



Department
for Environment
Food & Rural Affairs

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Process Guidance Note 4/02(13)

Statutory guidance for polymerisation or co-polymerisation of pre-formulated resins or gel coats containing unsaturated hydrocarbons

December 2013



Llywodraeth Cymru
Welsh Government



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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		

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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 for the polymerisation or co-polymerisation of any pre-formulated resin or pre-formulated gel coat which contains any unsaturated hydrocarbon. It is published only in electronic form and can be found on the [Defra](#) website. It supersedes PG4/02(05).
- 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](#), [Scotland](#), and [Northern Ireland](#).
- 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 Most of the activities covered by this note will have essentially the same characteristics and it is expected that the model permit and application form in **Appendices 1 and 2** will normally be used in order to simplify for business the process of applying for a permit and to simplify for regulators the process of issuing a permit. (See also the relevant LAPPC charging scheme for reduced application and subsistence charges for simplified permits).

If there are good reasons to consider diverging from normal use of the model permit, the starting point for drafting any additional conditions should be the arrowed bullets in the main body of this note.

In the case of activities covered by this note which use dicyclopentadiene, or have abatement plant for styrene emissions, or recycle acetone by distilling it onsite, it is expected that regulators will continue to use standard applications and permits.

1.7 For activities which use dicyclopentadiene, or have abatement plant for styrene emissions, or recycle acetone by distilling it onsite: In **Appendix 4**, arrows are used to indicate the matters which should be considered for inclusion as standard 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?

1.8 This guidance is for:

Regulators

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

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

- 1.9 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.
- 1.10 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

- 1.11 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

- 1.12 General guidance explaining LAPPC and setting out the policy and procedures is contained in separate documents for [England and Wales](#), [Scotland](#) and [Northern Ireland](#).

When to use another note rather than PG4/02

- 1.13 Coating the polymerised product and consuming more than 5 tonnes of organic solvent a year in doing so needs guidance note PG6/23 Coating of metal and plastic.
- 1.14 Making foam from di-isocyanates may need guidance note PG6/29 Di-isocyanate processes.

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		
Relevant paragraph/row in this note	Guidance	Compliance date
A simple permit and application form have been added in Appendix 1 and Appendix 2 .		
Para 5.6 bullet 7	Measurement of resin and catalyst at mixing is required	From 3 months after publication of this note
Table 5.2 row 1	Mass emission guide value reduced from 200 to 100kgs of styrene per tonne of resin used	From 12 months after publication of this note
Para 5.7	Odour counteractants are no longer allowed	From 3 months after publication of this note
For a full list of the main changes, please see Table 6.1 in Section 6.		

- 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. It is expected that local authorities will aim to vary existing permits so as to convert them into the model permit format in **Appendix 1** within 12 months of the publication of this note.
- 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](#) chapter 26, [Scotland, Practical guide](#) section 10, 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 processes involving the polymerising or co-polymerising of pre-formulated resins or gel coats containing unsaturated hydrocarbons. 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 B	Section 4.1 Part B	Section 4.1, Part B	Section 4.1 Part B

The links are to the original version of the Regulations. A consolidated version is not available on www.legislation.gov.uk

For England and Wales, an [unofficial consolidated version](#) is available but read the first page of that document in order to understand its status and content.

- 3.2 For all processes, this note refers to the polymerisation or co-polymerisation of any pre-formulated resin or pre-formulated gel coat which contains any unsaturated hydrocarbon, where the activity is likely to involve, in any period of twelve months, the polymerisation or co-polymerisation of 100 tonnes or more of unsaturated hydrocarbon.
- 3.3 This note covers all parts of the process from the receipt of materials through to the disposal and processing of waste materials. This includes treating, handling and storage of any materials used and the finishing and treating of products.
- 3.4 **Dicyclopentadiene (DCPD)** The original note PG4/02(96) was primarily aimed at controlling emissions from processes using styrene based resins and gel coats. Other unsaturated hydrocarbons, such as dicyclopentadiene (DCPD), are now being used.
- 3.5 Reactive DCPD systems should not be confused with DCPD modified polyester resins which may contain styrene. It is anticipated that the use of such resins will increase.

- 3.6 DCPD is used in much the same way as styrene resins and gel coats, although, it tends to be used without reinforcement and is most commonly used in reactive injection moulding (RIM). There is currently no baseline data for emissions from such processes and hence rows 4 to 8 of **Table 4.1** do not apply.
- 3.7 **Fibre reinforced plastics** consist of bundles of fibres bonded together in a resin matrix to produce a material which has much better mechanical properties than either the fibres or the cured resin would have if used separately. By far the most important fibre reinforcement used is glass fibre which can be supplied in a number of forms including continuous rovings, woven rovings, cloths and random chopped fibre mats. In recent years, however, carbon fibres and polyaramid fibres have been used to an increasing extent, particularly in the manufacture of lightweight structural components.
- 3.8 The most frequently used resins in the manufacture of fibre reinforced plastics are unsaturated polyester resins. These are syrups consisting of polymer chains dissolved in a reactive organic diluent. The most commonly used diluent is monomeric **styrene** (sometimes referred to as vinyl benzene), although alternatives such as methyl methacrylate and vinyl toluene may be employed. Resins generally also contain fillers and additives which improve aspects of their performance. These may include pigments, fire retardants and thixotropic agents which aid handling.
- 3.9 Polyester resins are cured via a free radical copolymerisation reaction, which is typically initiated by an organic peroxide "catalyst" which is generally added to the resin immediately before curing is required. The "catalyst" is normally broken down in the presence of an accelerator, such as cobalt octoate or a tertiary amine, to form highly reactive free radicals which react with the styrene to form further free radicals. The styrene free radicals then react with the double bond in the polyester chain. Thus, a solid, three dimensional structure is built up, consisting of polyester chains cross-linked with styrene molecules. Alternatively, the reaction may be initiated by radiation, for example heat or UV light.

