Sunderland City Council

Notice of variation and consolidation with introductory note

The Environmental Permitting (England & Wales) Regulations 2016

Nissan Motor Manufacturing (UK) Limited
Washington Road,
Sunderland,
Tyne And Wear,
SR5 3NS

Variation Notice Number

24/17353/PPCVAR

Permit number

LAIPPC/1018/04/2024

Nissan Motor Manufacturing (UK) Limited (NMUK) Permit number LAIPPC/1018/04/2024

Introductory note

This introductory note does not form a part of the notice

Under the Environmental Permitting (England & Wales) Regulations 2016 (schedule 5, part 1, paragraph 19) a variation may comprise a consolidated permit reflecting the variations and a notice specifying the variations included in that consolidated permit.

Schedule 2 of the notice comprises a consolidated permit which reflects the variations being made. All the conditions of the permit have been varied and are subject to the right of appeal.

Article 21(3) of the Industrial Emissions Directive (IED) requires the Regulator to review conditions in permits that it has issued and to ensure that the permit delivers compliance with relevant standards, within four years of the publication of updated decisions on Best Available Techniques (BAT) Conclusions. We have reviewed the permit for this installation against the revised BAT Conclusions for surface treatment using organic solvents including preservation of wood and wood products with chemicals published on 9th December 2020. Only activities covered by this BAT Reference Document have been reviewed and assessed.

This variation varies the Permit in its entirety

Brief description of the process

Nissan Motor Manufacturing (UK) Sunderland manufactures and subsequently paints passenger car bodies. The original paint plant was installed in 1985 for the painting of vehicle bodies on one production line (line 1). In 1992 the plant was increased in size to facilitate production of multiple vehicle models and has been subject to a number of significant operational and technological upgrades to ensure compliance with industry and regulatory expectations.

The plant now operates two integrated production lines (line 1 and line 2) and has the capability to paint all vehicles manufactured at NMUK Sunderland Plant. Both Lines 1 and 2 have the capacity to paint up to 60 vehicles per hour, and the overall plant up to 600 000 vehicles per year. The organic solvent throughput for both lines combined is in excess of 200 tonnes per annum. The actual organic solvent throughput is influenced by the product manufactured and the plant operating schedule.

On this basis, the site is regulated for the surface treatment of substances, objects or products using organic solvents, in particular coating of passenger vehicles in plant with a consumption capacity of more than 150kg or more per hour than 200 tonnes per year under Schedule 1, part 2 Section 6.4, Part A(2) of the Environmental Permitting Regulations 2016 (as amended) and includes a number of directly associated activities outlined in Table S1.1 .

NMUK (the Installation) is operated by Nissan Motor Manufacturing (UK) Ltd and is located in Sunderland, Tyne & Wear, England.

The status log of a permit sets out the permitting history, including any changes to the permit reference number.

Status log of the permit		
Description	**Date**	**Comments**
Application received	January 2005	Application for an A2 solvent coating activity namely coating of passenger cars
Permit determination	12/07/2005	Permit issued to NMUK Ltd.
Permit varied LA-IPPC/A2/CTG1/V2/2009	31/10/2009	Varied permit issued to NMUK Ltd to update process description
Permit varied LA-IPPC/A2/CTG1/2011	14/09/2001	Variation of permit to include ELVs prescribed in BREF document
Varied Permit Issued LA-IPPC/A2/CTG1/V3/2012	14/09/2011	Varied permit issued to NMUK Ltd to include new total emission limit and implementation of Compliance Report
Varied Permit Issued EP/A2/1018-4/2018	30/04/2018	Permit varied to reflect process change and inclusion of EC paintshop
Varied Permit Issued EP/A2/1018-4/2020	17/07/2020	Varied permit issued to NMUK Ltd to update process description
Varied Permit Issued EPR/AB0234CD/V00X	09/12/2024	Statutory review of permit – surface treatment using organic solvents including preservation of wood and wood products with chemicals BAT Conclusions published on 9/12/2020 Varied and consolidated permit issued. Effective from 09/12/2024

End of introductory note

Pollution Prevention & Control Act 1999
Environmental Permitting (England and Wales) Regulations
LAIPPC/1018/04/2024

Notice of variation and consolidation

The Environmental Permitting (England and Wales) Regulations 2016

Sunderland City Council (the Regulator) in exercise of its powers under regulation 20 of the Environmental Permitting (England and Wales) Regulations 2016 varies

Permit number

EP/A2/1018/04-4/2020

Issued to

Nissan Motor Manufacture UK Ltd (“the operator”)

Washington Road,

Sunderland,

Tyne And Wear,

SR5 3NS

Company registration number 01806912

to operate a regulated facility at:

Washington Road,

Sunderland,

Tyne And Wear,

SR5 3NS

to the extent set out in the schedules.

The notice shall take effect from 09/12/2024

Name	Date
pf. MD **Peter McIntyre** **Executive Director of City Development** **Authorised to sign on behalf of Sunderland City Council**	**09/12/2024**

Schedule 1

All conditions have been varied by the consolidated permit as a result of a Regulator initiated variation

Schedule 2 – consolidated permit

Consolidated permit issued as a separate document.

Pollution Prevention and Control Act 1999

Environmental Permitting (England and Wales) Regulations 2016

Operator	Nissan Motor Manufacturing (UK) Limited
Installation Name	NMUK
Address	Washington Road, Sunderland, Tyne & Wear, SR5 3NS
Permit Reference	LAIPPC/1018/04/2024
Grid Reference	NZ 34270 58567
Registered Office	Washington Road, Sunderland, Tyne And Wear, SR5 3NS
Registered Number	01806912

NMUK Ltd (“The Operator”) is hereby permitted by Sunderland City Council (“the Regulator”) to operate an installation at NMUK, Washington Road, Sunderland, SR5 3NS to the extent authorised by and subject to the conditions of this permit

Name	Date
Signature: pp. **Peter McIntyre** **Executive Director of City Development** Authorised to sign on behalf of Sunderland City Council	09/12/2024

Address for correspondence relating to the permit:
Environmental Health (Pollution Control)
Sunderland City Council
City Hall, Plater Way
Sunderland, SR1 3AA

Telephone 0191 520 5555

Email: public.health@sunderland.gov.uk

Activity Description

Nissan Motor Manufacturing (UK) Sunderland manufactures and subsequently paints passenger car bodies. The plant operates two integrated production lines (line 1 and line 2).

Vehicles bodies and both metal and plastic components enter the Main Paint shop and are cleaned and phosphate coated before being electrocoated, sealed, paint coated, finished and stored. A similar process occurs in relation to battery trays. Plastic component parts (bumpers, spoilers etc) are painted in a separate plastic paint shop. Service parts (spare parts) are also painted on site.

The Coating process is systematic and is outlined in brief in Figure 1 below;

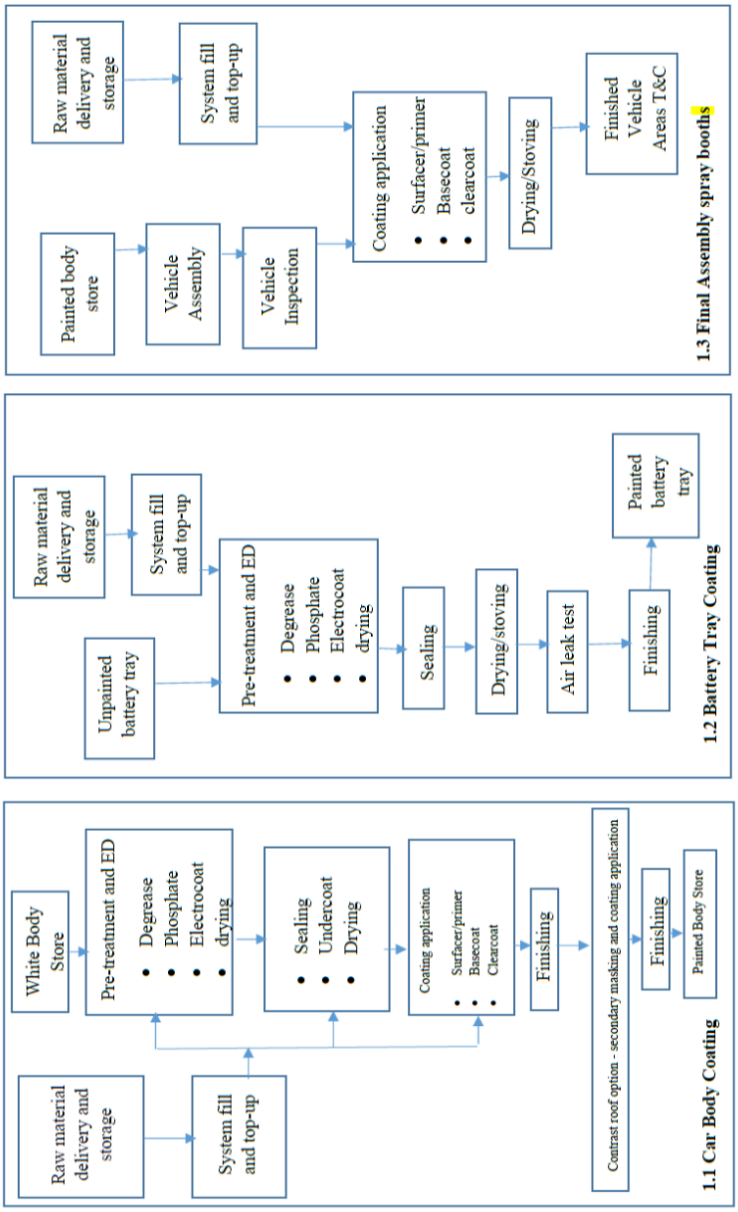


Figure 1 - Paint Coating Process Overview

A more detailed and technical explanation of the coating activity carried out on site is provided in Schedule 8

The main process areas to which this permit relates are identified on the site plan (Schedule 7) and include:

- Main Paint Shop (Body Paint) – includes EC Paintshop
- Trim & Chassis (minor repair booths, wax and blackout)
- Plastic Paint (Bumper Paint)
- Service Parts
- Battery Tray
- Fluidised Bed (metal decontamination)
- Trade Effluent Plant

Solvent consumption in the dedicated Service Parts Shop exceeds 5 tonnes but less than 200 tonnes per annum. The Service Parts coating process is itself a Part B activity however liquid waste from the process discharges to the effluent treatment plant and there is therefore a clear technical link with body and plastic painting processes. Liquid waste from both the Main and Plastic Paint Shop process are discharged to the effluent treatment plant.

The principal releases result from paint spraying activities and include Volatile Organic Compounds (VOCs), Particulate Matter, or dust, (TPM) and Nitrogen Dioxide (NO_x) and Carbon Monoxide via process stacks. Whilst VOCs and TPM are typically associated with spray coating, NO_x and CO result from thermal combustion associated with VOC destruction. NMUK operate 5 Regenerative Thermal Oxidisers (RTOs) and 3 incinerators to destroy VOCs before waste gases are released to atmosphere. Waste gases containing particulate matter are abated using a range of techniques including wet scrubbers, filtration and dry overspray separation using limestone.

The NMUK site is located within Washington, on the southern boundary of the International Advanced Manufacturing Park (IAMP), a hub for automotive, advanced manufacturing and technology businesses. It is surrounded to the west and south by other industrial manufacture and assembly units and a major highway (A19 to the east). Residential premises are located further to the east at a distance of approximately 150m at the closest point to the site boundary. Sunderland has 17 Sites of Special Scientific Interest, the nearest being the Wear River Bank, located 1.2km to the south east.

An extensive Environmental Management System is in place. The EMS is certified to ISO 14001:2015 and is subject to regular external audit.

Permit Conditions

1 Management

1.1 General management

1.1.1 The operator shall manage and operate the activities:

(a) in accordance with a written management system that identifies and minimises risks of pollution, including those arising from operations, maintenance, accidents, incidents, non-conformances, closure and those drawn to the attention of the operator as a result of complaints; and

(b) using sufficient competent persons and resources.

1.1.2 Records demonstrating compliance with condition 1.1.1 shall be maintained.

1.1.3 Any person having duties that are or may be affected by the matters set out in this permit shall have convenient access to a copy of it kept at or near the place where those duties are carried out.

1.2 Energy efficiency

1.2.1 The operator shall:

(a) take appropriate measures to ensure that energy is used efficiently in the activities.

(b) review and record at least every four years commencing from the start of full production whether there are suitable opportunities to improve the energy efficiency of the activities; and

(c) take any further appropriate measures identified by a review.

1.3 Efficient use of raw materials

1.3.1 The operator shall:

(a) take appropriate measures to ensure that raw materials and water are used efficiently in the activities.

(b) maintain records of raw materials and water used in the activities.

(c) review and record at least every four years whether there are suitable alternative materials that could reduce environmental impacts or opportunities to improve the efficiency of raw material and water use; and

(d) take any further appropriate measures identified by a review.

1.4 Avoidance, recovery and disposal of wastes produced by the activities.

1.4.1 The operator shall take appropriate measures to ensure that:

(a) the waste hierarchy referred to in Article 4 of the Waste Framework Directive is applied to the generation of waste by the activities; and

(b) any waste generated by the activities is treated in accordance with the waste hierarchy referred to in Article 4 of the Waste Framework Directive; and

(c) where disposal is necessary, this is undertaken in a manner which minimises its impact on the environment.

1.4.2 The operator shall review and record at least every four years whether changes to those measures should be made and take any further appropriate measures identified by a review.

2 Operations

2.1 Permitted activities

2.1.1 The Operator is only authorised to carry out the activities specified in schedule 1 table S1.1 (the “activities”).

2.2 The site

2.2.1 The activities shall not extend beyond the site, being the land shown edged in red on the site plan at schedule 7 to this permit.

2.3 Operating techniques

2.3.1 For the activities referenced in schedule 1, table S1.1 the activities shall, subject to the conditions of this permit, be operated using the techniques and in the manner described in the documentation specified in schedule 1, table S1.2, unless otherwise agreed in writing by the Regulator.

2.3.2 If notified by the Regulator that the activities are giving rise to pollution, the Operator shall submit to the Regulator for approval within the period specified, a revision of any plan or other documentation (“plan”) specified in schedule 1, table S1.2 or otherwise required under this permit which identifies and minimises the risks of pollution relevant to that plan, and shall implement the approved revised plan in place of the original from the date of approval, unless otherwise agreed in writing by the Regulator.

2.3.3 The Operator shall

(a) identify the process areas, sections or steps that make the greatest contribution to VOC emissions and energy consumption, which have the greatest potential for improvement.

b) identify and implement actions to minimise VOC emissions and energy consumption.

(c) review progress and update actions on an annual basis.

2.3.4 The Operator shall ensure that where waste produced by the activities is sent to a relevant waste operation, that operation is provided with the following information, prior to the receipt of the waste:

(a) the nature of the process producing the waste.

(b) the composition of the waste.

(c) the handling requirements of the waste.

(d) the hazardous property associated with the waste, if applicable; and

(e) the waste code of the waste.

2.3.5 The Operator shall ensure that where waste produced by the activities is sent to a landfill site, it meets the waste acceptance criteria for that landfill.

2.4 Improvement programme

2.4.1 The Operator shall complete the improvements specified in schedule 1 table S1.3 by the date specified in that table unless otherwise agreed in writing by the Regulator.

2.4.2 Except in the case of an improvement which consists only of a submission to the Regulator, the Operator shall notify the Regulator within 14 days of completion of each improvement.

3. Emissions and monitoring

3.1 Emissions to water, air or land

3.1.1 There shall be no point source emissions to water, air or land except from the sources and emission points listed in schedule 3 table S3.1.

3.1.2 The limits given in schedule 3 shall not be exceeded.

3.1.3 Total annual emissions from the emission point(s) set out in schedule 3 table S3.1 of a substance listed in schedule 3 table S3.4 shall not exceed the relevant limit in table S3.4.

3.1.4 Periodic monitoring shall be carried out at least once every 5 years for groundwater and 10 years for soil, unless such monitoring is based on a systematic appraisal of the risk of contamination.

3.1.5 The Operator shall

(a) maximise the availability and performance of equipment critical to the protection of the environment.

(b) record all periods of other than normal operation, their cause and duration and where possible their effect on emissions.

3.2 Emissions of substances not controlled by emission limits

3.2.1 Emissions of substances not controlled by emission limits (excluding odour) shall not cause pollution. The Operator shall not be taken to have breached this condition if appropriate measures, including, but not limited to, those specified in any approved emissions management plan, have been taken to prevent or where that is not practicable, to minimise, those emissions.

3.2.2 The Operator shall:

(a) if notified by the Regulator that the activities are giving rise to pollution, submit to the Regulator for approval within the period specified, an emissions management plan which identifies and minimises the risks of pollution from emissions of substances not controlled by emission limits;

(b) implement the approved emissions management plan, from the date of approval, unless otherwise agreed in writing by the Regulator.

3.2.3 All liquids in containers, whose emission to water or land could cause pollution, shall be provided with secondary containment, unless the Operator has used other appropriate measures to prevent or where that is not practicable, to minimise, leakage and spillage from the primary container.

3.3 Monitoring

3.3.1 The Operator shall, unless otherwise agreed in writing by the Regulator, monitor total emissions by compiling, at least on an annual basis, a solvent mass balance of the solvent inputs and outputs of the plant, as defined in Part 7(2) of Annex VII to Directive 2010/75/EU.

The solvent mass balance shall include:

- identification and documentation of solvent inputs and outputs, (e.g. emissions in waste gases, emissions from each fugitive emission source, solvent output in waste);
- substantiated quantification of each relevant solvent input and output and recording of the methodology used (e.g. measurement, calculation using emission factors, estimation based on operational parameters);
- identification of the main sources of uncertainty of the aforementioned quantification, and implementation of corrective actions to reduce uncertainty;
- regular update of solvent input and output data.

The solvent mass balance calculation methodology shall be agreed in writing by the Regulator.

3.3.2 The Operator shall, unless otherwise agreed in writing by the Regulator, undertake the monitoring specified in the following tables in schedule 3 to this permit:

(a) point source emissions specified in tables S3.1, S3.2 and S3.3.

(b) groundwater specified in table S3.5.

(c) process monitoring specified in table S3.6;

(d) land specified in table S3.7

3.3.3 The Operator shall maintain records of all monitoring required by this permit including records of the taking and analysis of samples, instrument measurements (periodic and continual), calibrations, examinations, tests and surveys and any assessment or evaluation made on the basis of such data.

3.3.4 Monitoring equipment, techniques, personnel and organisations employed for the emissions monitoring programme and the environmental or other monitoring specified in condition 3.3.2 shall have either MCERTS certification or MCERTS accreditation (as appropriate), where available, unless otherwise agreed in writing by the Regulator.

3.3.5 Permanent means of access shall be provided to enable sampling/monitoring to be carried out in relation to the emission points specified in schedule 3 table S3.1 unless otherwise agreed in writing by the Regulator.

3.4 Odour

3.4.1 Emissions from the activities shall be free from odour at levels likely to cause pollution outside the site, as perceived by an authorised officer of the Regulator, unless the Operator has used appropriate measures, including, but not limited to, those specified in any approved odour management plan, to prevent or where that is not practicable to minimise the odour.

3.4.2 The Operator shall:

(a) if notified by the Regulator that the activities are giving rise to pollution outside the site due to odour, submit to the Regulator for approval within the period specified, an odour management plan which identifies and minimises the risks of pollution from odour;

(b) implement the approved odour management plan, from the date of approval, unless otherwise agreed in writing by the Regulator.

3.5 Noise and vibration

3.5.1 Emissions from the activities shall be free from noise and vibration at levels likely to cause pollution outside the site, as perceived by an authorised officer of the Regulator, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved noise and vibration management plan to prevent or where that is not practicable to minimise the noise and vibration.

3.5.2 The operator shall:

(a) if notified by the Regulator that the activities are giving rise to pollution outside the site due to noise and vibration, submit to the Regulator for approval within the period specified, a noise and vibration management plan which identifies and minimises the risks of pollution from noise and vibration.

(b) implement the approved noise and vibration management plan, from the date of approval, unless otherwise agreed in writing by the Regulator

4 Information

4.1 Records

4.1.1 All records required to be made by this permit shall:

- (a) be legible.
- (b) be made as soon as reasonably practicable.
- (c) if amended, be amended in such a way that the original and any subsequent amendments remain legible, or are capable of retrieval; and
- (d) be retained, unless otherwise agreed in writing by the Regulator, for at least 6 years from the date when the records were made, or in the case of the following records until permit surrender:
- (i) off-site environmental effects; and
- (ii) matters which affect the condition of the land and groundwater.

4.1.2 The Operator shall keep on site all records, plans and the management system required to be maintained by this permit, unless otherwise agreed in writing by the Regulator.

4.2 Reporting

4.2.1 The Operator shall send all reports and notifications required by the permit to the Regulator using the contact details supplied in writing by the Regulator.

4.2.2 Within 28 days of the end of the reporting period the operator shall, unless otherwise agreed in writing by the Regulator, submit reports of the monitoring and assessment carried out in accordance with the conditions of this permit, as follows:

- (a) in respect of the parameters and emission points specified in schedule 4 table S4.1;
- (b) for the reporting periods specified in schedule 4 table S4.1 and using the forms specified in schedule 4 table S4.4; and
- (c) giving the information from such results and assessments as may be required by the forms specified in those tables.

4.2.3 A report or reports on the performance of the activities over the previous year shall be submitted to the Regulator by 31 January (or other date agreed in writing by the Regulator) each year. The report(s) shall include as a minimum:

(a) a review of the results of the monitoring and assessment carried out in accordance with the permit including an interpretive review of that data;

(b) the annual production/treatment data set out in schedule 4 table S4.2; and

(c) the performance parameters set out in schedule 4 table S4.3 using the forms specified in table S4.4 of that schedule.

4.2.4 The Operator shall, unless notice under this condition has been served within the preceding four years, submit to the Regulator, within six months of receipt of a written notice, a report assessing whether there are other appropriate measures that could be taken to prevent, or where that is not practicable, to minimise pollution.

4.2.5 The Operator shall submit an annual solvent management plan in order to demonstrate compliance with the requirements of the Industrial Emissions Directive, by 31 January each year in respect of the previous year.

4.3 Notifications

4.3.1 In the event:

(a) that the operation of the activities gives rise to an incident or accident which significantly affects or may significantly affect the environment, the Operator must immediately—

(i) inform the Regulator,

(ii) take the measures necessary to limit the environmental consequences of such an incident or accident, and (iii) take the measures necessary to prevent further possible incidents or accidents.

(b) of a breach of any permit condition the Operator must immediately—

(i) inform the Regulator, and

(ii) take the measures necessary to ensure that compliance is restored within the shortest possible time.

(c) of a breach of permit condition which poses an immediate danger to human health or threatens to cause an immediate significant adverse effect on the environment, the Operator must immediately suspend the operation of the activities or the relevant part of it until compliance with the permit conditions has been restored.

4.3.2 Any information provided under condition 4.3.1 shall be confirmed by sending the information listed in schedule 5 to this permit within the time period specified in that schedule.

4.3.3 Where the Regulator has requested in writing that it shall be notified when the operator is to undertake monitoring and/or spot sampling, the Operator shall inform the Regulator when the relevant monitoring and/or spot sampling is to take place. The Operator shall provide this information to the Regulator at least 14 days before the date the monitoring is to be undertaken.

4.3.4 The Regulator shall be notified within 14 days of the occurrence of the following matters, except where such disclosure is prohibited by Stock Exchange rules:

Where the Operator is a registered company:

(a) any change in the Operator’s trading name, registered name or registered office address; and

(b) any steps taken with a view to the Operator going into administration, entering into a company voluntary arrangement or being wound up.

Where the Operator is a corporate body other than a registered company:

(c) any change in the Operator’s name or address; and

(d) any steps taken with a view to the dissolution of the Operator.

4.3.5 Where the Operator proposes to make a change in the nature or functioning, or an extension of the activities, which may have consequences for the environment and the change is not otherwise the subject of an application for approval under the Regulations or this permit:

(a) the Regulator shall be notified at least 14 days before making the change; and

(b) the notification shall contain a description of the proposed change in operation.

4.3.6 The Regulator shall be given at least 14 days’ notice before implementation of any part of the site closure plan.

4.3.7 Where the Operator has entered into a climate change agreement with the Government, the Regulator shall be notified within one month of:

(a) a decision by the Secretary of State not to re-certify the agreement.

(b) a decision by either the Operator or the Secretary of State to terminate the agreement; and

(c) any subsequent decision by the Secretary of State to re-certify such an agreement.

