have regard to the full standards of this guidance from the first day of operation.

Substantially changed processes or activities

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

Permit reviews

Reviewing permits

2.9 Under LAPC the requirement is to review conditions in authorisations at least very four years. (Article 6(6) Industrial Pollution Control (NI) Order 1997)

2.10 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 six years ought normally to be sufficient for the purposes of Regulation 15(1) of Pollution Prevention and Control Regulations (NI) 2003.

More frequent review may be necessary in individual cases for the reasons given in Regulation 15(2). Further guidance on permit reviews is contained in the General Guidance Manual available on **www.doeni.gov.uk/epd** . Regulators should use any opportunities to determine the variations to authorisations/permits necessitated by paragraph **2.2** above in conjunction with these reviews.

2.11 Under both LAPC and LAPPC, conditions should be reviewed where complaint is attributable to the operation of the process and is, in the opinion of the regulator, justified.

3 Process description

3.1 Combustion of fuel manufactured from or comprised of solid waste in Appliances between 0.4 and 3MW rated thermal input processes/ installations are prescribed for:

- Local air pollution control, LAPC, under section 1.3 of Schedule 1 to the IPC Prescribed Processes and Substances) Regulations 1998, SR 28.
- Local air pollution prevention and control, LAPPC, under section 1.1 of Schedule 1 of the Pollution Prevention and Control Regulations (NI) 2003 SR 46.

Waste Incineration Directive (WID)

3.2 The Waste Incineration Directive 200/76/EC (WID) is implemented by Part A of the PPC Regulations, as ammended by by SR 2003 No 390. The Department has published guidance on WID (Ref d). This guidance NIPG 1/12 (Version2) only applies to processes that are not caught by the Directive.

3.3 This Note refers to the combustion of fuel manufactured from or comprising solid waste in appliances between 0.4MW and 3MW, and in appliances under 3MW aggregating to between 0.4 and 3MW, and such appliances over 3MW which are related to another Part C activity.

3.4 In the context of this Note, "process" or activity comprises the whole process from receipt of raw materials via production of intermediates to dispatch of finished products, including the treating, handling and storage of all materials and wastes relating to the process.

3.5 Notwithstanding any specific guidance contained in this note, the note does not apply to any activities which fall within the scope of the EU Waste Incineration Directive.
This Note applies:

- To processes and activities for the burning of fuel manufactured from or comprised of solid waste in any appliance with a rated thermal input of less than 3 MW but more than 400 kW and ·
- To processes and activities where a number of <3MW appliances are used together (whether or not simultaneously) where the aggregate rated thermal input is 400kW or more. In determining whether two or more appliances are used together, regulators should have regard to the following points
  (a) could the function of the appliances equally be undertaken by a single larger appliance?
  (b) are the appliances fed from the same fuel storage silo?
  (c) are the appliances connected to a common indirect heating system?
- Part C appliances which are under 400kW and which escape the preceding bullet should apply the Clean Air Order standards.
- To processes or activities where fuel manufactured from or comprised of solid waste is burned in an appliance with a net rated thermal input of 3 MW or more, and that process or activity is part of another process or activity prescribed for Part C. An example is a Part C timber process with a waste wood combustion appliance over 3MW both operated by the same person at the same location.

For combustion plant where straw, wood, or poultry litter is used as a fuel,

- 400kW approximates to a throughput of 90kg/hr of dry material
- whilst 3 MW approximates to a throughput of 675kg/hr of dry material.

It is proposed in a consultation paper issued by the Department on 24 September 2004 (replies by 19 November 2004) to ammend the PPC Regulations. The proposal is to amend section 1.1 of Schedule 1 to the Regulations to insert the word "net" in paragraphs (a)-(c) of the Part C definitions.

3.6 This Note refers to the combustion of a range of solid waste fuels. Some examples are given below:

Straw

3.7 Straw, which may include animal litter comprising predominantly straw (for example horse litter). The combustion of straw may be achieved either by the introduction of bales, chopped straw or wafers (manufac-tured fuel "pellets"). Straw typically has an ash content of between 1 and 8%, a fixed carbon content of between 8 and 18% and has a higher volatile content than coal at 60 to 78%. Consequently good combustion chamber design is paramount to achieve controlled combustion by for example, good turbulence characteristics and effective secondary air supply. Generally smaller input combustors will involve whole bale combustion whereas larger units will typically involve combustion of shredded or chopped straw.

Wood based waste

3.8 Waste wood, such as offcuts, chip and dust produced by woodworking operations., not regulated under the Waste Incineration Directive. The Note also details the requirements for processes involving the combustion of reconstituted, coated or preserved wood (called treated wood in NIPG1/12(Version 1)-for example by the application of a surface coating or by treatment with resins and binders to produce chipboard or fibreboard). Most waste wood combustion processes within the size range covered by this Note are operated in conjunction with timber manufacturing processes, for example, the manufacture of furniture and joinery.

3.9 Wood has a low ash content and a higher volatile content than coal and consequently, along with good control of the fuel size and moisture, good combustion chamber design is essential to achieve controlled combustion, for example, good turbulence characteristics and effective secondary air supply.

3.10 Wood may be introduced into the combustion chamber as offcuts, briquettes, pellets, woodchips, sawdust and fine dust. Often waste wood is transferred in a closed system by air from a woodworking process, through a cyclone directly to a storage hopper for automated feed into the furnace, and combustion of the waste wood is therefore an integral part of the arrestment plant for woodworking processes.