A summary of applications

- 3.10 Resin based Composite is a highly versatile material which is illustrated in the breadth of applications. The applications can be broadly segmented into industrial, building & construction and leisure sectors. Industrial parts are typified by truck cabs and refrigerated truck panels. There are a host of applications in building that include cladding for commercial buildings, roof-sheet, waste water treatment tanks and bath and shower trays. Leisure applications include pleasure boats and yachts, as well as many parts for caravans and motor-homes.

Descriptions of typical processes

Open mould processes

- 3.11 **Hand lamination** – resin is typically mixed by hand in a bucket and applied to the mould using a brush or roller. Normally a neat resin layer, referred to as a gel coat, is applied first and allowed to cure. Alternate layers of resin and reinforcement are then applied to the mould. A ribbed metal roller is used to consolidate the laminate and fully impregnate the reinforcement whilst air remaining in the laminate is forced out.
- 3.12 **Saturation** - this process is similar to hand lamination. However, rather than the resin being mixed by hand and applied by brush or roller, mixing is mechanical and the resin is sprayed on to the mould.
- 3.13 **Spray-up** - in this process, resin and fibre are sprayed on to the mould together. Strands of continuous reinforcement are cut up and ejected by an air driven chopper unit mounted on the spray gun. Spray-up can be automated to improve control over the distribution of fibres and resin.
- 3.14 **Filament winding** - this technique is particularly suitable for the manufacture of hollow shapes, such as pressure vessels. The component is moulded on a male former, mounted on a rotating shaft. Continuous fibre strands are fed through a resin bath and a comb, both mounted on a traverse, before being wrapped around the rotating former.
- 3.15 **Centrifugal casting** - this is another process which may be used to produce hollow articles although in this case the moulded surface is on the outside. Resin and reinforcement are placed inside a cylindrical mould which is rotated at high speed. For the production of simple mouldings, a traversing spray-up gun can be used to apply resin and reinforcement together.

Closed mould processes

- 3.16 **Vacuum bag moulding** - this is the simplest form of closed mould process. Following hand lay-up, a release film is laid over the laminate, followed by a rubber bag which is clamped to the edge of the mould. The space between the bag and the mould is evacuated so that atmospheric pressure is applied over the surface of the laminate to effect consolidation.
- 3.17 **Pressure bag moulding** - this technique is similar to vacuum bag moulding but higher pressures are achieved by the injection of compressed air into a void between the rubber bag and a lid which is clamped over the mould. A similar technique can be used within an autoclave where high product quality is essential.

- 3.18 **Resin Infusion** - this is a process where vacuum draws resin into a reinforcement pack in a one sided mould. A flexible film or membrane is placed over the mould and sealed by the vacuum around the mould periphery. The application typified by this process is wind turbine blades.
- 3.19 **Matched mould techniques** - these allow the production of a moulding with two moulded faces. The simplest form of matched mould process, known as leaky moulding, commences with hand lay-up in a female mould. A male mould is then clamped over the laminate. A better quality moulding can be produced by the use of a hydraulic press. The rate of production can be increased significantly by applying heat to the mould surface to accelerate curing. Hot press moulding is often carried out using pre impregnated reinforcement (prepreg) or moulding compounds.
- 3.20 **Resin injection** - as with matched moulding, the reinforcement pack is made up and loaded in the mould. In this process, however, the mould is closed on to the dry pack before the resin is introduced. Resin is mixed mechanically and dispensed into the mould through one or more injection points. Larger, stronger mouldings can be produced using vacuum assisted resin injection techniques. A seal is formed around the edge of the mould and a partial vacuum formed within the mould cavity. A flexible FRP upper mould or flexible film is used which deforms under injection pressure but allows the resin to pass across and through the reinforcement pack.
- 3.21 **Injection moulding** - this technique is suitable for high volume components. A dough is mixed containing resin and reinforcement which is then loaded into a hopper from where it is forced into the mould by a screw or piston.

Continuous processes

- 3.22 **Continuous lamination** - in this process, reinforcement and resin are combined and contained between two layers of release film which act as carriers transporting the laminate on a conveyor through a curing oven. On emerging from the oven, the release film is peeled off and the cured laminate cut to length. The process can be used to make flat sheet or, by using formers, a corrugated profile.
- 3.23 **Pultrusion** - reinforcement is impregnated with resin and pulled through a heated die from which it emerges fully cured. Resin impregnation can be by submerging the reinforcement in a bath or by injection directly into the die.
- 3.24 **Continuous filament winding** - filament wound pipe can be produced continuously using this technique. A winding head containing several "cheeses" of continuous yarn reinforcement rotates around the mandrel, wrapping on yarn as it does so. The pipe emerges at a constant rate from a curing oven whilst the mandrel continuously collapses onto itself and then reforms into a cylinder at the start of the process.

4. Emission limits, monitoring and other provisions

- 4.1 Emissions of the substances listed **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, without correction for water vapour content, unless stated otherwise.

These reference conditions do not apply to the expression of mass emissions of styrene, which does not require adjustment for temperature or pressure.

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

- 4.4 The aim is that emissions are free from offensive odour at any location at or beyond the site boundary. See Paragraphs 4.8 – 4.14

Table 4.1 - Emission limits, monitoring and other provisions

Row	Substance	Source	Emission limits/provisions	Type of monitoring	Monitoring frequency
1	Total particulate matter	Spray-up processes and finishing operations: (see Notes)	Designed to meet 10mg/m ³	Bag failure and alarm, plus	Continuous
				For plant without a manufacturer's guarantee of particulate emissions: Periodic Monitoring	Annual
				For plant new or replaced since 2005, or with a manufacturer's guarantee of particulate emissions: Retain the manufacturer's guarantee of particulate emissions	At commissioning

Note 1: "spray up and finishing" does not include coating of product with paint –that is dealt with by other process guidance notes

Note 2: Spray up/finishing operations may be carried out in totally enclosed proprietary type booths with integral particulate removal systems. Alternatively the discharge to atmosphere from spray up/finishing operations can be vented via abatement plant designed to remove particulate matter.

