

# LEVINGTON ENVIRONMENTAL

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FAO: Mr E Mayhew

**Test Report:** LE390006

**Project No.** 390

**Title:** Fugitive Emissions Monitoring

## **Introduction**

Monitoring of fugitive emissions was carried out at the above site on 28<sup>th</sup> January 2011, in accordance with the Pollution Prevention & Control Act 1999 and Pollution Prevention & Control (England & Wales) Regulations 2000, Permit Ref Number 6.4/LK/9-07.

## **1. Background**

As part of the PPC compliance, annual measurements of VOC emissions are routinely carried out from the two Komoroi heat set presses in order to comply with the Permit. A VOC register is produced in-house to calculate the VOC content of material purchased. Quantities of waste chemicals sent for recycling are recorded along with rags sent for disposal. In order to complete the VOC mass balance, and estimate of fugitive emissions of VOCs is needed and that is the purpose of this exercise. It will also provide data on compliance with the CoSHH Regulations.

## **2. Process description**

There are four printing presses in the factory:

Two similar Komori System 38S heat set web offset printing presses. Each of these presses is contained in a full height noise enclosure which is normally run with doors closed. In each case, emissions from the Megtec Dual Dry TNV9.1 driers are vented through an integrated recuperative thermal oxidiser to remove VOC's (volatile organic compounds) from the emissions. This has the effect of containing any VOC emissions from the process and from the use of chemicals in the enclosures. The design of the ovens is such that VOCs in the enclosures will be drawn into the drier and hence the afterburner, and should not leave the building unabated. The old ceiling fans in the enclosures no longer operate. A new press control system is being installed to reduce make ready times and reduce paper and ink consumption.

Two sheet fed presses. The 8 colour Mitsubishi, and the sheet fed KB are located in the main press room and are not enclosed, and have no LEV extraction systems. Vegetable based inks (VOC free) are used on these presses, but cleaning chemicals which contain VOCs are also used.

**3. Observations**

There are a number of chemicals in use in the factory which contain VOCs, predominantly the fount solution additive and cleaning solvents used in the print room. Information is taken from the suppliers Material Safety Data sheets.

From the solvent inventory provided by the client those that are used in greatest quantity are listed below:

Item	VOC %	Annual usage litres
Propoan-2-ol	100	3,050
Fountmax Blue 3030AF	7	295
Blanket Icon SF006	96	1,920
Delta MRC	100	1,500
DS Acedin Sprint 206	15	1,150

The above chemicals account for 7,868 of the 8,690 litres of VOC contained in the 30,133 litres of chemicals used (90.5%). Inks are not included in these amounts.

The Stehlin & Hostag heat set inks currently used on the Web presses have a significant solvent content, typically 30% petroleum distillate with a boiling range 240-290°C. However this is not classified as a volatile organic compound, as it has a very low vapour pressure and do not evaporate at room temperature. The inks currently used on the sheet fed presses are vegetable oil based with no VOC content and are non-hazardous.

The chemical used in the largest quantities is iso-propanol, which is used at a concentration of 10% in the fount solutions. Machine cleaning is carried out using proprietary solvents and thinners under various brand names, but these are predominantly aliphatic hydrocarbons, e.g. Delta MRC. Water based photographic chemicals are used in the pre-press area.

Chemicals are stored in an external brick built store adjacent to the side entrance. They are kept in sealed containers within the press room. Control of the use of cleaning solvents is achieved by providing lidded bins for waste solvent-soaked rags, 'press down' solvent dispenser tins and wash bottles. Control appears to be good and substances containing VOCs are stored correctly inside the press rooms. The solvent soaked cleaning rags awaiting disposal are currently stored in an external container at the rear of the building, prior to collection.

During the tests, the web presses were running for approximately 90% of the 5-hour test period, which is considered normal operations for this equipment. The Mitsubishi press was run intermittently during cleaning.

**4. Solvent Monitoring**

Sampling was carried out in accordance with Health & Safety Executives Guidance Note MDHS96, "Volatile Organic in Air". Samples were subsequently analysed for the two main solvent present in the chemicals, propan-2-ol and total hydrocarbons (VOC).

Samples were taken using two techniques;

1. Static samples were taken on each of the four presses, and a fifth in the centre of the press room.
2. Personal samples were taken on two operators, one on the webs and one on the Mitsubishi. The KBA was not in use and is rarely used now.

Sampling details are given in Appendix 1 and sample locations are shown in Appendix 2.

These results, along with details of solvent usage provided by the client, will be used to input into the mass balance calculations of emissions of VOC according to schedule 3 of the British Coating Federation VOC Workbook. This is the subject of a separate report.