3.11 Wood as fuel is normally stored in bunkers and storage silos, dependant on the fuel type, wetness and size of product. The fuel is often fed automatically by mechanical feed systems using hydraulic pushing, walking floor and screw feed systems.

3.12 Wet wood and bark is normally stored in bunkers with walking floor mechanisms to allow movement of larger pieces and prevent bridging. Dry wood chips and dust are stored in steel or concrete silos, and mechanical discharge systems that meter the material.

3.13 Wood fuel is fed into the combustion chamber mechanically by screw helix, blown in, or hydraulically pushed. Inside the combustion chamber, wood is moved by underfeed screw, blown in or moving grate.

3.14 The amount of fuel fed into the combustion chamber is controlled automatically and balanced with the amounts of primary and secondary air to complete the combustion process. In the latest plant available, programmable logic controller (PLC) control the combustion time, temperature, oxygen levels and balanced primary and secondary air.

3.15 Combustion gases are then directed into a boiler section either to produce hot water, steam or thermal fluid. Energy produced might be used for process heat, building or district heat or for combined heat and power.

3.16 Ash is removed from the exhaust gases, typically by multi-cyclones, or by electrostatic, bag or ceramic filters.

3.17 Wood gasifiers are under development. During the combustion of wood, combustible gases are evolved from wood which then burn. Gasifiers separate these two steps and the combustion step is in an engine or separate boiler. However this note has not been written to provide guidance about gasifiers.

Paper and card

3.18 The calorific value of paper is similar to that of wood, although its ash content tends to be higher. It may be briquetted prior to combustion.

Poultry and other animal litter

3.19 Poultry litter is a mixture of poultry faeces and wood shavings derived from poultry rearing units. The litter typically has an ash content of approximately 9%, a volatile content of approximately 60% and a fixed carbon content of approximately 13%.

3.20 The poultry litter is stored prior to use, which leads to a bulk temperature increase, which destroys micro-organism growth in the litter.

Figure 3.1: A solid waste boiler - labelled

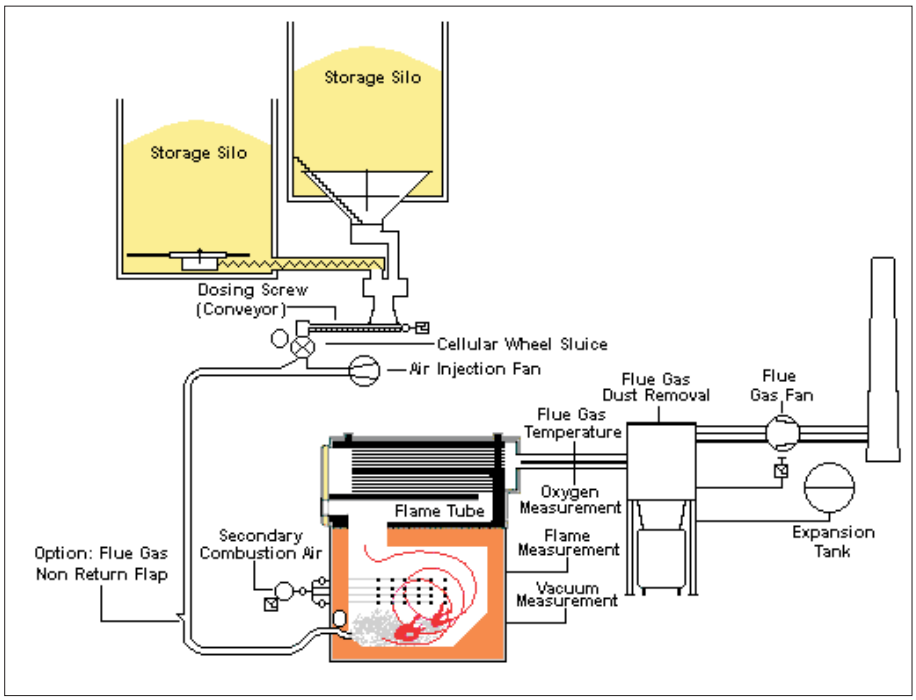
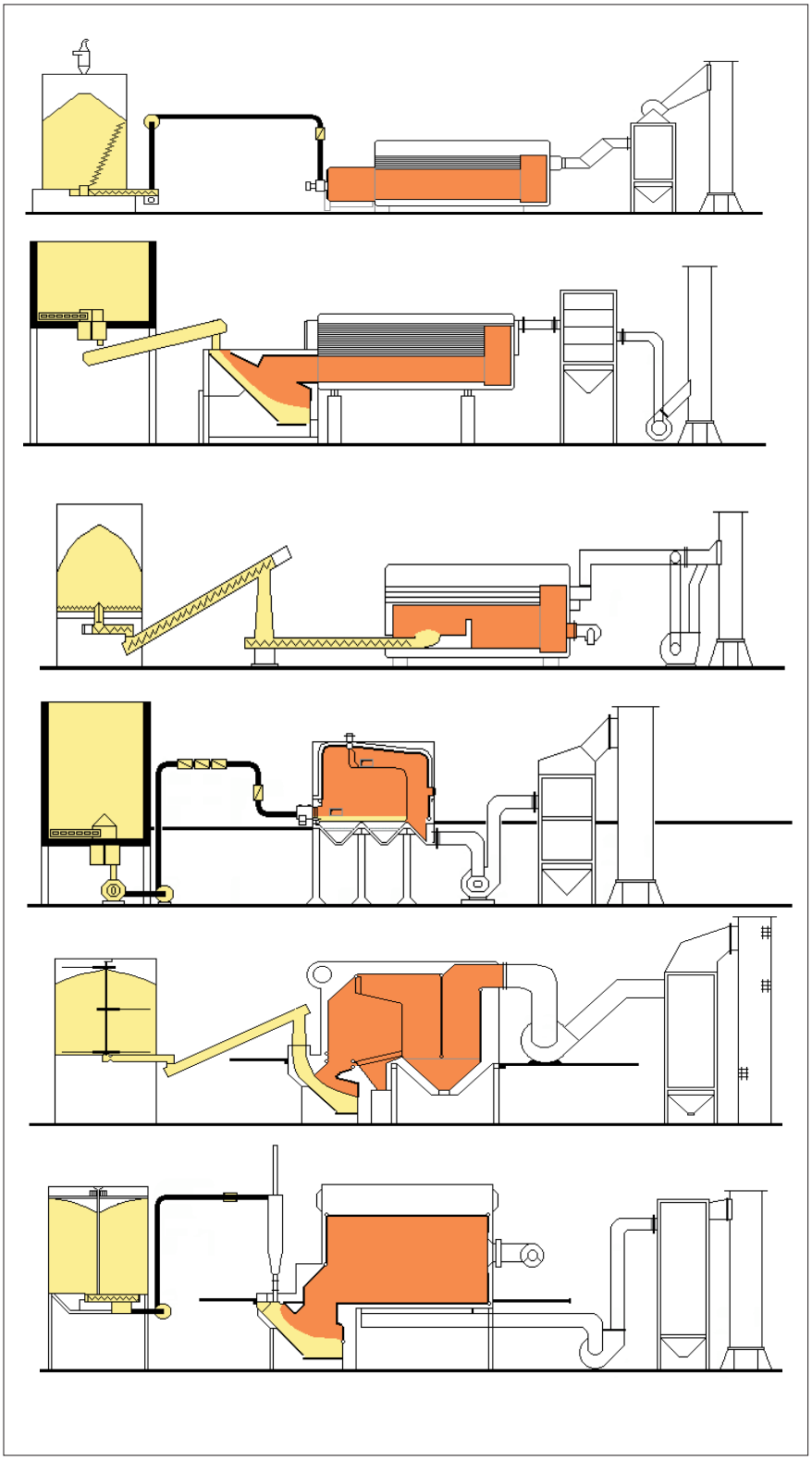