4.3.8 The Operator shall notify the Regulator without delay of the confirmed date of start of production.

4.4 Interpretation

4.4.1 In this permit the expressions listed in Schedule 6 shall have the meaning given in that schedule.

4.4.2 In this permit references to reports and notifications mean written reports and notifications, except where reference is made to notification being made “immediately” in which case it may be provided by telephone

Schedule 1 – Operations

Table S1.1 Activities		
Activity listed in Schedule 1 of the EP Regulations	**Description of specified activity and WFD Annex I and II operations**	**Limits of specified activity and waste types**
S6.4 A (2) (a)	Surface treating of substances, objects or products using organic solvents, in particular for dressing, printing, coating, degreasing, waterproofing, sizing, painting, cleaning or impregnating, in plant with a consumption capacity of more than 150kg per hour or more than 200 tonnes per year	Receipt of raw materials to application and drying of coating materials onto substrates and finishing of coated passenger car bodies, battery trays and plastic components.
S2.3 A(2) (a)	Surface treating metals using an electrolytic process where the aggregated volume of treatment vats is more than 30m^3	Receipt of raw materials to assembly of surface treated finished parts and despatch of finished parts. • Line 1 phosphate dip 90m^3 • Line 2 phosphate dip 79m^3 • Battery tray phosphate dip 8.1m^3 • Service Parts phosphate dip 30m^3
S6.4 (b)(c)(iii)	Application to a substrate, or drying or curing after such application, printing ink or paint or any other coating material as, or in the course of, a manufacturing activity, where the process may result in the release into the air of particulate matter or of any volatile organic compound and is likely to involve the use in any 12-month period of 5	Receipt of raw materials to application and drying of coating materials onto substrate and finishing of **service parts**

	or more tonnes of organic solvents	
S2.1 (b)	Heating iron, steel or any ferrous alloy (whether in a furnace or other appliance) to remove grease, oil or any other non-metallic contaminant (including such operations as the removal by heat of plastic or rubber covering scrap cable).	Receipt and cleaning of paint contaminated components such as metal floor grids
Directly Associated Activities		
Activity	**Process Area Location**	**Description**
Delivery and storage of raw materials	Main Paint Service Parts Plastic Paints Battery Tray	Receipt and storage of raw materials. Solid and liquid materials in bulk storage tanks, drums, IBCs, bags and other containers
System fill and top-up	Main Paint Service Parts Plastic Paints Battery tray	Decant and transfer of raw materials to coating activity
Storage and delivery of items to be coated	Main Paint Service Parts Plastic Paints Battery Tray	Decant and transfer of items to be coated (vehicle body, battery tray, plastic parts, service parts)
Degrease and pretreatment	Main Paint Service Parts Battery Tray	Cleaning and preparation (phosphate coating) of metal vehicle bodies/components prior to coating
Electrocoat	Main Paint Service Parts Battery Tray	Application of water-based primer to vehicle bodies and components using an electric current
Power wash	Plastic Paints	Cleaning and preparation of plastic components prior to coating
Sealing and undercoat	Main Paint	Application of PVC based sealant and undercoat to underbody of vehicle bodies prior to paint coating application

Sanding	Main Paint	Defects in primer layer are repaired prior to coating
Coating mix and application	Main Paint Service Parts Plastic Paints	Coating materials are delivered to specific mix room areas
Wax and blackout	Trim and Chassis	Application of black paint and injection of wax to cavitied areas of vehicle bodies
Repair/Finishing	Main Paint Trim and Chassis	Final defect repair prior to storage
Storage		Painted vehicle bodies and parts are delivered to dedicated storage areas prior to dispatch from site
Control & abatement systems for emissions to air	Main Paint Service Parts Plastic Paints	Abatement of releases to air Limited release through stack of correct height for adequate dispersion. Extraction and collection of waste gases and treatment in thermal oxidisers (RTO and incinerators) Wet scrubbers, filters and limestone filtration
Effluent discharge to foul sewer	Discharge of process water from the installation	From production of effluent to discharge to external foul sewer

Table S1.2 Operating Techniques

Description	Parts	Date Received
Review of Environmental Management System	Summary of BAT 1 review	07.12.2023
	Summary of BAT 2 review	31.01.2024
	Summary of BAT 13 review	31.01.2024
	Summary of BAT 20 review	31.01.2024
BAT Reviews	Summary of the BAT 3 & 4 review	07.12.2023
	Summary of BAT 5 review	07.12.2023
	Summary of BAT 6, 7, 8 and 9 review	31.01.2024
	Summary of BAT 14, 15, 16 and 17 review	31.01.2024
	Summary of BAT 18 review	31.01.2024

Energy Efficiency	Energy Efficiency Plan (BAT 19)	31.01.2024 & 17.10.2024
Emissions to water	BAT 21	10.10.2024
Waste Management	BAT 22	31.01.2024 & 18.10.2024

Table S1.3 Improvement Programme Requirements		
Reference	**Requirement**	**Date**
N/A	No Improvement requirements	

Schedule 2 – Waste Types, Raw Materials and Fuels

Table S2.1 Raw materials and fuels

Raw materials and fuel description	Specification
None Specified	

Schedule 3 – Emissions and monitoring

Table S3.1 Point source emissions to air – emission limits and monitoring requirements

Row	Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
Main Paint Shop **Identified on Stack Location Plan 7.2.1 and 7.2.2**							
1	• I1-4 • B1	• Shop RTO 1-4 • Battery Tray Incinerator	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	100 mg/Nm^3	Average over the sampling period	Minimum of once per year	BS EN 14792
2	• I1-4 • B1	• Shop RTO 1-4 • Battery Tray Incinerator	Carbon Monoxide	100 mg/Nm^3	Average over the sampling period	Minimum of once per year	EN 15058
3	• I1-4 • B1 • E1-10, E11-12 E14-15 • E13	• Main Paint Shop RTO 1-4 • Battery Tray Incinerator • Topcoat C & D Stack 1-Stack 5 • Surfacer B Stacks 1 and 2 • Basecoat 1 & 2 • Clearcoat/ ICFO	Particulate matter (Dust)	3 mg/Nm^3 from 09/12/2024	Average over the sampling period	Minimum of once per year	BS EN 13284-1
4	• I1-4 • B1	• Main Paint Shop RTO 1-4 • Battery Tray Incinerator	Temperature	To comply with performance standards detailed in Table S3.5	Continuous	Continuous Temperature Monitoring in the combustion chamber, combined with alarm for temperatures falling outside of optimised temperature window	BS EN 15267-1 BS EN 15267-1 BS EN 15267-1
5	• I1-4 • B1	• Main Paint Shop RTO 1-4 • Battery Tray Incinerator	TVOC	From 09/12/2024 no ELV however monitoring must be undertaken to inform mass balance	Average over the sampling period	Continuous TVOC monitoring if mass emission >10 10 kg C/h Minimum of once per year if mass emission is 0.1 to 10 kg C/h	BS EN 12619

Table S3.1 Point source emissions to air – emission limits and monitoring requirements

Row	Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
						Once every 3 years if mass emission is <0.1 Kg C/h	
6	• E1-E3 • **E4** • E5-E10 • E11-E12 • E14-E15 • E13	• Topcoat C & D Stack 1-3 & 5 • **Topcoat C Stack 4** • Surfacer B Stacks 1 and 2 • Basecoat 1 & 2 • Clearcoat/ ICFO	TVOC	From 09/12/2024 no ELV however monitoring must be undertaken to inform mass balance	Average over the sampling period	Continuous TVOC monitoring if mass emission >10 10 kg C/h Minimum of once per year if mass emission is 0.1 to 10 kg C/h Once every 3 years if mass emission is <0.1 Kg C/h	BS EN 12619 Generic EN Standards
7	• E4-E5 • E9-E10 • E13	• Topcoat C Stack 4 & 5 • Topcoat D Stack 4 & 5 • Clearcoat/ICFO	Isocyanates	0.1 mg/Nm3 (averaged over a 2 hour period as total NCO group)	Average over the sampling period	Minimum of once per year	US EPA conditional test method (CTM) 36
EC Paint Shop **Identified on Stack Location Plan 7.2.3**							
8	• F15	• RTO	Oxides of Nitrogen (NO and NO_2 expressed as NO^2)	100 mg/Nm^3	Average over the sampling period	Minimum of once per year	BS EN 14792
9	• F15	• RTO	Carbon Monoxide	100 mg/Nm^3	Average over the sampling period	Minimum of once per year	EN 15058
10	• F1-F16	• RTO • Manual touch up line A & B • Exterior Zones Line A & B • Pearl Line A & B • Heat Up Line A & B • Cooler Line A & B	Particulate matter (Dust)	3 mg/Nm^3 from 09/12/2024	Average over the sampling period	Minimum of once per year	BS EN 13284-1

Table S3.1 Point source emissions to air – emission limits and monitoring requirements

Row	Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
		• Clearcoat Line A & B • Oven Cooler Line A & B • Wax and Blackout Lines A & B • Mix Room 1 & 2					
11	• F15	• RTO	Temperature	To comply with performance standards detailed in Table S3.5	Continuous	Continuous Temperature Monitoring in the combustion chamber, combined with alarm for temperatures falling outside of optimised temperature window	BS EN 15267-1 BS EN 15267-2 BS EN 15267-3
12	• F15	• RTO	TVOC	From 09/12/2024 no ELV however monitoring must be undertaken to inform mass balance	Average over the sampling period	Continuous TVOC monitoring if mass emission >10 10 kg C/h Minimum of once per year if mass emission is 0.1 to 10 kg C/h Once every 3 years if mass emission is <0.1 Kg C/h	BS EN 12619 Continuous monitoring: BS EN 15267-1 BS EN 15267-2 BS EN 15267-3

Table S3.1 Point source emissions to air – emission limits and monitoring requirements

Row	Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
13	• F1-F14 • F16	• Manual touch up line A & B • Exterior Zones Line A & B • Pearl Line A & B • Heat Up Line A & B • Cooler Line A & B • Clearcoat Line A & B • Oven Cooler Line A & B • Wax and Blackout Lines A & B • Mix Room 1 & 2	TVOC	From 09/12/2024 no ELV however monitoring must be undertaken to inform mass balance	Average over the sampling period	Continuous TVOC monitoring if mass emission >10 10 kg C/h Minimum of once per year if mass emission is 0.1 to 10 kg C/h Once every 3 years if mass emission is <0.1 Kg C/h	BS EN 12619
14	• F11-F15 • F17-F18	• Clearcoat Line A • Clearcoat Line B • Oven Cooler Line A • Oven Cooler Line B • RTO • Mix Room 1 & 2	Isocyanates	0.1 mg/Nm3 (averaged over a 2 hour period as total NCO group)	Average over the sampling period	Minimum of once per year	US EPA conditional test method (CTM) 36
Service Parts **Identified on Stack Location Plan 7.2.5**							
15	• G1	• Incinerator	Oxides of Nitrogen (NO and NO$_2$ expressed as NO$_2$)	100 mg/Nm^3	Average over the sampling period	Minimum of once per year	BS EN 14792
16	• G1	• Incinerator	Carbon Monoxide	100 mg/Nm^3	Average over the sampling period	Minimum of once per year	EN 15058
17	• G1-G4	• Incinerator • Wash Dip • ED • Phosphate	Particulate matter (Dust)	3 mg/Nm^3 from 09/12/2024	Average over the sampling period	Minimum of once per year	BS EN 13284-1
18	• G1	• Incinerator	Temperature	To comply with performance standards detailed in	Continuous	Continuous Temperature Monitoring in the combustion chamber,	BS EN 15267-1 BS EN 15267-2

Table S3.1 Point source emissions to air – emission limits and monitoring requirements

Row	Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
				Table S3.5		combined with alarm for temperatures falling outside of optimised temperature window	BS EN 15267-3
19	• G1	• Incinerator	TVOC	From 09/12/2024 no ELV however monitoring must be undertaken to inform mass balance	Average over the sampling period	Continuous TVOC monitoring if mass emission >10 10 kg C/h Minimum of once per year if mass emission is 0.1 to 10 kg C/h Once every 3 years if mass emission is <0.1 Kg C/h	BS EN 12619 Continuous monitoring: BS EN 15267-1 BS EN 15267-2 BS EN 15267-3
20	• G2-G4	• Wash Dip • ED • Phosphate	TVOC	From 09/12/2024 no ELV however monitoring must be undertaken to inform mass balance	Average over the sampling period	Continuous TVOC monitoring if mass emission >10 10 kg C/h Minimum of once per year if mass emission is 0.1 to 10 kg C/h Once every 3 years if mass emission is <0.1 Kg C/h	BS EN 12619 Continuous monitoring: BS EN 15267-1 BS EN 15267-2 BS EN 15267-3
21	• G4	• Phosphate	Hydrogen Fluoride	2 mg/m^3 expressed as hydrogen fluoride	Average over the sampling period	Once every year	CEN TS 17340
Plastic Paints **Identified on Stack Location Plan 7.2.4**							

Table S3.1 Point source emissions to air – emission limits and monitoring requirements

Row	Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
22	• A8 • A11	• Combined Stack Topcoat Incinerator	Oxides of Nitrogen (NO and NO_2 expressed as NO^2)	100 mg/Nm^3	Average over the sampling period	Minimum of once per year	BS EN 14792
23	• A8 • A11	• Topcoat Incinerator • Combined Stack	Carbon Monoxide	100 mg/Nm^3	Average over the sampling period	Minimum of once per year	EN 15058
24	• A5-6, • A8, • A11 • A12-A14	• Topcoat Incinerator* • Combined Stack • Pearl White • Ambient ICFO • Mix Room • Abatement Recirc • Clearcoat Recirc	Particulate matter (Dust)	3 mg/Nm^3 from 09/12/2024	Average over the sampling period	Minimum of once per year	BS EN 13284-1
25	• **A9** • **A11**	• Topcoat incinerator • Abatement Incinerator (Combined Stack)	Temperature	To comply with performance standards detailed in Table S3.5	Continuous	Continuous Temperature Monitoring in the combustion chamber, combined with alarm for temperatures falling outside of optimised temperature window	BS EN 15267-1 BS EN 15267-2 BS EN 15267-3
26	• **A1** • A5-6, • **A8,** • A11 • A12-A14	• Topcoat Incinerator* • Combined Stack • Pearl White • Ambient ICFO • Mix Room • Abatement Recirc • Clearcoat Recirc	TVOC	From 09/12/2024 no ELV however monitoring must be undertaken to inform mass balance	Average over the sampling period	Continuous TVOC monitoring if mass emission >10 10 kg C/h Minimum of once per year if mass emission is 0.1 to 10 kg C/h Once every 3 years if mass emission is <0.1 Kg C/h	BS EN 12619 Continuous monitoring: BS EN 15267-1 BS EN 15267-2 BS EN 15267-3
	Measurements shall be made at the following monitoring positions and used to calculate emission concentrations in Combined Stack; A1, A2, A3, A4, A7, A9, A10						

Table S3.1 Point source emissions to air – emission limits and monitoring requirements

Row	**Emission point ref. & location**	**Source**	**Parameter**	**Limit (including unit)**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
Battery Tray **Identified on Stack Location Plan 7.2.6**							
27	• B1	• Incinerator	Oxides of Nitrogen (NO and NO_2 expressed as NO^2)	100 mg/Nm^3	Average over the sampling period	Minimum of once per year	BS EN 14792
28	• B1	• Incinerator	Carbon Monoxide	100 mg/Nm^3	Average over the sampling period	Minimum of once per year	EN 15058
29	• B1-B4	• Incinerator • ED • Oven • Oven Cooler	Particulate matter (Dust)	3 mg/Nm^3 from 09/12/2024	Average over the sampling period	Minimum of once per year	BS EN 13284-1
30	• B1	• Incinerator	Temperature	To comply with performance standards detailed in Table S3.5	Continuous	Continuous Temperature Monitoring in the combustion chamber, combined with alarm for temperatures falling outside of optimised temperature window	BS EN 15267-1 BS EN 15267-2 BS EN 15267-3
31	• B1	• Incinerator	TVOC	From 09/12/2024 no ELV however monitoring must be undertaken to inform mass balance	Average over the sampling period	Continuous TVOC monitoring if mass emission >10 10 kg C/h Minimum of once per year if mass emission is 0.1 to 10 kg C/h Once every 3 years if mass emission is <0.1 Kg C/h	BS EN 12619 Continuous monitoring: BS EN 15267-1 BS EN 15267-2 BS EN 15267-3
32	• B2-B4	• ED • Oven • Oven Cooler	TVOC	From 09/12/2024 no ELV however monitoring	Average over the sampling period	Continuous TVOC monitoring if mass emission >10	BS EN 12619 Continuous

Table S3.1 Point source emissions to air – emission limits and monitoring requirements

Row	Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
				must be undertaken to inform mass balance		10 kg C/h Minimum of once per year if mass emission is 0.1 to 10 kg C/h Once every 3 years if mass emission is <0.1 Kg C/h	monitoring: BS EN 15267-1 BS EN 15267-2 BS EN 15267-3
Minor Booth **Identified on Stack Location Plan 7.2.7**							
33	• D-D4, • D5-6, • B7-D8 • D9 • D10-12 • D13 • D14 • D15 • D16-D19 • D20 • D21-22 • D23 • D4-25 • D26-29	• Phosphate A(1) • Phosphate A(13) • Phosphate B(2) • Phosphate B(11) • ED Sanding A&B, • ED A&B, • Undercoat A • Undercoat B (6,7,8,9) • Undercoat Cooler • ED B • Surfacer Mix Room • Touch Up 26, 27, 28, 29 • SGC B • Surfacer Mix Room • Topcoat A & B Mix Rooms, • SV Mix Room • OLSR A & B • 2k Repair Booth Lane 2 – 5	Particulate matter (Dust)	3 mg/Nm^3 from 09/12/2024	Average over the sampling period	Minimum of once per year	BS EN 13284-1
34	• D5-6, • B7-D8 • D9 • D10-12 • D13 • D14 • D15 • D16-D19 • D20 • D21-22 • D23	• ED Sanding A&B, • ED A&B, • Undercoat A • Undercoat B (6,7,8,9) • Undercoat Cooler • ED B • Surfacer Mix Room • Touch Up 26, 27, 28, 29	TVOC	From 09/12/2024 no ELV however monitoring must be undertaken to inform mass balance	Average over the sampling period	Continuous TVOC monitoring if mass emission >10 10 kg C/h Minimum of once per year if mass emission is	BS EN 12619 Continuous monitoring: BS EN 15267-1 BS EN

Table S3.1 Point source emissions to air – emission limits and monitoring requirements

Row	Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
	• D4-25 • D26-29	• SGC B • Surfacer Mix Room • Topcoat A & B Mix Rooms, • SV Mix Room • OLSR A & B • 2k Repair Booth Lane 2 – 5				0.1 to 10 kg C/h Once every 3 years if mass emission is <0.1 Kg C/h	15267-2 BS EN 15267-3
35	• D2 • D4	• Phosphate A(13) and B(11)	Hydrogen Flouride	2 mg/m^3 expressed as hydrogen flouride	Average over the sampling period	Once every year	CEN TS 17340
36	• D26-29	• 2k Repair Booth Lane 2, 3, 4 and 5	Isocyanates	0.1 mg/Nm^3 (averaged over a 2 hour period as total NCO group)	Average over the sampling period	Minimum of once per year	US EPA conditional test method (CTM) 36
Trim & Chassis **Identified on Stack Location Plan 7.2.8**							
37	• H1 • D30-37	• Waxbooth • Trim and Chassis Repair Booth 1-8	Particulate matter (Dust)	3 mg/Nm^3 from 09/12/2024	Average over the sampling period	Minimum of once per year	BS EN 13284-1
38	• H1 • D30-37	• Waxbooth • Trim and Chassis Repair Booth 1-8	TVOC	From 09/12/2024 no ELV however monitoring must be undertaken to inform mass balance	Average over the sampling period	Continuous TVOC monitoring if mass emission >10 10 kg C/h Minimum of once per year if mass emission is 0.1 to 10 kg C/h Once every 3 years if mass emission is <0.1 Kg C/h	BS EN 12619 Continuous monitoring: BS EN 15267-1 BS EN 15267-2 BS EN 15267-3
39	• H1 • D30-37	• Waxbooth • Trim and Chassis Repair Booth 1-8	Isocyanates	0.1 mg/Nm3 (averaged over a 2 hour period as	Average over the sampling period	Minimum of once per year	US EPA conditional test method (CTM) 36

Table S3.1 Point source emissions to air – emission limits and monitoring requirements

Row	Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
				total NCO group)			
Fluidised Bed **Identified on Stack Location Plan 7.2.9**							
40	• C1	• Fluidised Bed	Dust	20 mg/Nm^3 from 09/12/2024	Average over the sampling period	Minimum of once per year	BS EN 13284-1
41	• C1	• Fluidised Bed	Organic compounds excluding particulate matter	20 mg/m	Average over the sampling period	Annual	BS EN 12619

Notes:

1 Certification to the MCERTS performance standards indicates compliance with BS EN 15267-3

2

Type of Measurement	Averaging Period	Definition
Continuous	Daily average	Average over a period of one day based on valid hourly or half-hourly averages.
Periodic	Average over the sampling period	Average value of three consecutive measurements of at least 30 minutes each (1).

(1) For any parameter where, due to sampling or analytical limitations and/or due to operational conditions, a 30-minute sampling/measurement and/or an average of three consecutive measurements is inappropriate, a more representative sampling/measurement procedure may be employed.

Table S3.2 Point source emissions to Water

Emission point ref. & location	Parameter	Source	Limit (incl. Unit)	Reference period	Monitoring frequency	Monitoring standard or method
No reported emissions to water						

Table S3.3 Point source emissions to sewer						
Emission point ref. & location	**Parameter**	**Source**	**Limit (incl. Unit)**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
W0493 Identified on location plan in Schedule 7.3	Nickel	Coating activity contribution discharged through Trade Effluent Plant	0.4 mg/l	24-hour flow proportional composite sample	Once every month	EN ISO 11885, EN ISO 17294-2, EN ISO 15586)
	Zinc	Coating activity contribution discharged through Trade Effluent Plant	0.6 mg/l	24-hour flow proportional composite sample	Once every month	EN ISO 11885, EN ISO 17294-2, EN ISO 15586)
	Adsorbable organically bound halogens, expressed as Cl (AOX)	Coating activity contribution discharged through Trade Effluent Plant	0.4 mg/l	24-hour flow proportional composite sample	Once every month	EN ISO 9562
	Fluorides	Coating activity contribution discharged through Trade Effluent Plant	25 mg/l	24-hour flow proportional composite sample	Once every month	EN ISO 10304-1

Table S3.4 Annual limits for total emissions		
Substance	**Medium**	**Limit (including unit)**
TVOC	Total	30 g VOCs per m^2 of surface area (2) for existing plant
		5-15 g VOCs per m^2 of surface area (2) for new plant (e.g. new production line)
(1) The BAT-AELs refer to emissions from all process stages, carried out at the same installation from the electrophoretic coating or any other kind of coating process up to and including the final wax and polish of the topcoat, as well as solvents used in cleaning of production equipment, both during and outside the production period. (2) The surface area is defined as set out in Part 3 of Annex VII to Directive 2010/75/EU.		

Table S3.5 Groundwater monitoring requirements

Location or description of point of measurement	Parameter	Monitoring frequency	Monitoring standard or method	Other specifications
16 locations identified in Table 6 Land and Groundwater Monitoring Plan, (Report Reference 164077/01)	• Metals (General suite) • Speciated PAHs • Phenol • BTEX • MTBE • Sulphates and chlorides • pH • VOCs • SVOCs • Other (non-standard suite): Bromine, Fluoride, Phosphate.	Within 6 months of and every 5 years thereafter	To be undertaken in accordance with the methodology identified in the Land and Groundwater Monitoring Plan, (Report Reference 164077/01) Analysis to be undertaken by an UKAS and MCERTS accredited laboratory	

Table S3.5 Process monitoring requirements

Emission point reference or source or description of point of measurement	Parameter	Monitoring frequency	Monitoring standard or method	Other specifications
Bumper Paint Abatement Incinerator	Combustion Temperature	Continuous	N/A	With alarm if temperature drops below 700˚C
Bumper Paint Topcoat Incinerator	Combustion Temperature	Continuous	N/A	With alarm if temperature drops below 720 ˚C
Battery Tray Incinerator	Combustion Temperature	Continuous	N/A	With alarm if temperature drops below 750 ˚C
EC RTO	Combustion Temperature	Continuous	N/A	With alarm if temperature drops below 790 ˚C
RTO 1	Combustion Temperature	Continuous	N/A	With alarm if temperature drops below 800˚C
RTO 2	Combustion Temperature	Continuous	N/A	With alarm if temperature drops below 800˚C
RTO 3	Combustion Temperature	Continuous	N/A	With alarm if temperature drops below 815˚C
RTO 4	Combustion Temperature	Continuous	N/A	With alarm if temperature drops below 800˚C
Site Boundary	Odour	Daily	Olfactory monitoring	Odour detection at the site boundary.

Table S3.7 Land monitoring requirements				
Location or description of point of measurement	**Parameter**	**Monitoring frequency**	**Monitoring standard or method**	**Other specifications**
16 locations identified in Table 6 Land and Groundwater Monitoring Plan, (Report Reference 164077/01)	• Metals (General suite) • Speciated PAHs • Phenol • BTEX • MTBE • Sulphates and chlorides • pH • VOCs • SVOCs • Other (non-standard suite): Bromine, Fluoride, Phosphate.	Within 6 months of and every 10 years thereafter	To be undertaken in accordance with the methodology identified in the Land and Groundwater Monitoring Plan, (Report Reference 164077/01) Analysis to be undertaken by an UKAS and MCERTS accredited laboratory	

Schedule 4 – Reporting

Parameters, for which reports shall be made, in accordance with conditions of this permit, are listed below.

Table S4.1 Reporting of monitoring data

Parameter	Emission or monitoring point/reference	Reporting period	Period begins
Emissions to air Parameters as required by condition 3.3.2	• A1-A14 • B1-B4 • C1 • D1-D37 • E1-E15 • F1-F18 • G1-G4 • H1 • I1-I	Every 12 months	1 January
Emissions to water or sewer Parameters as required by condition 3.3.2	• W0493	Every 12 months	1 January
Ground water monitoring Parameters as required by condition 3.3.2	• US01 • US02 • US03 • US04 • S01 • S02 • S03 • S04 • S05 • S06 • S07 • S08 • DS01 • DS02 • DS03	Every 5 Years	Within 6 months of the date of this permit
Land monitoring Parameters as required by condition 3.3.2	• US01 • US02 • US03 • US04 • S01 • S02 • S03 • S04 • S05 • S06 • S07 • S08 • DS01 • DS02 • DS03	Every 10 years	Within 6 months of the date of this permit

Table S4.2: Annual production/treatment

Parameter	Units
Solvent Consumption	tonnes
Solvent Mass Balance (SMB) as required by condition 3.3.1 and in accordance with condition 4.2.3	g VOCs per m2

Table S4.3 Performance parameters

Parameter	Frequency of assessment	Units
Specific water consumption	Annually	m3/vehicle coated
Specific energy consumption	Annually	MWh/vehicle coated
Specific waste sent offsite	Annually	Kg / vehicle coated

Table S4.4 Reporting forms

Media/parameter	Reporting format	Date of form
Air	Format as agreed in writing by the Regulator	
Water	Format as agreed in writing by the Regulator	
Sewer	Format as agreed in writing by the Regulator	
Performance parameters	Format as agreed in writing by the Regulator	

Schedule 5 Notification

These pages outline the information that the operator must provide.

Units of measurement used in information supplied under Part A and B requirements shall be appropriate to the circumstances of the emission. Where appropriate, a comparison should be made of actual emissions and authorised emission limits.

If any information is considered commercially confidential, it should be separated from non-confidential information, supplied on a separate sheet and accompanied by an application for commercial confidentiality under the provisions of the EP Regulations.

Part A

Permit Number	
Name of operator	
Location of Facility	
Time and date of the detection	

<table>
<tr><td colspan="2">(a) Notification requirements for any malfunction, breakdown or failure of equipment or techniques, accident, or emission of a substance not controlled by an emission limit which has caused, is causing or may cause significant pollution</td></tr>
<tr><td colspan="2">To be notified within 24 hours of detection</td></tr>
<tr><td>Date and time of the event</td><td></td></tr>
<tr><td>Reference or description of the location of the event</td><td></td></tr>
<tr><td>Description of where any release into the environment took place</td><td></td></tr>
<tr><td>Substances(s) potentially released</td><td></td></tr>
<tr><td>Best estimate of the quantity or rate of release of substances</td><td></td></tr>
<tr><td>Measures taken, or intended to be taken, to stop any emission</td><td></td></tr>
<tr><td>Description of the failure or accident.</td><td></td></tr>
</table>

(b) Notification requirements for the breach of a limit	
To be notified within 24 hours of detection unless otherwise specified below	
Emission point reference/ source	
Parameter(s)	
Limit	
Measured value and uncertainty	
Date and time of monitoring	
Measures taken, or intended to be taken, to stop the emission	

Time periods for notification following detection of a breach of a limit	
Parameter	**Notification period**

(c) Notification requirements for the breach of permit conditions not related to limits	
To be notified within 24 hours of detection	
Condition breached	
Date, time and duration of breach	
Details of the permit breach i.e. what happened including impacts observed.	
Measures taken, or intended to be taken, to restore permit compliance.	

(d) Notification requirements for the detection of any significant adverse environmental effect	
To be notified within 24 hours of detection	
Description of where the effect on the environment was detected	
Substances(s) detected	
Concentrations of substances detected	
Date of monitoring/sampling	

Part B – to be submitted as soon as practicable

Any more accurate information on the matters for notification under Part A.	
Measures taken, or intended to be taken, to prevent a recurrence of the incident	
Measures taken, or intended to be taken, to rectify, limit or prevent any pollution of the environment which has been or may be caused by the emission	
The dates of any unauthorised emissions from the facility in the preceding 24 months.	

Name*	
Post	
Signature	
Date	

* authorised to sign on behalf of the operator

Schedule 6 Interpretation

Term	Definition
Abatement equipment	equipment dedicated to the removal of polluting substances from releases from the installation to air or water media
Accident	an accident that may result in pollution
Application	the application for this permit, together with any additional information supplied by the operator as part of the application and any response to a notice served under Schedule 5 to the EP Regulations.
Authorised officer	any person authorised by North Lincolnshire Council, the regulator under section 108(1) of The Environment Act 1995 to exercise, in accordance with the terms of any such authorisation, any power specified in section 108(4) of that Act.
Background concentration	such concentration of that substance as is present in: • for emissions to surface water, the surface water quality up-gradient of the site; or • for emissions to sewer, the surface water quality up-gradient of the sewage treatment works discharge.
“Calendar monthly mean	means the value across a calendar month of all validated hourly means
CEM	Continuous emission monitor
EP Regulations	The Environmental Permitting (England and Wales) Regulations SI 2016 No.1154 and words and expressions used in this permit which are also used in the Regulations have the same meanings as in those Regulations
Emissions of substances not controlled by emission limits	means emissions of substances to air, water or land from the activities, either from the emission points specified in schedule 3 or from other localised or diffuse sources, which are not controlled by an emission or background concentration limit.
Emissions to land	includes emissions to groundwater
Groundwater	all water, which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil
Hazardous waste	has the meaning given in the Hazardous Waste (England and Wales) Regulations 2005 No.894, the Hazardous Waste (Wales) Regulations

	2005 No. 1806 (W.138), the List of Wastes (England) Regulations 2005 No.895 and the List of Wastes (Wales) Regulations 2005 No. 1820 (W.148).
Industrial Emissions Directive	DIRECTIVE 2010/75/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 November 2010 on industrial emissions as read in accordance with Schedule 1A to the Environmental Permitting (England and Wales) Regulations 2016.
ISO	International Standards Organisation
MCERTS	Environment Agency’s Monitoring Certification Scheme
Quarter	a calendar year quarter commencing on 1 January, 1 April, 1 July or 1 October.
Quarterly	for reporting/sampling means after/during each 3 month period, January to March; April to June; July to September and October to December and, when sampling, with at least 2 months between each sampling date.
SI	site inspector
Organic Compound	any compound containing at least the element carbon and one or more of hydrogen, halogens, oxygen, sulphur, phosphorus, silicon or nitrogen, with the exception of carbon oxides and inorganic carbonates and bicarbonates
Volatile Organic Compound	(VOC) means any organic compound means any organic compound as well as the fraction of creosote, having at 293.15 K, a vapour pressure of 0.01 kPa or more, or having a corresponding volatility under the particular conditions of use.
Waste code	the six digit code referable to a type of waste in accordance with the List of Wastes (England) Regulations 2005, or List of Wastes (Wales) Regulations 2005, as appropriate, and in relation to hazardous waste, includes the asterisk
Waste Framework Directive	WFD” means Waste Framework Directive 2008/98/EC of the European Parliament and of the Council on waste.
Year	calendar year ending 31 December. .