Note 3: The operator should maintain a record of the performance of the alarm system

Monitoring, investigating and reporting

- 4.5 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 24 months or until the next inspection, whichever is the longer; **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

- 4.6 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.
 - The operator should hold a list of key arrestment plant and should have a written procedure for dealing with its failure, in order to minimise any adverse effects.

Visible emissions

- 4.7 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.

Emissions of odour

- 4.8 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.
- 4.9 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.
- As part of that investigation styrene emission rates may be assessed using the method in **Appendix 3** and the guide values in **Table 5.2**.
- 4.10 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

Prepare - odour response procedure

- 4.11 The operator should prepare an odour response procedure. This is a summary of the foreseeable situations which may compromise his ability to prevent and/or minimise odorous releases from the process and the actions to be taken to minimise the impact. It is intended to be used by operational staff on a day-to-day basis and should detail the person responsible for initiating the action.

4.12 The odour response procedure should include a list of essential spares for odour control equipment (where fitted). The equipment manufacturer should recommend which spares are subject to wear and foreseeable failure and are critical for the correct operation of the odour arrestment equipment (such as pumps, nozzles etc.) and these should be held on site. It may be acceptable for certain spares to be available on guaranteed short delivery if the absence of a supply at the site would not lead to complete failure of the odour arrestment equipment or to offensive odours beyond the site boundary

Abnormal events - respond

4.13 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.
- 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.

Odour abatement equipment

4.14 Provisions about odour and VOC abatement equipment, if fitted, are in **Appendix 4**.

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.

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.

4.16 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.

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

- 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.
- 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

- 4.18 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.
- 4.19 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.
- 4.20 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.

Dilution air may be added for improved dispersion.

Varying of monitoring frequency

- 4.21 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.
- 4.22 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/m³ (when the emission limit is 50mg/m³).
 - b) the margin between the results and the emission limit: cases where results over a period are 45mg/m³ or more (when the emission limit is 50mg/m³).

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.

Representative sampling

- 4.23 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).

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
Use of resin	Styrene	Low emission resins where appropriate
Chopping of fibre and cutting of products	Particulate matter	Wet cutting Extraction and arrestment where necessary
Storage of resins	VOC	In fixed tanks Indoors
Mixing resin and catalyst	VOC	Measure the catalyst and resin
Processing	VOC	Resin application techniques e.g. rolling, brushing and flow coating Removal of excess resin where appropriate Spray-up in booth Wet-on-wet lay-up
Cleaning	VOC	Use water where possible Store used wipes in sealed containers

Resins supplemental information

Reducing styrene emissions by resin/gel coat formulation

Low styrene emission film forming resins (LSE)

- 5.2 The first such Low Styrene Emission (LSE) resins came on the market some 30 years ago. They function as the resin nears gel by the separation and surface migration of a film forming compound that severely curtails further styrene emission. Major resin suppliers will have invested substantial technical resource into assuring their LSE products will not compromise other performance properties such as inter-laminate bond strength. It is on this basis that processors should be advised against devising their own in-house solutions without comprehensive testing.
- 5.3 It should be noted that LSE resins are only effective in reducing emissions in the static phase when the laminate is no longer being worked. How effective they will be in reducing total workshop emissions will depend on a host of factors, including: process method employed, resin gel time, extraction system and workshop temperature. It is our experience of open mould processing that static emissions can represent between 30% and 70% of total emissions. Performances of LSE resins (and non LSE resins) can be compared in the laboratory mass emission test BS 2782 Part 4 (Method 432D).

Low volatile organic compound resins (LVOC)

- 5.4 Reducing the VOC content of a formulation reduces the subsequent emission on application. This approach has been customary in paint formulations for several years. Increasingly we now see this as one approach being adopted by resin suppliers in Europe – sometimes as an alternative to LSE resin formulations, sometimes in addition.
- 5.5 The objective with structural resin LVOC formulations is to significantly reduce the styrene content whilst maintaining acceptable working viscosity and subsequent mechanical properties. The base polymer chains require modification: either reduction of molecular weight or inclusion of specialised monomers. Dicyclopentadiene modified resins are often the chosen route as a result of the exceptional solubility of these polymer chains in styrene and the fact that even at reduced molecular weight, the mechanical and resistance properties of these resins are more than acceptable for many applications.

Techniques to control emissions from contained sources

- 5.6 Best available techniques are required to control emissions. The main principles for preventing emissions are the use of operational controls to minimise emissions, then containment and arrestment of emissions. Filtered particulate emissions can be expected to be below 10 mg/m³ if modern plant designed for the purpose is used.
- Emissions from activities likely to give rise to airborne particulate matter, for example the chopping of glass fibre rovings and the cutting and finishing of products, should be collected and extracted, where necessary, to suitable arrestment equipment.
 - Alternative procedures, such as wet cutting, may be employed if the operator can demonstrate their effectiveness to the satisfaction of the local enforcing authority.
 - The use of odour-masking agents and counteractants to meet the provisions of paragraphs 4.4 and 4.8 of this note should not be permitted as odour is used as an indicator to trigger further consideration of whether of dispersion is adequate for health reasons as well as odour reasons.
 - The pumping of resin in enclosed pipework from storage to the point of use will minimise emissions. Where operational considerations allow, this practice should be adopted.
 - Wherever practicable, other than in the case of continuous processes, filament winding or centrifugal casting, resin should be introduced into a closed mould which is not opened until curing has taken place. Where a closed mould system is used which has been designed with the intention that resin will be introduced into the mould when open, the mould should be closed or covered as soon as possible after layup. The use of closed mould techniques may not be practicable in certain circumstances such as where large mouldings are being manufactured.
 - Resins which give rise to low styrene emissions should be used wherever possible and in particular where open moulding takes place. Where they are not employed for open moulding, the process operator should provide justification for this decision to the local enforcing authority. Reasons for not using styrene suppressed resins containing waxes might include the need for a non-slip surface or a requirement for a high degree of structural integrity.
 - For mixing, resin and catalyst should be measured in graduated vessels

- Certain resin application techniques will give rise to lower levels of VOC emission. For example, rolling, brushing and flow coating tend to emit less VOC than spraying. The applicability of these techniques will be very process dependent, but there are likely to be cases where they can reasonably be used.
- Where resin is applied by means of fibres passing through a resin bath, excess resin should be removed from the fibres by, for example, nip rollers or a "doctor" blade.
- As a disproportionate amount of VOC is emitted from the top layer of a laminate, as many layers as possible should be built up at any one time, having regard to the design performance required. This is known as "wet-on-wet lay-up".

