

AFOEM Annual Training Meeting
Friday, 3 May to Sunday, 5 May 2019
Auckland, New Zealand

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Exposure to Occupational Hygiene

Suzanne Broadbent
COH, MAIOH, MNZOHS
Suzanne@has-expertise.co.nz
0274474373

NZOHS
New Zealand Occupational Hygiene Society

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Scenario – Stage 1

- You have identified that there is a significant hearing loss trend at a local plastics factory
- There is also a couple of cases of significantly reduced lung function and you have concerns regarding sensitisation and one worker complaining about his eye sight

First steps – ask me for more information if needed.

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CASE STUDY

- Plastics Industry
- Overview of site provided
 - Plastic extrusion
 - Finishing

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Stage 1 Results

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Scenario – Stage 1 Anticipation and Recognition

- Understand the process – what do they make, how, with what products, what sort of finishing?
- **Have a look**
- Discuss
- SDSs, research processes and hazards, **previous monitoring**, health monitoring, incident reports, employee feedback

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Scenario – Stage 2 Previous assessments

- Noise levels < 85 dBA (no knowledge of whether adjusted for 12 hr shifts)
- Dust – one sample ~10xWES
- Styrene – all below WES
- Nothing else ever tested

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Scenario – Stage 2 Case Study – Health hazards recognised

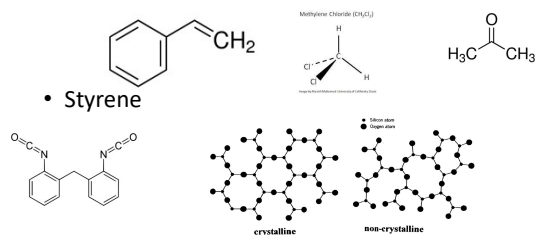
- Resin mixing, extrusion –
 - Polyurethane, polyester
 - Styrene, isocyanates, acetone, organic peroxides, toluene, fillers
- Part cleaning – methylene chloride
- Noise (throughout)
- Finishing, dust, silica (respirable?)

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Stage 2 Results

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Stage 2 results - What are they?



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Stage 2 results - Standards - Styrene

- NZ WES styrene 50 (TWA), 100 (STEL) need to adjust for 12 hr shift
- ACGIH TLV, European standards mostly 20 ppm (8hr TWA), 40 ppm (STEL or ceiling)
- Potential effects to hearing and vision <20 ppm
- Probable carcinogen (NTP 2011)

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Stage 3: IF/What and How Would you Monitor

- Given the previous information

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Stage 3 results?

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Stage 3 - Methods

- Styrene not well retained on charcoal – use badges/tubes that are pre-treated (6 wks to get to NZ)
- Respirable crystalline silica, respirable dust (samplers)
- Noise dosimetry
- PID (styrene, acetone) – note: conversions etc
- LEL other gases
- Colorimetric tubes
- Isocyanates – specific methodology

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Stage 3 - Styrene - methods

- PID –
 - Immediate, datalogging
 - Non-specific
 - check specific activities, locations
 - Convert (with badge results)
- Colorimetric tubes
 - Immediate
 - specific
- Badges/ charcoal tubes
 - Full shift exposure vs WES
 - Specific, accurate?



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Stage 4 Interpretation

- Results are given on next slides
- Interpretation is required – is there a health risk
- Should further controls be implemented
- What about further monitoring
 - Exposure monitoring
 - Health surveillance

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Scenario – Stage 4 Results - styrene

- Mixing shifts 10 to 20 ppm (badges)
- Up to 600 ppm cgeq on PID, incl STEL 200 ppm
- 2 hr exposure during cleaning – 46 ppm (charcoal)
- Is the WES exceeded? Is the employer required to reduce exposure? Could health impacts be occurring? Actions?

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Results - Noise

- Most levels 80 to 85 dBA
- 12 hour shifts
- Dosimetry results – almost all ~85 dBA (adjusted for 12 hr shift)
- Some tasks >90 dBA (v short duration)

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Results – Silica and Dust

- RCS all below detection limit
- Detection limit exceeded proposed WES in one case
- One respirable dust 50% of WES when adjusted for 12 hr shift
- Findings on site – very fine, not crystalline

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Stage 4 Interpretation - Results

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Interpretation/ Conclusions

- NZ Standards NOT exceeded other than noise
- Health effects likely (methylene chloride, noise)
- Ototoxicity
- Health effects possible (styrene, nanoparticulate silica dust, respirable dust, isocyanates)
- Health effects unlikely (acetone)

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Approximate Styrene concentration range	Health risk
0 to 10 ppm	Unlikely to be any. Odour threshold. Background, urban air is generally <0.01 ppm.
10 to 20 ppm	May be some risks (as for >20 ppm) with extended and ongoing exposure - including 12 hr shifts, over a 40 yr working life. Environmental exposure (e.g. elderly, children, existing health conditions, 24 hr) could also contribute to health impacts.
20 to 50 ppm	For ongoing, full shift exposure (8 to 12 hrs) and/or sensitive individuals, slight increased risk of: <ul style="list-style-type: none"> • Mild irritation, headache, fatigue. • Changes in sensory perception - noise, colour (vision) and smell. There has also been some indications that there may be some changes to cells (lymphocytes) at low levels (note: this has not been proven and no actual health impacts/symptoms have been identified)
50 to 100 ppm	Full shift exposure has potential for: <ul style="list-style-type: none"> • Fatigue, headache, dizziness • Reduced attention span, manual dexterity, slowed reaction time. • Loss of high-frequency hearing (ototoxicity) • Decreased colour discrimination (particularly blue-yellow) Possible increased risk of longer term health impacts, including carcinogenicity, effects to the reproductive system and unborn child (note: none of these three longer term effects have been completely proven).

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Controls

- Elimination of methylene chloride by using kerosene based degreaser/parts cleaning
- Reduction of noise levels through buy quiet policies, further maintenance of equipment, use of plastic parts instead of metals in conveying systems
- Ongoing use of hearing protection in areas in which noise is greater than 80 dBA

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Further monitoring

- Exposure monitoring for isocyanates
- Baseline and regular monitoring of hearing and lung function
- Biological monitoring for styrene – end of shift, mandelic acid in urine
- If exposure to TDI (toluene diisocyanate) is possible, biological monitoring for toluene diamine in urine, end of shift,

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End of Case study – key references and links

- WESs and BEIs
 - <https://worksafe.govt.nz/topic-and-industry/work-related-health/monitoring/exposure-standards-and-biological-exposure-indices/>
- NZOHS – including links to training courses
 - <https://nzohs.org.nz/>
- OHTA Training Modules, including Basic Principals
 - <http://www.ohlearning.com/training/training-materials/w201-basic-principles-in-occupational-hygiene.aspx>
 - Note: Basic Principals Course held in Auckland 11-14th June (NZOHS web site)

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Occupational Hygiene – Careers

- Certification (COH, CIH)
 - specific training (post grad), 5 years experience, examination (written, verbal), competency
- New pathways - intermediate options
- OHTA – OH Learning. NZOHS running courses
 - Poss qual in specific field (e.g., noise assessment)

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Health Related Hazards



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