

## Licence Alteration Request

Alteration Details		
Licence	<b>W0184-01</b>	<b>Enva Ireland Limited (Portlaoise)</b>
Licensee	Enva Ireland Limited	
Title of Alteration	<b>Installation of RTO Odour Abatement</b>	

### Screening Report

No.	Question	Answer
1	Does the proposed alteration require a new class of activity or process?	No
2	Does the proposed alteration cause a new / additional main emission point?	No
3	Does the proposed alteration increase or change specified emissions <b>significantly</b> ?	No
4	Does the proposed alteration increase <b>significantly</b> the overall total emission from the installation/facility?	No
5	Does the proposed alteration involve development or proposed development that has already been granted planning permission or requires a grant of planning permission and was/is subject to EIA by the Planning Authority or An Bord Pleanála?	No
6	Did the proposed alteration require the preparation of a Natura Impact Statement (NIS) for consideration by any Planning or Public Authority?	No
7	Does the proposed alteration indicate that the EPA should conduct an Appropriate Assessment (on foot of a screening for Appropriate Assessment)?	No
8	Does the proposed change conflict with BAT as set out in the relevant BAT Conclusions? See <a href="#">here</a>	No
9	Does the proposed alteration adversely affect the energy efficiency of the installation/facility?	No
10	Does the proposed alteration adversely affect the environmental risk of the installation/facility <b>significantly</b> ?	No



Application Details

License: W0104-01      Licensee: Evans & Sutherland Limited (EVS)

Licensee Address: Evans & Sutherland Limited

Title of Application: Installation of RTO Oxidation Apparatus

Summary Report

[Redacted Summary Report Content]

1. Does the proposed application require a new class of activity or process? ☐ No

2. Does the proposed application cause a new, or significantly increased, emission level? ☐ No

3. Does the proposed application cause or significantly increase emissions? ☐ No

4. Does the proposed application cause or significantly increase the level of total emission from the site? ☐ No

5. Does the proposed application involve development of a new or significantly increased emission level? ☐ No

6. Does the proposed application require the installation of a new or significantly increased emission level? ☐ No

7. Does the proposed application require the installation of a new or significantly increased emission level? ☐ No

8. Does the proposed application require the installation of a new or significantly increased emission level? ☐ No

9. Does the proposed application require the installation of a new or significantly increased emission level? ☐ No

10. Does the proposed application require the installation of a new or significantly increased emission level? ☐ No

For inspection purposes only.  
Consent of copyright owner required for any other use.



## Licence Alteration Request

11	Does the proposed alteration cause an increase above the capacity limitations specified in the licence?	No
12	Does the proposed alteration require an extension of operating hours (where controlled by the licence) for an installation/facility where the public is likely to have an interest in such an extension?	No
13	Does the proposed alteration involve the incineration or co-incineration of waste materials displaying hazardous properties that were not previously authorised (as per the WID/IED)?	No
14	Does the proposed alteration introduce materials or techniques which adversely alter the probability, magnitude and duration or complexity of the site transboundary impact?	No
15	Does the proposed alteration constitute a substantial change?	No
16	Does the proposed alteration require a change to a condition or schedule of the Licence?	Yes

### Recommendation

Based on your responses to the forgoing questions the recommended option is for you to submit a 'Request Licence Amendment' for this proposed alteration.

To submit this request to the EPA you should locate it in the 'Request Alteration' area in LMA. Click on 'Proceed' against this saved request, and then click on the 'Request Licence Amendment' button (in STEP 2 of the process). Then you will be required to provide more detailed information about your proposed amendment.

Note: The responses you have provided in this Screening Report will form part of the information record if you decide to proceed with this alteration request.

Recommendation Date: 27/11/2015

### Clerical or Technical Amendment Application Details

#### Proposed Alteration Description

Installation of a thermal oxidiser to abate odour emissions from the existing oil drying tanks. Please see attached documentation for further details.