Figure 3.2: A solid waste boiler and several feed configurations



4 Potential releases

4.1 The key emissions from these processes/activities that constitute pollution for the purposes of the Industrial Pollution Control (NI) Order or the Pollution Prevention and Control Regulations (NI) 2003 and therefore warrant control are those consisting of particulate matter, sulphur dioxide, nitrogen oxides, carbon monoxide and unburnt hydrocarbons emissions from flue gases. In addition: board materials can produce formaldehyde, melamine faced board can produce hydrogen cyanide and PVC and painted waste can produce hydrogen chloride.

4.2 **Particulate matter** can be emitted from the fuel or ash.

4.3 **Odour** can be emitted from poultry litter storage:

5 Emission limits, monitoring and other provisions

5.1 The emission limit values and provisions described in this section are achievable using the best available techniques described in **Section 6**. Monitoring of emissions should be carried out according to the method specified in this section or by an equivalent method agreed by the regulator. (See Ref. **(j)** (M1) and Ref. **(k)** (M2))

- The reference conditions for limits in **Table 2** - Emission Limits, Monitoring and Other provisions are 273K, 101.3kPa, 11% oxygen (or 9% carbon dioxide):

Table 2: Emission limits, monitoring and other provisions

Row	Substance	Process	Emission limits / provisions	Monitoring
1	total particulate matter	other combustion	200 mg/m^3	Continuous quantitative monitoring, visual and audible alarm, and record. See para **5.6** and **5.7** Annual manual extractive test. See para **5.8**
2	organic compounds		20 mg/m^3	Annual manual extractive test. See para **5.8**
3	carbon monoxide	processes existing as at 2 Mar 1998	what the plant can achieve	Continuous quantitative monitoring, visual and audible alarm, and record. See footnote and para**5.6** and **5.7** Annual manual extractive test. See footnote and para **5.8** Disregard • 30 minutes from cold start-up • periods of idling
4		other processes less than 1 MW	250 mg/m^3	
5		other processes over 1 MW	150 mg/m^3	
6	oxygen or carbon dioxide	all processes where continuous carbon monoxide monitoring is provided	Continuous quantitative concentration and record. See para **5.6** and **5.7**	
If appropriate, any of the following limits and provisions should be imposed.				
7	chlorine (expressed as hydrogen chloride)	For painted and PVC coated fuels	100 mg/m^3	Annual manual extractive test. See para **5.8**
8	hydrogen cyanide	for melemine faced fuels	5 mg/m^3	Annual manual extractive test. See para **5.8**
9	formaldehyde	for plywood, chipboard fibreboard and similar fules	5 mg/m^3	Annual manual extractive test. See para **5.8**
Continuous carbon monoxide monitoring is not required for plant burning only raw wood (see Definitions), straw, paper or cardboard Annual emission testing for carbon monoxide is not required for plant only burning paper and cardboard				