5.7 **Styrene emission rates.** Providing the overall aim for odour control in paragraphs 4.4 and 4.8 is met, then

- the figures in Table 5.2 can be used as guide values rather than control parameters.
- the frequency of assessment is annual initially and then is subject to earned recognition

Table 5.2 - Guide values for styrene releases	
Release source	Mass emission rate
Application of gel coat	Mass emission of styrene per tonne of resin used does not exceed 100 kg
Contact moulding, filament winding and centrifugal casting	Mass emission of styrene per tonne of resin used does not exceed 60 kg
Continuous sheet moulding	Mass emission of styrene per tonne of resin used does not exceed 40 kg
Resin transfer moulding hot press, cold press and injection moulding	Mass emission of styrene per tonne of resin used does not exceed 20 kg

Techniques to control fugitive emissions

5.8 Fugitive emissions should be prevented whenever practicable. Where this is not practicable emissions should be controlled at source by measures agreed between the regulator and the operator and by high standards of house-keeping or arrestment should be used.

- The receipt, handling and storage of polyester resins and other potentially odorous or harmful substances should be carried out in such a way that emissions are prevented, or where not practicable due to process characteristics, minimised and rendered harmless.
- Resins and amine accelerators should preferably be stored in fixed tanks. Emissions should be vented to suitable arrestment equipment if necessary to meet the appropriate provisions in paragraph 4.8.
- Bulk chemical storage tanks should be completely contained by bunding which is sealed and resistant to the chemicals in storage and capable of holding 110% of the capacity of the largest storage tank.
- To prevent overfilling, all bulk storage tanks should be fitted with suitable audible and visual alarms which will operate when any tank is in danger of becoming overfull. Where practicable (for example, where raw material delivery pumps are not mounted on delivery vehicles) an interlock to the tank filling system should be provided. Alternative tank filling procedures may be followed, subject to the agreement of the local enforcing authority.
- Where storage of resins in portable containers is unavoidable for operational reasons, such as use of only small quantities, all reasonable efforts should be made to minimise the amount of residual styrene bearing material left in drums and other containers after use. The location of open air storage areas for such drums and containers should be carefully selected to meet the provisions of paragraph 4.8 of this note. Used and partly-used containers should be securely lidded
- Where spillages of liquid resin occur, they should be immediately cleaned up and contaminated material should be held in a closed bin. Sufficient supplies of decontaminant and a suitable absorbent material should be kept at all times. A written procedure for dealing with spillages should be agreed with the regulator.
- Adequate provision to contain liquid and solid spillage is needed. Closed containers prevent wind whipping of dusty waste materials such as particles collected by arrestment plant.
- Dusty wastes, including those from finishing operations and the bag filters, should be stored in closed containers and handled in a manner that avoids emissions.
- All spillages should be cleared as soon as possible; solids by vacuum cleaning, wet methods, or other appropriate techniques. Dry sweeping of dusty spillages should not be permitted.
- A high standard of housekeeping should be maintained.

- Where the holding of resin in buckets and other small holding containers is unavoidable, the containers should be lidded at all times when resin is not being poured or used for layup.
 - Where proprietary booths are provided, all spray-up operations should be carried on in the booth so as to prevent fugitive emissions of odour and particulate matter.
- 5.9 Emissions of volatile organic compounds, including styrene, from cleaning operations should be minimised in accordance with paragraphs 5.10 to 5.13.
- 5.10 Operators should be encouraged to make arrangements for recycling for reuse of all dirty solvents which have been used (for example, for equipment cleaning) and all other liquid wastes which contain volatile organic compounds. When this is carried out in house then the conditions in this Note, (or those referred to in 6.9), relating to minimisation of VOC emissions should be applied.
- 5.11 Cleaning operations should be reviewed to identify any cleaning steps which can be eliminated.
- 5.12 Alternative cleaning techniques should be used where practicable. Examples include using water (with or without mechanical, chemical or thermal enhancements) or organic solvents which are significantly less volatile.
- 5.13 Where manual cleaning is unavoidable;
- cleaning solvents should be kept in enclosed containers whilst not in active use;
 - wiping cloths or brushes should be impregnated with cleaning solvent in a controlled manner, using a dispenser or similar device;
 - used wiping cloths or brushes should be stored in enclosed containers pending recovery or disposal.
- 5.14 Further controls on the use of solvents may be obtained from a number of the process guidance notes which specifically deal with volatile organic compounds e.g. PG6/14, PG6/17 etc.

Air quality

Dispersion & dilution

- 5.15 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.

- 5.16 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.
- 5.17 Where offensive odour is likely outside the process site boundary the assessment of stack or vent height should take into account the need to render harmless residual offensive odour.

Ambient air quality management

- 5.18 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

- 5.19 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.
- 5.20 When dispersion of pollutants discharged from the stack (or vent) is necessary, the target exit velocity should be 15m/s under normal operating conditions, however, lower velocities than 15m/s are acceptable provided adequate dispersion and dilution is achieved (see also the 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.

Management

Management techniques

- 5.21 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

- 5.22 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.

