

Workplace atmosphere measurements

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Under the Control of Substances Hazardous to Health (CoSHH) Regulations Reg.10, you are required to monitor exposure at the workplace. This is required where the CoSHH assessment indicates that, "it is requisite for ensuring the maintenance of adequate control of the exposure of employees to substances hazardous to health."

The intention of this paper is to disseminate information gathered by Strategic Safety Systems from different printers to enable you to assess whether further monitoring is necessary. Note that this data presently covers only workplace atmosphere measurement from litho printers. Both flexographic and gravure printing involves inks with a high level of solvent and it would always be worth carrying out individual atmosphere measurements in such cases.

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Summary

In general, the workplace atmosphere measurements have shown that both alcohol levels from IPA (isopropanol) and petrochemical solvents in blanket and rollers washes are below both the short term and long term workplace exposure limits (WELs) set either in EH40 Workplace Exposure Limits from the HSE or set by individual chemical manufacturers.

These give some indications of solvent concentrations. Where the measurements were by Draeger direct-indicating tubes, the accuracy is limited and the values are for indicative purposes only.

Workplace atmosphere measurement 1: Blanket washing on a Ryobi 2-colour litho printing press

I measured the following on a Ryobi B3 2-colour press:

Condition	Measurement (ppm)
Ventilation by nearby open windows. Measured as the operator applied blanket wash	2
No ventilation Measured as the operator applied blanket wash	100
No ventilation Measured 1 minute after the operator applied blanket wash	10

Considering the worst case condition of 100ppm (which exist for less than 1 minute) and using the concentrations in the blanket wash, (Spectrum 4020 non-water miscible wash) we get the following:

Constituent	Max %	WEL 15 mins (ppm)	Net ppm	Ratio
Trimethylbenzene	25	75	25	0.33
Xylene	9	150	9	0.06
Normal and iso-propylbenzene	5	75	5	0.07
Mesitylene	6	75	6	0.08

The indications are that the concentrations are below the OES particularly when the low exposure duration on a small, two-colour press is taken into account. When averaged over 15 minutes, the majority of which the operator spends on other duties, the exposure is very low.

Workplace atmosphere measurement 2: 2 Heidelberg 5 colour sheet-fed litho printing presses

The results were as follows:

Operation	Test type	Reading (ppm)	WEL (ppm)
Blanket wash	Hydrocarbon	<10	450
Roller wash	Hydrocarbon	25	400
Normal running	Alcohol	<100	400

Substances in use:

Substances where there is a known health effect have a workplace exposure limit which is listed in the HSE publication EH40. Where there is no such data, then companies may assess this themselves.

Blanket wash: HDP Appro HMK1 WM Blanket Wash

This comprises “Appro mixed alkanes and cycloalkanes” (50-100%) which is not listed in EH40. HDP have assessed the above as having a long-term workplace exposure limit of 150ppm. HDP have not assessed the short-term limit, but the general rule of thumb is to regard this as being 3 x the long-term exposure limit where there is no data to suggest otherwise.

Varn VWM Wash

This comprises a “Blend of aromatic and aliphatic hydrocarbons and petroleum distillates”. Again there is no listing in EH40 and Varn have not assessed a workplace exposure limit. In my experience, comparable substances contain Naptha (petroleum) hydrotreated, light for which manufacturers have assigned a workplace exposure limit of 400ppm.

Isopropanol

The short-term exposure limit from EH40 for this is 500ppm and the long term exposure limit is 400ppm. As this is permanently present, I have used the 400ppm figure as the workplace exposure limit.

Conclusions

The concentrations of substances present very close to their point of emission were:

- Blanket wash: < 2% of the workplace exposure limit
- Roller wash: 6% of the workplace exposure limit
- Isopropanol: < 25% of the workplace exposure limit

With dispersion which would occur between the emission points and the positions in which personnel spend their time, the actual exposure would be further attenuated. Therefore, there is no concern with the exposure to print personnel from the main substance present in the workplace.

Workplace atmosphere measurement 3: Blanket washing on small web-fed litho printing press

The concentrations measured using the Draeger tube were of the order of 10 parts per million (ppm). Wash-up solvents are normally based on Naphtha (Petroleum) Hydrotreated.

Substance	Test type	Reading (ppm)	WEL (ppm)
Blanket wash	350	<.10	350
	Activated carbon tube with subsequent laboratory analysis	1.8	
		2.8	

The results from the more accurate sampling carried out using activated carbon sampling tubes showed levels of 6.8 and 11.1 mg/m³. Naphtha (Petroleum) Hydrotreated is a complex mixture but if we assume that it has an equivalent molecular weight to that of toluene (92), then these figures translate into 1.8 and 2.9 ppm, ie lower than the Draeger tube readings but of the same order. The conversion from mg/m³ to ppm is as stated in the HSE publication EH40/2005.

There is no workplace exposure limit for this in the EH40 but chemical manufactures apply a long-term exposure limit of 300 to 400 ppm and no short-term limit. Therefore, the indications are that the concentrations are well below a level which could be expected to cause health problems.

Workplace atmosphere measurement 4: Methyl Ethyl Ketone (Butan-2-one) from inkjet printing.

This occurred on a small printer producing bar codes. Extraction was provided at floor level (MEK is heavier than air).

Room volume	103 m ³
Extraction Rate	0.557 m ³ /s via 6 vents
Air changes	19/hour
Concentration	100 ppm

The indications are that, even with very high extraction rates, general room extraction is insufficient to control the MEK concentration. Therefore, extraction local to the ink jet heads is desirable.

Cleaning newspaper press components 1

The operations comprised cleaning press components in a dedicated room which had no forced ventilation. The cleaning solvent (Safetykleen) was applied from a hose over a tank. The substances present were:

Substance	Compound	Content	Exposure limits (ppm) ¹	
			STEL ²	LTEL ³
Safetykleen SK Premium	Petroleum Distillates Hydrotreated Light	>99%	None	400
Eurostar Newsink	Hydrocracked Heavy	<10%	None	300
	Hydrodesulpherised Medium	<10%	None	400
	Paraffin oils	5 - 10%	None	None

I used Dräger tubes for Petroleum Hydrocarbons with a measuring range of 10 to 300 ppm. I took a sample above the spray tray during use and another sample in the centre of the room.

The maximum solvent concentration measured around 10 ppm.

The sample in the middle of the room was below the threshold of measurement.

The solvent concentrations of 10 ppm (parts per million) were considerably below the suggested workplace exposure limit. The substances used are not listed in EH40, which is the listing of workplace exposure limits published by the HSE. However, manufacturers of similar solvents suggest a long-term workplace exposure limit of 400 ppm.

The Dräger tube method is limited in its accuracy, but because of the large difference between the measured concentration and workplace exposure limit, it is not necessary to take more accurate measurements.

Cleaning newspaper press components 2

The operations were those shown in report 1, but were measured using sampling badges with subsequent laboratory analysis.

Sampling position	Solvent measurement (ppm)
Person cleaning on press	4.83
Person supervision	0.86
Person cleaning in room	24.06
Person cleaning in room	30.49
Person cleaning in room	4.96
Above spray tank	21.92

The conclusions were:

1. The measurements made using the earlier Dräger tube method were in the middle of the spread of results using the badge/analysis method covered by this report.
2. The solvent concentrations were, at worst, 7% of a prudent workplace exposure limit (WEL). Best practice is to aim for a maximum of 10% of the WEL, so this indicates that the operations are better than best practice.
3. There was a 6:1 variation within the 3 people working in the cleaning room.
4. The solvent exposure of the person cleaning on the press was similar to the lowest measurement in the cleaning room.



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