Monitoring, investigations and recording

5.2 The need for and scope of testing, and the frequency and time of sampling depend on local circumstances, operational practice and the scale of operation. As part of proper supervision the operator will monitor emissions, make tests and inspections of the process and keep records, in particular:

- The operator should keep records of inspections, tests and monitoring, including all non-continuous monitoring, inspections and visual assessments. The records should be:
  - kept on site
  - kept by the operator for at least two years; and
  - made available for the regulator to examine

Information required by the regulator

5.3 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 the 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/received. The operator should:
  - identify the cause and take corrective action
  - record as much detail as possible regarding the cause and extent of the problem, and the action taken by the operator to rectify the situation
  - re-test to demonstrate compliance as soon as possible; and
  - notify the regulator

Visible and odorous emissions

5.4 Visible and odorous emissions should be limited and monitored as follows. Abnormal emissions require action as described in paragraph **5.5**.

- Emissions from combustion processes should in normal operation be free from visible smoke and in any case should not exceed the equivalent of Ringelmann Shade 1 as described in British Standard BS 2742:1969.
- All reasonably practicable steps should be taken to minimise the duration and visibility of visible emissions during start-up and shut down, and changes of fuel or combustion load
- All releases to air, other than condensed water vapour, should be free from persistent visible emissions.
- All emissions to air should be free from droplets.
- There should be no offensive odour beyond the process boundary, as perceived by the regulator.
- Visual and olfactory assessments of emissions should be made frequently and at least once each day whilst the process is in operation. The time, location and result of these assessments should be recorded

Abnormal events

5.5 The regulator needs to be notified about certain events, whether or not there is related monitoring showing an adverse result, and 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 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.
- The regulator should be informed without delay:
  - 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 abatement plant, for example, bag filtration plant or scrubber units

Continuous Monitoring

5.6 Continuous indicative monitoring can be used as a management tool. In conjunction with continuous recording it identifies any trends in emissions; for example, that emissions are gradually increasing, which may indicate a need for maintenance. It can also be used with or without continuous recording to trigger an alarm when there is a sudden increase in emissions; for example, if arrestment plant fails. For a given concentration of particulate, the output level varies with the instrument. It should be noted that not all monitors provide a linear response to an increase in particulate matter. The monitor should be set up to provide a baseline output when the plant is known to be operating under the best possible conditions; i.e. such that emissions are fully compliant with the provisions. The instrument manufacturer should be able to set an output level which corresponds to around 75% of the emission limit, to trigger alarms. Thus the alarms are activated in response to this significant increase in particulate loading above the baseline, so that warning of the changed state is given before an unacceptable emission occurs.

- Continuous quantitative monitoring is only obtained when the monitor is fully calibrated. Real time concentration data is collected. It is then usually averaged over 10 or 15 minute periods, and recorded. The regulator may wish to agree the averaging period that is chosen.

5.7 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 accordance with the manufacturers' instructions, which should be made available for inspection by the regulator. The relevant maintenance and calibration (or referencing) should be recorded.
- All new continuous monitoring equipment should be designed for less than 5% downtime over any 3-month period

Calibration and compliance monitoring

5.8 Calibration of quantitative instruments and compliance monitoring should meet the following provisions as appropriate:

- No result should exceed the emission concentration limits specified, except where either:
  (a) data is obtained over at least 5 sampling hours in increments of 15 minutes or less; or
  (b) at least 20 results are obtained where sampling time increments of more than 15 minute are involved; AND in the case of (a) or (b)
  (c) 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
  (d) no 15-minute mean emission concentration should exceed twice the specified emission concentration limits during normal operation (excluding start-up and shut-down).
- Non-continuous emissions monitoring of particulate matter should be carried out according to the main procedural requirements of BS ISO 9096: 2003, with averages taken over operating periods, excluding start-up and shutdown.
- No result should exceed the emission concentration limits specified, except where
  (a) data is obtained over at least 5 sampling hours in increments of 15 minutes or less; or
  (b) at least 20 results are obtained where sampling time increments of more than 15 minutes are involved;

  and in such circumstances:
  (a) no more than 5% of all 15-minute mean emission concentrations should exceed the specified emission concentration limits (during normal operating hours (excluding start-up and shut-down);
  (b) no 15-minute mean emission concentration should exceed twice the specified emission concentration limits; and
  (c) where continuous monitoring is undertaken, compliance with (c) and (d) above should be demonstrated on a daily basis.
- Non-continuous compliance monitoring should be carried out while the combustion plant is operating at 80% or more of the maximum continuous rating.
- Non-continuous emissions monitoring of particulate should be carried out to BS6069: Section 4.3 1992 (identical to ISO 9096 : 1992), with averages taken over operating periods excluding start-up and shutdown.

5.9 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.

Varying monitoring frequency

5.10 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. When determining "consistent compliance" factors to consider include:
(a) the variability of monitoring results, for example, results which range from 15 - 45 mg/m3 , against an emission limit of 50 mg/m3 might not qualify for a reduction in monitoring.
(b) the margin between the results and the emission limit, for example, results which range from 45 - 50 mg/m3 when the limit is 50 mg/m3 might not qualify for a reduction in monitoring.