- 5.23 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

- 5.24 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

- 5.25 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
	Abatement provisions have been moved to Appendix 4	To simplify the note for the majority of operators, who do not have odour (or VOC) abatement	Odour abatement is uncommon in the styrene sector. DCPD is usually abated
Appendices 1 and 2	Simple permit and application form have been added	To simplify permit writing and inspection	
Table 4.1 and paragraph 5.6	Status of styrene emission limits changed to guide values provided that the odour aim is met	Offensive odour is a sufficient control for health as well as annoyance	
Paragraph 5.7	Odour counteractants specifically not allowed	Odour is a warning that health should be considered	

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, for example, having regard to the efficient use of auxiliary fuels, such as gas and electricity. Regulators may be willing to provide assistance and ideas, although cannot be expected to act as unpaid consultants.

Health and safety

Operators of 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.

Safety in Manufacturing Plastics & Composites is a pro-active H&S improvement initiative involving all sectors of the UK Plastics and Composites industry. Further information can be found at:

- www.compositesuk.co.uk
- www.hse.gov.uk

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.

Appendix 1 - Model Permit

This Appendix contains a model permit for installations involving the polymerising or co-polymerising of pre-formulated resins or gel coats containing unsaturated hydrocarbons. – see paragraph 1.6 of this note and paragraph 3.6 of the [General Guidance Manual on Policy and Procedures](#).

Notes:

- text in the model permit written in *italics* is advice to regulators.
- text in the model permit in [square brackets] offers choice to regulators or indicates where information needs to be inserted from the application;
- text bracketed with asterisks (eg *Alarms shall be tested at least once a week*.) may be omitted by a regulator where the past performance of the plant gives the local authority sufficient reassurance about operator compliance – “earned recognition”;
- the model permit has been drafted for local authorities in England and Wales. Regulators in Scotland and Northern Ireland will need to amend the legal heading and, where appropriate, references to ‘Council’;
- references to ‘installation’ will need to be substituted with ‘mobile plant’ in relevant cases, and other amendments made accordingly;
- the purpose of the activity description is to set down the main characteristics of the activity, including any directly associated activities, so it is clear to all concerned what is being authorised by the permit and therefore what changes would need further approval. Regulators are advised to include a description of any key items of abatement and monitoring equipment the operator intends to use or is using;
- it should normally be sufficient for records relating to simplified permits to be kept for no more than [24] months. Where, however, as a result of a ‘low risk’ rating, inspections are undertaken less often, regulators may want to specify a period which ensures the records are available at the next inspection.
- OR
- it should normally be sufficient for records relating to simplified permits to be kept until the next inspection or for 24 months whichever is the longer.

[] COUNCIL
POLLUTION PREVENTION AND CONTROL ACT 1999
Environmental Permitting Regulations 2010 (as amended)

Permit ref. no:

Name and address of person (A) authorised to operate the installation ('the operator'):

Registered number and office of company: (if appropriate)

Address of permitted installation (B)

The installation boundary and key items of equipment mentioned in permit conditions are shown on the plans attached to this permit.

Activity description

Conditions

The operator (A) is authorised to operate the activity¹ at the installation (B) subject to the following conditions.

Emissions

1. No visible particulate matter shall be emitted beyond the installation boundary.

Processing

2. *where low emission or skin forming resins are required* The following classes of resins shall be used: *list class or requirement*
3. Graduated vessels are used to measure resin and catalyst before mixing
4. *where open lay-up is not permitted, one or more of the following*
Open lay-up is not permitted
The following techniques are permitted: *(list)*
The following machines have extract ventilation where uncured resin is present: *(list)*

Buildings, ventilation

Condition 5 is not needed if general ventilation through doors and windows is sufficient for odour dispersal.

5. Buildings containing processing operations shall: *(delete the bullet that does not apply)*
 - vent the following at eaves level or above :*[list machines or operations that need extract ventilation]*
 - vent the following to stacks discharging [*metres*] above roof ridge: *[list either operations or machines that need ventilation]*

Loose, dry material - storage and loading

6. Dusty wastes shall only be stored in [*specify storage locations*] as detailed on the plan attached to this permit and their storage and transfer shall be subject to suppression and management techniques to minimise dust emissions.

Odour response plan

7. The operator shall have a written odour response plan.

Monitoring provisions

8. The emission requirements and methods and frequency of monitoring set out in **Table 1** shall be complied with.
9. *For spray-up and finishing operations:* All continuous monitors fitted to show compliance with the permit shall be fitted with a [visible] [audible] alarm warning of abatement failure or malfunction. *Alarms shall be tested at least once a week.*

¹ listed in Part B of section 4.1 in Part 2 of Schedule 1 to the Environmental Permitting Regulations

10. The operator shall, in the case of abnormal emissions, inform the regulator without delay if there is an emission likely to have an effect on the local community.

Records and training

11. Written or computer records of all tests and monitoring shall be kept by the operator until the next inspection, or for at least [24] months whichever is the longer. They shall be made available for examination by the regulator. *Records shall be kept of operator inspections, including those for odorous emissions.*
12. Staff at all levels shall receive the necessary training and instruction to enable them to comply with the conditions of this permit. *Records shall be kept of relevant training undertaken*.

The following two conditions are not needed for PPC permits which transferred automatically into the environmental permitting regime by virtue of regulation 69(6) of the 2007 Regulations and regulation 108(4) of the 2010 Regulations. Where permits are issued on or after 6 April 2008 the conditions will not automatically apply and need specific inclusion in the permit where required.

Best available techniques

13. The best available techniques shall be used to prevent or, where that is not practicable, reduce emissions from the installation in relation to any aspect of the operation of the installation which is not regulated by any other condition of this permit.

Process changes

14. If the operator proposes to make a change in operation of the installation, he must, at least 14 days before making the change, notify the regulator in writing. The notification must contain a description of the proposed change in operation. It is not necessary to make such a notification if an application to vary this permit has been made and the application contains a description of the proposed change. In this condition 'change in operation' means a change in the nature or functioning, or an extension, of the installation, which may have consequences for the environment.