**5. Results**

The results for the personal exposure monitoring on the two operators are given below:

Location	Filter	Propan2ol		Total VOC	
		Result mg/m3	% of WEL 8hr	Result mg/m3	% of WEL 8hr
Mitsubishi	B1	1	0.1%	28	n/a
Komori web	B2	5	0.5%	8	n/a
WEL 8hr TWA		999	400ppm	n/a	
WEL 15min STEL		1249	500ppm	n/a	

The results for the background VOC monitoring are given below:

Location	Filter	Propan2ol		Total VOC	
		Result mg/m3	% of WEL 8hr	Result mg/m3	% of WEL 8hr
Komori 2 Drier inlet	T1	2	0.2%	4	n/a
Komori 1 Drier inlet	T2	0	0.0%	3	n/a
Mitsubishi Rollers	T3	1	0.1%	14	n/a
KBA Outlet	T4	1	0.1%	4	n/a
KBA Rollers	T5	0	0.0%	0	n/a
WEL 8hr TWA		999	400ppm	n/a	
WEL 15min STEL		1249	500ppm	n/a	

## **6. Discussion**

The above results are all extremely low and show that VOC levels in the building are well controlled. The propanol results were negligible, less than 0.2% of WEL. The highest result for total VOC was measured on the operator who was cleaning the rollers on the Mitsubishi sheet fed press using the Delta MRC. The corresponding background result in this area was also the highest. The results inside both Komori enclosures were very low. There is currently no EH40 exposure limit for total VOC, however in this instance the solvents are mostly aliphatic hydrocarbons. The 1996 version of EH40 gave an 8hr TWA limit of 550mg/m<sup>3</sup> and 15min STEL of 575mg/m<sup>3</sup>, so these are used for guidance only.

From a CoSHH perspective, these results are satisfactory and show adequate control of personal exposure.

From a PPC perspective, the results are satisfactory and show adequate control of fugitive emissions.

## **7. Recommendations**

The following recommendations are made as a result of the survey work carried out.

- A full COSHH Assessment document should be produced incorporating information from this report and in-house data. It should be a concise, easy to use reference source, incorporating the MSDS and risk assessments for the chemicals used and results of any air monitoring.
- A system of standard operating procedures should be introduced for the presses, which should include Health and Safety information appropriate to the chemicals being used on each press. These should be written in a simple and easy to use format with the safety precautions highlighted.
- Staff safety training should be carried out at all levels to ensure greater safety awareness, and this should be updated regularly.
- Given the results obtained from the preliminary air testing, we do not recommend further test work at this stage.

**Signed:**.....*P J Darnell*.....  
P.J.Darnell MRSC

**Date:** 11<sup>th</sup> February 2011

APPENDIX 1

LEVINGTON ENVIRONMENTAL AIR SAMPLING RESULTS

PROJECT: 390

CLIENT: Ancient House

SITE: Ipswich

DATE: 28th January 2011

Name	Location	Filter	Time on	Time off	Duration	Rate	Vol	
					hr:min	l/min	litres	
Harry	Mitsubishi	Operator	B1	09:50 AM	03:20 PM	05:30	0.029	9.57
Jo	Webs	Operator	B2	09:51 AM	03:20 PM	05:29	0.029	9.54

Filter	Propan2ol mg	Total VOC mg
B1	0.01	0.27
B2	0.05	0.07

Location	Filter	Propan2ol		Total VOC	
		Result mg/m3	% of WEL 8hr	Result mg/m3	% of WEL 8hr
Mitsubishi	B1	1	0.1%	28	n/a
Komori web	B2	5	0.5%	8	n/a
WEL 8hr TWA		999	400ppm	n/a	
WEL 15min STEL		1249	500ppm	n/a	

Name	Location	Filter	Time on	Time off	Duration	Rate	Vol	
					hr:min	l/min	litres	
Static	Komori 2	Drier inlet	T1	10:10 AM	03:20 PM	05:10	0.100	31.00
Static	Komori 1	Drier inlet	T2	10:12 AM	03:20 PM	10:11	0.100	61.10
Static	Mitsubishi	Rollers	T3	10:15 AM	03:21 PM	05:06	0.100	30.60
Static	KBA	Outlet	T4	10:16 AM	03:21 PM	05:05	0.100	30.50
Static	KBA	Rollers	T5	10:17 AM	03:20 PM	05:03	0.100	30.30

Filter	Propan2ol mg	Total VOC mg
T1	0.05	0.11
T2	0.02	0.16
T3	0.02	0.42
T4	0.02	0.12
T5	0.01	0.01