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

- three or more monitoring exercises within two years or;
- two or more monitoring exercises in one year supported by continuous monitoring.

Any significant process changes that might have affected the monitored emission should be taken into account.

5.11 The frequency of testing should be increased, for example, as part of the commissioning of new or substantially changed processes, or where emission levels are near to or approach the emission concentration limits.

Sampling provisions

5.12 Care is needed in the design and location of sampling systems in order to obtain representative samples. BS6069 calls for sampling within a straight section of flue, about 7 to 10 diameters in length.

- The operator should ensure that adequate facilities for sampling are provided on vents or ducts.
- Sampling points on new plant should be designed to comply with the British or equivalent standards.

6 Control techniques

Summary of best available techniques

6.1 The following table 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 5**. 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 3: Summary of control techniques

Release Source	Fuel	Substance	Control Technique
Fuel store	Poultry litter	Odour	Covered store, keep dry, handle carefully
	All other fuels	Particulate matter	Silos, or enclose, cover. Automatic fuel feed, Cyclone or filter emissions to air
Flue gas	All fuels	Particulate matter	Cyclone or filter exhaust gases
		Carbon monoxide	Good combustion
		Volatile organic compounds incl PAH,	Good combustion
		PCCD/F	Good combustion. Minimise chlorine content of fuel. Particulate abatement if needed.
	Plywood, chipboard, fibreboard etc	Formaldehyde	Good combustion
		Nitrogen oxides	Avoid excessive temperatures
	Melamine faced wood	Hydrogen cyanide, nitrogen oxides	Less melamine burnt, good combustion
	Painted or PVC faced	Hydrogen chloride	Minimise chlorine content of fuel
	Tyres	Sulphur oxides	Control sulphur in fuel or abate emission
		Metals and their salts	Control carryover or abate emission
Ash		Particulate matter	Contained ash storage and handling, filter emissions to air.

Techniques to control emissions from contained sources

Design

6.2 Matching the heat requirement with the waste load promotes good control. When the heat requirement is low and the waste load is high, a heat dump will be needed to dissipate unwanted heat and minimise idling. A multi-compartment combustor might be set up for different fuels in the separate compartments. Separate stokers could handle different sized fuels.

Fuel control

6.3 Variation in fuel size and moisture content limits the ability of combustion control systems to produce good combustion. Uncovered storage of fuels should be avoided to keep fuel dry. The separate storage and feeding of offcuts, briquettes, woodchips and dust allows improved control if there are difficulties in complying with the emission limits.

6.4 Part of the chlorine in the material burnt becomes hydrogen chloride during combustion. Control is by restricting the amount of PVC and other chlorine containing materials burnt. PVC wrapping from baling systems would release chlorine into the combustion. Non PVC wrapping is available.

- PVC wrappings should not be burnt.

Fuel feed

6.5 Automatic fuel feed systems prevent the emission of smoke fumes and other substances during charging and promote better combustion by charging little and often. For existing processes, automatic feed systems should be used wherever practicable with regard to combustion plant design. For new processes

- Automatic fuel feed systems should be used.

Good combustion

6.6 Good combustion needs control of fuel content and its rate of feed, primary and secondary air, temperature in the chamber and the heat exchanger, and oxygen trim is advisable. Controls that also use levels of carbon monoxide and inflammables are possible but uncommon. Continuous feed produces better combustion than stop-start burning. Furnace design, combustion controls and operation are as important as fuel control to produce low levels of emissions.

6.7 On start up from cold, prior to the introduction of reconstituted, coated or preserved wood into the furnace, the combustion zone temperature needs to be raised. To meet the provisions of this Note, either an ancillary burner fired by gas or oil, or raw wood should be used. Similarly for poultry litter combustion a preheat fuel should be used.

- Reconstituted, coated or preserved wood should not be burnt during the start up from cold.
- Poultry litter should not be burnt during the start up from cold.

6.8 Carbon monoxide is formed by the incomplete combustion of carbonaceous fuels. No techniques are available for its removal, but good combustion will minimise it. Maintaining adequate oxygen levels is the main technique. However, with too much excess air, there will be considerable particulate carryover, a drop in temperature and thermal efficiency, and increased production of PAH (polyaromatic hydrocarbons). When the burner is idling, carbon monoxide concentrations can rise significantly.

6.9 Polyaromatic hydrocarbon emissions (PAH) are minimised by good combustion. PAH is emitted principally at start up from cold, and also during ordinary combustion. Idling and cool down produce very little PAH. Fuel with a narrow size and moisture distribution burns much better than mixed-size fuels or fuel of variable moisture level. Limiting chlorine in the fuel, good combustion and low particulate emissions minimise the emission of PCDD/F (polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans).

6.10 Leakage of gases in or out of the combustion and flue systems is undesirable and inefficient.

- Combustion chambers, casings, ductwork and ancillary equipment should be made and maintained as gas tight as is practicable.

6.11 The furnace should be designed with the aim of minimising the period of time during which the operator needs to gain access to the combustion space for the purpose of de-ashing.

Poultry litter

6.12 Where poultry litter is burnt, the combustion unit should operate continuously, subject only to maintenance requirements and process failure. This should be achieved by design of the combustor capacity to minimise boiler idling and shut down.