Table 1 - Emission limits, monitoring and other provisions

Row	Substance	Source	Emission limits/provisions	Type of monitoring	Monitoring frequency
1	Total particulate matter:	Spray-up processes and finishing operations: see Notes 1 + 2	Designed to meet 10 mg/m ³	Bag failure and alarm, plus	Continuous
				For plant without a manufacturer's guarantee of particulate emissions: Periodic Monitoring	Annual
				For plant new or replaced since 2005, or with a manufacturer's guarantee of particulate emissions: Retain the manufacturer's guarantee of particulate emissions	At commissioning

Delete the lines and Notes not needed

Note 1: "spray up and finishing" does not include coating of product with paint –that is dealt with by other process guidance notes

Note 2: Spray up/finishing operations may be carried out in totally enclosed proprietary type booths with integral particulate removal systems. Alternatively the discharge to atmosphere from spray up/finishing operations can be vented via abatement plant designed to remove particulate matter.

Note 3: The operator should maintain a record of the performance of the alarm system

Note 4: The reference conditions for limits in **Table 1** are: [273.1K, 101.3kPa], without correction for water vapour content, unless stated otherwise.

All periodic monitoring shall be representative, and shall use standard methods.

All periodic monitoring results shall be checked by the operator on receipt and sent to the Council within 8 weeks of the monitoring being undertaken..

Right to Appeal

You have the right of appeal against this permit within 6 months of the date of the decision. The Council can tell you how to appeal [*or supply details with the permit*]. You will normally be expected to pay your own expenses during an appeal.

You will be liable for prosecution if you fail to comply with the conditions of this permit. If found guilty, the maximum penalty for each offence if prosecuted in a Magistrates Court is £50,000 and/or 6 months imprisonment. In a Crown Court it is an unlimited fine and/or 5 years imprisonment.

Our enforcement of your permit will be in accordance with the [Regulators' Compliance Code](#)

Appendix 2 - Application form

Application for a permit for an installation involving the polymerising or co-polymerising of pre-formulated resins or gel coats containing 100 tonnes or more of unsaturated hydrocarbons in a year.

Local Authority Pollution Prevention and Control
Pollution Prevention and Control Act, 1999
Environmental Permitting (England and Wales) Regulations 2010

Introduction

When to use this form

Use this form if you are applying for a permit to a Local Authority to operate a [*insert activity description*] installation as defined in Schedule 1 to the Environmental Permitting Regulations.

The appropriate fee must be enclosed with the application to enable it to be processed further. When complete, send the form and the fee and any additional information to:

[*Insert local authority address*]

If you need help and advice

We have made the application form as straightforward as possible, but please get in touch with us at the local authority address given above if you need any advice on how to set out the information we need.

For the purposes of Section G of the form, a relevant offence is any conviction for an offence relating to the environment or environmental regulation.

For Local Authority use

Application reference	Officer reference	Date received

LAPPC application form - to be completed by the operator

A The basics

A1 Name and address of the installation

Postcode:	Telephone:
-----------	------------

A2 Details of any existing environmental permit or consent

(for waste operations, include planning permission for the site, plus established use certificates, a certificate of lawful existing use, or evidence why the General Permitted Development Order applies.)

--

A3 Operator details

(The 'operator' = the person who it is proposed will have control over the installation in accordance with the permit (if granted).)

Name:
Trading name, if different:
Registered office address:
Principal office address, if different:
Company registration number:

A4 Any holding company?

Is the operator a subsidiary of a holding company within the meaning of section 1159 of the Companies Act 2006? If "yes" please fill in details of the ultimate holding company.

Yes No

Name: Trading name, if different:
Registered office address: Principal office address, if different:
Company registration number:

A5 Who can we contact about your application?

It will help to have someone who we can contact directly with any questions about your application. The person you name should have the authority to act on behalf of the operator - This can be an agent or consultant.

Name and position: _____
Telephone: _____
Email: _____

B The installation

B1 Does the installation do any of these?

Use dicyclopentadiene

Operate odour abatement plant

Distill acetone based cleaning fluid on site

Yes No

If you have answered 'yes' to B1 the installation is not suitable for a simple permit

B2 Do you polymerise or co-polymerise pre-formulated resin and pre-formulated gel coat that in 12 months contains 100 tonnes or more of unsaturated hydrocarbon?

Yes No

B3 Why is the application being made?

new installation

change to existing installation means it now needs a permit

B4 Site maps – please provide:

A location map with a red line round the boundary of the installation

Document reference: _____

A site plan or plans showing where all the relevant activities are on site:

a) where the processing plant will be installed

b) the areas and buildings/structures designated for materials and waste storage and the type of storage

c) the conveyors and transfer points

d) any directly associated activities or waste operations.

To save applying for permit variations, you can also show where on site you might want to use for storage etc in the future.

Document reference: _____

B4 Are there any sites of special scientific interest (SSSIs) or European protected sites nearer than any of the following distances to the proposed installation?

2km - for an installation which includes Part B combustion or incineration

Yes No

0.5km for all other Part B activities

Yes No

If 'yes', is the installation likely to have a significant effect on the special scientific interest or European protected sites?

Yes No

If 'yes', please write on a separate sheet or enclose a relevant document explaining what the implications are for the purposes of the Conservation (Natural Habitats etc) Regulations 1994 (see appendix 2 of Annex XVII of the [general guidance manual](#))

Document reference: _____

B5 Will emissions from the activity potentially have significant environmental effects (including nuisance)?

Yes No

If 'yes', please list the potential significant local environmental effects (including nuisance) of the foreseeable emissions on a separate document.

Document reference: _____

If 'yes', please enclose a copy of any environmental impact assessment which has been carried out for the installation under planning legislation or for any other purpose.