#### Priority

3. Urgent

#### Category of Amendment

(b) Facilitating the doing of any thing pursuant to a condition attached to the licence where the doing of that thing may reasonably be regarded as having been contemplated by the terms of the condition or the terms of the licence taken as a whole but which was not expressly provided for in the condition





11. Does the proposed alteration involve the use of hazardous materials?  
No
12. Does the proposed alteration involve the use of hazardous materials?  
No
13. Does the proposed alteration involve the use of hazardous materials?  
No
14. Does the proposed alteration involve the use of hazardous materials?  
No
15. Does the proposed alteration involve the use of hazardous materials?  
No
16. Does the proposed alteration involve the use of hazardous materials?  
Yes

For inspection purposes only.  
Consent of copyright owner required for any other use.

[Redacted text]

[Redacted text]

[Redacted text]

[Redacted text]

[Redacted text]

[Redacted text]

[Redacted text]

[Redacted text]

[Redacted text]

[Redacted text]

[Redacted text]

[Redacted text]



## Licence Alteration Request

Licence Condition Changes		
Condition / Schedule Reference	Current Condition / Schedule Wording	Suggested New Wording
5.3	Condition 5.3	Drying of waste oils will be carried out with an appropriate abatement system operating to ensure air emissions from these tanks do not give rise to nuisance at the facility or the immediate area of the facility.

Questions		
Q1	Is planning permission required to support the proposed alteration?	No
Q2	Does the application involve an installation boundary change?	No
Q3	Does the application involve changes to emissions to sewer?	No
Q4	Attach Appropriate Assessment Screening Report here	ScreeningReport_1.pdf

Additional Documentation	
	Approval Request for RTO Odour Abatement.pdf
	Attachment 1 Proposed Location of RTO.pdf
	Attachment 2 Durr RTO Functional Description.pdf
	ScreeningReport.pdf

Final Declaration	
Name	Gareth Kelly
Position	Director

Application Details			
Selected by:	Gareth Kelly	Selected date:	27/11/2015
Submitted by:	Gareth Kelly	Submitted date:	27/11/2015









Office of Environmental Enforcement,  
Environmental Protection Agency,  
Regional Inspectorate,  
Seville Lodge,  
Callan Rd.,  
Kilkenny

**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 28<sup>th</sup>) which also requested submission of a programme for the installation and testing of the proposed system.

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

☐ Clonminam Industrial Estate,  
Portlaoise, Co. Laois  
Tel: 057 8678600  
Callsave 1850 504 504

☐ Smithstown Industrial Estate,  
Shannon,  
Co. Clare  
Tel: 061 707400

☐ Raffleen Industrial Estate,  
Ringaskiddy Road,  
Monkstown, Co. Cork  
Tel: 021 4387200

☐ JFK Road,  
Naas Road,  
Dublin 12  
Tel: 01 4508111

www.enva.com

Enva Ireland Limited t/a Enva

a DCC company

Registered No: 317186 VAT No: IE 6337186A

Clonminam Industrial Estate, Portlaoise, Co. Laois, Republic of Ireland, R32 XD95

Directors: T. Walsh (Managing), I. Breen, I. Davy, S. Dick, G. Kelly, A. Fitzpatrick.





only. No other use.

Consent of copyright owner required for any other use.



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 odorous 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°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.

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 odorous/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



... only. for any o

For inspection purposes, the right owner required



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.

#### **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



For information purposes only. Not for use in any other manner.



supplier (Durr) currently has several RTO units operating within Ireland some of which have relatively high levels of chlorinated compounds (up to 10g /Nm<sup>3</sup>) which are operated at 850°C with no significant dioxin formation occurring (<0.1ng/m<sup>3</sup>). 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:

<b>RTO temperature:</b>	monitored and recorded continuously;
<b>LEL Meters</b>	monitored and recorded continuously;
<b>Pressure in ducting</b>	monitored continuously;
<b>TOC</b>	monitored quarterly;
<b>Dioxins</b>	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 of 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).

