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HEALTH & SAFETY LABORATORY

Sanding of Isocyanate Based Paints – Part 1

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EXECUTIVE SUMMARY

Objectives

To establish whether the dried paint dust from sanding of a fully cured isocyanate based paint can liberate free isocyanates.

Main Findings

The sanding of a cured isocyanate based paint does not liberate the free isocyanate.

In a research paper published after the commissioning of this work other researchers monitored isocyanate exposure in a car repair shop during **grinding and welding** operations [Henriks-Eckerman *et al*]. Some low NCO concentrations were measured (maximum = 1.1$\mu g/m^3$), so in operations which generate high temperatures there is the possibility of isocyanates being released.

Recommendations

There is no need for routine isocyanate monitoring during sanding operations

Other harmful emissions will be evaluated in part 2 of this work

Evaluation of the findings of Henriks-Eckerman *et al* would be useful.

1 INTRODUCTION

The car body repair industry is widely known to have high potential exposure to free isocyanates, this occurs during the spraying of so-called 2-pack paints. Isocyanates are respiratory sensitisers (asthmagens) for which it has not been possible to establish a no-adverse-effect level. Isocyanates can also cause irritation to the eyes, skin and respiratory system. There has been much work carried out in this field and the Health and Safety Executive (HSE) has published MDHS 25/3 which provides a method by which isocyanate exposure can be quantified.

HSE has recently been asked to produce some guidance on the potential for isocyanate exposure during the sanding of a cured isocyanate based paint. There is little known about whether the heat generated during flatting (sanding) of a cured isocyanate based paint would be sufficient to generate the free isocyanate, so it was felt necessary to investigate this potential for exposure further.

2 EXPERIMENTAL DETAILS

A car door was obtained and sprayed using a hexamethylene diisocyanate (HDI) based paint by a Sheffield based, long established vehicle body repair shop. A bulk sample of the paint used was obtained, analysed and found to be predominantly polymeric HDI with a small amount of monomeric HDI.

The door was sanded in a fume cupboard using a Makita (model BO4553) palm sander with bag attachment and P100 grade sanding paper. Atmospheric monitoring was carried out using six impingers (containing 1-(2-methoxyphenyl) piperazine (MP) solution) backed up by MP impregnated GF/A filters in Swinnex type sampling heads. The positions of samplers are shown in figure 1. The sampling operation lasted 8 minutes in which time the entire door was thoroughly sanded. It may appear in figure 1 that the door has not been fully sanded, however, the door was sanded fully and then a couple of small areas were taken down to bare metal in order to represent a “worst case” scenario. Following the sanding operation dust (approx 3g) was collected from the sander bag and from the area surrounding the operation and immediately desorbed in MP solution. An Infra-red thermometer was used to monitor the surface temperature of the car door throughout the sanding operation.

All samples were analysed by HPLC as per MDHS 25/3. The impinger, filters and dust samples were all analysed for monomeric HDI. The dust extracts were also analysed for polymeric HDI.

Figure 1. Sanding operation with sampling positions.

3 RESULTS

Sample results are shown in table 1.

Sample	Monomeric HDI result
Impinger 1	ND
Filter 1	ND
Impinger 2	ND
Filter 2	ND
Impinger 3	ND
Filter 3	ND
Impinger 4	ND
Filter 4	ND
Impinger 5	ND
Filter 5	ND
Impinger 6	ND
Filter 6	ND
Dust sample	ND

Additionally the dust sample was analysed for polymeric HDI, result = ND.

Limits of detection;

Impingers/filters = 1 $\mu g/m^3$ NCO (based on a 15 L litre air sample taken at 1 litre/minute).

Dust = 0.02 μg NCO per gram of dust.

Surface temperature

Initial surface temperature = 24 ^{o}C

Maximum temperature during sanding operation = 36 ^{o}C

4 CONCLUSIONS

1. Recently published work [Henriks-Eckerman *et al*] has shown that tasks in car body repair shops which generate high temperatures (grinding, welding) can result in small exposure to isocyanates. The sanding operations undertaken in this study did not generate high temperatures comparable to grinding or welding operations.

2. Isocyanates are not generated during the sanding of a cured HDI based paint.

3. Additionally the dust generated does not contain free isocyanate.

5 ACKNOWLEDGEMENTS

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6 REFERENCES

M. Henriks-Eckerman, J. Välimaa, C. Rosenberg, K. Peltonen and K. Engström. Exposure to airborne isocyanates and other thermal degradation products at polyurethane-processing workplaces. *J. Envir. Monit*. 2002. Vol 4, 717-721.