

Mary Frances Rochford

From: Anne Phelan <APhelan@enva.ie>
Sent: 22 April 2014 14:50
To: Mary Frances Rochford
Subject: FW: COM 000596 & RI002301
Attachments: Review of emissions - Envirolex model.pdf

Hi Mary Frances

Apologies I note Joan is out of the office and I sent this to her Friday. I closed off the RFI ALDER response without uploading this.

I am forwarding this to you as per conversation with Dermot Burke this afternoon.

If you have any questions please do not hesitate to contact me.

Regards

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From: Anne Phelan
Sent: 18 April 2014 15:52

To: Joan Fogarty (J.Fogarty@epa.ie)
Subject: COM 000596 & RI002301

Hi Joan

I uploaded a response to the Agency request RI002301. I attached up the response but did not attach the report regarding the envirolex modelling to it on ALDER and it closed. So I am attaching to this email. I can re-attach on Tuesday if you want through ALDER.

Regards

Anne

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Enva Ireland Limited
Quantification of Emissions from
Heated Oil Tanks

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1 INTRODUCTION

Envia Ireland Limited operates under an Industrial Emissions Licence (Register No. W0184-01) from the EPA for the facility in Clonminam Industrial Estate, Portlaoise, County Laois, Laois. As part of the operation under the licence, the facility is authorised to accept and recover waste oils. These waste oils are recovered in a series of large heated oil tanks located at the facility in Clonminam Industrial Estate.

The EPA has requested Envia to monitor the emissions of organic compounds from these tanks with regard to the TA Luft Guidelines on Air Quality. To this end Envia have carried out the following:

- In December 2012 Envia attempted to quantify the emissions through direct measurements but this approach was not viable given the low volume flow of air from the top of the tanks.
- Subsequently in January 2013, Envia, at the request of the EPA, employed the US EPA TANKS model to apply site specific characteristics and local meteorological data to quantify the emissions from the tanks. This model indicated that the mass emissions of Total VOCs from the tanks were in compliance with the TA Luft limit for organic substances (0.5kg/hr).

In March 2014, the EPA further requested Envia to carry out analysis using an Enviro-Lex published model, to again quantify the emissions from the tanks and to speciate the emissions. This report presents the results of the assessment undertaken for the Envia facility using the Enviro-Lex model.

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2 METHODOLOGY

2.1 APPROACH

The Enviro-Lex model is presented in a paper entitled "*Report on sampling of emissions to air and water arising from the treatment of used oil*" (July 2006). The model, derived with the assistance of the Oil Recycling Association in the UK, identified actual measured emissions of VOCs from oil recovery tanks and develops a standard model to assist in the reporting of total emissions. This report identifies the total emissions to atmosphere from the tanks only and does not quantify any other emissions.

The key variables include annual throughput, tank temperature and batch times. Specific data for the Enva facility has been employed to generate emission rates for a standard tank at the facility. Model data for "inland oil" (Table 4a) have been employed as opposed to "marine oil slops" (Table 4b). Data relating to tank size and throughput is as per that reported for the TANKS model.

2.2 INPUT DATA

There are a number of oil recovery tanks at the Enva facility and all have a similar throughput and operation. The analysis presented in this report is for a standard generic tank and the results are applicable to all similar tanks. **Table 2.1** presents the input data employed in the model. Where data varies from the model defaults the nearest default data has been employed to facilitate the modelling. As the Enviro-Lex model only provides analysis for default temperatures at 70°C and 90°C, the higher 90°C temperature was used in this assessment as it was deemed the most appropriate of the two temperatures.

Table 2.1: Input data employed in the model

Parameter	Enva Input Data
Process Tank Temperature	90°C (actual tank temperatures range from 50°C up to a maximum of 102°C)
Process Batch Time	20 hours (actual times vary depending on a range of factors but 20 hours is a conservative estimate)
Batch size	79m ³ or 70 tonnes
Oil density	0.89 tonnes/m ³ (model default)
Batches per annum	50
Annual throughput	3,950 m ³ or 3,500 tonnes

Table 2.2 presents the model factors employed in the model that apply to the Enva facility.

Table 2.2: Model factors employed in the model

Parameter	Factor
Top 15 VOC emission rate (Process Tank 90°C unabated)	11.05 g/h per 100 tonnes (Table 4.1a)
Speciated VOC emission rate (Process Tank 90°C unabated)	Various (Table 1a)

3 RESULTS

3.1 TOTAL VOC EMISSIONS

The results of the modelling are presented below and fully laid out for clarity:

Total VOC release per batch (g) = emission factor (g/h per 100 tonnes) x fraction batch size x batch time (hours)

$$= 11.04 \times 0.7 \times 20$$

$$= \mathbf{154.56 \text{ g per batch}}$$

Total Annual Emissions (kg) = Total VOC per batch x No. of batches

$$= \mathbf{7.728 \text{ kg per annum}}$$

Mass Emission Rate (kg/hr) = annual emissions (per annum) / production hours per annum

$$= 7.728 / (20 \times 50)$$

$$= \mathbf{0.0077 \text{ kg/hr}}$$

When compared to the TA Luft (2002) mass emission rate limit of 0.5kg/hour the modelled emission per batch equates to 1.5% of this limit and the operation of the tanks is in compliance with the TA Luft limit.