Where a minimum limit is set for any emission parameter, for example pH, reference to exceeding the limit shall mean that the parameter shall not be less than that limit Unless otherwise stated, any references in this permit to concentrations of substances in emissions into air means:

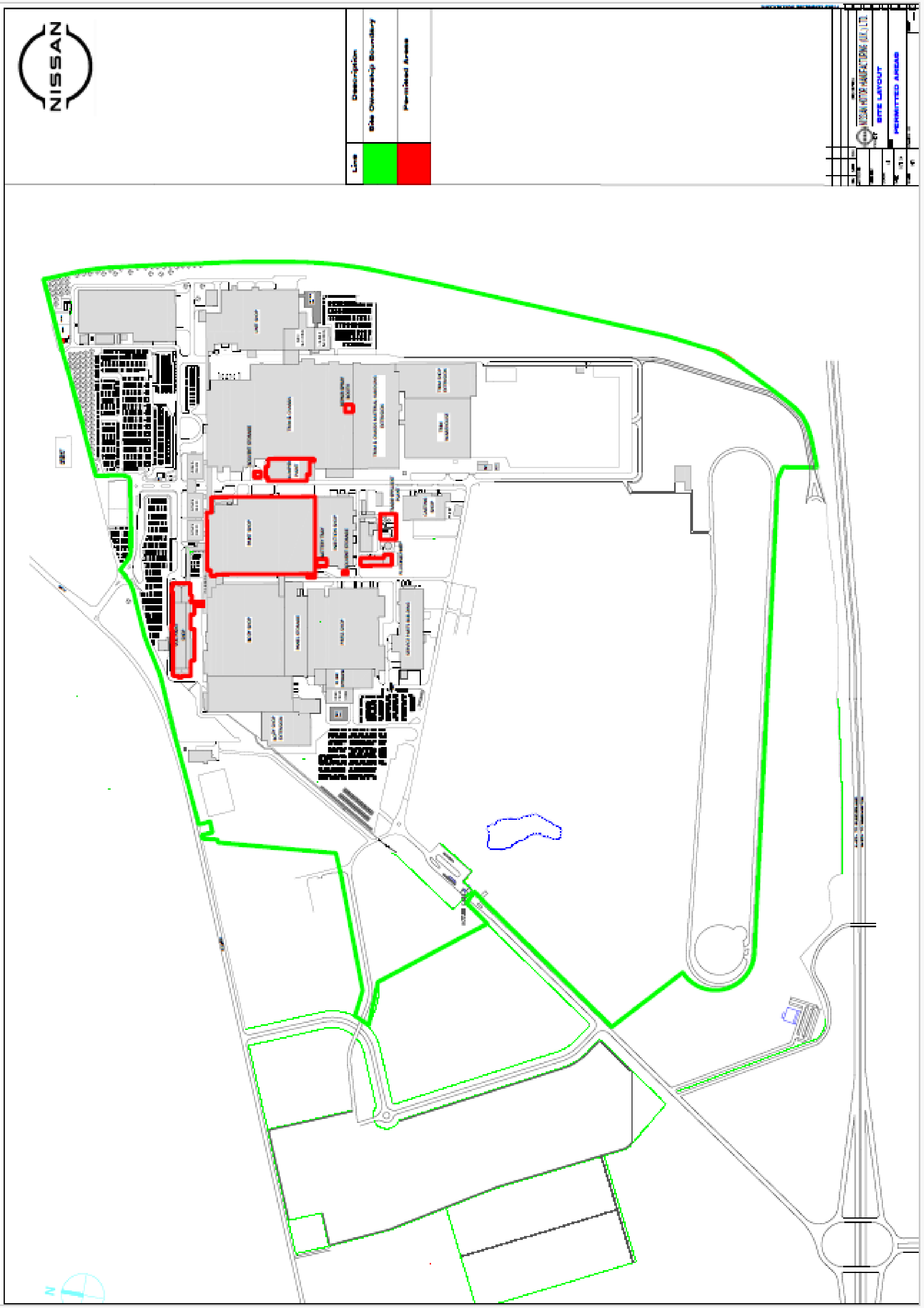
(a) in relation to emissions from combustion processes, the concentration in dry air at a temperature of

273K, at a pressure of 101.3 kPa and with an oxygen content of 3% dry for liquid and gaseous fuels, 6% dry for solid fuels; and/or

(b) in relation to emissions from non-combustion sources, the concentration at a temperature of 273K and at a pressure of 101.3 kPa, with no correction for water vapour content

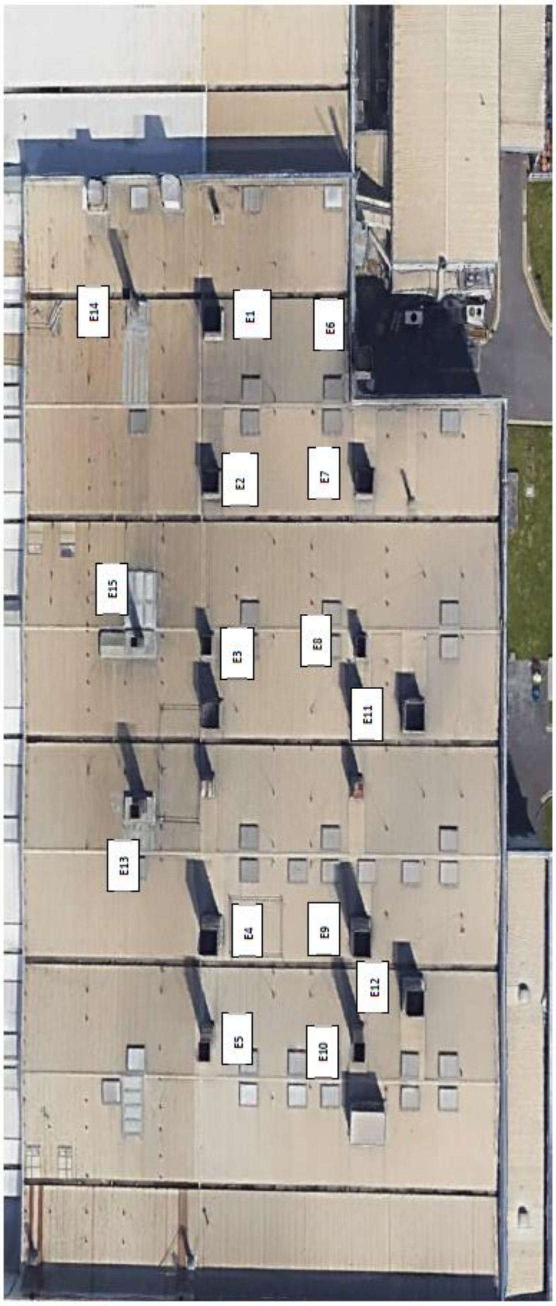
Schedule 7 Site Plans

7.1 Site Boundary and Permitted Areas



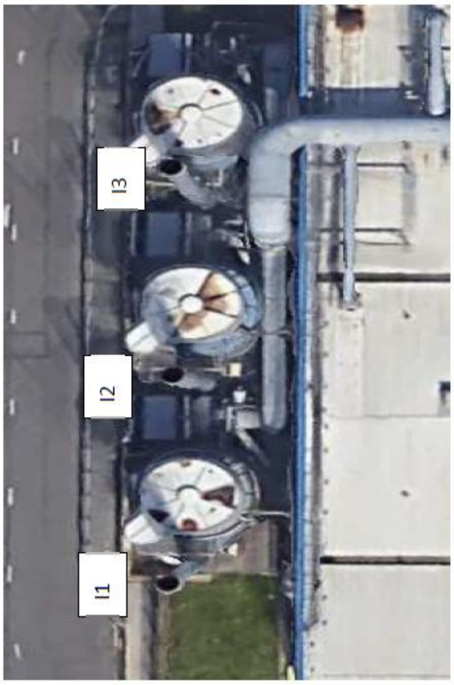
7.2 Stack Locations

7.2.1 Main Paint Shop Stack Locations



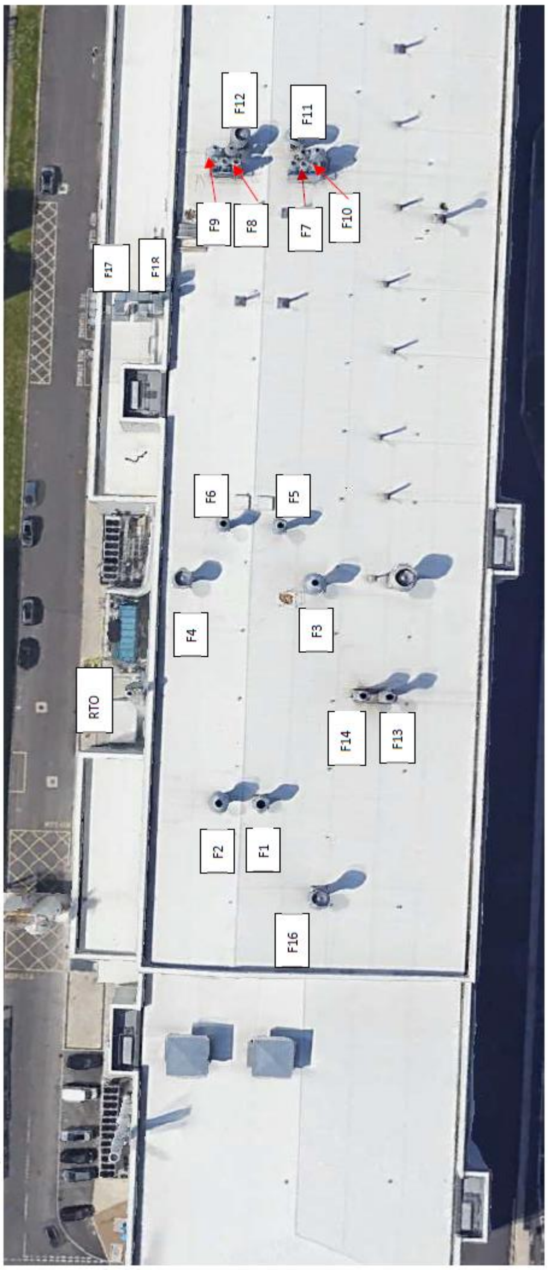
Main Paint Shop Stack Locations					
Stack Reference	**Process**	**Stack Reference**	**Process**	**Stack Reference**	**Process**
E1	Topcoat C Stack 1	E6	Topcoat D Stack 1	E11	Surfacer B Stack 1
E2	Topcoat C Stack 2	E7	Topcoat D Stack 2	E12	Surfacer B Stack 2
E3	Topcoat C Stack 3	E8	Topcoat D Stack 3	E13	Clearcoat / ICFO
E4	Topcoat C Stack 4	E9	Topcoat D Stack 4	E14	Basecoat 1
E5	Topcoat C Stack 5	E10	Topcoat D Stack 5	E15	Basecoat 2

7.2.2 Main Paint Shop RTO Locations



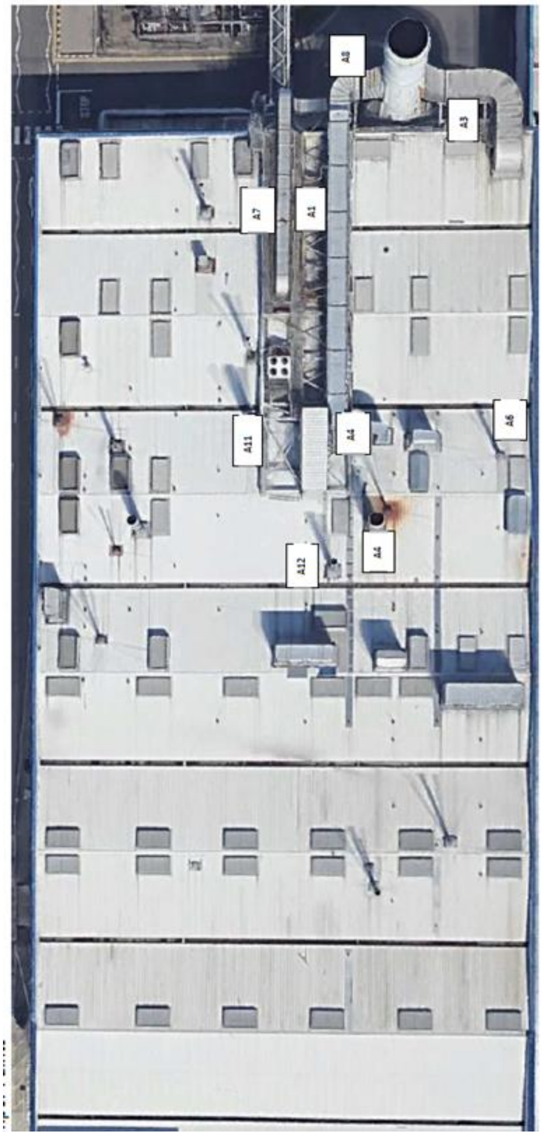
Main Paint Shop RTO Locations			
Stack Reference	**Process**	**Stack Reference**	**Process**
I1	RTO 1	I3	RTO 3
I2	RTO 2	I4	RTO 4

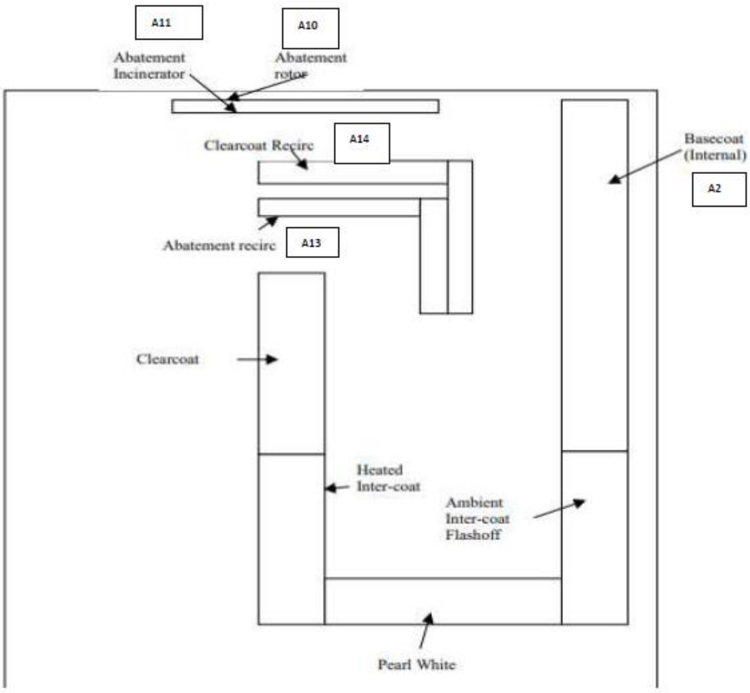
7.2.3 EC Paint Shop Stack Locations



EC Paint Shop Stack Locations					
Stack Ref	**Process**	**Stack Ref**	**Process**	**Stack Ref**	**Process**
F1	Manual Touch Up Line A EC07	F7	Heat Up Zone 1&2 Line A EC25	F13	Oven Cooler Line A EC32
F2	Manual Touch Up Line B EC14	F8	Heat Up Zone 1&2 Line B EC21	F14	Oven Cooler Line B EC38
F3	Exterior Zones Line A EC08	F9	Cooler Line A EC22	F15	RTO
F4	Exterior Zones Line B EC15	F10	Cooler Line B EC26	F16	Wax & Black out EC40
F5	Pearl (Auto) Line A EC09	F11	Clearcoat Line A EC10	F17	Mix Room EC1
F6	Pearl (Auto) Line B EC1	F12	Clearcoat Line B EC17	F18	Mix Room EC2

7.2.4 Plastic Paint Stack Locations





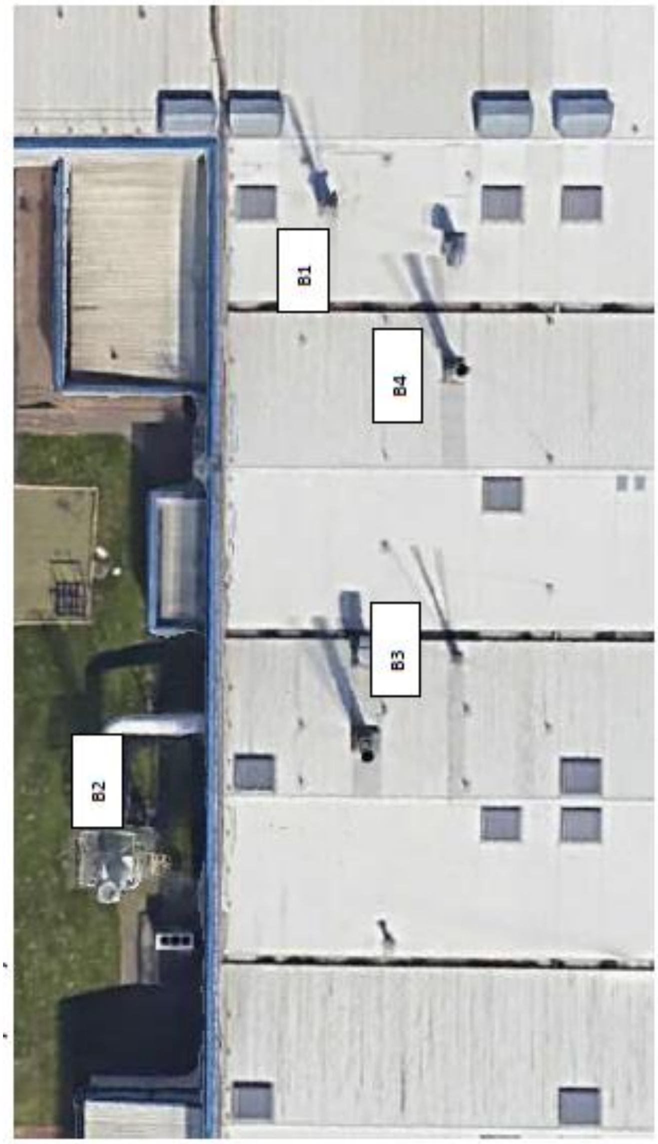
Plastic Paint Stack Locations (External)			
Stack Reference	**Process**	**Stack Reference**	**Process**
A1	Primer Booth	A7	Clearcoat Boot
A3	Basecoat External	A8	Combined Stack
A4	Pearl White	A11	Topcoat Incinerator
A4	Hot Blow ICFO	A12	Mix Room
A6	Ambient ICFO	-	-

Plastic Paint Stack Locations (External)	
Stack Reference	**Process**
A2	Basecoat Internal
A10	Abatement Rotor
A11	Abatement Incinerator
A13	Abatement Recirc
A14	Clearcoat Recirc

7.2.5 Service Parts Stack Locations

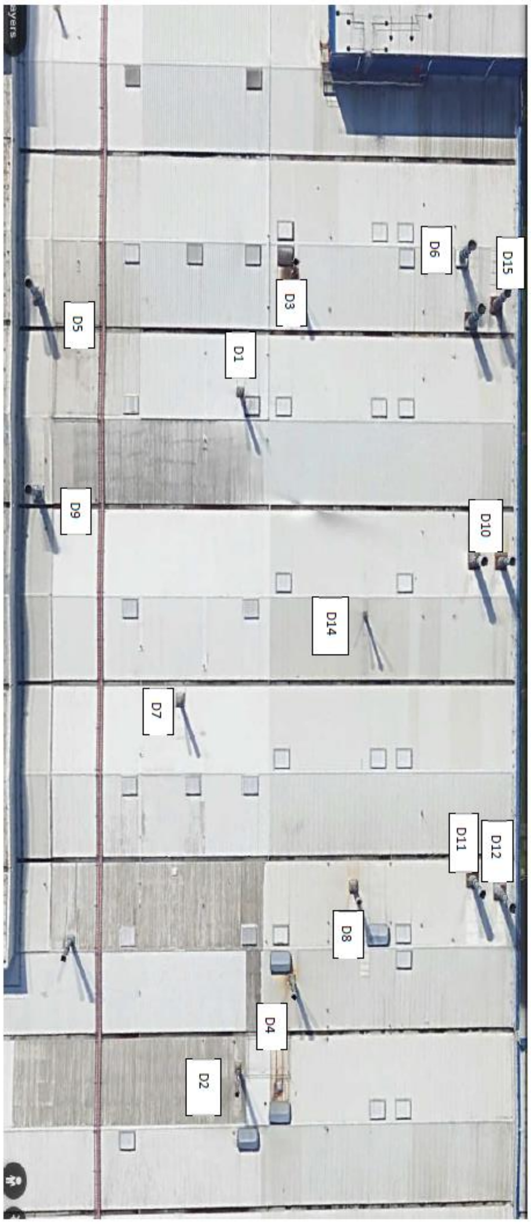
Service Parts Stack Locations			
Stack Reference	**Process**	**Stack Reference**	**Process**
G1	Incinerator	G3	ED
G2	Wash Dip	G4	Phosphate

7.2.6 Battery tray Stack Locations



Battery tray Stack Locations			
Stack Reference	**Process**	**Stack Reference**	**Process**
B1	Incinerator	B3	Oven
B2	ED	B4) Oven Cooler	Oven Cooler

7.2.7 Minor Booths Stack Locations

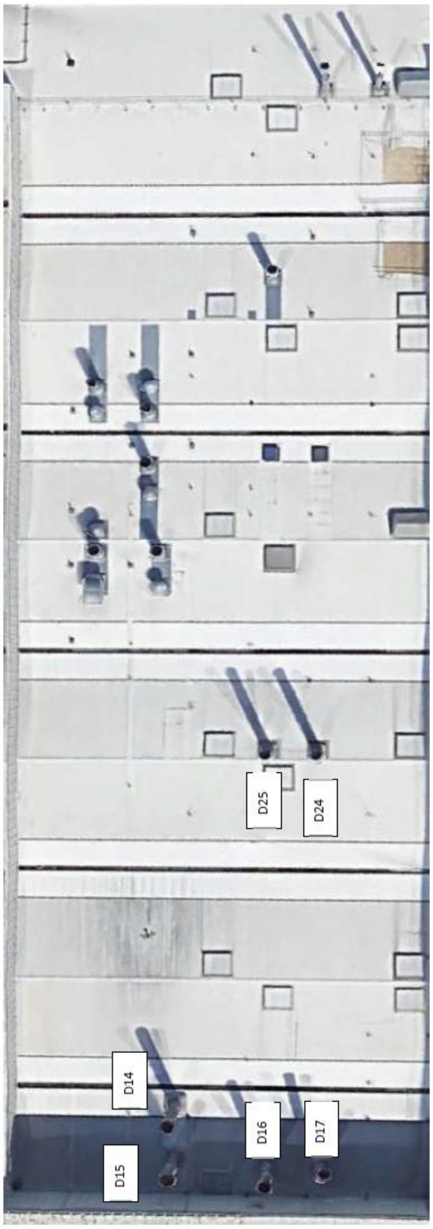


Minor Booths Stack Locations					
Stack Reference	**Process**	**Stack Reference**	**Process**	**Stack Reference**	**Process**
D1	Phosphate A (1)	D6	ED Sanding B (3)	D11	Undercoat B (8)
D2	Phosphate A (13)	D7	ED A (14)	D12	Undercoat B (9)
D3	Phosphate B (2)	D8	ED (10)	D14	ED B
D4	Phosphate B (11)	D9	Undercoat A (68)	D15	SGC B (5)
D5	ED Sanding A	D10	Undercoat B (6&7)	-	-

Minor Booths cont…

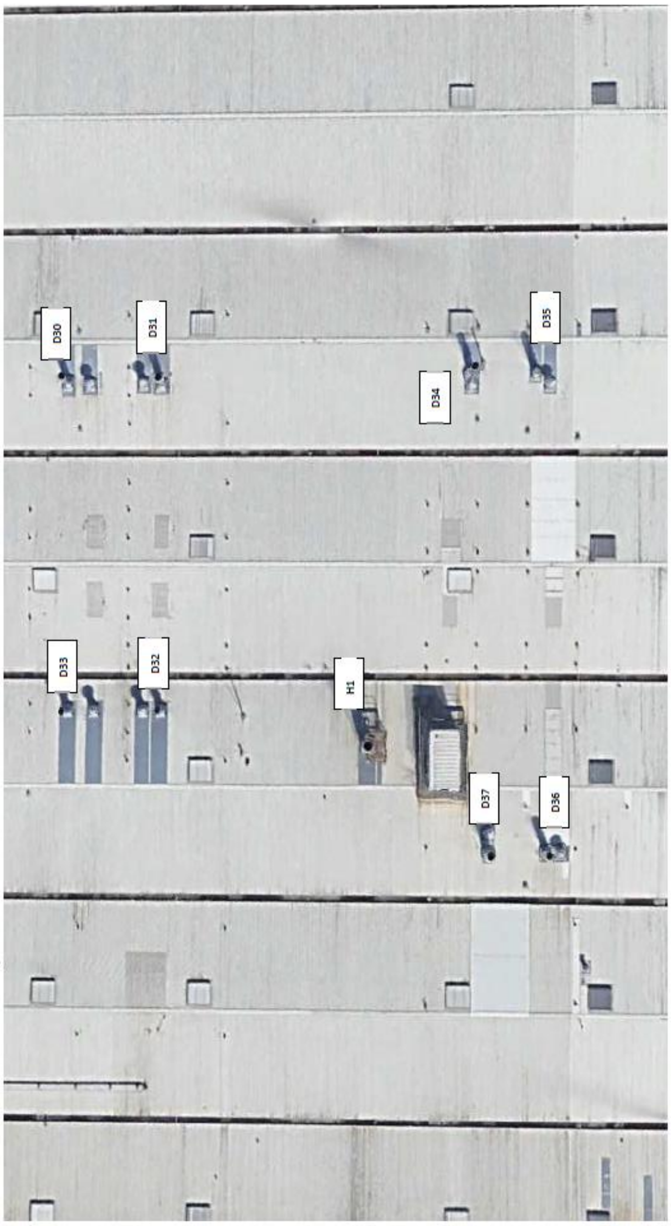
Minor Booths Stack Locations			
Stack Reference	**Process**	**Stack Reference**	**Process**
D23	SV Mix Room	D22	Topcoat B Mix Room
D20	Surfacer Mix Room	D13	Undercoat Cooler (80)
D21	Topcoat A Mix Room	-	-

Minor Booths Cont….



