Appendix 3a

Emissions Control

1 Monitoring Methods

1.1 Emissions to atmosphere.

Potential point source of emissions from pyrolysis ovens are the emission stacks located on each oven. Pyrolysis Oven Model PTR675 No.1 & No.2 have two 400mm insulated stacks at a minimum height of 11.5 meters from ground level. Each stack receives a representative emission flow from the oven, with air flow split evenly between each stack. Pyrolysis Oven PTR92 No.3 is a smaller oven model with 350mm insulated stack at minimum height of 11.5 meters from ground level. Both models have the same pyrolysis functions and process.

Stack height to be constructed in accordance with Technical Guidance Note Dispersion D1, ensuring minimum stack height of 3 meter above ridge height of process building.

NMUK propose to carry out monitoring and control of emissions to atmosphere from the facility in accordance with Process Guidance Note 2/09(13) and the relevant best available techniques.

Non-continuous monitoring:
Non-continuous monitoring will be carried out in line with Process Guidance Note 2/09(13), adhering to the frequency requirements listed in Table 1.1.

Table 1.1 Non-continuous Monitoring Frequency

Shop	Facility	Frequency
		Annual
Metal Decontamination	Pyrolysis Ovens 1	✓
	Pyrolysis Ovens 2	✓
	Pyrolysis Ovens 3	✓

Shop	Facility	Frequency
		Annual
Metal Decontamination	Pyrolysis Ovens 1	✓
	Pyrolysis Ovens 2	✓
	Pyrolysis Ovens 3	✓

Non-continuous monitoring will be carried out by a third-party organisation under contract to NMUK. All instrument calibration will be carried out by the monitoring organisation, in line with emission monitoring methods detailed in Table 1.2 and Appendix 3b. Monitoring will be undertaken in line with reference conditions for limits in Section 4 of Process Guidance Note 2/09(13) which specifies 273.1K, 101.3kPa, without correction for water vapour content, unless stated otherwise. The parameters monitored listed in table 1.2, are those specific to the NMUK pyrolysis process, which will only treat components contaminated with paint. The reference conditions should be normalised to 11% oxygen measured dry, averaged over the firing cycle.

On completion of sampling and analysis, written survey reports are issued to NMUK. The reports will then to be forwarded to the local authority (Sunderland City Council) in accordance with permit reporting requirements.

As part of the commissioning test of each oven a full suite of non-continuous monitoring will be undertaken in line with the parameters and methods listed in table 1.2.

Emissions monitoring methods Table 1.2.

Shop	**Facility**	**Emissions Monitoring Method**			
		Oxygen	**Total Particulate Matter**	**Organic Compounds**	**Chloride**
		Method TP2	**Method TP1**	**Method TP5**	**Method TP4**
Metal Decontamination	Pyrolysis Oven PTR675 No.1	✓	✓	✓	✓
	Pyrolysis Oven PTR675 No.2	✓	✓	✓	✓
	Pyrolysis Oven PTR92 No.3	✓	✓	✓	✓

Continuous Monitoring:

Process Guidance Note 2/09(13) requires indicative continuous monitoring of total particulate matter during metal decontamination processes. In line with current industry practises, NMUK consider the Controlled Pyrolysis Cleaning Ovens, will operate sufficiently within the emission limits on a consistent basis that continuous monitoring of total particulate matter would not be required on all stacks.

NMUK propose to install a continuous monitoring probe on each oven and complete a period of rigorous commissioning tests and ongoing periodic monitoring to demonstrate compliance. On the Pyrolysis Oven Models PTR675 No.1 & No.2 only one of the stacks of each oven will have a continuous monitoring probe installed. This is believed sufficient as each stack receives a representative emission flow from the oven, with air flow split evenly between each stack. Stack infrastructure will allow for the probe to be circulated between stacks. Oven PTR92 No.3 has one stack and will have a designated continuous monitoring probe for total particulate matter.

Each oven will be installed on a phased installation plan. Pyrolysis Oven PTR675 No.1 will be the first oven to be installed within the paint removal building. This will be in a trial position until commissioning and installation buy off has been confirmed. Following the test commisioning of Oven No.1, the two remaining ovens are to be installed in the final position, undergoing a period of commissioning. Oven No.1 will subsequently be relocated into the final position as detailed in Appendix 1b of this application.

NMUK commissioning proposal includes continuous monitoring per individual stack, allowing sufficient time to process all combinations of batch components to be cleaned and thus demonstrating emissions remain within compliance for all batch combinations.

From the point of installation NMUK propose to undertake a minimum period of two weeks per stack of continuous total particulate matter monitoring to provide sufficient data for review of compliance. See Table 1.3.