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



For inspection purposes only.  
Consent of copyright owner required for any other use.



1. THIS DRAWING IS PRELIMINARY ONLY AND ALL DETAILS TO BE CONFIRMED FROM SPECIALIST RTO CONTRACTOR



**ME** **McElroy Associates**  
Mechanical & Electrical  
Consulting Engineers & Project Managers  
72 Haddington Road, Balleriga, D4  
Tel: 060 9000 Fax: 060 9099 E Mail: info@me.ie Web: www.me.ie

CLIENT:  
ENVA

PROJECT: RTO PROPOSAL

op

TIME

GENERAL LAYOUT ARRANGEMENT

DESIGNED:	CHECKED:	APPROD:
JA	BH	BH
DRAWN:	DATE:	SCALE: 1:100 @ A1
JA	29/10/15	
DRG. No.	ME15059-MH01	REV. D



For inspection purposes only.  
Consent of copyright owner required for any other use.

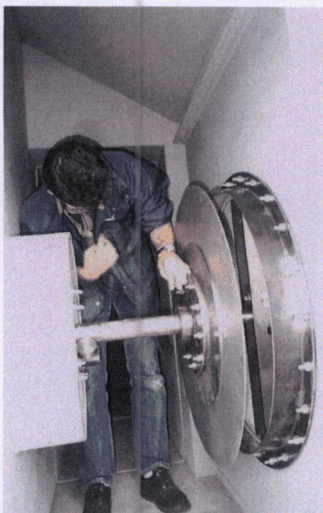
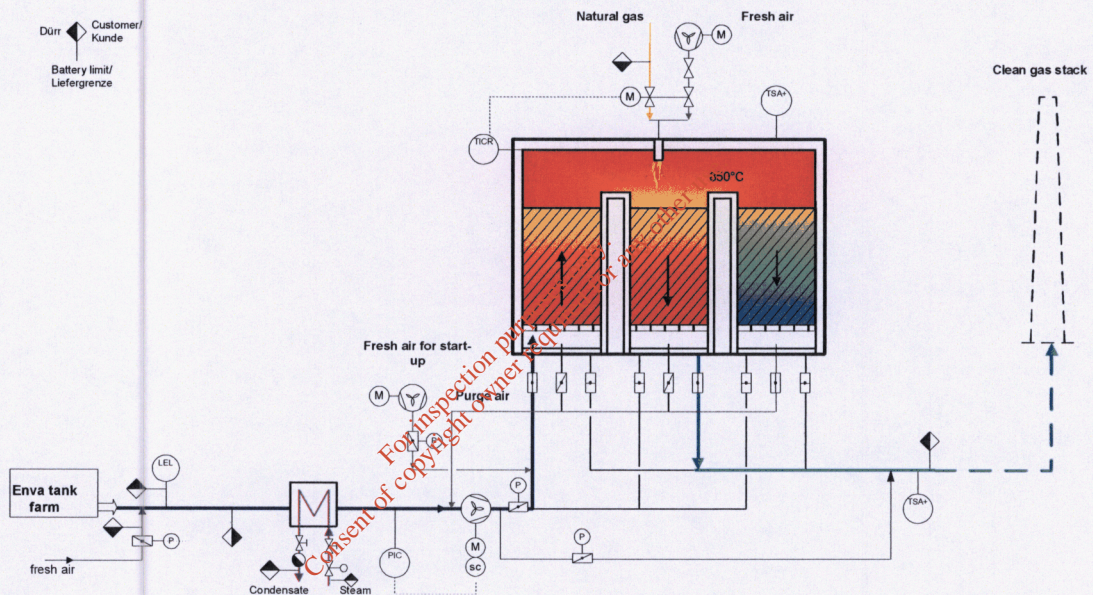


## 1 Functional description

### Regenerative thermal oxidizer

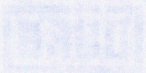
The Regenerative Thermal Oxidizer (RTO) unit comprises essentially of regeneration towers, combustion chamber with burner system and related air ducting system equipped with valves and fan.