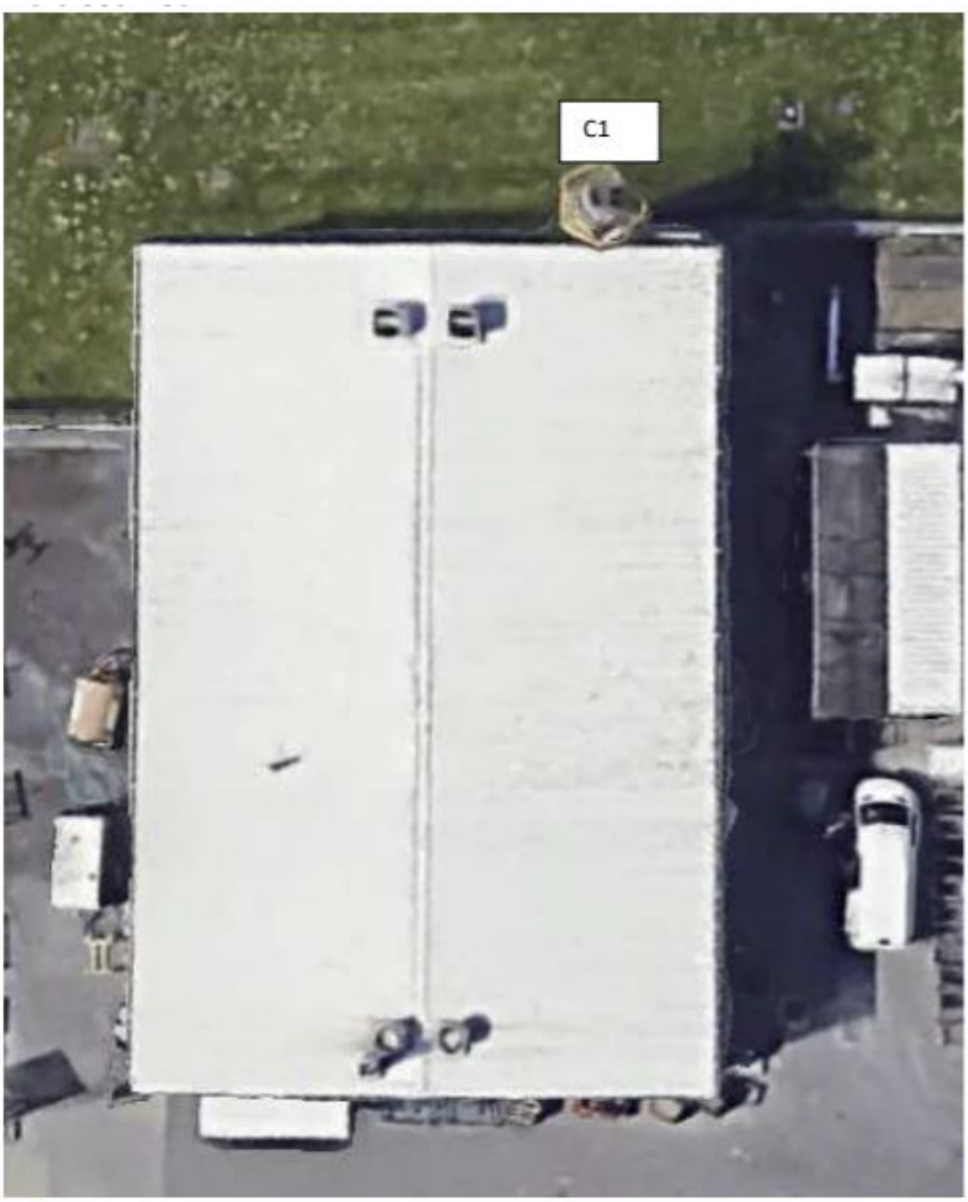
Minor Booths Stack Locations			
Stack Reference	**Process**	**Stack Reference**	**Process**
D24	OLSR A	D29	2k Repair Booth Lane 5
D25	OLSR B	D16	Touch Up (26)
D26	2k Repair Booth Lane 2	D17	Touch UP (27)
D27	2k Repair Booth Lane 3	D18	Touch Up (28)
D28	2k Repair Booth Lane 4	D19	Touch Up (29)

7.2.8 Trim & Chassis Stack Locations



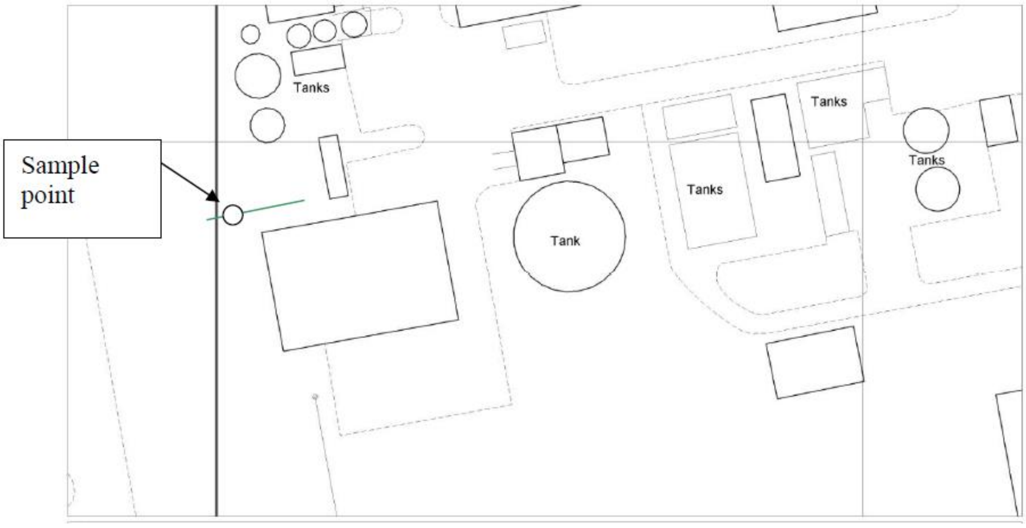
Trim & Chassis Stack Locations			
Stack Reference	**Process**	**Stack Reference**	**Process**
H1	Wax Booth	D34	Repair Booth 05
D30	Repair Booth 01	D35	Repair Booth 06
D31	Repair Booth 02	D36	Repair Booth 07
D32	Repair Booth 03	D37	Repair Booth 08
D33	Repair Booth 04	-	-

7.2.9 Fluidised Bed Stack Location

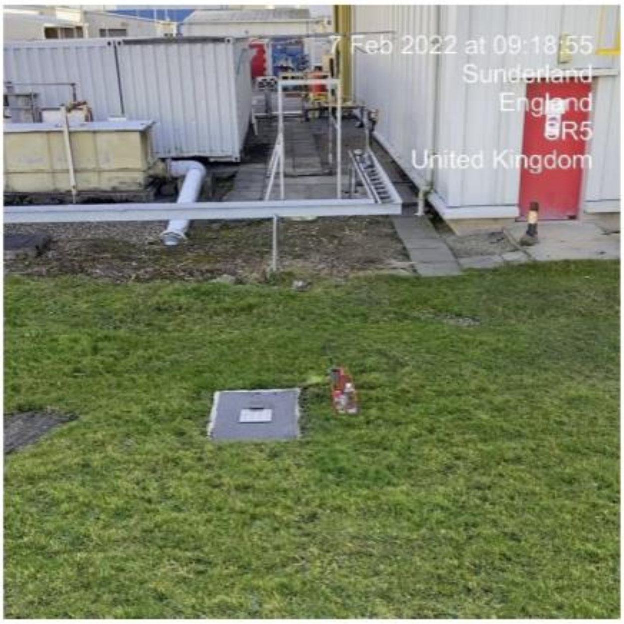


Fluidised Bed Stack Location	
Stack Reference	**Process**
C1	Fluidised Bed

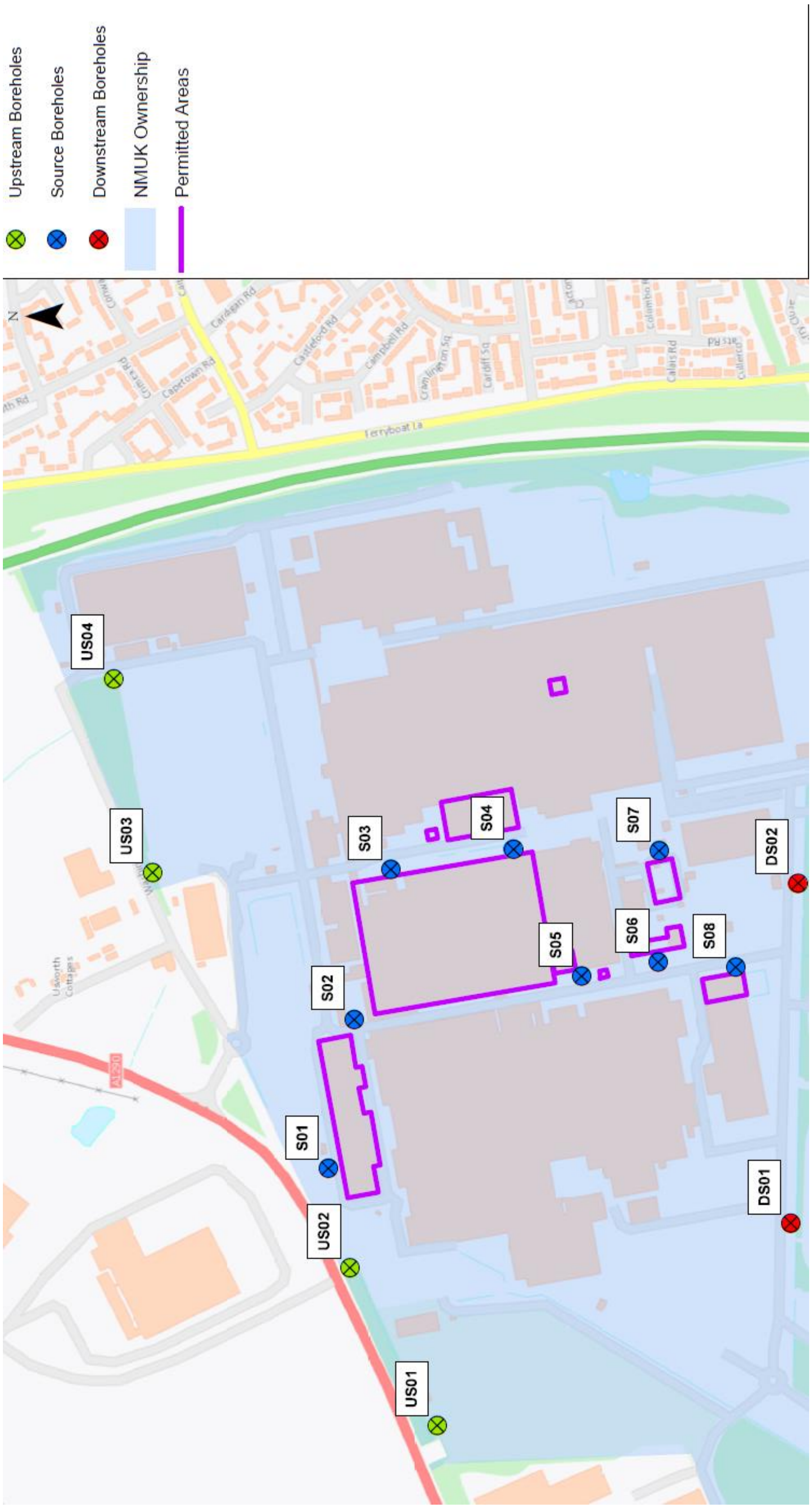
7.3 Water Discharge Consent Sampling Location (W0493)



Sample point in front of red door



7.4 Groundwater and Land Monitoring Locations



Schedule 8

8. Detailed Activity Description:

NMUK Ltd manufacture and spray paint car bodies at the site in Sunderland. Permitted activities take place in a number of process areas (shops), each of which is described below.

Main Paint shop (includes EC Paint shop) The overall paint coating process carried out in Main Paint shop is outlined in Figure 1 above.

Permitted activities take place in a number of process areas (shops), each of which is described below.

8.1 Main Paint Shop (includes EC paintshop)

8.1.1 Delivery and Storage of raw materials / System fill and top-up

Both liquid and solid materials are delivered to site using a variety of methods. Liquids are generally delivered in bulk by tanker and transferred into on-site fixed storage tanks or in smaller portable containers. Solids are generally delivered in portable packaging, limestone for the EC Paint Shop is delivered in bulk tankers and transferred to on-site silos

Material	**Delivery**	**Stored volume**
Electrocoat resin	Bulk tanker and 1m3 totes	2 tanks 20m^3 each
Electrocoat pigment	1m^3 totes	N/A
Solvents	Bulk tanker	Original paint shop tanks 25m^3
		EC paint shop tank 10m^3
Coating materials	25 litre tins and 205 litre drums	N/A
Sealant/waxes	205 litre drums	N/A
Undercoat	1m3 totes	N/A
Dry powders	Bags	N/A
Pre-treatment materials	1m3 totes and 205 litre drums	N/A
Booth water chemicals	205 litre drums	N/A
Limestone	Bulk tanker or bags	50 tonne (86m3) silo, 1m^3 bags
Other liquid chemicals	25/50/205 litre containers	N/A

With the exception of undercoat totes, all delivery containers are provided by the material supplier. Wherever possible containers are re-usable and can be returned to suppliers or recycled. Material deliveries are attended and supervised by a representative from NMUK or the material supplier. Bulk deliveries comply with NMUK Guidance note 21CG08

All materials are stored at locations where the surface water drainage system is protected by one or more of the following:-

- Storage areas are hard surfaced
- Hard standing areas are installed with a impervious membrane layer
- Sealed construction joints
- Rain interceptors
- Bunding
- Catchment tanks (sumps)
- All floor gullies in the original shop drain into the site Trade Effluent Plant
- All floor gullies in EC Paint shop drain into a shop sump and are pumped into the foul drains.

Chemicals are stored undercover inside buildings. Any chemicals stored outdoors are in suitable weatherproof containers. All bulk tanks are fitted with displaced air vents and pressure vacuum relief valves. Tanks designed to store solvents are fitted with carbon filters. Bulk solvent tanks are light coloured and are fitted with high level sensors and alarms interlocked to the filling operation to prevent overfill. All filling points are inside areas with protected or no drainage. Filling points are locked when not in use.

Bulk raw material limestone silo has sensors to detect correct position of delivery tanker and high, mid and low level sensors. Displaced air from the silo is discharge to atmosphere via a filter unit. The silo is protected from over pressurisation by a pressure relief valve.

NMUK company procedure 21CP23 covers planning for and limitation of environmental impact from spillage. Additionally NMUK supply local spillage response equipment for trained staff to use in the event of a spill. There are separate dedicated delivery locations for the EC paint shop and a separate bulk solvent tank.

System fill and top-up

Dry chemicals for main shop pre-treatment are decanted manually from bags into process vats. Limestone and solvent are decanted using tanker pumps into storage tanks or silos. When delivery of limestone, for EC paint shop, is in bags the bagged limestone is fed into the silo. Limestone is delivered to the EC paint shop spray booths either automatically or manually via a dosing hopper located in the limestone annex. Limestone delivery pipework is fitted with over pressurisation detection.

Liquid chemicals are transferred from storage into process vats using electric or pneumatic pumps. NMUK operate dedicated paint mix rooms and sealed supply pipework for storage and delivery of paints to the coating zones.

Filling pipes for solvent materials extend to the base of the container or process vessel.

Storage and delivery of items for painting - Unpainted vehicle body storage and delivery

Unpainted car bodies are delivered into the White Body Store (WBS) from the Body welding shop onto an overhead conveyor. All models are stored in WBS until scheduled for painting. Bodies are removed from WBS in the order required for painting and enter the process via a hoist or drop section. All conveyors and hoists are powered by electricity

Battery tray storage and delivery

Unpainted battery trays are loaded onto wheeled stillages in the Body welding shop and delivered to the dedicated battery tray paint plant using two trucks.

Unpainted trays are loaded onto an overhead conveyor in the order required for painting. The conveyor is powered by electricity.

Trim and Chassis vehicle storage and delivery

Final vehicle assembly occurs in Trim and Chassis. Finished vehicles which have an identified paint defect in the final assembly shop are stored locally and prepared for repair and repair of the damaged area. Vehicles are driven into the booths in the order required for painting. If individual panels require painting (for example bumpers) these are carried into the booths in the order they require painting.

8.1.2 Pre-treatment and ED

Trim and Chassis and contrast roof spray booths have no pre-treatment and electrocoat steps.

There are:
- One pre-treatment and electrocoat process in battery tray coating and
- Two pre-treatment and electrocoat processes in vehicle body coating.

Vehicle body facilities serve all paint lines including EC paint shop. Each consists of several steps on a continuous process namely:

- Degrease
- Conditioning
- Phosphate coating and drying oven for bodies (not battery trays)
- Immersion in electrophoretic paint coating
- Curing in an oven

Degrease and pre-treatment

Car bodies and battery trays are processed in the main paint shop. On the separate process lines car bodies or battery trays are passed through a series of immersion tanks including one alkaline solution and spray washed to remove surface contamination. Oils are removed from the rinse water and removed from the shop as waste.

The conditioning tank contains a solution of Zinc Bis Dihydrogenphosphate salts in suspension. This aids the formation of a dense uniform phosphate coating by providing nucleoids for improved formation of zinc phosphate crystals on the surface of the metal in the next stage of the process: the phosphate dip tank. The phosphate solution contains phosphoric acid, nickel phosphate, manganese phosphate, coating promoters and accelerants. An additional additive requirement is necessary for the treatment of aluminium parts in order to achieve the full benefits of the phosphate process. The additional additive is an ammonium fluoride salt, this is only added for the pre-treatment of aluminium part

The benefits of phosphating are:

- Improved electrocoat adhesion
- Improved corrosion protection

Tank volumes are:

- Line 1 phosphate dip 90m^3
- Line 2 phosphate dip 79m^3
- Battery tray phosphate dip 8.1m^3

Following phosphate coating the body or battery tray is passed through a series of rinses, including deionised water. For quality purposes following rinsing the vehicle body is dried in an oven. Drying of battery trays is not required.

The vehicle body pre-treatment and phosphate process takes place in ventilated enclosures extracted to atmosphere via a stack or chimney. Battery tray tanks are fitted with local exhaust ventilation vented to atmosphere via a stack.

Boilers provide heat to the wash tanks and vehicle body phosphate tanks.

Battery tray tanks are electrically heated.

The process is fully automated. No manual treatment of the metal is required.

8.1.3 Electrocoat

The phosphate coated car bodies or battery trays are next coated with a water-based primer. Application is carried out in a dip tank where an electric current is applied to the paint. An anode in the tank applies a positive charge to the paint pigment which is attracted to the negatively charged car body or battery tray. Organic resin molecules deposit on the surface of the metal by a process of electrophoresis. The deposited paint particles mechanically bond to the zinc phosphate layer on the surface of the metal. Electrocoat (ED) paint is designed to prevent moisture from reaching the surface of the metal so inhibiting corrosion. Electrocoating ensures a complete costing of all surfaces including those which could not be reached by spray painting. Figure 3 illustrates the electrocoat process.

Deionised water is used to dilute the ED resin and pigment. The residual ion in solution, following deposition of the pigment onto the metal surface, is acidic. Excess acid (low pH) causes quality problems. Acid molecules are removed from the paint in the tank using an anolyte membrane. Following coating the car body or battery tray is passed through a series of washes to remove excess paint. Paint solids are removed from the rinse water by ultra-filtration and returned to the paint tank. Ultra-filtrate is re-used in the wash process.

The electrocoat tanks volumes are:
- Body paint line 1 ED tank 245 m^3
- Body paint line 2 ED tank 235 m^3
- Battery tray ED tank 16 m^3

The vehicle body electrocoat process takes place in ventilated enclosures extracted to atmosphere via a stack or chimney. Battery tray tanks are fitted with local exhaust ventilation vented to atmosphere via a stack.

The process is fully automated. No manual treatment of the metal is required.

Following electrocoat the car body or battery tray is passed through gas fired ovens. Air from the car body process is treated in a Regenerative Thermal Oxidiser (RTO) before discharge to atmosphere via an exhaust stack. Battery tray oven exhaust air is treatment using a thermal oxidiser (incinerator).

8.1.4 Sealing and undercoat

The cooled car body is then transferred to booths where PVC based sealant is applied to seams using airless pressurised application guns. The process can be either manual or automatic (robots). Following sealing and masking PVC based undercoat is applied to underbody areas. LASD (Liquid Applied Sound Deadner) is applied and stone guard coat is applied to areas of the car body at risk of stone chips during use. SGC and undercoat is applied using airless-air assist spray guns.

Sealing is carried out in booths which are supplied with air and vent into the building. Underbody coating and SGC are applied in booths which discharge to atmosphere via an exhaust stack.

Manual battery tray sealing takes place in the battery tray annex in a dedicated sealing area. There is no underbody coating, SGC or application of sound deadening pads in battery tray coating process. There is no sealing in the Trim and Chassis and contrast roof booths.

Following sealing and/or undercoat the car body passes through an oven to harden the materials. The sealant, SGC and undercoat start to cure and the sound deadening pads soften and mould to the shape of the body panel to which they have been attached. Exhaust from the ovens is discharged into

Regenerative Thermal Oxidiser (RTO) system which is described later in this document.

The battery tray is fully cured in an oven. Exhaust from the oven is discharged via a thermal oxidiser (incinerator), which is used as a heat source for the oven. After cooling and inspection the tray is transferred to storage awaiting transfer to the battery manufacturing plant. The battery tray is processed no further through the painting process as no primer / surfacer or topcoat is applied.

8.1.5 Sanding

Following drying the car bodies are inspected in dedicated booths. There are separate booths for Line 2 and EC paint shop. The EC paint shop booth is located in the new building referred to in the introduction. Electro-coated car bodies which are scheduled for painting in EC paint shop are transferred to the new ED repair booths on an electrically powered conveyor.

Where defects are found these are repaired by either manual or mechanical sanding. Sanding booths are supplied with air. Exhausted air is filtered prior to discharge to atmosphere. Line 2 has a wet floor to capture dust particles entrained in the booth downdraft air. Periodically the wet floor is discharged to the on-site Trade Effluent Plant.

EC paint shop ED booth has a wet floor for entrainment of particulate matter.

Periodically the water is discharged to the foul drain via the shop sump

Generally three coats of paint are applied to car bodies:

- Surfacer/primer
- Basecoat
- Clearcoat

Surfacer / Primers are generally grey but can be coloured. Basecoat is the colour layer. For some colours and paint effects, for example pearlescent coatings, basecoat is applied as two layers. Clearcoat provides a protective top layer and can be clear or coloured. Clearcoat can be one component (known as 1K) or 2 component isocyanate based (known as 2K). Basecoat and clearcoat are often collectively known as topcoat.

Coating application is primarily automated, many areas have robot application. There are small areas of manual application. Automatic application is by electrostatic rotating bells and manual uses pneumatic spray guns. All spraying takes place in enclosed spray booths. A canister paint delivery system has been installed for basecoat application.

8.1.6 Mix rooms

Paint is supplied to the application areas from mix rooms. The main paint shop has separate surfacer / contrast roof and topcoat mix rooms and associated storage areas. EC paint shop has one mix room and adjacent storage area. Each mix room is supplied with filtered air which is ultimately exhausted to atmosphere. The air change rate is determined for safety purposes and is calculated to prevent the creation of a flammable atmosphere in the facility. Materials (paint) is delivered in lidded tins, totes or drums, from which the paint is transferred to lidded holding tanks using a pneumatic pump in main paint shop. In EC paint shop paint is gravity fed into the holding tanks. Generally paint is delivered ready for use (RFU). Each colour has its own dedicated tank. Each tank lid is closed when the tank is not being filled. Holding tanks are temperature controlled to maintain the paint quality. Occasionally, if required, paint is transferred to a mixing tank so that thinners can be added to achieve the correct viscosity. For main paint shop these thinners are organic solvent, For EC paint shop the primer and basecoat thinners are primarily water from a reverse osmosis unit with some additives. EC paint shop clear coat thinner is organic solvent.

Paint from the mix rooms is supplied to the application areas in pressurised pipes. Paint is continually circulated through the pipes by circulation pumps (pneumatic and electric), delivering paint to the spray booths and returning unused paint to the mix room. Return paint is filtered before it enters the tank. Flushing chemicals for colour change and maintenance of quality standards is collected in a dedicated system separate from the solvent supply system. Waste is pumped into bulk tanks and collected for off-site re-processing for re-use. There are separate tanks for solvent and water based flushing materials in both main paint shop and EC paint shop. EC paint shop waste tanks are each 22.5m^3 in volume.

Paint supplied to Line 2 is primarily solvent based containing in the region of 40 to 60% volatile organic compounds. Primer (EC only) and base-coat paint supplied to the EC paint shop and contrast roof are primarily water based containing in the region of 10% to 15% volatile organic compounds. Clearcoat remains solvent based.

8.1.7 Surfacer / Primer application (Main paint shop)

On both lines and prior to application of Surfacer/Primer paint dust is mechanically removed for the surface of the car body. Depending on the area to be painted application may be automatic or manual. Black coating is applied to the car body sash area (sash black). The coated car body passes through a flash off zone and into a gas fired oven.

Following drying and cooling the surfacer paint layer is inspected for defects and repaired, if necessary. Repair involves mechanical sanding, masking and spot paint repair. Sanding booths are provided with filtered air. Line 2 sanding booth has a wet floor fitted to capture particles entrained in the booth downdraught.

There is only one surfacer booth in main paint shop (Surfacer B (Line 2).

8.1.8 Topcoat application (Main paint shop)

On both line 1 (Contrast Roof) and line 2 prior to application of basecoat paint dust is mechanically removed for the surface of the car body. Following basecoat application the car body passes through a flash off zone prior to clearcoat application. Depending on the area to be painted application may be automatic or manual. The clearcoat painted car body passes through a flash off zone and into a gas fired oven.

Following drying and cooling the topcoat layers are inspected for defects. If necessary, defects are repaired.

There are two topcoat booths and ovens per line 2 and 1 contrast roof booth and oven on Line 1.

8.1.9 All main shop spray booths

Air is drawn into the shop by Air Handling Units. The air is filtered, warmed and humidified with towns water (Line 2) or de-mineralised water (Contrast Roof) and supplied to each booth via a booth header plenum. Air is directed down into the booth. The downdraught captures paint overspray.

On Line 2 air with entrained paint particles then passes through a wet scrubbing system in each booth underfloor area to remove the paint particles from the airstream. The paint particles are captured in the scrubber water. Paint residues are removed from the water by a system of flocculation. Air is discharged to atmosphere. The solid fraction is separated from the water for collection and disposal as waste. Water is recirculated for re-use in the scrubber. When required for cleaning of the booth structure, the water is periodically discharged to the onsite effluent treatment plant.

On the Contrast Roof line air with entrained paint particles passes through a series of filters to remove the paint from the airstream. The paint particles are captured within the various levels of filters. The air is recirculated into the booth. The dry filters get periodically exchanged and the old filters get disposed.

Floor grids in the booths do get fouled with paint overspray. The contaminated grids are periodically removed from the booths for cleaning. The cleaning process is outside of the paint shop. Cleaning is either chemical or thermal decomposition followed by a water rinse of the paint on the grids. Thermal decomposition is regulated under a separate Part B permit.

8.1.10 All main shop ovens

All main paint shop ovens discharge to a number of regenerative thermal oxidisers (RTO) via a common manifold. The gas fuelled RTOs provide abatement of VOC from the airstream by thermal decomposition of the organic compounds emitting thermal decomposition products to atmosphere.

8.1.11 Contrast roof (main shop)

A market requirement for two colour vehicles, known as contrast roof, has been identified. Contrast roof vehicles are identified after the first surfacer/primer and topcoat process and removed from the main process line and into a dedicated masking booth. The vehicle body is masked to expose only the areas requiring paint application and then passed though the surfacer/primer and topcoat processes. Following the removal of the masking material in the de-mask booth, the vehicle is returned onto the main line.

8.1.12 Finishing (main shop)

Following coating, each layer is inspected and any defects repaired. Defect repairs can be conducted online with the car body remaining in process, or taken offline for more substantial spot repairs. Online repairs are carried out in ventilated booths which discharge directly into the shop via floor filtration, paint stoving utilises infra red spot heaters. Offline repairs are conducted in dedicated ventilated repair booths with integral low temperature oven stoving and Infra red spot heaters.

The final stage of the coating process is injection of wax into cavities of the car which may be vulnerable to corrosion if left unprotected. Wax material is pumped directly from the delivery container into a holding tank and dispensed under pressure to the waxing zone. The booths are supplied with filtered air and exhausts to atmosphere via stacks.

8.1.13 Oven abatement

Main paint shop operates 12 ovens, 10 for body coating and two for battery tray coating. Emissions from body paint ovens are abated using thermal decomposition of VOC by Regenerative Thermal Oxidisers (RTOs).

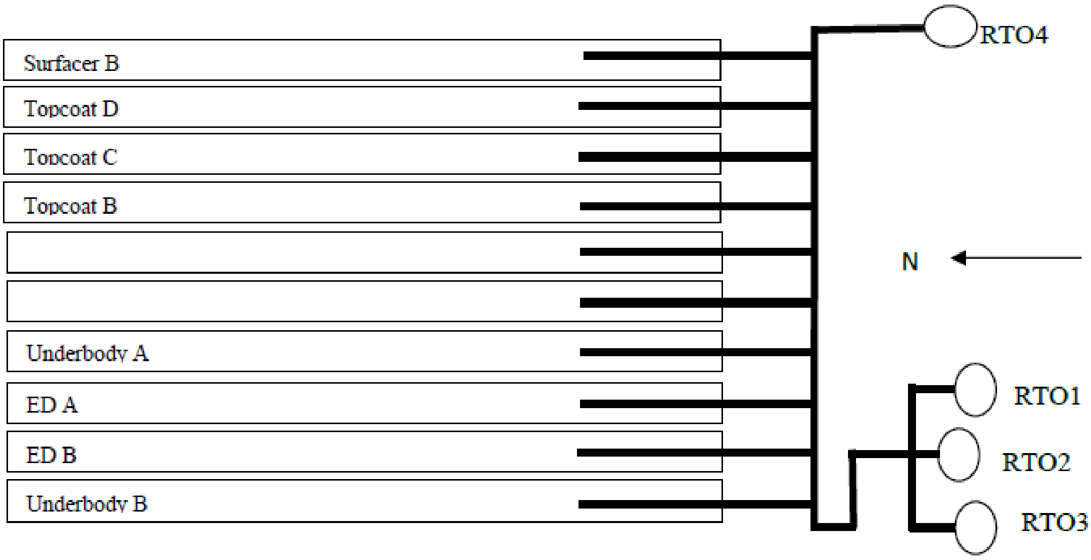


Figure 2 – Main Paint Shop VOC Abatement

Battery tray ED oven abatement is also thermal decomposition but uses an incinerator not an RTO.