Table 1.3 Commissioning Period

Shop	Facility	Total Particulate Matter: Commissioning Period	
		Stack 1	Stack 2
Metal Decontamination	Pyrolysis Oven PTR675 No.1	2 Weeks	2 Weeks
	Pyrolysis Oven PTR675 No.2	2 Weeks	2 Weeks
	Pyrolysis Oven PTR92 No.3	2 Weeks	NA

Total Particulate Matter continuous monitoring will be carried out, using an MCERTS approved particulate measurement system for continuously monitoring emissions from industrial sources. The equipment proposed is a single-sensor system, mounted within the emissions stack at a minimum of 3 meters above the point the stack leaves the oven containment. The sensor has the ability to monitor within a potential stack temperature of over 800 degrees C. The instrument measures the current signature created by particles interacting with the sensing rod in the stack. The sensor extracts a specific frequency band of this signal and electronically filters out the DC current caused by particle collisions. The signal may be correlated to dust concentration by comparison to the results of an isokinetic sample for those types of industrial applications for which the instrument is designed.

Continuous monitoring probes will be subject to an annual calibration by an appointed contractor, which include servicing and testing. Probe will be altered in line with calibration factor established during testing.

The data output is taken from the single sensor system to a central processor from which, operators will be able to view the level and variation of emissions in real-time via a continuously updated data display and in addition provide an early warning and local alarm in the event of a breach of particulate matter emission limits.

Data can then be downloaded to review trends and analyse data relevant to batches being processed within the pyrolysis ovens. From this data NMUK will be able to demonstrate that all batches are continuously compliant.

Continuous monitoring commissioning tests will also be confirmed by a schedule of manual monitoring undertaken by a third party. This will include the full non-continuous monitoring permit requirements suite (Table 1.2) on three separate occasions during the 2-week commissioning period of each stack.

It can be noted continuous monitoring of total particulate matter is not industry practice, where equivalent emission compliant processes of metal documentation by pyrolysis is only monitored though periodic emissions testing and not via a fixed continuous monitoring system. In addition, test data provided by the supplier within Table 1.4, show periodic monitoring levels to be consistently within emission limits.

Following commissioning and during normal operation, if a breach of total particulate matter is identified during periodic monitoring an investigation will be undertaken and a schedule of retesting completed to demonstrate the process remains in compliance.

Continuous temperature monitoring and automatic recording will be used to demonstrate that optimal temperature and residency time (> 850 degrees centigrade and at least 2 second residency time) is being maintained within the ovens, to achieve satisfactory destruction of VOCs and emissions in line with the commissioning profile, thus also negating the requirement for continuous VOC monitoring.

Ensuring continued efficient operations and compliant emissions will be further supported by a written preventative maintenance programme.

Table 1.4 Supplier Test Data

Component	Test Results 2004	Test Results 2010	Test Results 2014	Limit Values mg/m³				
				UK	Germany	Netherlands	Belgium	Spain
Total Particulate mg/m³ note 1	1.38	0.5	4	20	20	25	30	10
VOC as C mg/m³ Organic compounds	5.5	5.0	1.2	20	20	50	30	10
HCl mg/m³ Hydrogen chloride	0.00	0.00	0.7	10	20	Unknown	Unknown	7
Afterburner Temperature	850°C	850°C	850ºC 2 second dwell period	850°C 2 second dwell period	850°C 2 second dwell period	850°C 2 second dwell period	850°C 2 second dwell period	850°C 2 second dwell period

Odour Emissions:

The pyrolysis oven control system process ensures the removal of contaminants from emissions, as result it is anticipated by NMUK that the process will not generate any odour outside of the installation boundary.
It is recognised there are potential sensitive receptors within the vicinity of the installation boundary, as a result a procedure is in place to respond to any odour reports.

Within the certified environmental management system detailed in Appendix 4a of this application NMUK operate to a number of procedures relating to management of potential odorous emissions to atmosphere:

21CP05 Communication - The Needs & Expectations of External Interested Party's
21CP11 Contact with Environmental Regulatory Bodies
21CP19 Olfactory Assessment of Emission

If NMUK receive a report of odour detected beyond the site boundary, for which the source is believed to be within the NMUK site boundary, an investigation will be carried out. The investigation may include a review of the following factors:

- Results of olfactory assessments of emissions
- Wind Speed & direction
- Location of reported odour in relation to NMUK
- NMUK process activities
- Environmental Concern Reports raised
- Facility malfunction and breakdown reports
- Other applicable variables, which may effect facility operations.

Correspondence regarding odour reports are recorded and reported on an Environmental Concern Report portal. The last reported odour report was dated as 8 February 2022, with in frequent reports prior to this date. All reports were processed in line with NMUKs EMS with the outcomes communicated to the relevant interested parties.

From the frequency of odour reports received from the existing site facility and the mitigation in place for the pyrolysis ovens process, NMUK to do not consider odours to be significant, as defined in the EMS. In line with the EMS, NMUK will continue to respond to reports received from external individuals or organisations, of odour detected outside the site boundary that are believed to have originated from on site process.