Document reference: _____

C The details

C1 What types of resin do you use?

[informs condition 2]

- a) low styrene emission resin: (tick all that apply)
b) low volatile organic compound resins:
c) other: please specify type _____

C2 Do you cut or chop raw fibre?

[informs Table 1]

Yes No

Do you cut finished products?

Yes No

Is any of the cutting or chopping fitted with local exhaust ventilation?

Yes No

C3 What open mould processes do you use for applying the resin?

[informs condition 4]

- a) hand lamination (tick all that apply)
b) saturation
c) spray up
d) filament winding
e) centrifugal casting
f) other: please specify _____

What closed mould techniques do you use?

[informs condition 4]

- a) vacuum bag moulding (tick all that apply)
b) pressure bag moulding
c) resin infusion
d) matched mould
e) resin injection
f) injection moulding
g) other: please specify _____

What continuous techniques do you use?

[informs condition 4]

- a) continuous lamination (tick all that apply)
b) pultrusion
c) continuous filament winding
d) other: please specify _____

C4 Do you have local exhaust ventilation for uncured resin emissions?

[informs condition 4]

Yes No

If yes, does it discharge:

- a) below the building eaves *(tick all that apply)*
b) between eaves and roof ridge
c) above the roof ridge specify how high above the ridge _____metres

Please mark all local exhaust ventilation emissions points on the plan to be provided with the application form:

Document reference: _____

C5 Will the resin be stored in fixed tanks?

[informs condition 13]

Yes No

If yes, will the resin be pumped from tank to mixing point

Yes No

C6 Is a graduated vessel used for measuring resin and catalyst?

[informs condition 3]

Yes No

C7 For cleaning the process, is the cleaning fluid you use?

[informs condition 13]

- a) acetone based
b) water based
c) other: please describe _____

C8 Where do you store dusty wastes?

[informs condition 13]

C9 Do you have bag failure monitors and alarm on spray up and finishing operations emission points?

[informs Table 1, condition 9]

Yes No

If yes, do the continuous monitors have alarms which are:

- a) visible *(tick all that apply)*
b) audible

C10 Do you have a written odour response procedure?

[informs condition 7]

Yes No

D Anything else?

Please tell us of anything else you would like us to take account of:

Document reference: _____

E Application fee

You must enclose the [relevant fee](#) with your application.

If your application is successful you will also have to pay an annual subsistence charge, so please say who you want invoices to be sent to.

Name and position:

Telephone:

Email:

F Protection of information

F1 Any confidential or national security information in your application?

If there is any information in your application you think should be kept off the public register for confidentiality or national security reasons, please say what and why. [General guidance manual](#) chapter 8 advises on what may be excluded. *(Do not include any national security information in your application. Send it, plus the omitted information, to the Secretary of State or Welsh Ministers who will decide what, if anything, can be made public.)*

Document reference : _____

F2 Please note: data protection

The information you give will be used by the Council to process your application. It will be placed on the relevant public register and used to monitor compliance with the permit conditions. We may also use and or disclose any of the information you give us in order to:

- consult with the public, public bodies and other organisations;
- carry out statistical analysis, research and development on environmental issues;
- provide public register information to enquirers;
- make sure you keep to the conditions of your permit and deal with any matters relating to your permit;
- investigate possible breaches of environmental law and take any resulting action;
- prevent breaches of environmental law;
- offer you documents or services relating to environmental matters;
- respond to requests for information under the Freedom of Information Act 2000 and the Environmental Information Regulations 2004; (if the Data Protection Act allows)
- assess customer service satisfaction and improve our service.

We may pass on the information to agents/representatives who we ask to do any of these things on our behalf.

F3 Please note: it is an offence to provide false information

It is an offence under regulation 38 of the EP Regulations, for the purpose of obtaining a permit (for yourself or anyone else), to:

- make a false statement which you know to be false or misleading in a material particular;
- recklessly make a statement which is false or misleading in a material particular;
- intentionally to make a false entry in any record required to be kept under any environmental permit condition;
- with intent to deceive, to forge or use a document issued or required for any purpose under any environmental permit condition.

If you make a false statement:

- we may prosecute you; **and**
- if you are convicted, you are liable to a fine or imprisonment (or both).

G Declarations A and B for signing, please

These declarations should be signed by the person listed in answer to question A3. Where more than one person is identified as the operator, all parties should sign. Where a company or other body corporate is the operator, an authorised person should sign and provide evidence of authority from the board.

Declaration A: I/We certify

EITHER - As evidence of my/our competence to operate this installation in accordance with the EP Regulations, no offences have been committed in the previous five years relating to the environment or environmental regulation.

OR - The following offences have been committed in the previous five years which may be relevant to my/our competence to operating this installation in accordance with the regulations:

Signature: _____ Name: _____

Position: _____ Date: _____

Declaration B:

I/We certify that the information in this application is correct. I/We apply for a permit in respect of the particulars described in this application (including the listed supporting documentation) I/we have supplied.

(Please note that each individual operator must sign the declaration themselves, even if an agent is acting on their behalf.)

Signature: _____ Name: _____

Position: _____ Date: _____

Signature: _____ Name: _____

Position: _____ Date: _____

Signature: _____ Name: _____

Position: _____ Date: _____

Appendix 3 - Monitoring styrene emissions

Monitoring styrene emissions for the purpose of comparison with the mass emission provisions in **Table 5.2**.

Wherever possible, emissions of styrene from FRP manufacturing processes should be measured by monitoring the concentration of styrene and the airflow in the exhaust stacks. In this way, a mass emission over a period of time, preferably eight hours but at least a complete process cycle, may be calculated. This can then be compared with, the mass of resin that has been used over the same period. Sampling points should be situated at least five stack diameters downstream from any bends or obstructions in the stack.