8.1.14 Paint Application EC Paint shop

EC Paint shop operates two paint lines in parallel. Each capable of painting all line 1 vehicle body shape and size. Car bodies are transported into and through the booths and ovens on independently driven skids (or carriers). Each line is integrated with main paint shop.

Car bodies enter EC paint shop from main paint shop on skids and pass into an ED heavy repair booth for inspection and ED repair described earlier in this document.

Electrocoated vehicle bodies then pass into a booth where a very light water mist water is sprayed using a lance into the vehicle interiors for dust suppression. This process is automatic using a dedicated robot to control the lance position and mist discharge. Vehicles then pass through a mechanical dust removal booth which uses feathers to remove dust from the outer surfaces of the vehicle body. These booths are supplied with heated and humidified air from an ASU. Exhaust air is recirculated within the cleaning booths and into other zones such as:

- General shop air
- Manual primer zones

Each line has two booths:

- Primer and Basecoat
- Clearcoat

There is a heated (gas fired) Inter Coat Flash off (ICFO) between the two booths which dries the water-based basecoat layer prior to application of the solvent based 2 component clearcoat layer.

8.1.15 Primer and Basecoat Application

Application is automatic, using dedicated robots, with manual backup. The manual back up zone is also use for quality checks. Basecoat application zones follow immediately after primer with no intermediate flash off. Basecoat is applied to wet primer. Where two layer basecoats are applied there is an ambient flash off zone within basecoat booth to enable a level of air drying before the second basecoat layer is applied. Following paint application with painted car body passes through the heated intercoat flash off (approx. 70oC) to dry the primer and basecoat layers.

8.1.16 Clearcoat Application

Application is automatic, using dedicated robots, with manual backup. The manual back up zone is also use for quality checks. Following paint application the coated body passes into a flash off zone and then into a gas fired oven.

8.1.17 All booths

Air is drawn into the shop by Air Handling Units (Air Supply Units). The air is filtered, warmed and humidified with water from a reverse osmosis (RO) unit and supplied to manual zones and vestibules in each booth via a booth header plenum. Exhaust air from the manual zone is recirculated into the unmanned flash off zone.

Exhaust air from the booth is recirculated using Air Handling Units (Air Recirculation Units). Volume is topped up with air drawn into the shop from outside. Recirculated air does not require heating, it is humidified using water from the RO unit. Recirculated air is supplied to robot/automatic zones within the booths.

Air is directed down into the booth. The downdraught captures paint overspray. The dry underfloor area is protected from overspray by masking with polythene which is periodically replaced.

Floor grids in the booths do get fouled with paint overspray. The contaminated grids are periodically removed from the booths for cleaning. The cleaning process is outside of the paint shop. Cleaning is either chemical or thermal decomposition followed by a water rinse of the paint on the grids.

Air with entrained paint particles from the auto application zones then passes through a dry scrubbing system to remove the paint particles from the airstream. The paint particles are captured in the scrubber. The dry scrubber is charged with limestone paint particles are adsorbed onto the limestone. Paint coated limestone is periodically, automatically transferred, in pipes, from the dry scrubber units to either an intermediate waste hopper or, if the hopper is full, into bags. The waste is then transferred to a bulk silo. The waste silo is fitted with high level sensors to warn of over filling and pressure relief panels to prevent over pressurisation. If necessary, waste limestone can be transferred to bags instead of the silo via a diverter valve. Paint coated limestone is collected in bulk tanker and removed as waste for re-use off site. Interlocks and sensors are fitted to prevent tanker overfill.

Air is recirculated through the ARU and ultimately discharged to atmosphere. Air from the manual and flash off zones passes through dry filters. Paint particles are captured on the filer medium. Paint coated filters are periodically removed from site as waste. Air is recirculated through the ARU and ultimately discharged to atmosphere.

8.1.18 Oven

The EC Paint shop oven discharges to a regenerative thermal oxidisers (RTO). The gas fuelled RTO provides abatement of VOC from the airstream by thermal decomposition of the organic compounds emitting thermal decomposition products to atmosphere.

8.1.19 Contrast Roof

Contrast vehicles are identified after painting and removed from the main process line and into a dedicated masking booth. The vehicle body is masked to expose only the areas requiring paint application and then passed though the primer, basecoat and clear coat processes. Following the painting process the masking material is removed and the vehicle is finished off.

8.1.20 Finishing

Following coating, each layer is inspected, and any defects repaired. Defects can be conducted online with the car body remaining in process or taken offline for more substantial spot repairs. Online repairs are carried out in ventilated booths with infra red spot stoving facility. Offline repairs are conducted in dedicated ventilated repair booths with integral low temperature oven stoving and Infra red spot heaters. The ventilated booths discharge either:

- directly into the shop air via filters or
- into other repair booths
- into the oven

8.1.21 Wax and blackout

The final stage of the coating process is black out, where areas of the car are coated in black paint. The paint air dries. The dedicated booth is supplied with air from an Air Handling Unit and exhausts to atmosphere via stacks. The booth also has a wet floor for entrainment of particles. Water from the wet floor is discharged periodically to foul drain via a shop sump.

The facility also serves as a wax booth where wax is injected into cavities of the car which may be vulnerable to corrosion if left unprotected. Wax material is pumped directly from the delivery container into a holding tank and dispensed under pressure to the waxing zone

8.1.22 Painting in Trim and Chassis

In Trim and Chassis there is some risk of secondary damage during the process of vehicle assembly. Any damage identified as part of the routine inspection process is repainted in small dedicated spot repair booths.
Trim and Chassis painting facilities are modular spray booths with filtered down draft ventilation supplied by a dedicated air handling unit. There is an integral low temperature oven and small dedicated mix room. The mix rooms are used for storage and mixing of paints used during the painting process. Paint is supplied from approved paint suppliers is delivered in portable paint pots. There is no fixed paint supply and distribution system in this small facility.

The mix room and integral booth and oven discharge to atmosphere.

8.2 Service Parts:

NMUK service parts paint plant was installed in 1990 for the painting of motor vehicle body panels for the after sales service sector.

The plant has the capability to paint panels from all vehicle models either currently or historically manufactured at NMUK. The solvent throughput is in excess of 5 but less than 200 tonnes per annum.

The Service Parts coating process is itself a Part B activity. Liquid waste from the process discharges to the effluent treatment plant. There is a technical link with body and plastic painting processes. The solvent throughput is influenced by the product manufactured.

The main process steps are outlined in Figure 2 below:

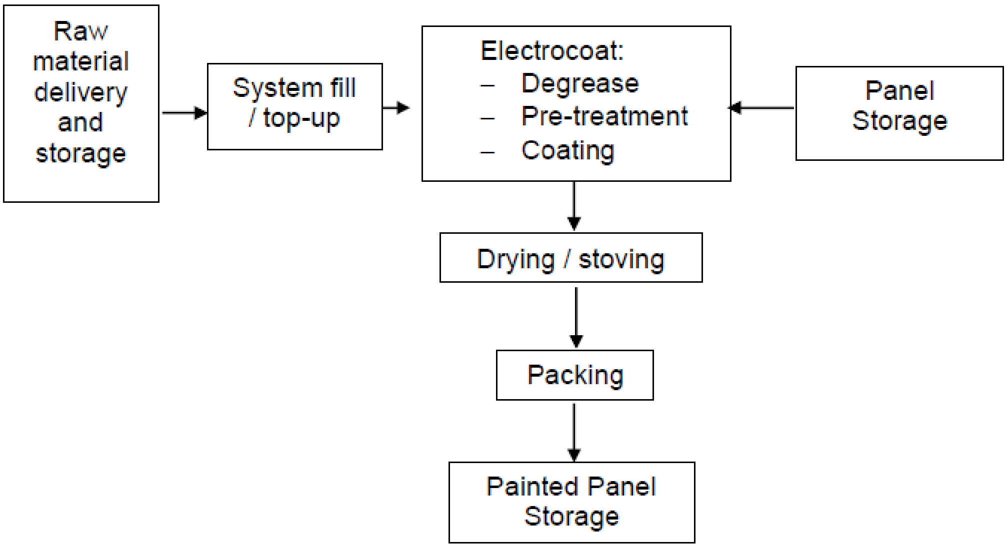


Figure 3 – Service Parts Painting Process

8.2.1 Delivery and Storage of raw materials / System fill and top-up

Both liquid and solid materials are delivered to site

Material	Delivery	Stored volume
ED resin	1000 l totes, 205 l drums	N/A
ED pigment	205 l drums	N/A
Solvents	25 l containers	N/A
Pre-treatment materials	100 l drums, 200 l drums	N/A
Dry powders	Bags	N/A

All delivery containers are provided by the material suppliers. All deliveries are supervised by NMUK staff. All materials are stored at locations where the surface water drainage system is protected. Drainage protection involves one or a combination of the following:

- Storage areas are hard surfaced
- Bund
- Catchment tank (sump)
- Floor gullies which drain into the on-site effluent treatment plant

As part of the Environmental Management System NMUK operate a company procedure entitled limitation of environmental pollution resulting from spillage

System fill and top-up

Dry chemicals are decanted manually into process vats. Liquid chemicals are generally transferred using electric or air powered pumps directly from the delivery container to the process vat

Storage

Unpainted car body panels are delivered into the process and manually loaded onto an overhead conveyor system. Any metal car body panel from current and previous models manufactured by NMUK can be processed through the facility. The conveyor system is powered by electricity.

8.2.2 Electrocoat

Electrocoat consists of several steps in one continuous process namely:

- Degrease
- Conditioning
- Pre-treatment
- Coating
- Rinsing
- Curing
- De-grease and pre-treatment

Unpainted car body panels are passed through a series of immersion tanks and spray wash areas to remove oil and other surface contaminants. The main cleaning stage is alkaline.

The conditioning material consists of titanium phosphate salts in suspension, which ‘activates’ the surface of the metal, the conditioning step aids the formation of a dense, uniform phosphate crystalline coating.

Following the conditioning tank the panel is dipped in the phosphate tank where a surface film of zinc phosphate crystals is applied. The benefits of phosphating are:

- improved ED coating adhesion
- improved corrosion protection

The phosphating solution consists of phosphoric acid, zinc phosphate, nickel phosphate and manganese phosphate, coating promoters/accelerators. The phosphate dip tank volume is approximately 30m^3.

The phosphated panel is rinsed in a series of rinse tanks and sprays the final rinse being de-ionised water spray. The water is de-ionised on site in a specialised unit adjacent to the rinse tanks. De-ionisation removes ionisable minerals from towns-water by passing it through an anion and cation bed. The pre-treatment process takes place in a ventilated enclosure. The phosphate process is fully automated. No manual treatment of the panel is required.

NMUK operate one pre-treatment line in the service parts shop.
NMUK operate two gas fired boilers supplying hot water for heat transfer to some wash tanks and to the phosphate tank. The boilers are rated at 1172kW each.

8.2.3 Coating and curing

Phosphate coated panels are coated with a primer. Application is carried out in a dip tank. The primer coats the panel when an electric current is applied. The electrocoat primer (ED) mechanically bonds to the zinc phosphate layer created by the pre-treatment process. The electrocoat is designed to prevent moisture from reaching the metal and therefore inhibit corrosion. This method of application ensures that coating can be applied to hard to reach surfaces of the panel. Organic resin molecules are deposited on the surfaces of the panel by the process of electrophoresis (the migration of electrically charged particles in a conductive medium). Electrocoat primer is waterbased.

The coating process operated by NMUK is cathodic electrodeposition.
De-ionised water is used to dilute the ED resin and pigment. When the resin pigment deposits on the panel (the cathode) the residual ion left behind in solution is acidic. Excess acid build up and reduced pH of the tank leads to quality problems. An anolyte membrane separates the acid molecules from the paint pigment thereby maintaining the pH of the paint.

The ED coated panel then passes through a series of rinse tanks where paint residues are washed off.

The application takes place in a ventilated enclosure.

Following painting the panel is passed through a stoving oven. The ED oven exhausts via a thermal incinerator.

The coating process is fully automated. No manual treatment of the panel is required.

8.2.4 Storage

Painted panels are delivered into a dedicated storage area prior to packing for dispatch from site.

8.3 Plastic Paint Process:

NMUK plastic paint plant was installed in 1995 for the painting of motor vehicle plastic components, for example bumpers, spoilers and bump strips. The plant is used to paint some of the plastic components fitted to all models produced at NMUK Sunderland site.

The plant has the capability to paint plastic parts for all vehicles manufactured at NMUK. The solvent consumption can be in excess of 200 tonnes per annum.
The consumption capacity is influenced by the product manufactured. The main process steps are outlined in Figure 3 below

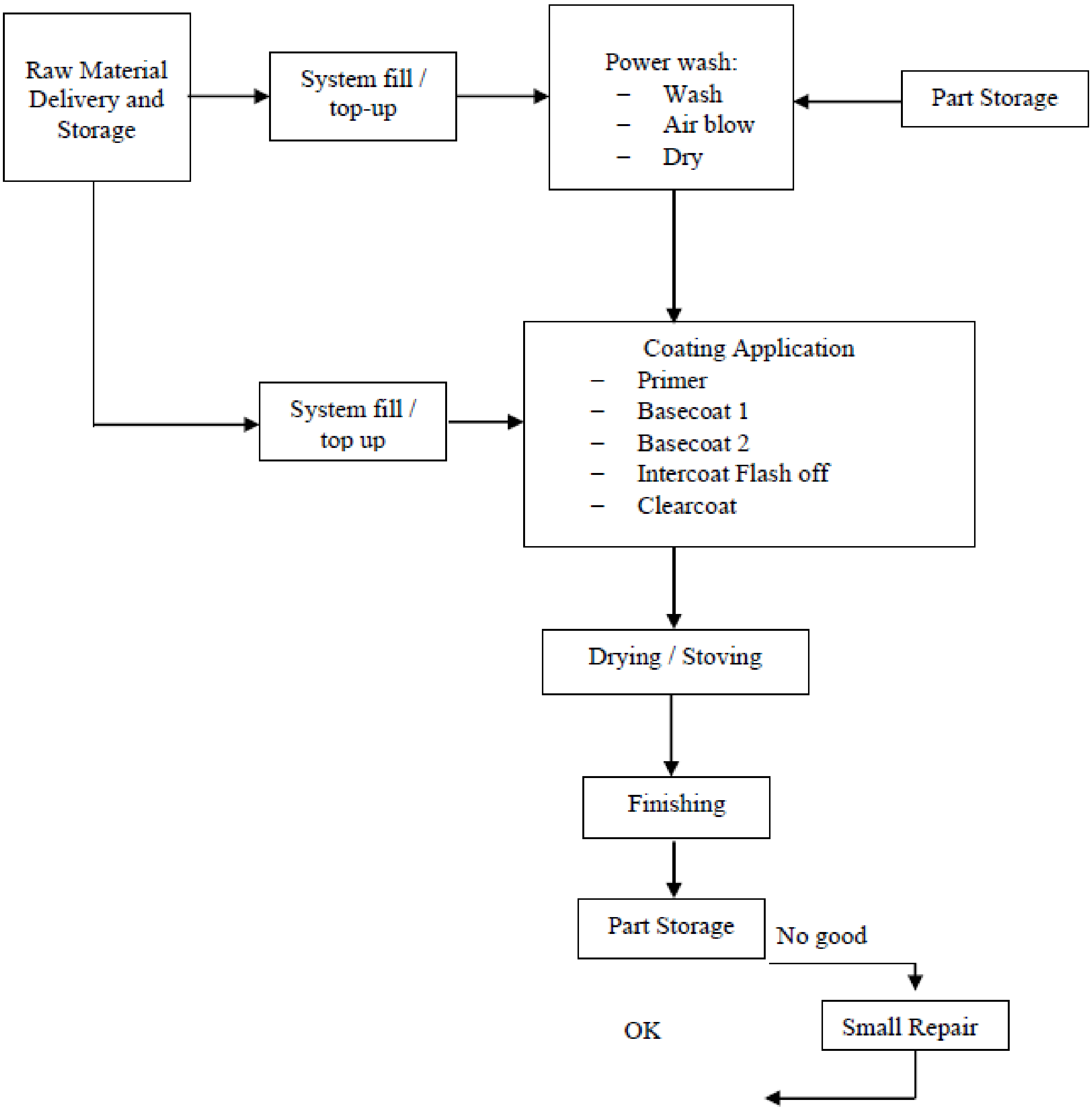


Figure 4 – Plastic Painting Process

8.3.1 Delivery and storage of raw materials / System fill and top-up

Both liquid and solid materials are delivered to site. Liquids may be delivered in bulk tankers and dispensed into on site storage tanks

All delivery containers are provided by the material suppliers. Supervision of deliveries of materials in bulk complies with NMUK Guidance Note ref: 21CG08. All other deliveries are supervised. All materials are stored at locations where the surface water drainage system is protected. Drainage protection involves one or a combination of the following:

- Storage areas are hard surfaced

- Interceptor
- Bund
- Catchment tank (sump)
- Floor gullies which drain into the on-site effluent treatment plant

As part of the Environmental Management System NMUK operate a company procedure entitled limitation of environmental pollution resulting from spillage ref: 21CP23.

System fill and top-up

Liquid chemicals are generally transferred using electric or air assisted pumps directly from the delivery container to the process tanks. Some materials are poured manually directly from their delivery container.

Material	Delivery	Stored volume
Solvents	Bulk tanker	$10m^3$
Coating materials	25l containers	N/A
Coating materials	205 l drums	N/A
Coating materials	5 Litre drums	N/A
Power-wash materials	1000 l totes, 100 l drums	N/A
Booth chemicals	1000l totes and 205 l drums	N/A

All delivery containers are provided by the material suppliers and deliveries of materials in bulk are supervised by NMUK staff. All materials are stored at locations where the surface water drainage system is protected. Drainage protection involves one or a combination of the following:

- Storage areas are hard surfaced
- Interceptor
- Bund
- Catchment tank (sump)
- Floor gullies which drain into the on-site effluent treatment plant

System fill and top-up

Liquid chemicals are generally transferred using electric or air assisted pumps directly from the delivery container to the process tanks. Some materials are poured manually directly from their delivery container.

Storage

Unpainted plastic components are delivered into a storage area from the plastic moulding shop or external suppliers and manually loaded onto an overhead conveyor. The conveyor system is powered by electricity.

8.3.2 Power-wash

The unpainted parts are stored in lanes overhead until required for painting. The continuous overhead conveyor system carrying parts passes through a spray wash tunnel which consists of a detergent wash and a number of water rinses. The last rinse is with de-ionised water. De-ionisation removes ionisable minerals from towns-water by passing it through an anion and cation bed. Following rinsing surface water is blown off the part prior to passing into a gas fired dry-off oven. Power-wash and dry off take place in two ventilated enclosures.

The power-wash and dry off oven is fully automated, no manual handling of the bumper is required after loading onto the overhead conveyor. Following power-wash the conveyor passes through a dust shelter and into the mask and load area.

NMUK operate a small gas fired boiler which provides hot water to the warm wash stage of power-wash. The boiler rating is 850kW

8.3.3 Coating Application

The parts from the dust shelter are removed from the overhead conveyor by an automated drop lifter system and manually placed on racks, where, if required, they are masked by hand using adhesive masking tape. Following masking the parts are manually transferred onto the floor conveyor used to transport the parts through the coating application process.

Three coats of paint are applied to the plastic components:

- Primer
- Basecoat 1
- Basecoat 2
- Clearcoat

8.3.4 Primer

The first stage in the process is a final non-solvent surface cleaning step which can be either manual or automated. The solvent based primer is applied manually using hand held High Volume Low Pressure (HVLP) spray guns. Following coating application the component passes through a flash off zone and then enters the basecoat booth.
The basecoat process operates a two step base coat process for coating of plastic parts.

8.3.5 Basecoat 1

In this spray booth water based paint is manually applied to the plastic parts using HVLP spray guns. Where there are critical quality areas base coat will be applied with conventional pneumatic spray guns.

8.3.6 Ambient Flash Off

Following Basecoat 1 application area, the process parts pass through an ambient flash off before entering base coat 2.

8.3.7 Basecoat 2

In this spray booth an automated robotic spray application is operated, where water-based material is applied to plastic parts using bell atomisers. After the automatic application zone there is a small inspection area which has the capability for manual application in the event of an operating concern with a robot.

8.3.8 Inter-coat Flash Off (ICFO)

Following application of base coat 2, the parts enter a flash off. In this area the parts are heated to drive off any water prior to the application of clear coat. The final step is to blow chilled air oven the coated parts to reduce the surface temperature to an acceptable level for the clear coat application.

8.3.9 Clearcoat

The solvent based 2 pack clearcoat is a lacquer layer and is applied automatically using robots and bell atomisers. The coating consists of two components resin and hardener. These are automatically mixed using a dedicated mix facility prior to application. There is a manual backup zone within the spray booth to support during automatic application malfunction. Following coating the component passes through a flash off zone and into a drying oven (topcoat oven).

8.3.10 All spray booths

Primer, Basecoat 1, Basecoat 2 and clearcoat resin is supplied to the booths from paint mix rooms. The mix rooms serving the plastic painting process are located within the plastic paint building. Within the plastic paint mix room water and solvent based materials are segregated into areas separated by a fire wall. Filtered air is supplied to the mix rooms, which exhaust to atmosphere. Coatings are transferred from their delivery container into a lidded holding tank using a pneumatic pump. If required, the coatings are transferred to a mixing tank and thinners added until the correct viscosity is achieved. The supply pipe work is pressurised and the delivery system consisting of tank and pipework is fully enclosed when not being filled. The holding tanks for solvent based coatings are temperature controlled. During operating hours paint is continually circulated through the pipework which delivers paint to the primer and basecoat booths and clearcoat resin to the clearcoat booth and returns unused paint through a filter to the tank. Fill and flow filters also help ensure coating quality is maintained.

There is a separate delivery system, outside the mix rooms, for the clearcoat hardener. The two components of the coating are mixed prior to application in the spray booth.

Filtered air is supplied to each spray booth via a header plenum. Clearcoat booth has an automatic booth balance control system to maintain the booth at negative pressure in relation to the rest of the shop. During the application process downdraft air entrains paint over spray. Then air passes through a wet scrubbing system, in the booth floor, designed to remove particulate matter from the air stream. Paint residues once separated from the water are collected for disposal. Water and treatment chemicals are periodically discharged to the effluent treatment plant.

VOC abatement is installed on the robot zone of the clearcoat spray booth. The topcoat oven operates with a thermal incinerator.

Following coating application and drying masked finished components are de-masked, all painted parts are inspected and where necessary defects repaired. There are repair booths operated in the process heavy repair for major defects requiring sanding and re-painting and a spot repair booth for minor defects requiring minimal repair work. Both repair booths exhaust to atmosphere.

Finished coated components are transferred to an unload station. The finished component is then manually transferred to storage racks prior to sub-assembly and fitting to the appropriate vehicle in the final assembly shop.

Secondary damage to the painted part which occurs in the final assembly shop (Trim and Chassis) is repaired in a small paint booth located in the final line area of Trim and Chassis shop. The coating materials used for these minor repairs are supplied from the main plastic paint facility.

8.4 Trade Effluent Plant:

NMUK has two Trade Effluent Treatment Plants which were commissioned in 1985 and 1991. Both plants utilise the same treatment methodology to remove heavy metals and suspended solids from the liquid waste produced by the NMUK coating installation.

Both plants were designed to comply with the requirements of the Northumbrian Water Ltd (the sewerage receiver) Discharge Consent (ref: W0493).

Both plants operate by the process of pH adjustment, coagulation and settlement to remove metals and suspended solids. The total plant capacity is 250m^3/hour. The actual plant throughput is governed by the sites production volume.

The main process steps are outlined in Figure 4 below

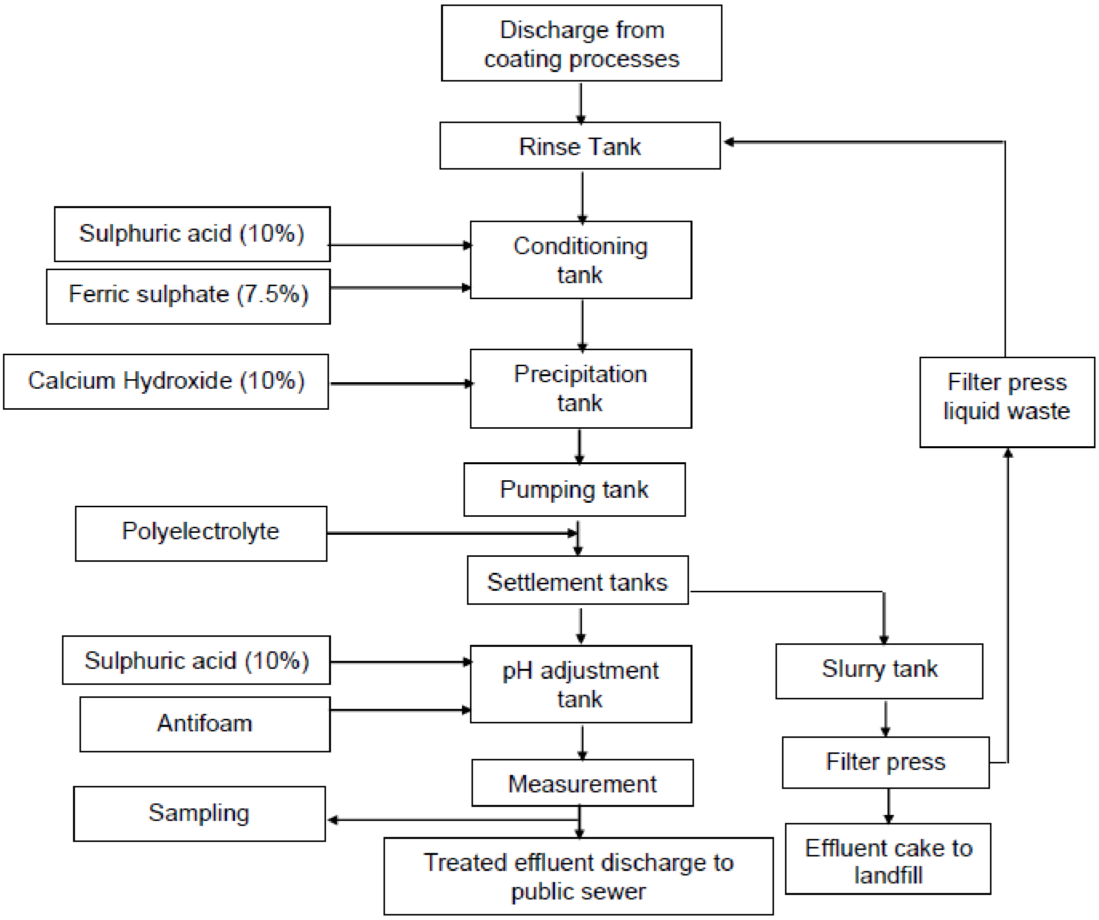


Figure 5 – Effluent Treatment Process

8.4.1 Delivery and storage of raw materials.

The following raw materials are delivered to site for use in the treatment process

Material	Delivery
96 % Sulphuric Acid	Bulk tanker
40 % Ferric Sulphate	Bulk tanker
Calcium Carbonate	Bulk tanker
Polyelectrolyte	Bags
Antifoam	Drums

All delivery containers are provided by the material suppliers. All deliveries are supervised by NMUK staff.
All drainage in the immediate area flows back into the effluent catchment tank. This system provides drainage protection. In addition, bulk delivered materials are stored within bunded areas.

8.4.1 System fill and top-up

Bulk delivered chemicals are decanted directly into storage containers by the delivery vehicle. Bagged polyelectrolyte is decanted manually into a dedicated facility. Antifoam is electrically pumped directly from the delivery drum container.

8.4.2 Effluent transfer

The effluent is pumped through the plant by two electrically driven process pumps.

8.4.3 Slurry transfer

The slurry is transferred into the slurry tank by a pneumatically driven pump.

8.4.4 Chemical dilution / transfer

All chemical distribution is achieved by pneumatically driven pumps.

8.5.5 Filter press / cake transfer

The filter press is operated by an electrically driven hydraulic power press. The effluent cake is transferred into a skip via an electrically powered conveyer.

8.5 Metal Decontamination

NMUK Metal Decontamination process was installed in 1987 to remove paint over-spray from components used in the coating process. The original process consisted of three (3) dip tanks two (2) containing a hot caustic solution, one (1) wash tank. In 1993 the building was extended to house a Fluidised bed. The two metal decontamination operations are run independently of one another.

The caustic cleaning process is not in itself a scheduled activity however, the fluidised bed activity is a scheduled activity.

Use of the processes described in this application is influenced by the product manufactured.

