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Office of Environmental Enforcement,
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**Date:** 27/11/15

**Licence Ref. No: W0184-1**

Dear Ms Fogarty,

I refer to our proposal to install an odour abatement system and the Agency's subsequent approval of our proposal (dated September 28th) which also requested submission of a programme for the installation and testing of the proposed system.

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The abatement system will represent a very significant investment in our Portlaoise facility and the company need to ensure that the system will serve its needs for the long term. The proposed condenser based system indicates on technical assessment a high degree of assurance in achieving a very significant reduction in odour/air emissions. However, insufficient performance warranties are available from the suppliers of the proposed condenser based system in respect of the level of odour abatement and which Enva require for the scale of the investment involved. There is also concern that the proposed condenser system would have little or no ability to abate compounds that are gaseous and odourous at low temperatures. Finally Enva was unable to identify a suitable reference site that processed the same range of wastes on a similar scale using a condenser based abatement system. As a result of these factors Enva now wish to enhance the odour abatement proposal submitted to the Agency as detailed herein.

Odour abatement techniques are generally more technically challenging than many emissions controls. However, Enva are resolutely committed to identifying and installing the most appropriate and effective odour/air emissions abatement system at our facility. Since making the submission, Enva have in addition to preparing for the installation of the condenser based system also continued an ongoing investigation into available odour abatement technologies. During our preliminary review of potential abatement techniques we had identified both condensation and thermal oxidation as potentially suitable abatement techniques. While we have focused on progressing a condenser based system we have also continued to further assess thermal oxidation as an odour abatement solution for the facility. Thermal oxidation is widely recognised and accepted as being the most effective odour abatement technique, although it is generally the most costly option.

We acknowledge that this proposed enhancement will inevitably lead to a short term delay in implementing a solution for potential nuisance odours, however it is in all parties interest that the issue is resolved in the most effective and reliable manner for the long term. A thermal oxidation



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solution will require a significantly higher level of investment than the condenser based system but will provide a much greater level of assurance in terms of odour and emissions abatement. We are therefore proposing some additional temporary measures in the interim as detailed herein.

**Abatement Proposal**

The proposed system will continue to involve capturing the air emissions from the three drying tanks using ducting but instead of ducting the emissions to a chiller the system will deliver the airstream to a Regenerative Thermal Oxidiser (RTO). The RTO will expose the air emissions stream to a high temperature on aerobic conditions thereby thermally oxidising the odourous compounds before being emitted to atmosphere. The proposed location of the RTO will be adjacent to the existing boiler house and stack (see Attachment 1).

The operation of the proposed abatement system is detailed in Attachment 2 and summarised as follows:

Step 1 Capture & Preheat: The warm moist airstream from the tanks is captured by new ductwork to be installed and delivering the exhaust airstream to an initial preheat step to increase the temperature to over 110$^{o}$C. This is to ensure there are no air droplets in the airstream and prevent corrosion in the RTO. The preheat step will be facilitated by a heat exchanger with the heat feed being provided by steam from the existing steam raising boiler.

Step 2 Thermal Oxidation: Subsequent to the pre-heat step the exhaust airstream is then drawn into the RTO by the RTO fan.

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Step 2a: Once within the RTO the exhaust stream is directed alternately by time controlled dampers to the appropriate zones of hot ceramic heat exchanger media. The heat exchanger bed is comprised of three regenerator columns of ceramic media. At any given moment, the exhaust stream moves upwards through the media taking on heat and raising the temperature (to approximately 780 °C) such that the odourous/VOC compounds start to oxidise.

Step 2b: The air is then routed through to the combustion chamber in the upper section of the RTO. In the combustion chamber of the RTO, the natural gas fired burner increases the temperature of the exhaust gas to at least 850 °C, thus completing the oxidation process.

After the combustion chamber the oxidised airstream then travels up through one chamber and then down through another to facilitate heat transfer (back into the ceramic media) before being discharged to atmosphere through the exhaust stack. There are 3 chambers of ceramic media in the RTO, and the airstream travel path is altered depending on the temperature in each of the chambers. The airstream will travel through 2 of the 3 chambers, the path being controlled by the valves at the bottom of the chambers – they open and close on a cyclical basis, determined by the temperature in each of the chambers.

In the RTO, part of the clean air flows through one of the two upward zones in order to purge the zone prior to entering the clean side. Due to this mode of operation, one of the columns is always purged clean preventing any pollutant leaks during switching over of the RTO inlet valves.

The RTO is started and heated up at a reduced flow rate by the natural gas burner system. For safety reasons, the RTO will be operated for start-up and shut-down only with fresh air.

The system is designed for a high thermal efficiency to reduce the energy consumption of the burner to a minimum. Any solvent loading in the exhaust air provides additional energy for the oxidation

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process. The potential for additional heat recovery was considered as part of the design and discussed with the proposed supplier of the RTO. However because the proposed system is highly efficient in recovering heat with an outlet temperature of only circa 120°C and the process of drying oil is not operated continuously it is not currently proposed to install such a heat recovery system.

The RTO requires approximately 90 minutes to come up to the required temperature (850°C) from a cold start. As the oil drying process also entails heating of the oil this is straightforward to interlock the system such that drying will not commence until the RTO is operating at the required temperature of 850°C. In any case it is proposed that the RTO can be automatically set to start at a particular time and thus be available at the operating temperature when required.