The regeneration towers are filled with ceramic packing and clad with an insulation layer to suit the high reaction temperatures involved. The combustion chambers are also clad with fibrous material and link the individual regeneration towers with one another. The burner system is installed at the side for easy accessibility and has a separate connection for combustion air. All necessary monitoring instruments are installed and tested by us at the factory and are connected to the burner via flexible connections.



Ecopure RTO, Poppet valve





Company: Duke Energy

## 1 Functional Description

The functional description of the system is as follows: The system is designed to provide a continuous flow of water to the system. The system is designed to provide a continuous flow of water to the system. The system is designed to provide a continuous flow of water to the system.

The system is designed to provide a continuous flow of water to the system. The system is designed to provide a continuous flow of water to the system. The system is designed to provide a continuous flow of water to the system. The system is designed to provide a continuous flow of water to the system.



For inspection purposes only.  
Consent of copyright owner required for any other use.



Company: Enva Ireland Ltd.



The RTO's air ducting system includes ducts for untreated and purified gas with integrated, tightly sealing valves for inlet of exhaust air stream and outlet of treated gas as well as dampers for outlet of purge air. All valves and dampers are installed in easily accessible positions in the lower section of the regeneration tower group.

The warm water-laden airstream from the oil 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°C. This is to ensure there are no aerosols or oil or water droplets in the airstream and prevent condensation and 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.

The exhaust air stream is then pushed through the RTO by the fan and led, in sequence, via time-controlled valves to one or other of the regeneration towers. The exhaust air stream flows through the hot heat exchanger material from bottom to top, and is pre-heated in the process where a large part of the hydrocarbons are oxidized. The exhaust air stream is then heated further, as necessary, to its ultimate reaction temperature in the combustion chamber. The burner will provide additional energy (if necessary) to maintain a temperature in the combustion area above 850°C all the time. The hot purified exhaust air stream then flows through the other towers in the group from top to bottom transferring its heat to the ceramic packing.

As is proposed where an RTO is made up of an uneven number of towers, one tower is purged with air before the exhaust air stream is led into it as part of the next cycle. The use of this method, whereby one tower is always in the purge phase, prevents peaks in pollutants in the purified gas stream when the poppet valves are switched from open to closed or vice versa.

The RTO system is started and heated up at a reduced air flow rate by the fresh air fan and by the natural gas burner system. Only fresh air will be used for heat up and shut down of the RTO unit.

The system is especially designed for a high thermal efficiency of the ceramic heat exchanger packing in the 3 towers to reduce the energy consumption during operation to a minimum. Any VOCs in the exhaust air stream provide additional exothermal energy for the oxidation. At a certain level of heat input from the oxidation reaction of the VOCs the natural gas burner system can switch off and the RTO unit operates autothermally without any natural gas consumption.

Certain substances if present in the exhaust air (e.g. silicon) can lead to the formation of dust/deposits in the RTO unit which if not removed can build up and block the ceramic heat exchanger packing over time. The proposed system provides good access for cleaning the ceramic heat exchanger packing when build ups occur in order to reduce the required down time for this cleaning to a minimum.

### **Safety Measures & Abnormal Operation**

As the organic content of VOCs in the exhaust air stream could potentially be above the permitted lower explosion limit LEL value of 25 % LEL, an LEL monitor will be installed in the ductwork to the RTO and if necessary atmospheric air will be added to the exhaust air stream prior to the RTO to ensure that the organic content in the vent gas at the RTO inlet is always below 25% of LEL.

Additionally the system includes a bypass line to feed the exhaust air stream directly to the stack in case of shut down of the RTO or of inadmissible high VOC concentration above 25 % LEL.