8.5.1 Delivery and storage of raw materials and components

Both liquid and solid raw materials are delivered. Liquid materials used in the caustic cleaning process are delivered to site in 205l drums and manually decanted into the tanks as required.

- Sand and gravel used in the fluidised bed are delivered in bags.
- All delivery containers are provided by the material suppliers.
- All deliveries are supervised by the facility operators.
- All materials are stored at designated locations.
- All drains in the process and storage areas flow into the effluent treatment plant concentrates tanks.
- All storage areas are hard surfaced.

Components contaminated with paint over spray are collected from the coating processes and delivered to the Paint Removal Building by fork lift truck. Components are stored in designated locations. Components which are coated in PVC containing materials and those which will not tolerate a hot process are separated from all others. Those separated components are not put through the fluidised bed process, they are cleaned in the caustic cleaning process.

8.5.2 Caustic Cleaning

Components are manually loaded into baskets suspended from an overhead hoist. The components are then dipped into the caustic solution. The Caustic solution is heated using an indirect gas burner to a temperature of approximately 120 to 126^{o}C. The paint is denatured and removed from the component. Following caustic dip the baskets are dipped in a wash tank, then sprayed with water to remove any remaining debris and excess caustic before air drying

8.5.3 Fluidised Bed

Components are manually loaded into baskets and transferred to the fluidised bed using an overhead hoist. The bed consists of a tank filled with calibrated (sized) sand. Air and natural gas are blown through the sand, this causes it to act like a fluid. The sand is heats to a temperature of approximately 425^{0}C. The paint thermally decomposes in conditions of pyrolysis and is removed from the surface of the metal. The process produces minimal waste. The sand requires replenishing infrequently. Sand entrained on flat surfaces when the components and baskets are removed from the bed can be returned for re-use.

The main steps in the process are:

- Load paint contaminated parts into baskets in the load/unload area
- Transfer loaded baskets to the surface of the bed (bed lid must be open to facilitate this)
- Close the bed lid
- Fluidise the bed and the basket sinks into the fluidised sand
- Apply heat to the bed
- The cycle time for each load is approximately 30 minutes
- Turn off the heat supply
- Remove the loaded basket from the bed (bed lid must be open to facilitate this)
- Transfer the loaded basket to the load/unload area to cool
- Unload the clean components from the basket.
- The components may be jet washed to remove any remaining debris

8.5.4 Abatement

The upper part of the fluidised bed tank forms the first level of VOC abatement. The pyrolysis gases are burnt at the top surface of the sand. Air is directed into the tank to ensure sufficient oxygen is present to support thermal decomposition and to direct the gas into the incinerator installed in the fluidised bed exhaust. All gases from the fluidised be dare drawn into an incinerator operating at a temperature of approximately 850 to 8700C. The incinerator is designed to have a residence time of more than 1 second. The VOC waste gases produced in the fluidised bed are incinerated. Fluidisation of the sand and the temperature of the incinerator are interlocked to prevent fluidisation if the incinerator is not operating at an appropriate temperature.

Exhaust gases from the incinerator are ducted through a bank of four cyclones to remove particulate matter from the air stream prior to discharge to atmosphere through a stack.