Fly ash abatement

6.13 Abatement will be needed to remove soot and ash from the exhaust gases and multicyclones are commonly used. Ceramic filters would be able to filter gases at raised temperature. Fabric filters would need the gases to be cooled before filtration.

Techniques to control fugitive emissions

6.14 Stocks of dusty, or potentially dusty, materials can be stored, for example, with covering and screening that prevent wind whipping. Ash and abatement plant dust can be kept enclosed and bag filters can prevent emissions to air at transfer points. Covering stocks of offcuts and bales of wood will prevent wind whipping of dust and rain increasing the moisture content. All woodchips and sawdust should be stored in covered containers or purpose-built silos. Where the wood waste is delivered to the silo automati-cally from the production process, displacement air should be discharged through suitable arrestment plant, for example a bag filter. Attention is drawn to the fire and explosion risks associated with moving wood dust and wood waste.

- All waste fuels, and all dusty or potentially dusty materials should be stored in covered containers, purpose-built silos or undercover.

6.15 Normally, when producing woodchips or shredding bales, a machine under negative pressure will minimise the emission of particulate matter.

- Shredding of offcuts and bales should be done in a machine under negative pressure vented to suitable arrestment plant - for example a bag filter.

6.16 Dusty or potentially dusty spillages can be cleaned up promptly, without dry sweeping. Major spillages need vacuum cleaning which can be brought to site the same day. A high standard of housekeeping is needed. Prevention is preferable but external dust on structures and roofs is prone to wind entrainment, and needs clearing up. Loading to and from stockpiles should be carried out so as to minimise emissions to the air.

- All spillages should be cleared up promptly by vacuum cleaning, wet methods, or other appropriate techniques. Dry sweeping of dusty spillages should not be permitted. Wet material from spillages should be dried before being burnt.
- All ductwork and piping used to deliver fuel to the storage system and combustion plant should be leakproof to prevent the emission of particulate matter.
- A high standard of housekeeping should be maintained.

6.17 Silos and supply hoppers

- Silos and supply hoppers to baling, shredding or combustion plant should be fitted with a high level alarm or volume indicator to warn of overfilling.
- The delivery system should be provided with an interlock to prevent the silo or supply hopper being overfilled. The interlock mechanism should cause the material to be discharged to an alternative storage container, where necessary vented to suitable arrestment plant.

Poultry litter

6.18 Good control of storage and handling will prevent, or minimise emissions of offensive odour beyond the process boundary.

- All poultry litter should be stored under cover and kept dry.

Air quality

Ambient air quality management

6.19 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 Part C process itself is a significant contributor to the problem, it may be necessary to impose tighter emission limits. If the emission limit that is in danger of being exceeded is not an EC Directive requirement, then industry is not expected to go beyond BATNEEC/BAT to meet it. Decisions should be taken in the context of a district council's Local Air Quality Management action plan. For example, where a Part C process is only responsible to a very small extent for an air quality problem, the council should not unduly penalise the operator of the process by requiring disproportionate emissions reductions. More guidance on this is provided in the revised Local Air Quality Management Technical Guidance, LAQM. TG (03) and in the Environment (NI) Order 2002 Local Air Quality Management Policy Guidance. Both of these documents are available from the Environment and Heritage Service website **www.ehsni.gov.uk** .

Dispersion and dilution from stack

6.20 Pollutants that are emitted via a stack require sufficient dispersion and dilution in the atmosphere to ensure that they ground at concentrations that are harmless. This is the basis upon which stack heights are calculated using HMIP Technical Guidance Note D1 (D1). The emission limit in this PG note should be used as the basis for stack height calculation. The stack height so obtained is adjusted to take into account local meteorological data, local topography, nearby emissions and the influence of plant structure. It is necessary that the assessment also take into account the relevant air quality standards that apply for the emitted pollutants.

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. D1 relies upon the unimpeded vertical emission of the pollutant. A cap or other restriction over the stack impedes the vertical emission and hinders dispersion. For this reason where dispersion is required such flow impeders should not be used. A cone may sometimes be useful to increase the efflux velocity and achieve greater dispersion.

An operator may choose to meet tighter emission limits in order to reduce the required stack height.

Where an emission consists of air and particulate matter only, (i.e. no products of combustion or other gaseous pollutants are emitted) the emission should be contained. In such circumstances dispersion into the atmosphere at high level may be inappropriate.

Stacks, vents and process exhausts

6.21 Liquid condensation on internal surfaces of stacks, flues 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.

6.22 Unacceptable emissions of droplets could possibly occur from wet arrestment plant where the linear velocity within the associated ductwork exceeds 9 m/s. The use of mist eliminators reduces the potential for droplet emissions.

- Where a flow rate of 9 m/s is exceeded in the ductwork of existing wet arrestment plant, the linear velocity should be reduced, subject to health and safety considerations, to ensure that droplet fallout does not occur.
- Stacks, flues and ductwork should be cleaned to prevent accumulation of materials, as part of the routine maintenance programme.
- Exhaust gases discharged through a stack or vent should achieve an exit velocity greater than 15 m/sec during normal operating conditions.

- Stacks or vents should not be fitted with any restriction at the final opening such as a plate, cap or cowl, with the exception of a cone which may be necessary to increase the exit velocity of the emissions.