Noise Emissions:

NMUK commission a third-party organisation to undertake annual off-site environmental noise surveys and assessment. Measurements are taken of identified key industrial sound sources throughout the site. The surveys and subsequent assessments consider the nearest individual or group of sensitive receptors, typically residential areas; during normal site operations at NMUK. It is intended that the survey provides information relevant to NMUKs responsibilities regarding their impact on the local environmental noise climate.

The noise survey was initially carried out to comply with the requirements of permits issued under the Pollution Prevention and Control Regulations (PPC) / Environmental Permitting Regulations (EPR); Ref: LA-IPPC/A2/CTG1/2005 and LA-IPPC/A2/NER1/2006. A noise monitoring programme commenced in 1993. Surveys and assessments were carried out as a continuation of this programme, in support of the site-specific permits. The survey covers the entire NMUK site at Sunderland, where recent findings continue to conclude the day time and night-time noise levels at the nearby residential properties are dominated by local traffic and A19 traffic.

Noise from the movement of traffic on the A19 and surrounding local road network is dominant. Calculated noise levels from various sources at the NMUK site are measured and compared to the background levels at the nearby residential properties indicating that noise from NMUK site is unlikely to give rise to complaint. It is considered the pyrolysis oven process will not add to the noise generated by the overall NMUK facility.

NMUK will continue to carry out regular environmental noise surveys in compliance with relevant standards at a frequency deemed appropriate taking plant conditions into account.

Visible Emissions:

Due to the afterburner abatement process within the ovens it is not expected that any visible emission will be produced from the pyrolysis process. This will be ensured through scheduled maintenance and operational checks. In addition, stack emissions will be visually monitored as part of operation checks to ensure they do not exceed the equivalent of Ringelmann shade 1 as described in British standard BS 2742.

Contingency Assessment:

Maintenance
To ensure efficient and an emission compliant process of the pyrolysis ovens, a written preventative maintenance programme will be implemented including a record of maintenance activities undertaken. Planned Preventive Maintenance activities to be undertaken in accordance with manufacturers guidelines and will be used to highlight any degradation in the system that may risk compliance and allow mitigation measures to be implemented to maintain a compliant process.

Critical Spares:
As there are very few moving parts to the ovens, the most common faults that occur are the water solenoid valves failing especially in areas with hard water and the water spray nozzles becoming blocked. Spray nozzles are critical for maintaining oven temperature. A stock will be retained on site, with spares available from supplier next day. All critical spares to be held in line with manufacturers guidelines.

Operational Controls

The process will be operated in line with Zone Instruction Sheets detailing performance standards expected of the operation to ensure compliant emissions. This will include standard operations and contingency procedures in the event of an emergency breakdown including abatement failure.

Key start up and shutdown controls will be integrated into the process to reduce the potential for high emissions, this includes minimising, where possible, the number of start-ups/shut-downs and having adequate procedures in place for start-up/shut-down emergencies.

With exception of loading, setting controls and unloading, limited operator attendance is required during the pyrolysis cycle. To maintain an emission compliant process, the following safety measures are built into the process:

1) If the water supply pressure is below 2.7bar under flow conditions i.e. with the water spray system on before start up, the primary burner will not light.
2) If, during the oven cycle time the pressure falls below 2.1bar the primary burner will be switched off.
3) On reaching a temperature 50 degrees centigrade above the main operating temperature (430 degrees centigrade) in the oven main chamber the water spray is activated to prevent overheating.
4) A manual reset thermostat set at 530 degrees centigrade is also situated in the main oven chamber and is the second line of defence against overheating should the water spray fail.
5) Situated in the furnace stack is a thermostat set at a temperature 60 degrees centigrade above the maximum idle temperature of the stack, which can range between 850 and 950 degrees centigrade depending on the type of oven. The thermostat will operate the water spray when this temperature is reached. This has the effect of limiting the production of Pyrolysis gas to a rate that the secondary burner system can handle with a wide safety margin.
6) An alarm function is built into the stack temperature controller which is activated when the temperature in the stack rises a further 50 degrees centigrade above the set point outlined in point 5. When activated water spray is sprayed into the oven main chamber at a rate of 3.9 litres per minute. This spray system is independent to the ones mentioned previously and is designed to prevent overheating should the other water spray system fail or the furnace be overloaded and unable to control the rate of smoke emission even with the primary water spray operating.
7) If for any reason the secondary burner fails, power to the primary burner will be interrupted.
8) Door interlock is provided to prevent the doors of the furnace being opened during the operating cycle. This can be set to a temperature determined by the client, usually 260 degrees centigrade and will not allow the furnace doors to be opened when the temperature is above this point.
9) Gravity sealed explosion relief door are in place to protect the oven chamber from over pressuring.

In the event of complete oven failure there is sufficient capacity within the remaining two ovens to handle NMUK cleaning requirements. In the event of further failure, components will be sent for offsite treatment at a permitted cleaning facility.