Difficulties may arise in situations where there are no extraction points close to the processing area and fugitive emissions represent a significant proportion of the total releases. In these circumstances, measured stack emissions should be supplemented with mass balance calculations in which resin consumption is compared with the mass of parts produced, allowing for contamination of drapes, filters, tools etc.

Three methods which are appropriate for the determination of styrene emissions are described below:

Flame ionisation detection (FID)

FID based analysers utilise the principle of hydrogen flame ionisation for detection and measurement of organic vapours. The carbon-containing ions that are generated are driven to a collecting electrode and the resulting ionisation current is measured. Instruments are calibrated by the manufacturer against hydrocarbon standards, generally methane or propane. Regular recalibration is required. Correlation to styrene concentrations is achieved using predetermined response factors. FID does respond to other volatile organic compounds, such as cleaning solvents, and the use of these should therefore be avoided during the sampling period. If this is not feasible, the coupling of the FID with a gas chromatograph should be considered, in order that differentiation of the organics present can take place.

Photo ionisation detection (PID)

PID shares the same basic principles as FID, but ionisation is achieved by means of an ultraviolet light source rather than a hydrogen flame.

Infrared vapour analysis

Organic compounds absorb infrared radiation at characteristic wave lengths. Infrared analysers are factory calibrated for a particular compound. This specificity means that these analysers are particularly suitable for measuring styrene in the presence of other volatiles which may be present in the resin or other materials such as cleaning compounds.

Appendix 4 - Additional provisions for odour and VOC abatement

Odour and VOC abatement plant is rare at styrene processes, so, to make the note easier to use for most users, the provisions about abatement have been moved from sections 4 and 5 to this appendix.

For styrene sites with odour or VOC abatement plant, and for DCPD sites, this appendix should be read as being part of **Sections 4 and 5**. The paragraph numbers show where they come from eg paragraph 4.28 or paragraph 5.29.

4. Emission limits, monitoring and other provisions - continued

Table 4.2 continued - Emission limits, monitoring and other provisions

Row	Substance	Source	Emission limits/provisions	Type of monitoring	Monitoring frequency
2	Carbon monoxide	From oxidation plant	100 mg/Nm ³ as 30 minute mean for contained sources	Monitoring and recording PLUS Manual extractive testing	Continuous PLUS Annual
3	Nitrogen oxides (measured as nitrogen dioxide)	From oxidation plant	100 mg/Nm ³ as 30 minute mean for contained sources	Manual extractive testing	Annual
4	VOC expressed as total carbon excluding particulate matter	Arrested emissions	50 mg/Nm ³ as 30 minute mean	Indicative monitoring with continuous recording PLUS Monitoring to comply with BS EN 13526	Continuous PLUS Annual

Note 5: There may be some circumstances in which it will be difficult to maintain compliance with the emission limit in row 4 of Table4.2continued relating to VOCs. Notably, this may occur where the input styrene concentration to the thermal oxidiser is extremely high (typically above 15 g/m³). In these circumstances it may be necessary to assess what emission standard is achievable in accordance with BAT and specify a limit which can be achieved using the quoted arrestment efficiency of the proposed thermal oxidiser. It is not envisaged that this would result in a significant derogation from the VOC limit.

*olfactory results shall be checked by the operator on receipt and sent to the Council within 8 weeks of the monitoring being undertaken.

Visible emissions

- 4.24 Where ambient monitoring is carried out it may also be appropriate for the regulator to specify recording of wind direction and strength.
- 4.25 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.

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.

- In the case of thermal oxidisers or combustion equipment, the combustion efficiency is a good indication of performance. Emissions may be tested for carbon monoxide and the indicative guide value of 100mg/m^3 should be used.

Emissions of odour

- 4.26 The operator should respond to any odour control equipment malfunction (where installed), any incident of odours being detected during the site inspection and to complaints.
- In cases where offensive odours are detected beyond the process boundary the operator should undertake an assessment of process operations and odour controls. If, after this assessment, there is no obvious cause of odour release it may be necessary to check the odour arrestment plant performance.
 - In the case of thermal oxidisers or combustion equipment, the combustion efficiency is a good indication of arrestment plant performance. Emissions may be tested for carbon monoxide and the indicative guide value of 100mg/m^3 should be used.

4.27 Where it is installed any odour arrestment equipment should be inspected at least once a day to verify correct operation and to identify any malfunctions. Depending upon the type of any arrestment plant used this inspection should include:

- identification of any leaks in air handling equipment and ductwork
- in the case of scrubbing equipment, thermal oxidisers and other combustion equipment, the inspection should include verification of the operation of any continuous monitoring equipment, the presence of any blockages and also identification of any leaks of either odorous air or liquid.
- in the case of biofilters, the surface should be inspected to identify any cracking of the surface or voids in the bed, leaks around the edge of the filter or air handling equipment, review of the moisture content (considering both flooding and drying out) and looking for signs of compaction or uneven flow.
- In the specific case of soil biofilters, the growth of plants and weeds should be inspected as any excessive flow or odour escape is often indicated by scorching of the earth or plant growth dying off.

Continuous monitoring

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

- All continuous monitoring readings required by the permit should be on display to appropriately trained operating staff.

Calibration and compliance monitoring

4.29 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.

4.30 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.

Varying of monitoring frequency

- 4.31 A reduction in monitoring frequency should not be permitted where continuous 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.
- 4.32 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.
- 4.33 Where the operator can demonstrate that a number of individual extracts vent from similar parts of the process which lead to emissions of the same nature and volume, the regulator may approve a sampling programme involving monitoring less frequently than once a year. In any case, each stack should be tested at least once every four years, and at least 25% of all stacks should be tested each year. Emissions from arrestment plant should be tested at least once a year.

Monitoring of unabated releases

- 4.34 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.

5. Control techniques - continued

Techniques to control emissions from contained sources

5.26 No additional provisions

Techniques to control fugitive emissions

5.27 No additional provisions

Air quality

5.28 An exception to the paragraph 5.20 on exit velocities 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.

5.29 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.