8.6 Schematic Drawings

8.6.1 Main Paint Process

8.6.1.1 Degrease and Pre-Treatment

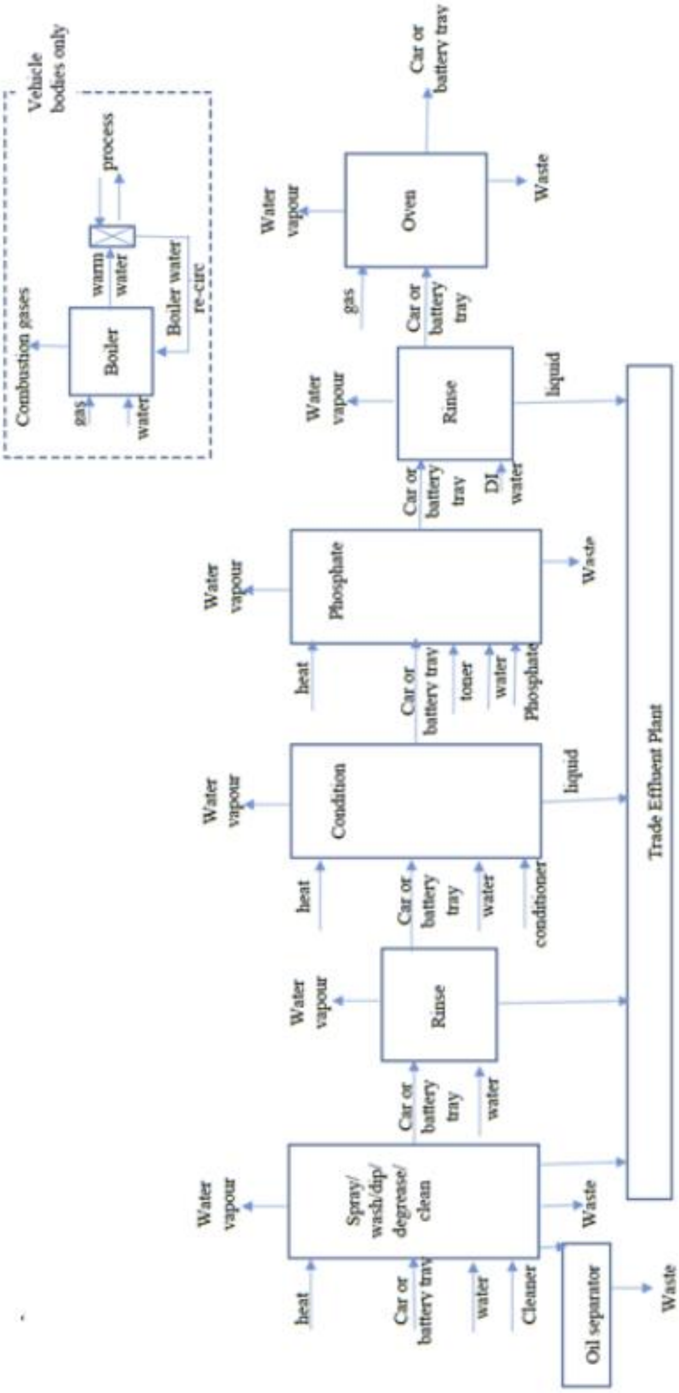


Figure 6 - Degrease and Pre-Treatment

8.6.1.2 Electrodisposition

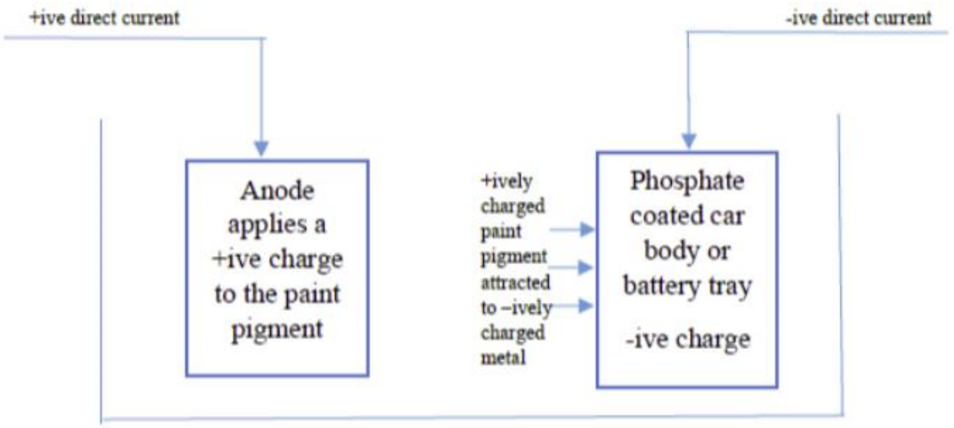


Figure 7 - Electrodisposition Process

8.6.1.3 Electrocoat

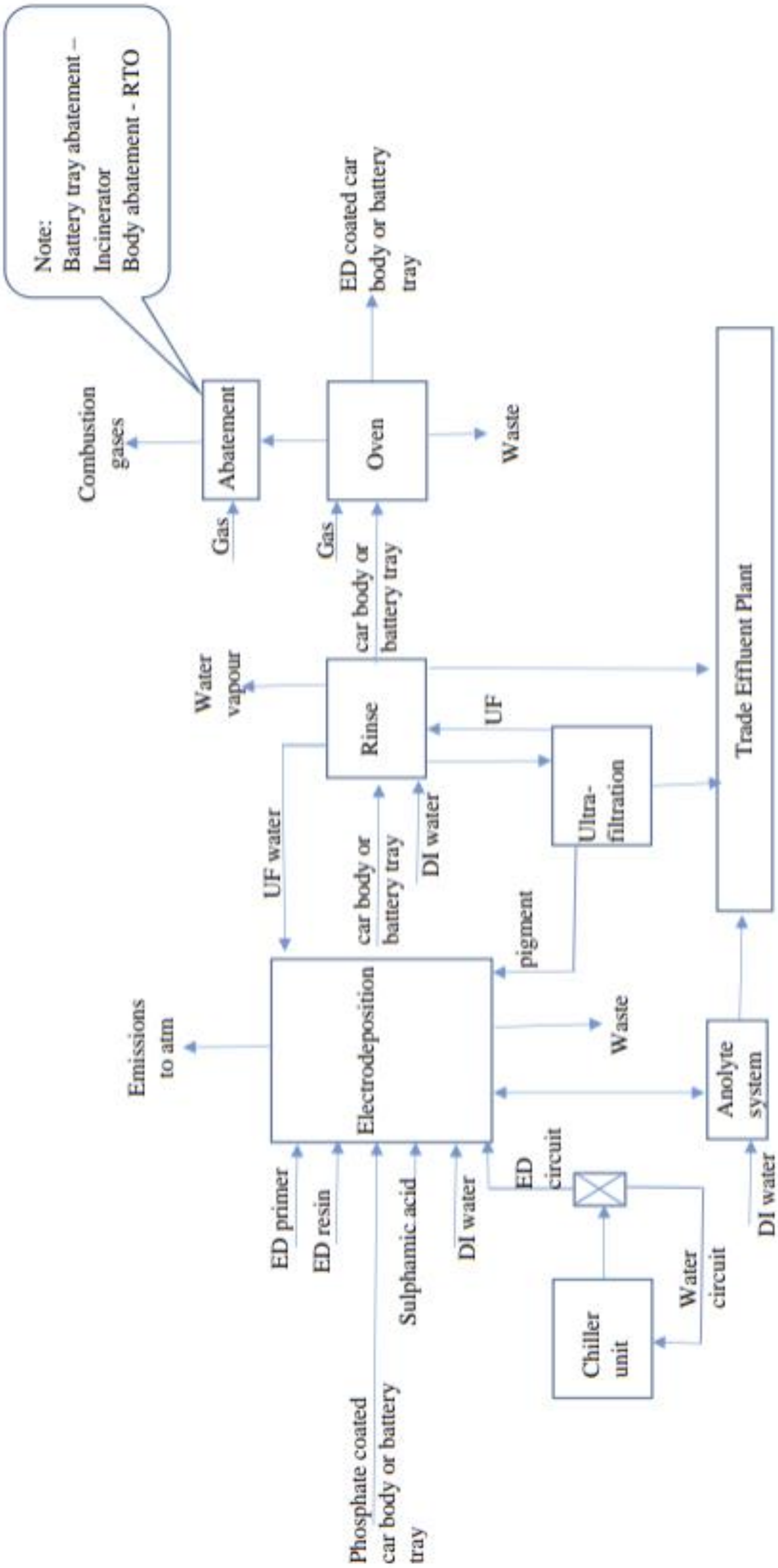


Figure 8 – Electrocoat Process

8.6.1.4 Sealing and Undercoat (Vehicle)

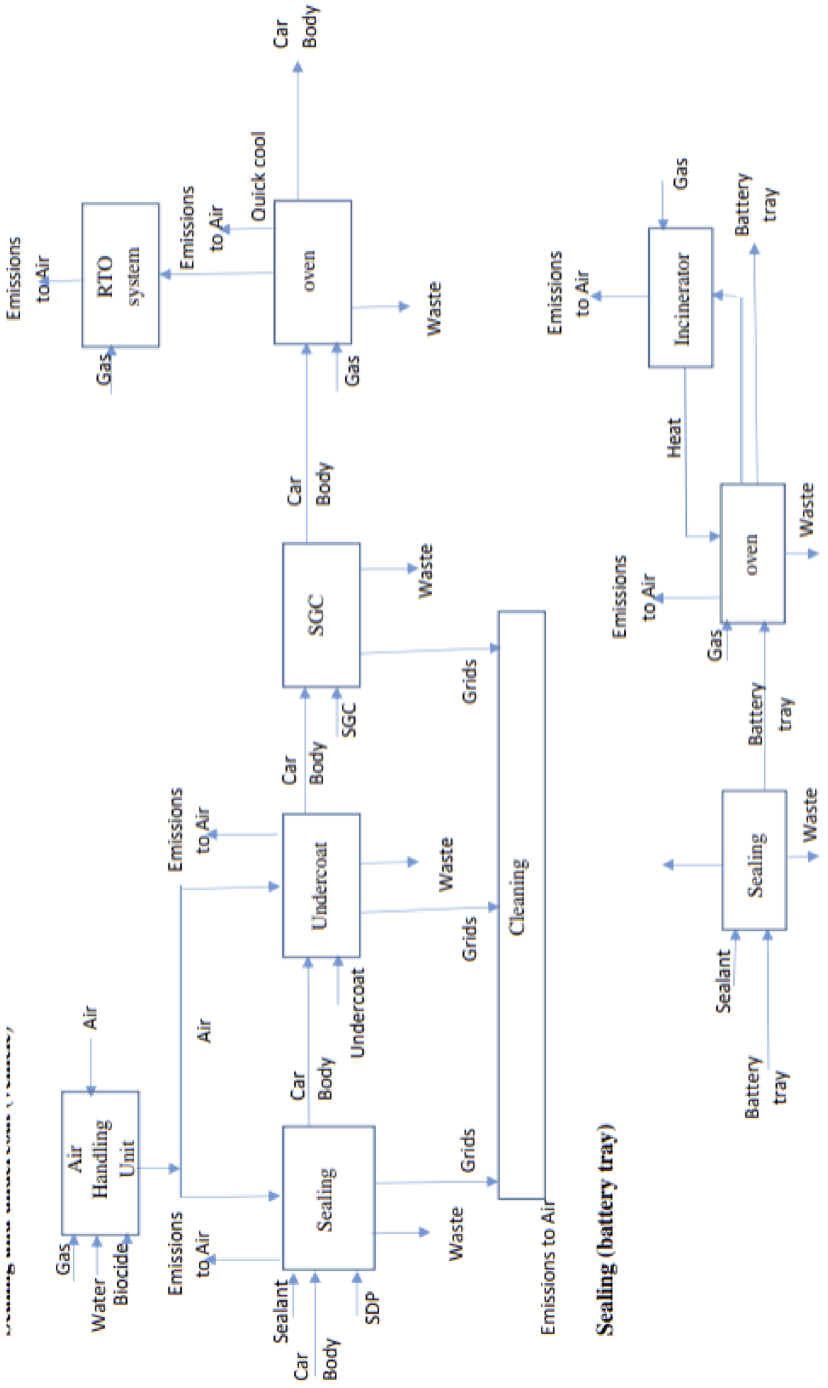


Figure 9 - Sealing and Undercoat (Vehicle) Application

8.6.1.5 Coating Application Main Paint Shop

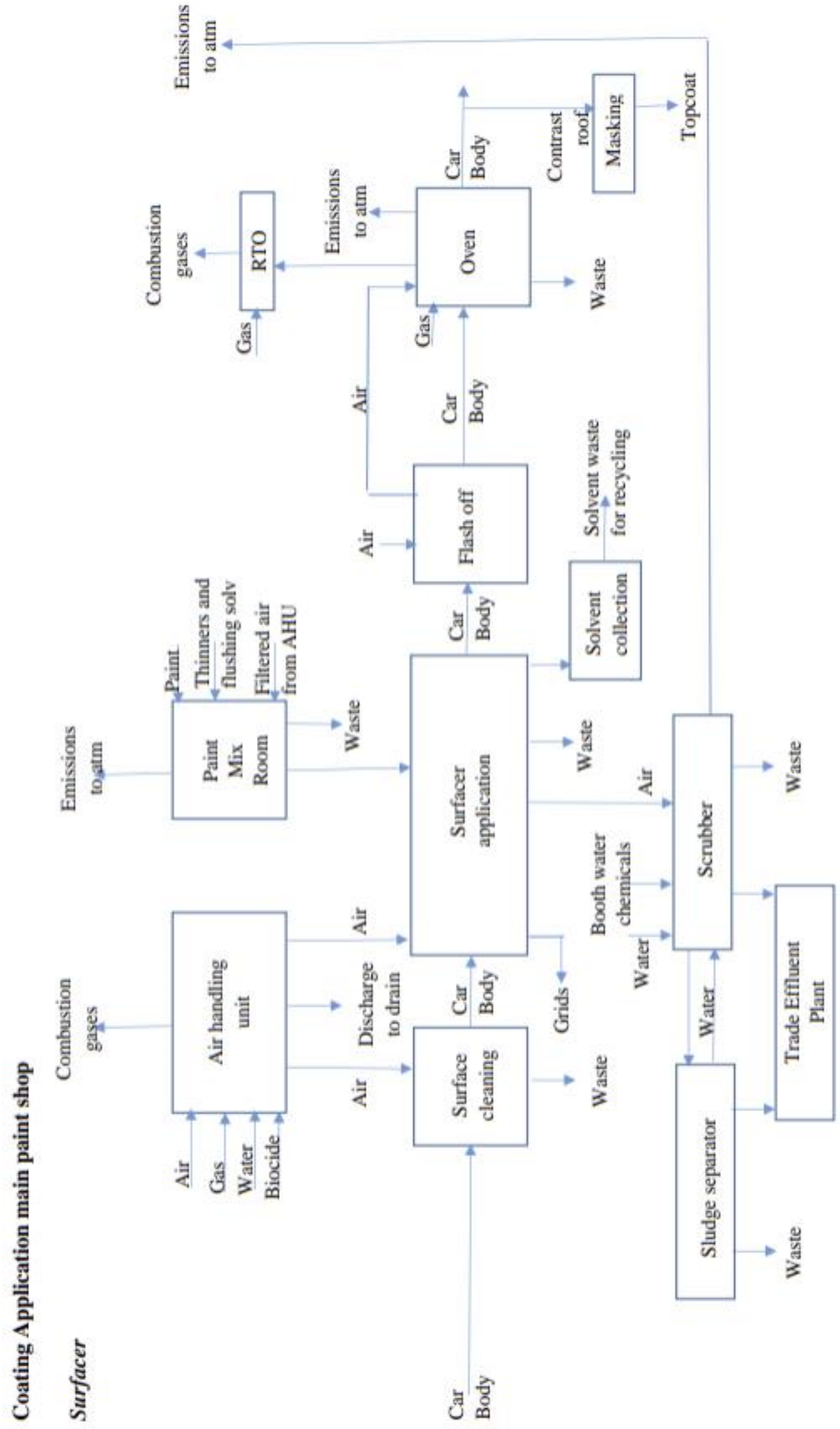


Figure 10 - Coating Application Main Paint Shop

8.6.1.6 Topcoat

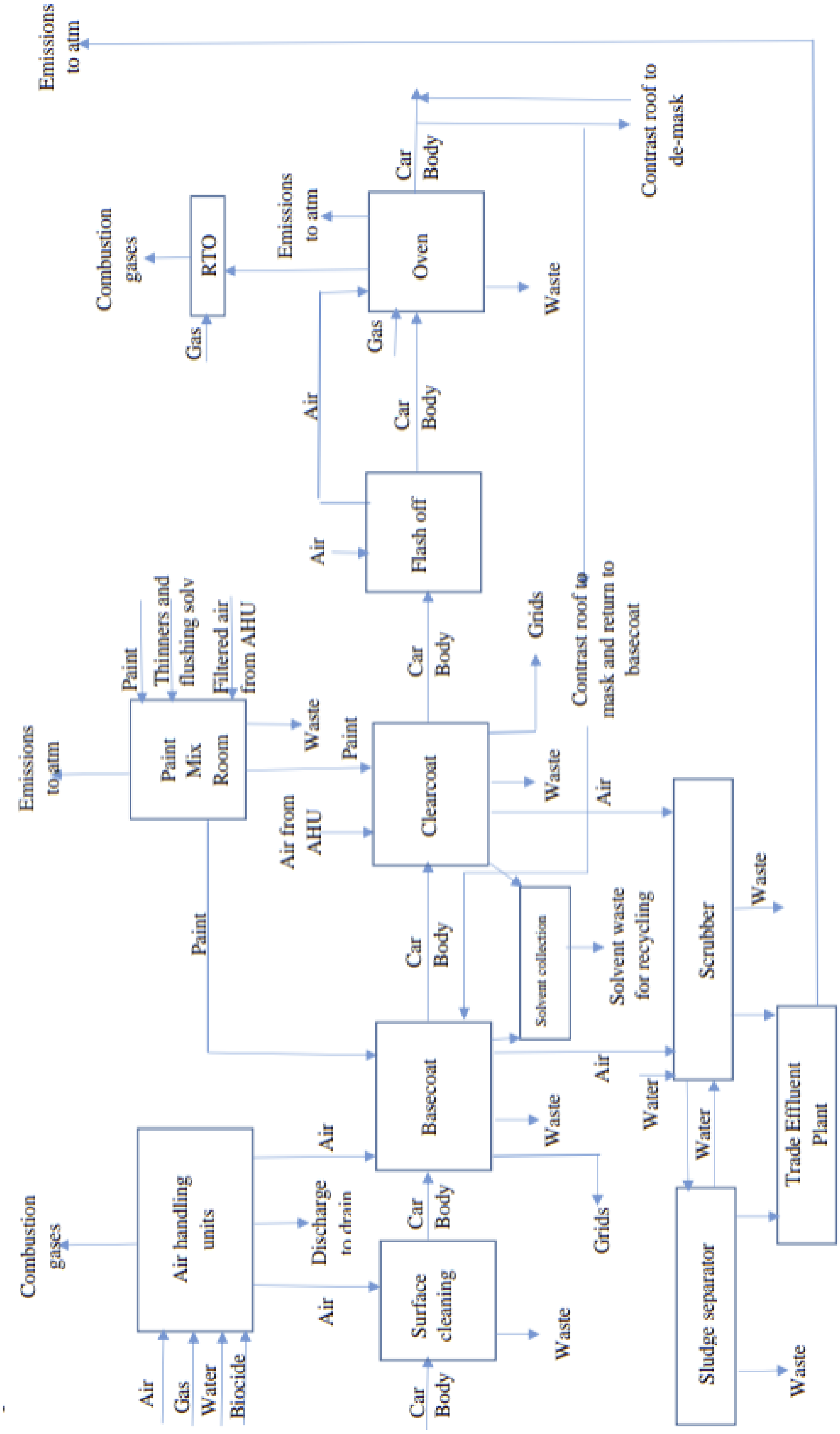


Figure 11 – Topcoat Application

8.6.1.7 Primer and Basecoat

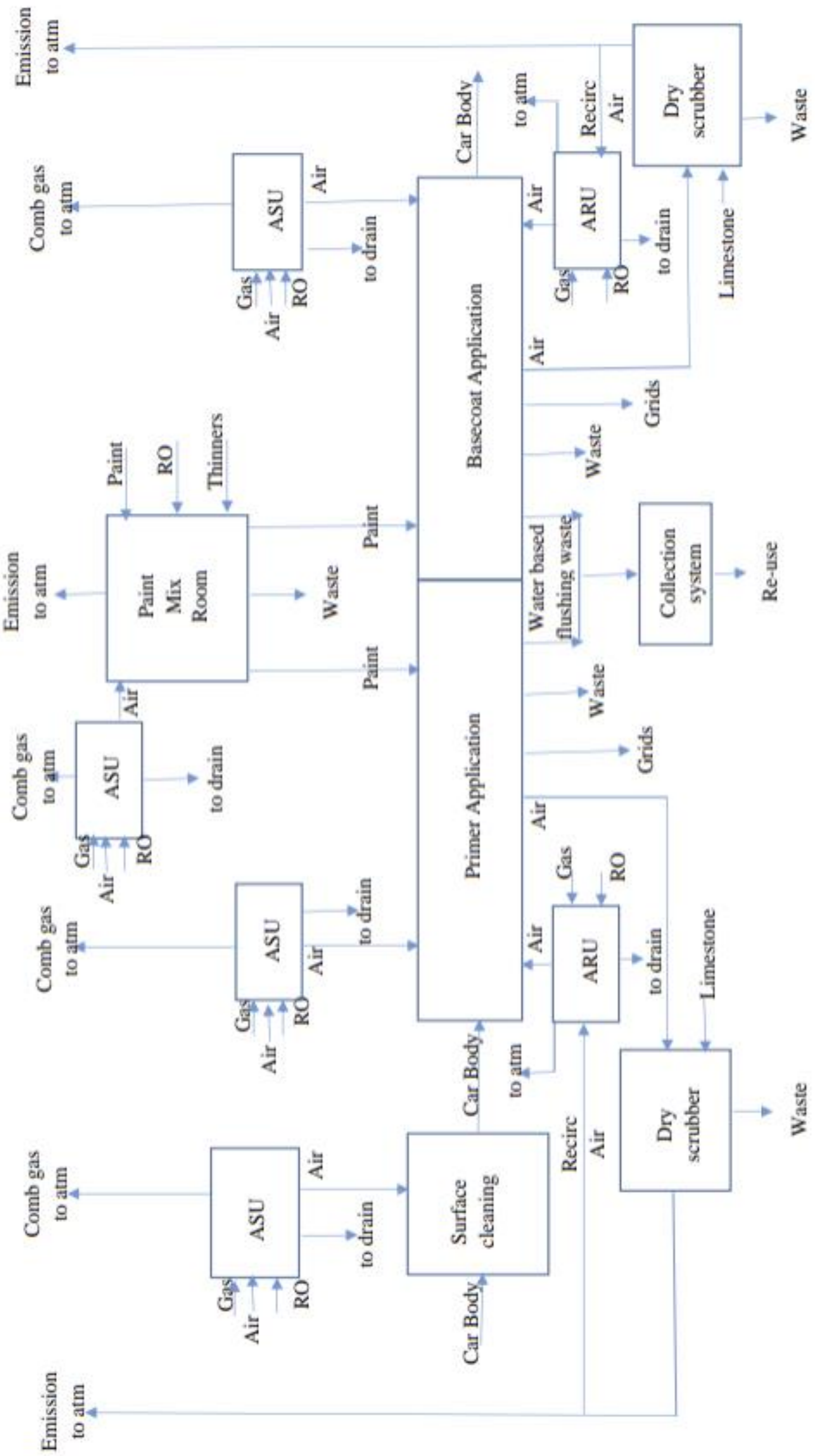


Figure 11 – Primer and Basecoat Application

8.6.1.8 Intercoat Flash Off and Clearcoat

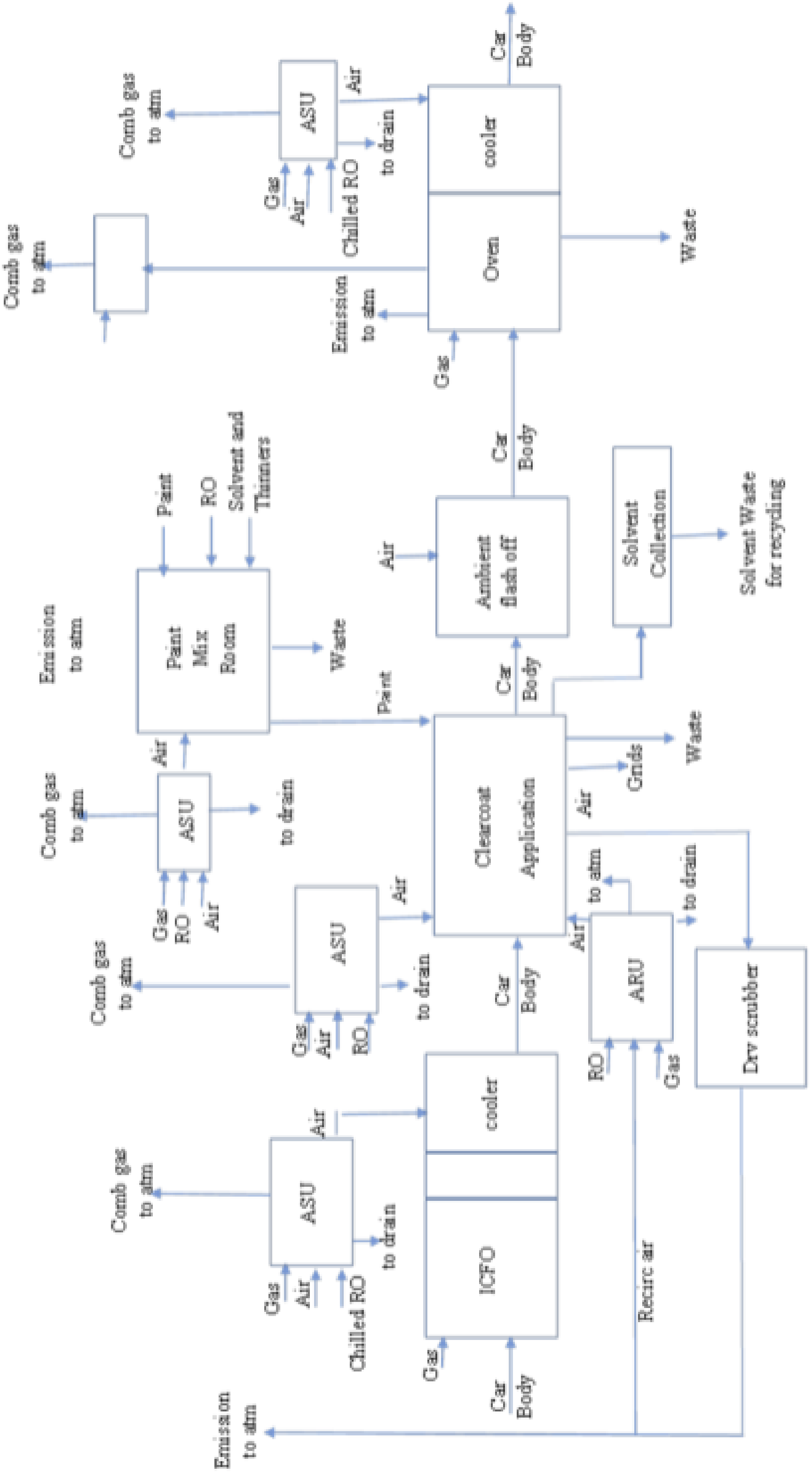


Figure 12 - Intercoat Flash Off and Clearcoat Application

8.6.3 Painting in Trim and Chassis

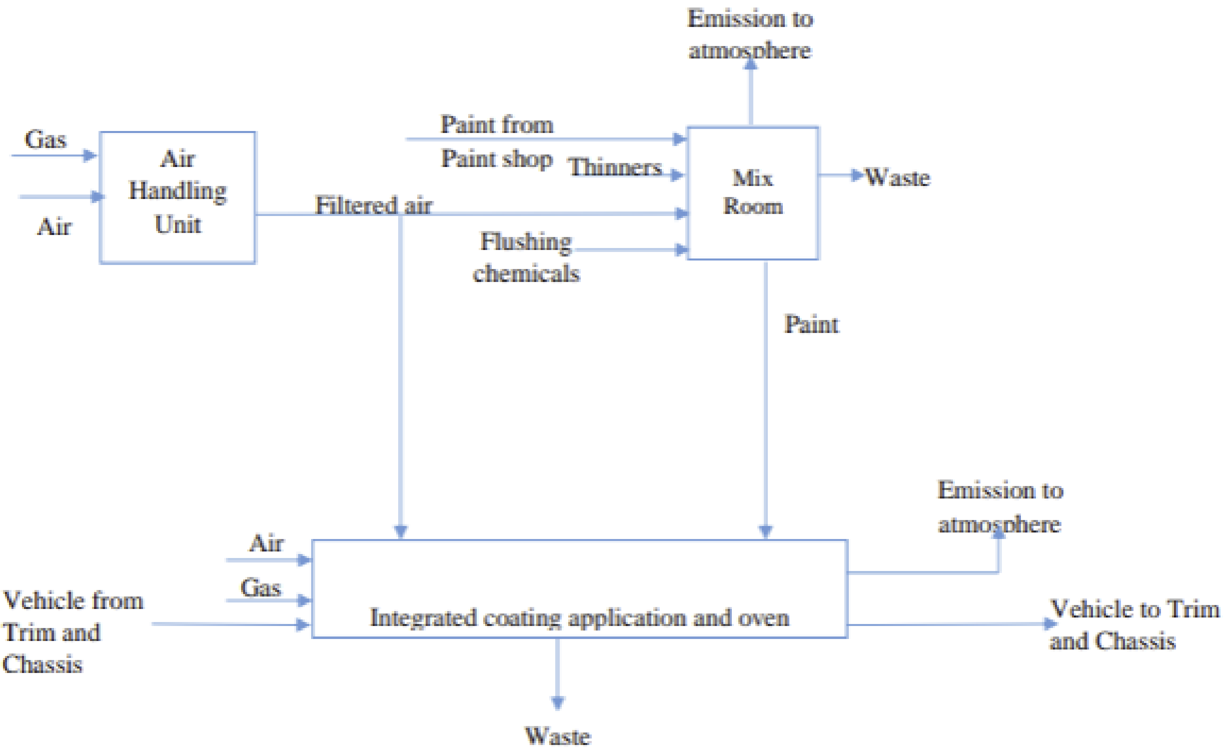


Figure 13 – Painting Process Overview Trim and Chassis

8.6.2 Plastic Paints Painting Process

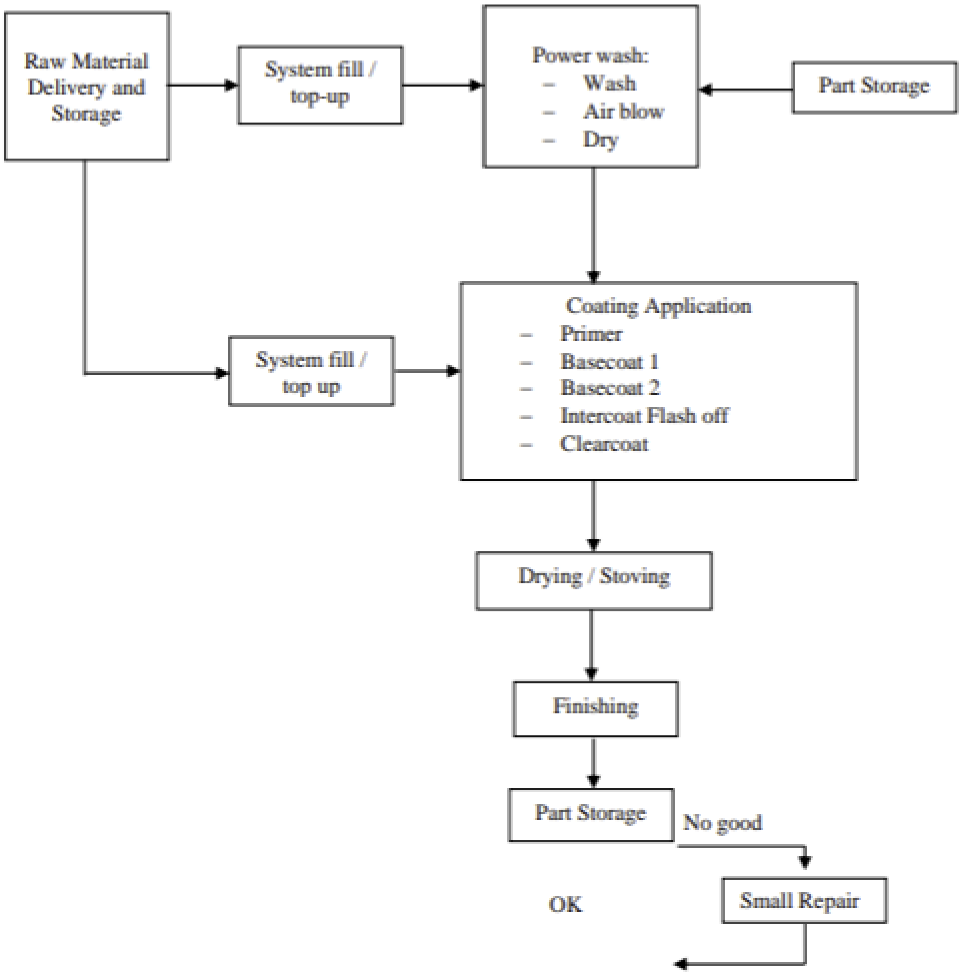


Figure 14 – Plastic (Bumper) Paint Process Overview

8.6.2.1 Power-Wash and Dry Off Oven

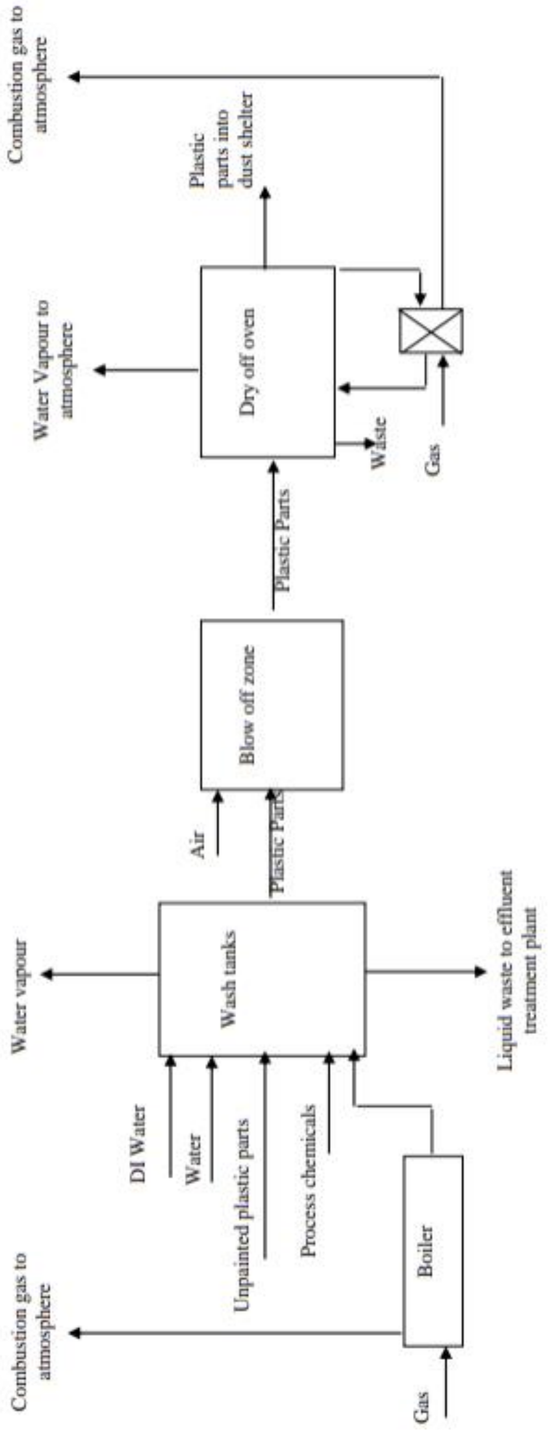


Figure 15 – Power Wash and Dry Off, Plastic Paints

8.6.2.2 Primer Application

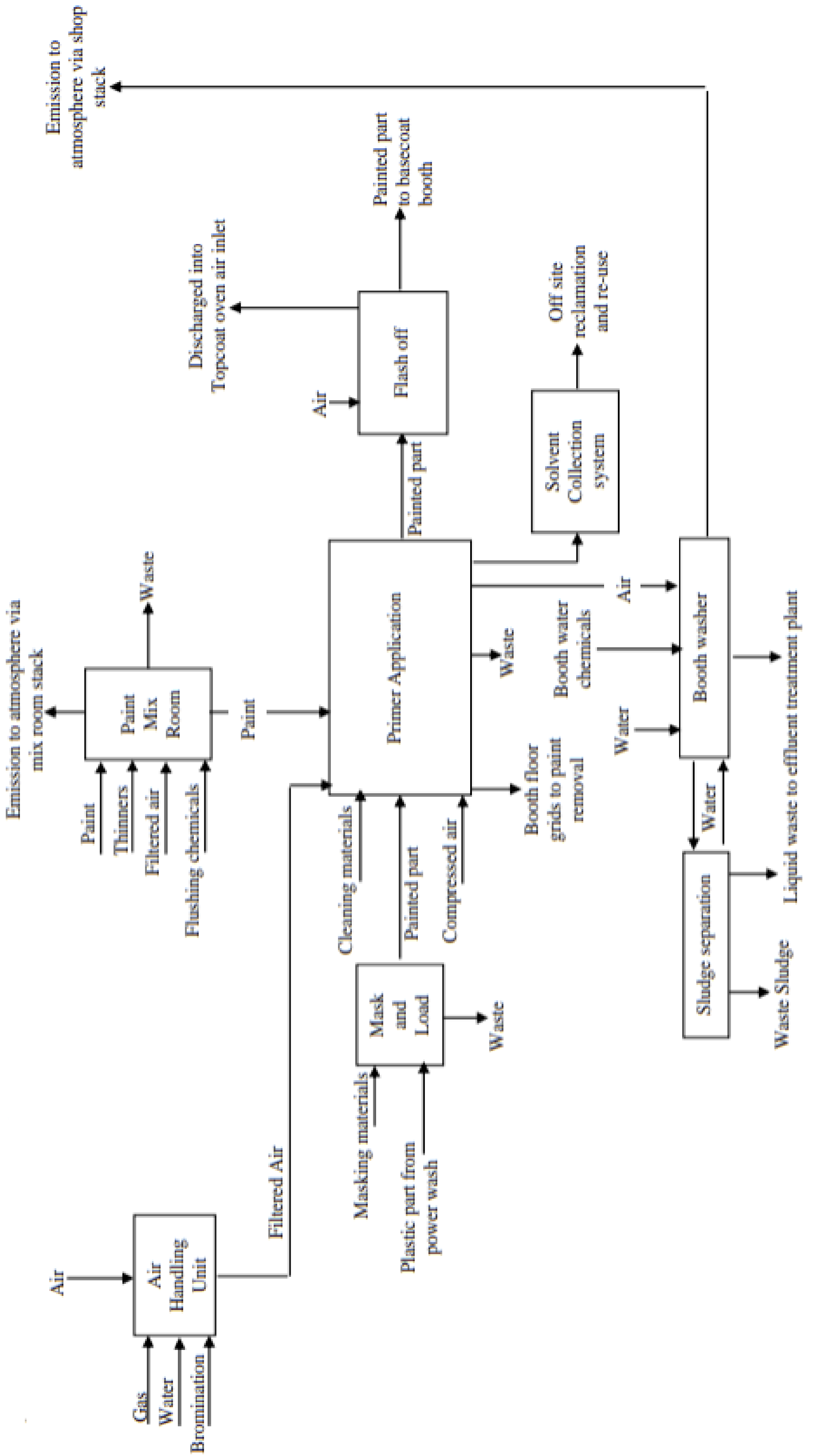


Figure 16 – Primer Application process, Plastic Paints

8.6.2.3 Basecoat Application

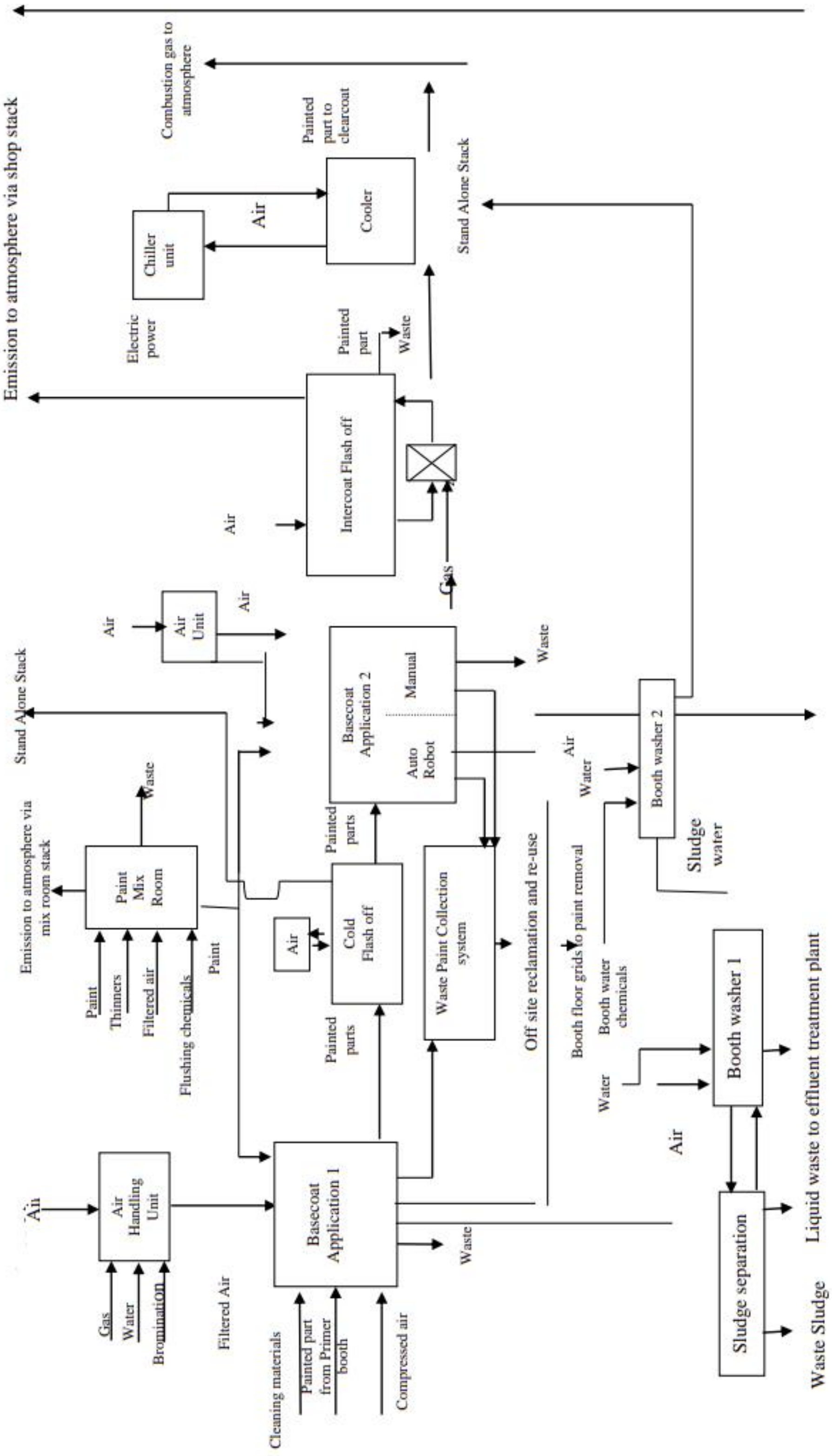


Figure 17 – Basecoat Application Process, Plastic Paints

8.6.2.4 Clearcoat Application

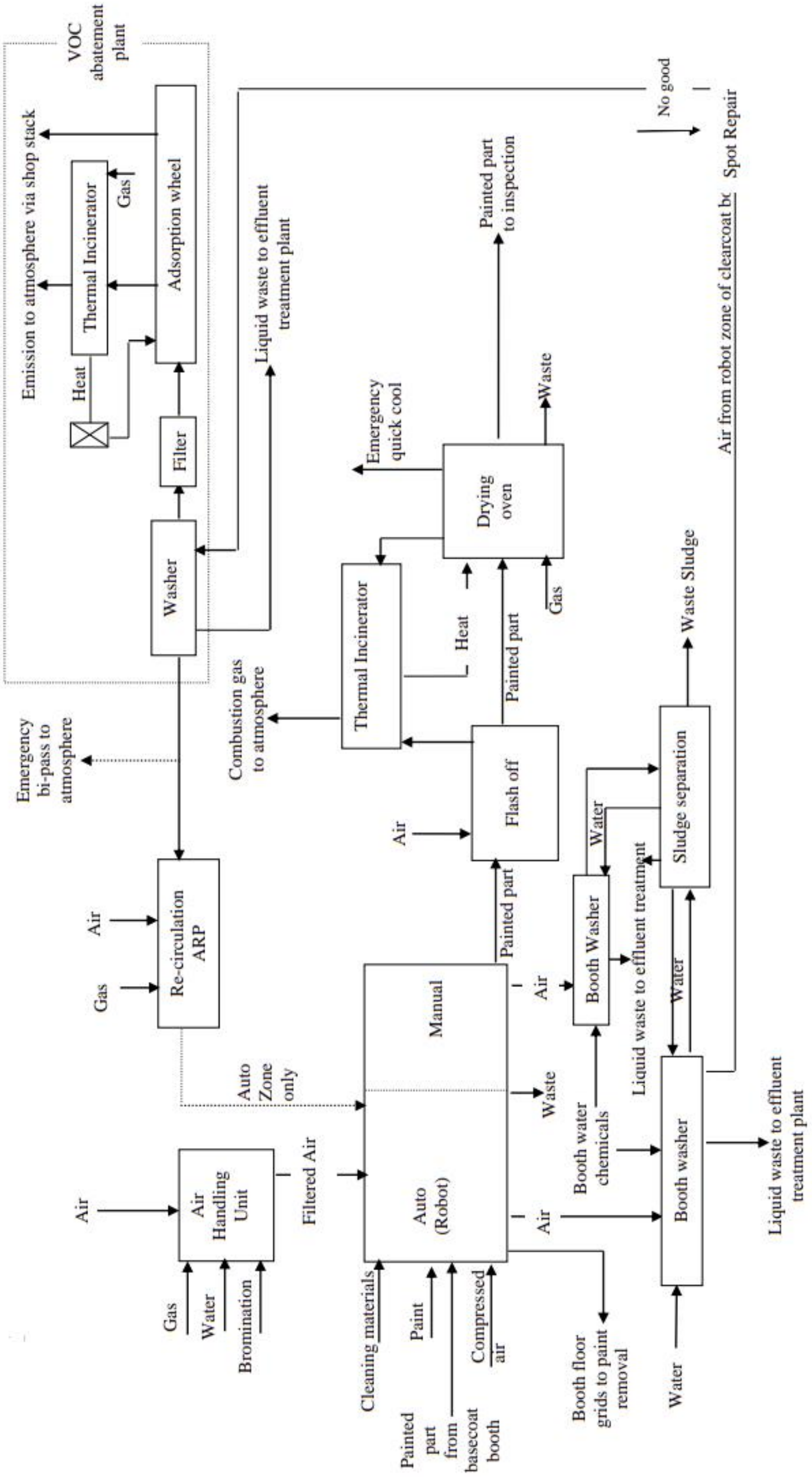


Figure 18 - Clearcoat Application, Primer Paint

8.6.2.5 Repair

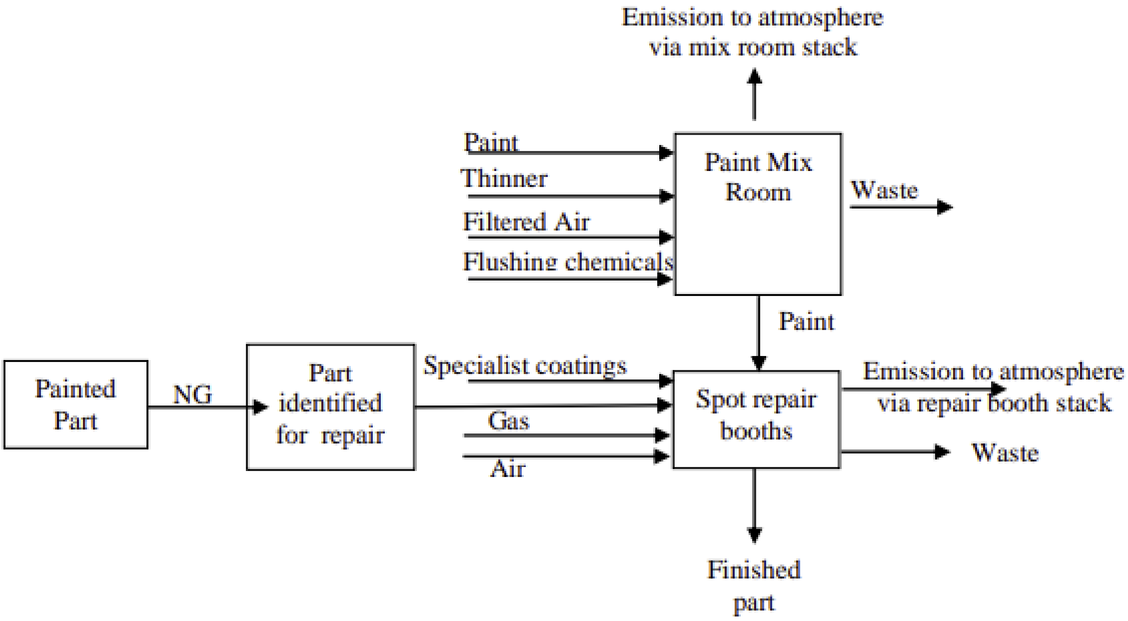


Figure 19 – Defect Repair Process, Plastic Paint

8.6.3 Service Parts

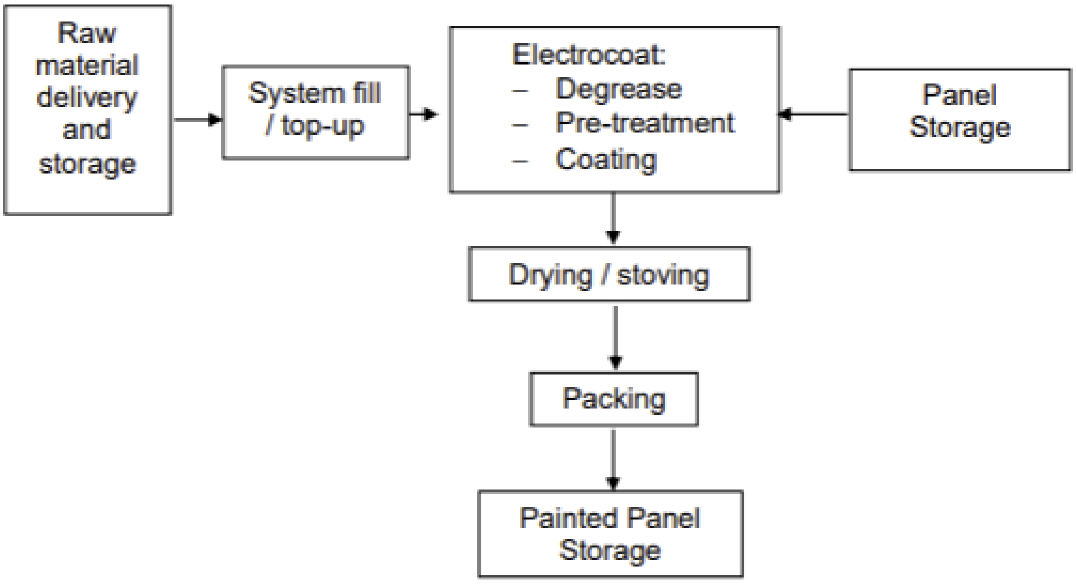


Figure 20 – Service Parts Coating Process Overview

8.6.5 Trade Effluent Plant

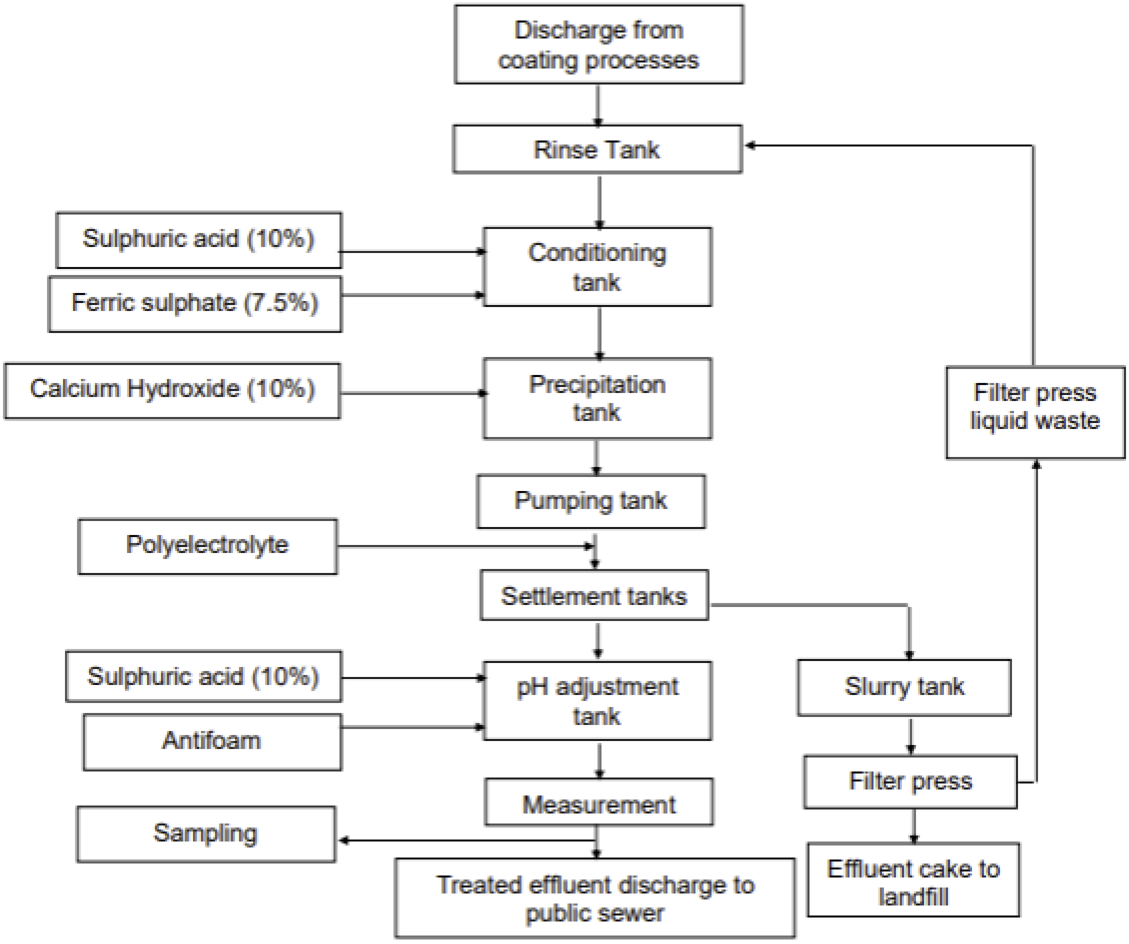


Figure 21 – Trade Effluent Plant Treatment Overview Process

8.6.5 Metal Decontamination

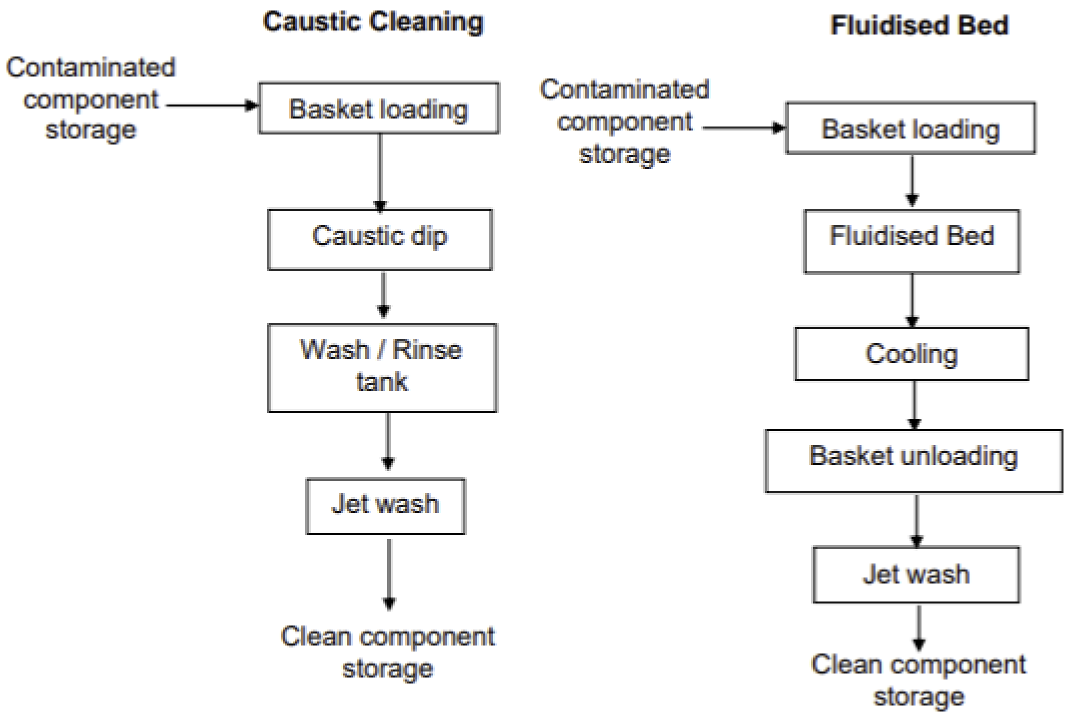


Figure 22 – Metal Decontamination Process Overview

Schedule 9 - Solvent Mass Balance Calculations

This schedule gives further guidance on how to make solvent mass balance calculations – see BAT 10.

1. What is a Solvent Mass Balance

The solvent mass balance is the method used for accounting for all the organic solvents entering and leaving a regulated process or activity. It is used in every Installation that comes within the scope of the STS BAT conclusions. It is also used in every Solvent Emission Activity or relevant Part B process.

The solvent mass balance is the method by which either the total emissions or the fugitive emissions from the process or activity are calculated. The value of the total or fugitive emissions is then used to assess compliance with the relevant Emission Limit Value (ELV) or with the Solvent Reduction Scheme, where this is applicable.

The solvent mass balance comprises a set of standard equations, which are built up from a set of defined parameters

This document gives guidance on how to measure, calculate or estimate these parameters with a sufficient level of accuracy, so that they can be used for assessing compliance with the relevant emission standard.

2. Scope of a Solvent Mass Balance

It is very important to define precisely the scope of each solvent mass balance and to ensure that it is consistent with the activities described in the environmental permit. The boundary of the mass balance should be that of the permitted installation.

In some cases, it may be convenient to make a mass balance on a smaller scale than the installation boundary and then to use that data to construct an overall mass balance. It is also possible that in some cases, activities which are not within the scope of the permit need to be excluded.

In all cases, it is the responsibility of the operator to set out clearly the scope of the solvent mass balance. It is then for the Regulator to be satisfied that the scope used is appropriate for the installation concerned.

3. Time Period of a Solvent Mass Balance

The time frame for a solvent mass balance calculation will ordinarily be one year. In some cases, for operational reasons, a shorter time frame may be more appropriate, e.g. over a particular type of production campaign. However, in no circumstances should the time frame be greater than one year.

The time frame in the permit will, as a default, be one year. If a shorter time frame is more appropriate this should be agreed between the operator and the Regulator.

4. How to Produce a Good Quality Mass Balance

The first step is for the operator to set out in detail the methodology that will be followed in making the solvent mass balance. This methodology should be set out in writing and agreed with the Regulator.
The results of the solvent mass balance should be presented in a report, which should include all the results and contextual information needed for the Regulator to follow the calculation steps and verify the results and assumptions or estimates made.

It is recommended the following elements are either included in the solvent mass balance report or referenced in the calculation methodology for discussions between the operator and the Regulator.

- Simplified lay out of the installation including:
  - relevant process steps and secondary installations (e.g. mix room, wastewater treatment plant, waste handling areas, etc.)
  - Off-gas treatment equipment (process type, technical data)
  - Stacks (release points of VOC into the air: position, dimensions, upstream processes)
  - Release points of wastewater (with VOC), destination of wastewater after it leaves the work area
- Contextual information to each applied calculation parameter, like off-gas treatment efficiencies, emission factors, conversion factors:
  - Description of the calculation process (equations used)
  - Description of data sources
  - Definition
  - Date of last determination
  - Reference to the respective measurement report (the operator must make available to the Regulator on request)
  - Statement, why the used parameter is applicable (e.g. “paint shop design, material and application method not changed since last determination”)
  - Consideration of the uncertainty of the result.
- As annexes:
  - used raw data
  - measurement reports, if direct measurements were used for the establishment of the solvent balance.

5. How to Deal with Uncertainty

Every solvent mass balance report must include a systematic assessment of the uncertainty in making the mass balance. Because the mass balance contains a mixture of data from numerous sources, uncertainties will accumulate.
Contributions to uncertainty include:

- Tracking the movements of all solvent containing raw materials, especially when there is a large inventory of different substances, e.g. different colour paints, inks and cleaning solvents
- Sampling errors, particularly those streams with a high level of variability such as may be found in some solid waste streams

- Use of data sheets, where solvent concentrations are given as a range
- Breakdowns and other than normal operating conditions
- Analytical errors
- Measurement errors
- Calculation errors

Some of these contributors to uncertainty will be more important than others. For example, a small error in the calculation of the solvent input could be very significant in comparison with the fugitive emission limit value, whereas a larger error in a smaller component may be less important.

Where there is a breach of an ELV, Regulators will take account of the uncertainty relative to the scale of the exceedance in deciding on whether to take enforcement action.

Ideally uncertainty should not exceed 20% of the Emission Limit Value. The operator must take action to reduce uncertainty where it exceeds 40% of the Emission Limit Value.

Operators should in any event periodically review uncertainty in the solvent mass balance methodology, using a stepwise process for reducing uncertainty as follows:

- Make an estimation of overall uncertainty
- Determine the most significant individual contributors to overall uncertainty
- Target improvements on those measurements
- Repeat
-

From time to time, it will be necessary to use short intensive measurement campaigns to update or verify emission factors which are used in the calculation methodology.

6. Equations for Use in Solvent Mass Balance Calculations

6.1 Total Emissions

The total emission (E) shall be calculated according to one of the two following equations:

$E = O1 + O2 + O3 + O4 + O9$ Equation 1
$E = I1 – O5 – O6 – O7 – O8$ Equation 2

Equation 1 can be rewritten as follows:

$E = O1 + F$ Equation 3

Where, each of the terms in equations 1, 2 and 3 are as described in Point 7.
More detailed guidance on how to measure, calculate or estimate each element in the above equations is given in Point 8. Not every element will need to be determined, depending on the calculation route chosen.

The total emission limit value is expressed as a mass emission divided by a relevant production parameter.

The calculation of the production parameter used in ELVs for total emissions differs depending on the industry sector. This is therefore not covered in this document.

Operators must set out the mechanism whereby the production parameter is determined as part of their mass balance method statement.

The relevant ELV is set out in the BAT conclusions of the STS BREF (ref 1).

6.2 Fugitive Emissions

The fugitive emission (F) shall be calculated according to one of the two following equations:

$F = O2 + O3 + O4 + O9$ Equation 4
$F = I1 – O1 – O5 – O6 – O7 – O8$ Equation 5

Where, each of the terms in equations 4 and 5 are as described Point 7.

The fugitive emission limit value is expressed as a percentage of the solvent input, which shall be calculated according to equation 6 below:

$I = I1 + I2$ Equation 6

Where, each of the terms in equation 6 are as described in Point 7.

More detailed guidance on how to measure, calculate or estimate each element in the above equations is given in Point 8. Not every element will need to be determined, depending on the calculation route chosen.

The relevant ELV is set out in the BAT conclusions of the STS BREF (ref 1).

6.3 Solvent Reduction Scheme

The Solvent Reduction Scheme is no longer available to processes / activities that come within scope of the STS BAT conclusions.

Operators currently using the solvent reduction scheme will need to adopt one of the other methods of compliance.

7. Definitions

Table 1 The following definitions provide a framework for the mass balance calculations.

Parameter	Description	
E	Total emissions	
F	Fugitive emissions	
I = I1 + I2	Total input of organic solvents in the time frame over which the mass balance is being calculated	
	I1	The quantity of organic solvents or their quantity in mixtures purchased which are used as input into the process/activity (including cleaning solvents).
	I2	The quantity of organic solvents or their quantity in mixtures recovered and reused as solvent input into the process/activity. The recycled solvent is counted every time it is used to carry out the activity.
O	Outputs of Organic Solvents in the time frame over which the mass balance is being calculated.	
O1 = O1.1 + O1.2	Emissions in waste gases	
	O1.1	Captured emissions which are treated, if appropriate taking into account waste gas treatment when calculating O5.1.
	O1.2	Captured emissions which are untreated
O2	Organic solvents lost in water, if appropriate taking into account wastewater treatment when calculating O5.2.	
O3	The quantity of organic solvents which remains as contamination or residue in products output from the process/activity.	
O4	Uncaptured emissions of organic solvents to air. This includes the general ventilation of rooms, where air is released to the outside environment via windows, doors, vents and similar openings.	
O5	Organic solvents and/or organic compounds lost due to chemical or physical reactions.	
	O5.1 (air)	Organic solvents destroyed by thermal oxidation or other waste gas treatments.
	O5.2 (water)	Organic solvents destroyed by biological oxidation or other wastewater treatments.
O6	Organic solvents contained in collected waste.	
O7	Organic solvents, or organic solvents contained in mixtures, which are sold or are intended to be sold as a commercially valuable product.	
O8	Organic solvents contained in mixtures 'recovered for reuse but not as input into the process/activity, as long as not counted under O7.	
O9	Organic solvents released in other ways. E.g. abnormal events or spillages if not included under O6.	

8. More Detailed Guidance on Solvent Mass Balance Calculations

Calculation of I

The total input of solvent is given by the simple equation: I = I1 + I2

Calculation of I1

This is the quantity of solvents used in the process. The quantity should be determined from the consumption of all solvent containing materials, this includes all coating materials, but also any thinners and cleaning materials used.

This requires a full and accurate record of all materials delivered to storage during this period. It also requires a stock take of materials in storage at the beginning and end of the mass balance period.

Consumption = Solvent in storage at start of mass balance + Solvent received during the mass balance period – Solvent in storage at the end of the mass balance.

To make this calculation, you will need to know the solvent content of each material used as well as the total quantity of each material used.

The solvent content may be available from the information provided by the supplier, e.g. quality control data, or possibly from the safety data sheet. Alternatively, it could come from sampling and analysis of incoming raw materials.

Note, that for compliance with the requirements of IED Article 59.5 (ref 2) it is important to check the content of the applied solvents regarding CMR substances or other hazardous organic substances. It is recommended to ask the suppliers for a written confirmation and to check additionally the components data in Section 3 of the Safety Data Sheets.

It is very important to determine this figure with the highest level of accuracy possible. Calculating total or fugitive emissions often involves measuring the difference between two big numbers, thus the error in determining these numbers could drown out the effect that is being sought to detect.

The solvent content of each substance may only be available as a range. This introduces uncertainty into the mass balance calculation. In order to minimise uncertainty, it is preferable to base calculations on measured data provided by the manufacturer with each batch, rather than MSDS. If this is not available, it may be necessary that the operator measures the solvent content of some incoming raw materials.

Calculation of I2

This is the quantity of solvent that is recycled internally during the mass balance period. Any such material in storage at the beginning and end of the mass balance period must be included in the stock taking exercise used to determine I1.
Solvent might be recovered from condensers, adsorbent materials or spent scrubbing liquors used in air abatement systems. These may be sent offsite for further treatment and recovery (see O7 and O8). However, some may be reused, or used for a different purpose than that which was originally purchased. For example, solvents present in coatings recovered from condensers might be used as thinners or for cleaning.

Calculation of O1

(Emissions in waste gases)

O1 has been sub-divided into O1.1 and O1.2 depending on whether the captured emission is treated or untreated.

The total is given by the simple equation: O1 = O1.1 + O1.2

Calculation of O1.1

(Emissions in waste gases, captured emissions which are treated)

All emissions which use abatement must be monitored. If emissions are greater than 10 Kg C/h, this monitoring must be continuous. Otherwise, monitoring may be periodic, at least once per year. These emissions may also need to comply with a concentration based ELV. Compliance with concentration based ELVs is not considered in this guidance.

Where this is the case, periodic monitoring must be done under the conditions expected to coincide with the expected maximum release during normal operating conditions. However such monitoring could overestimate the actual emissions if used in mass balance calculations. Thus additional monitoring under a range of different operating conditions could be necessary to calculate the overall mass emission.
Use of emission limit values instead of real data is not recommended as this will overestimate the value of O1.1. This, in turn will result in an underestimate of other parameters that are determined by difference.