Location	Filter	Propan2ol		Total VOC	
		Result mg/m3	% of WEL 8hr	Result mg/m3	% of WEL 8hr
Komori 2 Drier inlet	T1	2	0.2%	4	n/a
Komori 1 Drier inlet	T2	0	0.0%	3	n/a
Mitsubishi Rollers	T3	1	0.1%	14	n/a
KBA Outlet	T4	1	0.1%	4	n/a
KBA Rollers	T5	0	0.0%	0	n/a
WEL 8hr TWA		999	400ppm	n/a	
WEL 15min STEL		1249	500ppm	n/a	

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APPENDIX 2



Sample T1 – behind window



Sample T2 – behind window



Sample T3 – on roller case



Sample T4 – at room centre



Sample T5 – on roller case

## APPENDIX 3

### 1. Definition of Workplace Exposure Limits

The COSHH Regulations require employers to prevent employees being exposed to hazardous substances or, where this is not reasonably practicable, to ensure that exposure is adequately controlled.

1.1 From 2005, Occupational Exposure Limits have been replaced by **Workplace Exposure Limits (WEL)** based upon the concentration of the substance in the air people breathe, averaged over the short term (15 minutes) or long term (8 hours). Control of a hazardous substance will only be considered adequate if the WEL is not exceeded, and the principles of good practice for the control of exposure are applied.

**Workplace Exposure Limit values are available at:** <http://www.hse.gov.uk/coshh/table1.pdf>

1.2 Two new limits are being introduced for Refractory Ceramic Fibres and Subtilisins. The OESs for around 100 substances have been deleted as the substances are now banned, scarcely used or there is evidence to suggest adverse health effects close to the old limit value.

As the numerical values of the other limits being transferred to the new system are unchanged, suppliers may exhaust stocks of safety data sheets that refer to MELs and OESs before producing new ones that refer to WELs. Similarly, COSHH assessments can be updated as part of duty holder's periodic reviews.

1.3 Principles of good practice should be used to control exposure by measures proportionate to the health risk;

- Design and operate processes and activities with a view to minimising emission, release and spread of substances.
- Take into account all relevant routes of exposure, inhalation, skin absorption and ingestion when developing control measures.
- Choose the most effective and reliable control options that minimise the escape and spread of substances hazardous to health.
- Where adequate control of exposure cannot be achieved by other means, provide in combination with other control measures, suitable personal protective equipment (PPE).
- Check and review regularly all elements of the control measures to ensure that they remain effective. Inform and train all employees about the hazards and risks from the substances with which they work, and the use of control measures developed to minimize risks.

1.4 Adequate control of exposure will require employers to:

- apply the eight principles of good practice for the control of substances hazardous to health;
- ensure that the WEL is not exceeded; and
- ensure that exposure to substances that can cause occupational asthma; cancer; or damage to genes that can be passed from one generation to another; is reduced as low as is reasonably practicable.

### 2. Definition of Total & Respirable Dust and Fume

Not all dusts have been assigned an exposure limit, but lack of a limit does not imply they are non-hazardous. In the absence of a specific limit, personal exposure should be kept below the general level for dust and fume of 10mg/m<sup>3</sup>, 8 hr TWA for total inhalable dust and 4 mg/m<sup>3</sup>, 8hr TWA respirable dust.

Total inhalable dust is the fraction of airborne material, which enters the nose and mouth during breathing and is available for deposition in the respiratory tract. Respirable dust is the fraction which penetrates to the gas exchange region of the lung. Fume is normally defined as solid particles generated by chemical reaction or condensed from the gaseous state after volatilisation.



### **3. White Spirit**

White spirit is not assigned a WEL in the current version of EH40. The limit of 550mg/m<sup>3</sup> is based on the 1996 version of EH40 which gave a long term OES of 575mg/m<sup>3</sup>.

### **4. Respirator Fit Testing**

*Respirator fit testing is a requirement of the approved code of practice and guidance to the COSHH Regulations 2002 (Section 7, paragraphs 147 – 151).*

The performance of tight-fitting face pieces depends on achieving a good contact between the wearer's skin and the face seal of the face piece. As people come in all shapes and sizes there is no guarantee that one particular type, or size of RPE face piece will fit everyone. Inadequate fit will significantly reduce the protection provided to the wearer. Any reduction in protection may lead to ill health or even put the RPE wearer's life in danger.

Fit testing is also useful for checking that a wearer can put on a respirator face piece correctly. Correct fitting of the face piece at all times is vital to prevent exposure to hazardous substances. A fit test is not a substitute for correct and careful day-to-day fitting of the face piece, which should always include a pre-use fit check.

More information can be found in the following HSE Operational Circular:

#### **OC 282/28 - Fit Testing of Respiratory Protective Equipment Face pieces**

Available at <http://www.hse.gov.uk/pubns/fittesting.pdf>

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