3.2 SPECIATED VOC EMISSIONS

In addition to the total VOC emissions estimated in Section 3.1, the model also allows for the generation of speciated mass emissions for each of the main VOC compounds identified in the vapours from the oil recovery process. The speciated VOCs are a mixture of mainly aromatics, alkanes and alkenes which are standard constituents in fuel/oil vapours and combustion exhausts. **Table 3.1** over lists each of the speciated VOCs, the model relative mass releases, the resultant Enva emissions and the relevant TA Luft limits.

The only speciated VOC assigned a limit in TA Luft is benzene (a known carcinogen). The emissions from the Enva tanks equates to a mass emission of 0.36g/h compared to the TA Luft limit for a Class III carcinogen of 2.5g/h. The modelled emissions from the Enva tanks are calculated to be 14% of the TA Luft Limit. Benzene is a constituent of petrol (limited to 1% w/w) and is emitted from all petrol vapours and also vehicle emissions.

The remaining speciated VOCs are not assigned a limit in TA Luft. These are not carcinogens and are not assigned as higher risk Class I (Annex 4 TA Luft) or Class II Organic Substances as defined in Section 5.2.5 of TA Luft. As such, there are no defined limits in the TA Luft for these substances. However, paragraph 5.2.5 states that:

The organic substances or their secondary products not listed under their names in Annex 4 which comply with one of the following categories or meet one of the following criteria:

- they are highly odour-intensive,
shall, on principle, be allocated to class I.

While the VOCs listed in **Table 3.1** are standard solvents used in petrol/diesel and are not “highly odour-intensive”, given that some concerns have been raised by residents in the area in relation to odour, this clause is applied and the Class I Organic Substance is presented as a conservative indicator of compliance.

Table 3.1 shows that the VOC with the highest emission rate is toluene. As with benzene, toluene is also a standard constituent of petrol vapours and vehicle emissions. The modelled mass emissions of toluene from the Enva tanks are less than 2% of the Class I Organic Substances limit specified in TA Luft. The remaining speciated VOCs are 1% or less than the TA Luft Limit for Class I Organic Substances.

Table 3.1: Speciated emissions from the Enva tanks

VOC	Relative Mass Release (%)	Enva Emission (g/h)	TA Luft Limit (g/h)	TA Luft Class
Benzene	0.0467	0.36	2.5	Class III Carcinogen
Toluene	0.2303	1.78	100	Class I Organic Substance
Hexene	0.1385	1.07		
Petane	0.0870	0.67		
Heptane	0.0741	0.57		
Pentene	0.0709	0.55		
Dichloromethane	0.0580	0.45		
Methylpentane	0.0564	0.44		
Hexane	0.0580	0.45		
Methylbutane	0.0370	0.29		
Cycloheptane	0.0386	0.30		
Butane	0.0258	0.20		
Heptene	0.0306	0.24		
Butene	0.0258	0.20		
Methylhexane	0.0225	0.17		

4 REQUIREMENTS OF BAT

The EPA also requested Enva to consider any relevant/comparable BAT emission levels as specified in the BAT Reference Document on Waste Treatments Industries (August 2006).

Generic BAT 41 on page 521 of the relevant BREF document states that BAT is to reduce VOC air emissions to the level of 7 – 20mg/m³. But for low VOC loads, the higher end of the range can be extended to 50mg/m³. Given the low flows from the tanks, the use of the low VOC load approach is appropriate.

While these limits are expressed as concentrations and not mass emissions (as used in this report) direct comparison is not viable. However it should be noted that the higher end of 50mg/m³ is inline with the TA Luft limit for organic substances (paragraph 5.2.5) which has a corresponding mass emission rate of 0.5kg/hr. In this regard the BAT limit and TA Luft limit are analogous.

BAT 95 to 104 of the BREF document states what measures apply to BAT for the re-refining of waste oils. However, there are no listed emission limits for this process so the generic BAT described above applies.

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5 CONCLUSION

In March 2014, the EPA requested Enva to carry out analysis using an Enviro-Lex published model to quantify the VOC emissions from the oil recovery tanks. This report presents the results of the assessment undertaken for the Enva facility using the Enviro-Lex model.

In the first instance the model indicates that the total emissions of VOCs from a standard tank at the Enva facility complies in full with the TA Luft limit for Organic Substances. The modelled emissions are estimated to be 1.5% of the limit.

The modelled emissions of the only carcinogenic VOC, benzene, are also in full compliance with the TA Luft limit for Class III Carcinogenic Substances. The modelled emissions are approximately 14% of the relevant TA Luft limit.

Finally, for all other speciated VOCs, the modelled emissions have been presented against the TA Luft limit for Class I Organic substances which has been used as a conservative comparator. All modelled emissions are less than 2% of this limit.

The results of the Enviro-Lex model indicate that emissions from typical operating conditions in a standard tank in Enva, comply in full with the emission limits of the TA Luft Guidelines and the BAT Reference Document on Waste Treatments Industries.

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