Measurement from a thermal or catalytic oxidiser or more rarely from a bio-reactor will normally be made using an FID device and will be measured as Total Volatile Organic Carbon (TVOC) and expressed as mgC/Nm^3. All measurements of TVOC should be carried out according to the standard BS EN 12619.

To convert this measurement to a mass emission of solvent will require firstly the ratio of the molecular weight of the solvent and that of the carbon content of the solvent. This assumes that all the TVOC is still present as the original solvent. Whilst this is almost certainly not the case, this assumption represents a worst-case scenario from the point of constructing a mass balance.

Measurement from an adsorption bed or similar can be done in the same way. Here the solvent is not changed by the abatement. The solvent is not destroyed by abatement simply removed from the air and transferred into a liquid or solid medium. In these cases, it may be more appropriate to measure the solvent directly rather than convert from a measurement of TVOC.

Having measured or calculated the solvent concentration in the emission, the next step is to multiply the concentration by the volumetric flow of the air and the operating hours of the abatement equipment.

For mixed solvent streams, the ratio of solvents in the waste gas will not be the same as that consumed, due to their different volatilities and may vary over time due to production changes. To get a better under understanding of the solvents in the waste gas stream, it may be necessary to sample and used gas chromatography CEN/TS 13649:2014.

Practical experience has shown that after the completion of painting processes, the release of solvents does not abruptly return to zero. In particular, dissolved solvents are further released (stripped) from wet scrubbers or adsorbent beds over a longer period (1 to 2 hours). This must be respected in the mass balance calculation. Measured emission mass flows from stacks must always be determined from the simultaneous measurement of substance concentrations and the flue gas volume. If the determination of solvent mass flows is part of the measuring task, the necessary parameters for the calculation of the exhaust gas volume flow will be simultaneously determined, in addition to the actual pollutant measurement. Therefore, solvent mass flows which are determined either continuously or periodically should be based on matching pairs of substance concentration and waste gas flow figures. It should be noted that the volumetric flow rate measurement is an important contributor to the uncertainty of the overall mass release calculation.

One way to cope with this intrinsic disadvantage of periodic monitoring, is to supplement each sampling and monitoring campaign for a specific release point by recording the throughput of the product units and/or the coating material /solvents used. This data could then be used to derive an emission factor for that specific process, which can then be used to calculate emissions based on production information. The advantage of this method is that a more realistic result of the annual emission is attained, especially if the factory operates with changing production levels.

Calculation of O1.2

(Emissions in waste gases, captured emissions which are untreated)
The extent to which emissions monitoring is carried out will not be less for untreated emissions than for treated emissions.

Any captured emission of 10 Kg/hr or more must be continuously monitored. But it is unlikely that any such emission would be unabated. If this is the case, BAT would be to treat that emission and so move the emission from O1.2 to O1.1.

Any captured emission of 0.3 Kg/hr or more must be monitored at least annually, regardless of whether there is abatement in place. For smaller emissions, calculations may be used. These emissions may also need to comply with a concentration based ELV. Compliance with concentration based ELVs is not considered in this guidance. Note: the monitoring threshold is 10 g/hr where substances meeting the criteria of Article 58 are used and 100 g/hr where substances meeting the criteria of Article Art 59.5 are used.

Measured emission mass flows from stacks must always be determined from the simultaneous measurement of substance concentrations and the flue gas volume. If the determination of solvent mass flows is part of the measuring task, the necessary parameters for the calculation of the exhaust gas volume flow will be simultaneously determined, in addition to the actual pollutant measurement. Therefore, solvent mass flows which are determined either continuously or periodically should be based on matching pairs of substance concentration and waste gas flow figures. It should be noted that the volumetric flow rate measurement is an important contributor to the uncertainty of the overall mass release calculation.

One way to cope with this intrinsic disadvantage of periodic monitoring, is to supplement each sampling and monitoring campaign for a specific release point by recording the throughput of the product units and/or the coating material /solvents used. This data could then be used to derive an emission factor for that specific process, which can then be used to calculate emissions based on production information. The advantage of this method is that a more realistic result of the annual emission is attained, especially if the factory operates with changing production levels.

Calculation of O2

(Organic solvents lost in water)

If appropriate taking into account wastewater treatment when calculating O5.2. Solvents may be found in the circulating water of wet scrubbers, e.g. for paint overspray, in dryer oven condensates, and in wastewater from electrophoretic dip coating.

Wet scrubbers are usually run as closed loop systems. Solvent containing paint sludge will be removed from time to time. If the volume of wastewater is low, this may also be removed from site in drums or by tanker. In which case both streams should be considered as waste (O6).

If solvent containing wastewater is treated in a wastewater treatment plant which is operated on the same site, the abated quantity is counted as O5.2, and only the remaining quantity which leaves the installation is O2. Any solvent evaporation from the wastewater treatment plant will contribute to O4.

Sampling of wastewater would ordinarily be done using a flow proportional sampler, this way the concentration in the sample multiplied by the flow will give the mass emission rate. However, if the solvent is volatile, grab sampling might be more appropriate due to evaporation losses between sampling and analysis.

Emissions from a biological treatment plant will normally be measured as Total Volatile Organic Carbon (TVOC) and expressed as mgC/l. All measurements of TVOC should be carried out according to the standard BS EN 1484.

To convert this measurement to a mass emission of solvent will require the ratio of the molecular weight of the solvent and that of the carbon content of the solvent. This assumes that all the TVOC is still present as the original solvent. Whilst this is almost certainly not the case, this assumption represents a worst-case scenario from the point of constructing a mass balance.

Measurement from an adsorption bed or similar can be done in the same way. Here the solvent is not changed by the abatement. The solvent is not destroyed by abatement simply removed from the water and transferred into a solid medium. In these cases, it may be more appropriate to measure the solvent directly rather than convert from a measurement of TVOC.

Emissions to water may also need to comply with a concentration based ELV. Compliance with concentration based ELVs is not considered in this guidance.

Calculation of O3

(The quantity of organic solvents which remains as contamination or residue in products output from the process/activity.)

The VOC remaining as contamination or residue in the product is considered part of the fugitive emission because it will be slowly released to the environment during the lifetime of the product.

For coating processes, it will be necessary to take an emission factor approach to calculating this figure. For example, by calculating the amount of coating material applied to each production unit (after drying / finishing) and the residual VOC content

Heatset web offset printing is a special case in that the solvent residue in the finished product is not to be considered as part of the fugitive emissions. This is because the solvent used in the ink is not a VOC under ambient conditions. (It is a VOC only under the conditions used in the production process.) Thus O3 = 0.
Nevertheless, the amount of residual solvent still needs to be calculated and removed from the overall fugitive emission figure.

Calculation of O4

(Uncaptured emissions of organic solvents to air.)
This includes the general ventilation of rooms, where air is released to the outside environment via windows, doors, vents and similar openings.

This figure is very difficult to measure directly. In almost all cases, it will only be possible to calculate this by difference by measuring the other parameters in the mass balance equations. O4 is only one component in the fugitive’s figure (F), however it could be the dominant one.

For areas with controlled ventilation systems, it may be possible to use occupational health monitoring techniques to determine the amount of solvent present in the workplace air and multiply this by the number of air changes and their volume. Workplace air will need to comply with any relevant occupational health standard under Health and Safety Law.

Calculation of O5

(Organic solvents and/or organic compounds lost due to chemical or physical reactions.)

O5 has been sub-divided into O5.1 for solvents destroyed in air abatement systems and O5.2 for solvents destroyed in water abatement systems.

The total is given by the simple equation: O5 = O5.1 + O5.2

Calculation of O5.1 (Emissions to air)

This calculation can only be made, when the emission is treated in an abatement device that destroys the solvent, i.e. a thermal or catalytic oxidiser or a bio-filter, or in a boiler plant.

Solvents, which are captured and leave the installation as solvent containing wastes, wastewater or by-products cannot be counted as O5.1.

This parameter is the quantity of solvent destroyed by the abatement device. Therefore it is necessary to measure the destruction efficiency of the abatement device. To do this, a monitoring exercise under a range of typical operating conditions will need to be carried out.

The destruction efficiency will be the:

100 x (Solvent inlet conc – Solvent outlet conc) / Solvent inlet conc

To calculate the solvent outlet concentration, it will be necessary to convert the measurement of TVOC using the ratio of the molecular weight of the solvent and the carbon content of the solvent as described in the calculation O1.1.
Once the destruction efficiency has been determined. O5.1 can be calculated as follows:

O5.1 = O1.1 x 100 / (100 – destruction efficiency)

Installations using more than one solvent may find that the destruction efficiency is different depending on the mix of solvent in use. This may need to be factored into the monitoring exercise. This may be the case where central abatement units collect waste gases from several application booths and/or dryer ovens. Continuous measurement may be a cost-effective alternative in such cases.

Calculation of O5.2 (Emissions to water)

This calculation can only be made, when the emission is treated in an abatement device that destroys the solvent, e.g. a biological treatment plant.

This parameter is the quantity of solvent destroyed by the abatement device. Therefore it is necessary to measure the destruction efficiency of the abatement device. To do this, a monitoring exercise under a range of typical operating conditions should be carried out.

The destruction efficiency will be the:

100 x (Solvent inlet conc – Solvent outlet conc) / Solvent inlet conc

To calculate the solvent outlet concentration, it will be necessary to convert the measurement of TVOC using the ratio of the molecular weight of the solvent and the carbon content of the solvent as described in the calculation O2.

Once the destruction efficiency has been determined. O5.2 can be calculated as follows:

O5.2 = O2 x 100 / (100 – destruction efficiency)

Installations using more than one solvent may find that the destruction efficiency is different depending on the mix of solvent in use. This may need to be factored into the monitoring exercise

Calculation of O6

(Organic solvents contained in collected waste)

Careful and accurate recording of waste disposal is an important part of the solvent mass balance calculation. This also applies to streams O7 and O8.
Solvent containing wastes could include:

- Waste paint, ink, adhesive or coating material
- Waste solvents
- Sludges
- Other solvent containing materials, examples are: packaging material, filters, spent waxes, wiping clothes.

It is important that both the quantity and solvent content of each waste stream is accurately recorded, so this parameter can be calculated. Waste can be highly variable in both quantity and solvent content. It can also be notoriously difficult to get representative samples of some solid waste streams for analysis. This has the potential to be a source of uncertainty in the overall mass balance calculation.

If unused paint or other materials are returned to the supplier for reuse, then this does not count as waste and should be excluded altogether from the mass balance.

Those waste streams which are sent to a treatment facility for the recovery and reuse of the solvent. E.g. where an adsorbent has been used for abatement, e.g. in a carbon filter. If that material is sent to an offsite facility which desorbs the solvent and collects this for reuse, then this should be counted under O8 rather than O6.

Solvent streams collected from condensation systems. Some of this might be reused directly in which case it will be part of stream I2. Otherwise it will also be counted under O8.

Waste water streams, e.g. those arising from water scrubbers used for abatement, if these are discharged to water or sewer, this should be counted under O2. Although the sludge from scrubbers will probably be a waste. Waste water taken away in containers or by road tanker should be counted under O6.

Calculation of O7

(Organic solvents, or organic solvents contained in mixtures, which are sold or are intended to be sold as a commercially valuable product)

Those waste streams which are sent to a treatment facility for the recovery and recycling of the solvent, but not for its reuse, should be counted under O7 rather than O6 or O8.

Examples could include the use of limestone as an adsorbent material. The spent limestone is sent to a cement plant with the adsorbed solvent used as part of the fuel. Disposal of spent carbon adsorbent at a hazardous waste incineration plant would not count as O7 but as O6.

Solvent might be recovered on site from condensers, adsorbent materials or spent scrubbing liquors used in air abatement systems. These may be sent offsite for further treatment and recovery. If this was then reused, it would count as O8, otherwise it should be counted here as O7. However if some of this stream is used internally, that portion would count as I2, and not be included in this figure.

Calculation of O8

(Organic solvents contained in mixtures 'recovered for reuse but not as input into the process/activity, as long as not counted under O7)

Those waste streams which are sent to a treatment facility for the recovery and reuse of the solvent. E.g. where an adsorbent has been used for abatement, e.g. in a carbon filter. If that material is sent to an offsite facility which desorbs the solvent and collects this for reuse, then this should be counted under O8 rather than O6 or O7.

This will also include those solvent streams collected from condensation systems. Some of this might be reused directly in which case it will be part of stream I2. Otherwise it will also be counted under O7 or O8.

Calculation of O9

(Organic solvents released in other ways)

Category O9 should be limited to the release of organic solvents in ways that are otherwise difficult to categorise. For example, it can be used to record solvents released through spillages, accidents or abnormal events arising from other than normal operating conditions. Care is needed to avoid omissions or double counting of such streams.

It may not be possible to totally disaggregate such emissions from other parameters, whilst a solvent spillage will produce more waste (O6) from clean up, there will also be an increase in fugitive emissions to air (O4) and some release to water (O2).

However attempting to identify and separately classify these events should assist operators and Regulators in understanding the level of emissions that can ordinarily be expected from a well performing plant.