The RTO is a thermal oxidizer that is designed to destroy VOCs and HAPs. It consists of a combustion chamber and a heat exchanger. The combustion chamber is where the VOCs and HAPs are burned, and the heat exchanger is where the heat from the combustion is transferred to the incoming gas stream.

The RTO is designed to operate at a temperature of 1500 to 1800 degrees Fahrenheit. The heat exchanger is designed to preheat the incoming gas stream to a temperature of 400 to 600 degrees Fahrenheit. The RTO is designed to have a residence time of 1 to 2 seconds.

The RTO is designed to have a combustion efficiency of 95 to 99 percent. The heat exchanger is designed to have a heat recovery efficiency of 80 to 90 percent. The RTO is designed to have a pressure drop of 1 to 2 inches of water column. The RTO is designed to have a flow rate of 100 to 200 cubic feet per minute.

The RTO is designed to have a combustion efficiency of 95 to 99 percent. The heat exchanger is designed to have a heat recovery efficiency of 80 to 90 percent. The RTO is designed to have a pressure drop of 1 to 2 inches of water column. The RTO is designed to have a flow rate of 100 to 200 cubic feet per minute.

The RTO is designed to have a combustion efficiency of 95 to 99 percent. The heat exchanger is designed to have a heat recovery efficiency of 80 to 90 percent. The RTO is designed to have a pressure drop of 1 to 2 inches of water column. The RTO is designed to have a flow rate of 100 to 200 cubic feet per minute.

The RTO is designed to have a combustion efficiency of 95 to 99 percent. The heat exchanger is designed to have a heat recovery efficiency of 80 to 90 percent. The RTO is designed to have a pressure drop of 1 to 2 inches of water column. The RTO is designed to have a flow rate of 100 to 200 cubic feet per minute.

The RTO is designed to have a combustion efficiency of 95 to 99 percent. The heat exchanger is designed to have a heat recovery efficiency of 80 to 90 percent. The RTO is designed to have a pressure drop of 1 to 2 inches of water column. The RTO is designed to have a flow rate of 100 to 200 cubic feet per minute.

## Safety Measures & Automatic Operation

The RTO is designed to have a combustion efficiency of 95 to 99 percent. The heat exchanger is designed to have a heat recovery efficiency of 80 to 90 percent. The RTO is designed to have a pressure drop of 1 to 2 inches of water column. The RTO is designed to have a flow rate of 100 to 200 cubic feet per minute.

The RTO is designed to have a combustion efficiency of 95 to 99 percent. The heat exchanger is designed to have a heat recovery efficiency of 80 to 90 percent. The RTO is designed to have a pressure drop of 1 to 2 inches of water column. The RTO is designed to have a flow rate of 100 to 200 cubic feet per minute.



Company: Enva Ireland Ltd.