Management

Management techniques

6.23 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
- it is good practice to ensure that spares and consumables are available at short notice in order to rectify breakdowns 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.

- Spares and consumables - in particular, those subject to continual wear - should be held on site, or should be available at short notice from guaranteed suppliers, so that plant break-downs can be rectified rapidly.

Appropriate management systems

6.24 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 processes 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.

Regulators should use their discretion, in consultation with individual operators, in agreeing the appropriate level of environmental management. Simple systems which ensure that LAPC considerations are taken account of in the day-to-day running of a process may well suffice, especially for small and medium-sized enterprises. While authorities may wish to encourage wider adoption of EMS, it is outside the legal scope of an LAPC authorisation/LA-PPC permit to require an EMS for purposes other than LAPC/LA-PPC compliance. For further information/advice on EMS refer to EMS Additional Information in **Section 8**.

Training

6.25 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.

- Training of all staff with responsibility for operating the process should include:
  - awareness of their responsibilities under the permit;
  - minimising emissions on start up and shut down
  - action to minimise emissions during abnormal conditions
- The operator should maintain a statement of training requirements for each operational post and keep a record of the training received by each person whose actions may have an impact on the environment. These documents should be made available to the regulator on request.

Maintenance

6.26 Effective preventative maintenance should be employed on all aspects of the process including all plant, buildings and the equipment concerned with the control of emissions to air. In particular:

- A written maintenance programme should be provided to the regulator with respect to pollution control equipment; and
- A record of such maintenance should be made available for inspection.

7 Summary of changes

Reasons for the main changes are summarised below.

Table 4: Summary of Changes

Section / Paragraph / Row	Change	Reason	Comment
3.5	Change from net to gross rated thermal input	The PPC Regs changed in line with the IPPC Directive	May be reversed for Part C only, by amending the PPC Regulations. See current Departments consultation issued 24 September 2004
Best available techniques			
6.3	Additional guidance about fuel size and moisture	Offers a wider range of options to any operators who are struggling to comply	
6.7	preheat fuel required for poultry litter	To reduce emissions during start up	

8 Definitions

This guidance	Process Guidance Note NIPG 1/12(Version 2)
Previous guidance	Process Guidance Note NIPG 1/12(Version 1)
LAPC	explained in the Introduction of this guidance
LAPPC	explained in the Introduction of this guidance
Permit	the written permission to operate an installation prescribed for LAPPC – (the replacement for authorisation under LAPC)
Authorisation	the written authority to operate a process prescribed for LAPC - (will be replaced by permit under LAPPC)
Existing process	should be taken to have the following meaning: • a process which was being carried on at some time in the 12 months immediately preceding the first day of the month following publication of this guidance note • a process which is to be carried on at a works, plant or factory or by means of mobile plant which was under construction or in the course of manufacture or in the course of commission on the first day of the month following publication of this guidance note, or the construction or supply of which was the subject of a contract entered into before that date
New process	not an existing process.
Installation	should be interpreted in accordance with the guidance contained in the the General Guidance Manual on Policy and Procedures for Part C Installations.
Process	the term "process" has been used in this guidance note to refer to both "processes" under the Industrial Pollution Control (NI) Order 1997 and "installations" under the Environment (NI) Order 2002.
Reconstituted wood	material made from wood and resin / adhesives, such as plywood, particleboard, oriented strand board (OSB), and fibreboard incl. mdf and hardboard.
Coated wood	wood with a coating e.g. paint, varnish, veneer, foil or laminate.
Preserved wood	wood that may contain halogenated organic compounds or heavy metals as a result of treatment with wood preservatives or coating.
Raw wood	wood that is neither reconstituted wood nor coated wood nor preserved wood.
Oxygen trim	is a combustion control technique where the oxygen level in or close to the combustion chamber outlet is continuously monitored and the level is fed back into the programmable logic controller.

Health and safety

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

- requirements of a permit or authorisation should not put at risk the health, safety or welfare of people at work
- equally, the permit or authorisation 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 Industrial Pollution Control (NI) Order 1997 or the Environment (NI) Order 2002 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

EMS additional information

Further information/advice on EMS may be found from the following:

- Envirowise at **www.envirowise.gov.uk** and **www.energy-efficiency.gov.uk** and Environment and Energy Helpline freephone 0800 585794
- ISO 14001 **www.bsi.org.uk** or telephone BSI information centre (020 8966 7022)
- EU Eco Management and Audit Scheme (EMAS) **www.emas.co.uk** or telephone the Institute of Environmental Management and Assessment (01522 540069)

Regulators and process operators may also like to be aware of:

BS 8555: a new standard to help SMEs implement an EMS, by offering a five-phase approach, is contained in BS 8555 which was published in 2003 following on from work undertaken by the Acorn Trust. The Institute of Environmental Management and Assessment, which has taken over the Trust's activities, is developing a scheme of accredited recognition for companies achieving different phases of BS 8555. BS 8555 can be used to achieve ISO 14001 and registration to the higher standard, EMAS.

Some of the **High Street banks**, such as NatWest and the Coop, now offer preferential loan rates to organisations that can demonstrate they are committed to improving their environmental performance. The NatWest also produce a self help guide for SMEs, 'The Better Business Pack', focusing on waste, utilities, transport and supply chain issues. It gives tools, guidance and examples. Contact: WWF-UK on 01483 426444.