**Abnormal Operation & Safety Measures**

In the event that the RTO shuts down for any reason, an emergency valve will automatically open and allow the exhaust air to bypass the RTO and discharge to the atmosphere via the proposed RTO stack. Drying of oil will be promptly stopped in an orderly and safe manner thereafter and no drying will take place subsequently until the RTO is operating correctly and the operating temperature is at least 850°C. All such events will be recorded and communicated to the Agency

In the event of a by-pass of the RTO an alarm will provide visual and audible indication of the by-pass to production operators and a controlled shutdown of the drying process will take place. All by-pass events will be recorded and reported to the Agency.

The system has been designed to prevent the establishment of a potentially explosive atmosphere within the ductwork system prior to treatment in the RTO. This involves the provision of LEL sensors monitoring in the exhaust ductwork to ensure that the maximum concentration of VOCs in the exhaust is maintained below 25% LEL by controlling the addition of dilution air and isolating the header in the event of LEL's above 25% (bypassing the RTO). See attached Schematic of the RTO.

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**Interim Temporary Measures**

As the proposed modification to the abatement system will lead to several months delay in installing the system Enva are proposing to extend the height of the drying tank chimneys on a temporary basis until RTO installation is complete. The extension to the existing tank chimney is expected to provide an increased level of dispersion of the existing emissions to atmosphere and thereby reduce the potential for odour nuisance. Initially one drying tank chimney will be extended and if this is successful the other two chimneys would then be similarly extended. It is proposed to extend the existing chimney heights by 3m until the RTO is installed and operational.

**Air Emissions**

The proposed abatement system will significantly reduce the existing impact associated with the facilities current emissions to atmosphere. Thermal oxidation is widely acknowledged as the most effective odour abatement technique and the proposed RTO supplier (Durr) provide a performance warranty of at least 95% abatement in relation to organic odours. Thermal oxidation can also achieve very high destruction rates for inorganic odourous compounds and will deliver at least a 95% reduction in Hydrogen Sulphide, Ammonia and Mercaptans. While the proposed system is primarily an odour abatement system it will in tandem result in a significant reduction in the concentrations of VOCs being emitted currently. Thermal Oxidation can routinely deliver in excess of a 95% reduction in the concentrations of VOCs in an exhaust airstream.

The potential for Dioxin formation has also been considered during the design and was determined not to present a significant risk. Dioxin formation is generally associated with the presence of chlorinated compounds in the air stream being treated in a thermal oxidiser. The proposed RTO

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supplier (Durr) currently has several RTO units operating within Ireland some of which have relatively high levels of chlorinated compounds (up to 10g /Nm3) which are operated at 850$^{o}$C with no significant dioxin formation occurring (<0.1ng/m$^{3}$). However the risk of significant concentrations of chlorinated compounds in the exhaust air from the oil drying tanks is considered very low (primarily as the use of these compounds is very limited and well regulated). As such, the high temperature of the RTO coupled with the absence of elevated chlorinated solvents in the waste stream means the dioxin risk is very low.

The proposed emissions stack associated with the RTO will be located in close proximity to the existing boiler stack and will have a minimum height of 13m but not exceed the height of existing boiler stack at the facility (~20m). The stack will have a suitable access platform to facilitate monitoring of stack emissions.

**Parameter Monitoring**

The proposed abatement system would include recording of the following parameters:

| | |
|---|---|
| **RTO temperature:** | monitored and recorded continuously; |
| **LEL Meters** | monitored and recorded continuously; |
| **Pressure in ducting** | monitored continuously; |
| **TOC** | monitored quarterly; |
| **Dioxins** | monitored annually; |

**BAT/BREF**

The BREF for the Waste Treatments Industries (2006 adopted BREF) is the most relevant to the Enva facility and has been consulted as part of the abatement feasibility review for the heated oil tanks. Section 4.6.18 of the BREF outlines some the environmental benefits and operational data of Regenerative Thermal Oxidation as an abatement option. The document specifically recognises Thermal Oxidation as a waste gas treatment technique in Waste oil Processing (Table 4.70). Table 4.74 of the BREF compares a variety of VOC abatement techniques and indicates RTO to be the most flexible and well adopted technique. The BREF for Waste Treatments specifically states that for the re-refining of waste oils, BAT is to direct vent streams to a thermal oxidiser (BAT 99).

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A more recent related BREF document is the BREF for Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector (July 2014 formal draft) which includes draft details on best practice for odour abatement. Section 3.5.1.2.5 of this BREF indicates that regenerative thermal oxidisers can achieve odour abatement rates as high as 98-99.9% (refer Table 3.202 of the BREF) indicating the high efficiency of this system.

These BREF documents are the fundamental basis of best environmental practice in the EU. While it is important to note that these are currently undergoing a review process at EU level it is considered almost certain that Thermal Oxidation will continue to be included as a well established and recognised technique for odour and VOC abatement.

Enva would invite the Agency to assess the enhanced abatement proposal as detailed herein and respond as appropriate. Please do not hesitate to contact me should you require any additional information or clarification.

Yours Sincerely

Gareth Kelly
Director

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