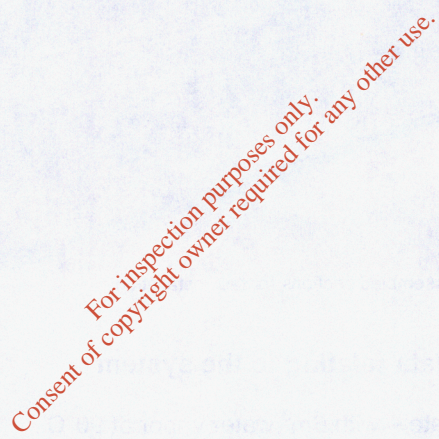


Components delivered as pre-assembled sections for fast installation

## 1.1 Technical data relating to the system

Off gas flow rate – with 6m <sup>3</sup> water vapor at 90°C	approx. 20,000	m <sup>3</sup> /h
Off gas flow rate – maximum possible at 90°C	24,600	m <sup>3</sup> /h
Off gas flow rate – minimum at 90°C	4,000	m <sup>3</sup> /h
Purified gas flow rate to stack – maximum possible at 140°C	30,000	m <sup>3</sup> /h
Maximum amount of VOCs that can be handled by the RTO	160	kg/h
Exhaust air temperature before pre-heat	90	°C
Exhaust air temperature after pre-heat	> 110	°C
Combustion chamber temperature	850	°C
Purified air temperature at outlet	123 - 140	°C
Required natural gas connection	45	Nm <sup>3</sup> /h
Natural gas in standby mode – no water being evaporated	6	Nm <sup>3</sup> /h
Natural gas when > 4 kg/h VOCs/oil and 1m <sup>3</sup> /h evaporated water	0	Nm <sup>3</sup> /h
Natural gas at 20.000 Nm <sup>3</sup> /h, 6 m <sup>3</sup> /h water evaporated and no VOCs	21	Nm <sup>3</sup> /h
Required electrical power connection	52	kW
Electrical power consumption for fan motors at 20,000 m <sup>3</sup> /h air flow	48	kW
Compressed air consumption at 6 bar	8	Nm <sup>3</sup> /h







Company: Enva Ireland Ltd.



## 1.2 Space requirements and weight incl. fan

Plant dimensions		RTO
Length approx.	m	8,0
Width approx.	m	4,0
Height approx.	m	4,8
Weight	kg	33,000

## 1.3 Emission levels during stable operation

Removal efficiency of organic odours	> 95	%
TOC	≤ 20	mg/Nm <sup>3</sup>
CO	≤ 100	mg/Nm <sup>3</sup>
NOx	≤ 200	mg/Nm <sup>3</sup>

### Remarks

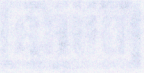
Pure gas data based on actual composition of the pure gas and at 1013 mbar.

## 1.4 Scope of proposed RTO

- RTO unit consisting of 3 canisters in carbon steel 1 combustion chamber with ceramic heat exchanger packing, internal ceramic fibre insulation
- 1 natural gas burner with gas train, combustion air fan, inlet and outlet valves, valve blades in stainless steel 304 with actuators, support grids in temperature resistant steel
- Dampers for fresh air with drive and damper for isolation of exhaust air with drive
- 1 exhaust fan with motor and frequency converter
- 1 combustion air fan with motor
- exhaust air duct in carbon steel and purified air duct in carbon steel external lagged and cladded underneath the RTO canisters and from fan to RTO inlet and from RTO outlet to stack or collection duct
- Control panel with PLC and HMI, type Siemens, installed in a cabinet with air conditioning at the RTO unit
- Steel construction underneath the RTO canisters and platform with access ladder along the burner

The proposed Thermal Oxidizer is manufactured according European regulations and Durr standard.





## 1.2 Space requirements and weight restrictions

Parameter	Value
Weight	1000 kg
Height	2.0 m
Width	0.8 m
Depth	0.8 m

## 1.3 Environmental limits and operating conditions

Parameter	Value
NOx	≤ 500 mg/m³
CO	≤ 100 mg/m³
TOC	≤ 20 mg/m³
Operating temperature	20 - 95 °C

General: The gas data is based on a test atmosphere of 10% gas and 90% nitrogen.

## 1.4 Scope of the PTO

PTO: The PTO consists of a container with a pressure relief device and a safety valve.

1.1.1. The PTO is designed to operate at a pressure of 10 bar and a temperature of 20 °C.

1.1.2. The PTO is designed to operate at a pressure of 10 bar and a temperature of 20 °C.

1.1.3. The PTO is designed to operate at a pressure of 10 bar and a temperature of 20 °C.

1.1.4. The PTO is designed to operate at a pressure of 10 bar and a temperature of 20 °C.

1.1.5. The PTO is designed to operate at a pressure of 10 bar and a temperature of 20 °C.

1.1.6. The PTO is designed to operate at a pressure of 10 bar and a temperature of 20 °C.

1.1.7. The PTO is designed to operate at a pressure of 10 bar and a temperature of 20 °C.

The proposed PTO is designed to operate at a pressure of 10 bar and a temperature of 20 °C.