References

(a) The Department's guide on LAPPC "General Guidance Manual on Policy and Procedures for Part C Installations", September 2003- available from the Department at **www.doeni.gov.uk/epd**.

(b) Section 10 of NIGG2 "Authorisations" (issued March 1998) provides further advice on the assessment of odour.

(c) Current air quality objectives are specified in: The Air Quality (NI) Regulations 2003 (2003 No 342).

(d) The Departments guidance on Directive 2000/76/EC on the Incineration of Waste - available from the Departments website **www.doeni.gov.uk/epd** .

(e) Scottish Executive Guidance: The Practical Guide for Part B Activities Issue 1 - available from the SEPA web-site. **http://www.sepa.org.uk/pdf/ppc/guidance/practical_guide_part_b_activities.pdf**

(f) DOE/WO Additional Guidance AQ17(94), issued to local authorities by the Air and Environment Quality Division of DEFRA and by the Welsh Office, provides further advice on the assessment of odour.

(g) Defra draft guidance on Directive 2000/76/EC on the Incineration of Waste- available from the Defra website and, in hard copy, from the Defra Publications line 08459 556000 **www.defra.gov.uk/environment/ppc/index.htm**

(h) Current air quality objectives are specified in:
- The Air Quality (England) Regulations 2000 SI 928
- The Air Quality (England) (Amendment) Regulations 2002 SI 3043
- The Air Quality (Wales) Regulations 2000 SI 1940 (W.138)
- The Air Quality (Wales) (Amendment) Regulations 2002 SI 3182 (W.298)
- The Air Quality (Scotland) Regulations 2000 SSI 97
- The Air Quality (Scotland) Amendment Regulations 2002 SSI 297

(i) HMIP Technical Guidance Note D1: "Guidelines on Discharge Stack Heights for Polluting Emissions", published by The Stationery Office, ISBN 0-11-752794-7.

(j) M1 Sampling requirements for monitoring stack emissions to air from industrial installations, Environment Agency July 2002 **(EA website)**

(k) M2 Monitoring of stack emissions to air. Environment Agency May 2003 **(EA website)**

Web addresses

Web-site of the Department's Environmental Policy Division: **www.doeni.gov.uk/epd**

Web-site of the Department's Environment and Heritage Service: **www.ehsni.gov.uk/**

Energy saving and environmental management measures can increase industry profits. Envirowise (formerly E.T.B.P.P.) show how at **www.envirowise.gov.uk** (or freephone 0800 585 794)

Appendix 1: Extract from Pollution Prevention and Control Regulations (NI) 2003, 2003 No 46

DEFINITION OF COMBUSTION ACTIVITIES IN SCHEDULE 1 TO THE POLLUTION PREVENTION AND CONTROL REGULATIONS (NI) 2003, 2003 No 46*.

(The processes for district council air pollution prevention and control are listed under "Part C". The "Part A" and Part "B" processes are for Chief Inspector control.)

ENERGY INDUSTRIES

SECTION 1.1

COMBUSTION ACTIVITIES

Part A

(a) Burning any fuel in an appliance with a rated thermal input of 50 megawatts or more.

(b) Burning any of the following fuels in an appliance with a rated thermal input of 3 megawatts or more but less than 50 megawatts unless the activity is carried out as part of a Part B or Part C activity -

(i) waste oil;

(ii) recovered oil;

(iii)any fuel manufactured from, or comprising, any other waste.

Interpretation of Part A

For the purpose of paragraph (a), where two or more appliances with an aggregate rated thermal input of 50 megawatts or more are operated on the same site by the same operator those appliances shall be treated as a single appliance with a rated thermal input of 50 megawatts or more.

Part B

Nil.

Part C

Unless falling within paragraph (a) of Part A of this Section -

(a) Burning any fuel, other than a fuel mentioned in paragraph (b) of Part A of this Section, in a boiler or furnace or a gas turbine or compression ignition engine with, in the case of any of these appliances, a rated thermal input of 20 megawatts or more but less than 50 megawatts.

(b) Burning any of the following fuels in an appliance with a rated thermal input of less than 3 megawatts -

(i) waste oil;

(ii) recovered oil;

(iii)a solid fuel which has been manufactured from waste by an activity involving the application of heat.

(c) Burning fuel manufactured from or including waste, other than a fuel mentioned in paragraph (b) in any appliance -

(i) with a rated thermal input of less than 3 megawatts but at least 0.4 megawatts; or

(ii) which is used together with other appliances which each have a rated thermal input of less than 3 megawatts, where the aggregate rated thermal input of all the appliances is at least 0.4 megawatts.

Interpretation of Part C

2. Nothing in this Part applies to any activity falling within Part A of Section 5.1.

3. In paragraph (c), "fuel" does not include gas produced by biological degradation of waste.

Interpretation of Section 1.1

For the purpose of this Section -

"waste oil" means any mineral based lubricating or industrial oil which has become unfit for the use for which it was intended, such as used combustion engine oil, gearbox oil, mineral lubricating oil, oil for turbines and hydraulic oil;

"recovered oil" means waste oil which has been processed before being used.

*Every effort has been taken to ensure that this Appendix is correct at the date of issue of this Note, but readers should note that the Regulations are likely to be subject to periodic amendment, and this Appendix should not therefore be relied upon as representing the up-to-date position after the issue date.