Continuing Education Session:
Health Risk Assessment
Occupational Health and Occupational Hygiene

- Work Activity
- Exposure
- Disease
- Occupational Hygiene (Risk Assessment)
- Occupational Medicine (Detection and Treatment)
- Occupational Health
The focus of Occupational Hygiene is the risk assessment of exposure to harmful agents.
- **Psychosocial**
  - Fatigue
  - Stress
  - Work Design

- **Physical**
  - Noise and vibration
  - Heat and cold
  - Radiation
  - Electromagnetic fields
  - Lighting

- **Biological**
  - Bacteria
  - Fungi
  - Amoeba
  - Viruses

- **Chemical**
  - Gases
  - Vapours
  - Solids
  - Fibres
  - Liquids
  - Dusts
  - Mists
  - Fumes, etc.
Health Risk Assessment allows us to:

- Identify potential harm
- Identify unacceptable exposure
- Prioritise controls
- Justify/prioritise spending
- Predict legacy issues
Like any risk assessment, a health risk assessment is the calculation of:

**Likelihood x Consequence**

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<th>Insignificant</th>
<th>Minor</th>
<th>Moderate</th>
<th>Major</th>
<th>Catastrophic</th>
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Likelihood

- The chance that exposure will occur in a harmful dose considering:
  - The concentration of the exposure compared to the Workplace Exposure Standard (WES)
  - The length of exposure
  - The frequency of the exposure
  - The amount of people exposed
Workplace Exposure Standards

• In New Zealand we apply WES to determine what:
  • Nearly all workers
  • Working 8 hours per day
  • 5 days per week (40 hour work week)
  • Can be exposed to without causing harm

It is a quantification of likelihood not a determination of harm
The impact of occupational illness or disease
- Is it acute or chronic?
- Is it treatable or incurable?
- Are the effects reversible?
- Is the outcome potentially fatal?
Stages of Health Risk Assessment

EN689:2018 Workplace Exposure – Measurement of exposure by inhalation to chemical agents – Strategy for testing compliance with occupational exposure limit values

Figure 1 — Schematic overview of the strategy
<table>
<thead>
<tr>
<th>Stages of Health Risk Assessment (EN628)</th>
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<tbody>
<tr>
<td>Basic Characterisation of Hazards</td>
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<tr>
<td>Constitution of Similar Exposure Groups</td>
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<td>Selection of suitable measuring procedure</td>
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<td>Performing exposure measurements</td>
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<td>Validation of exposure measurement results and SEGs</td>
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<tr>
<td>Comparison of results with OELV’s (WES)</td>
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<td>Report of Results</td>
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<td><strong>Confirmation of control effectiveness??</strong></td>
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Alternative Health Risk Assessment Methodologies

AIOH Simplified Occupational Hygiene Risk Management Strategies
Alternative Health Risk Assessment Methodologies


Basic Characterisation of the Workplace

Workplace Organisation
- Organisation and headcount
- Job Roles and Job Function
- Work Shifts

Workplace Environment
- Location of task
- Surrounded work
- Existing controls

Processes and Tasks
- Tools and Techniques
- Ingredients
- Products/By-products
Workplace Organisation

**Organisation and headcount**
- How many people are allocated to each job task?
- How are the task allocated to workers? Are some workers excluded from certain tasks

**Job Roles and Job Function**
- What activities are associated with each job title?
- What are the frequencies of the tasks as a part of the job role?

**Work Shifts**
- Shift length; <8, 8, 10, 12, >12
- Roster Pattern; 5:2, 4:4, 6:1, 7:7, 9:5, 28:7
- Is there a residential component with potential exposure; e.g. fishing boats, oil rigs.
Workplace Environment

Location of task
• Is the work indoor, outdoor?
• Is the work mobile or regularly shifting?
• Confined Spaces?

Surrounding work
• What hazards are produced by surrounding work, e.g. noise, heat, dust?

Existing controls
• Is there ventilation systems in place?
• How effective are the controls? Known or unknown?
Processes and Tasks

Tools and Techniques
- Do the tools or techniques create a hazard?
- What are the likely emission points? Where are agents likely to concentrate?
- Are there alternative processes available?

Ingredients
- What products are used as a part of the process?
- What do the SDS’s for the products say? Are they a known health hazard?
- Are physical agents such as heat, steam, vibration, radiation or pressure a part of the process?

Products/By-products
- What is produced by the process?
- Are there unwanted by-products? Gases?
Exercise 1: Basic Characterisation
Hazard Assessment
Determining Consequence

- The impact is dependant on the hazard toxicokinetics.
- The Assessor needs a basic understanding of the health impacts of the hazard.
- Information is available from a range of reliable sources:
  - CDC – NIOSH Pocket Guide to Chemical Hazards
  - PubChem – US National Library of Medicine, National Centre for Biotechnology Information
  - World Health Organisation
  - International Agency for Research on Cancer (IARC)
  - Government Health Department’s
  - Worksafe NZ
  - Wikipedia???
Exercise 2: Health Consequences
Determining Likelihood

- Likelihood is a mix:
  - Exposure Levels
  - Frequency of exposure
  - Length of exposure
  - Amount of people exposed.
Estimation of Exposure

A best guess based on personal experience of the risk assessor

A banding method based on the risk matrix is recommended

- **Almost Certain**
  - Greater than 150% of the WES

- **Likely**
  - Between 100% and 150% of the WES

- **Possible**
  - Between 50% and 100% of the WES

- **Unlikely**
  - Between 10% and 50% of the WES

- **Rare**
  - Less than 10% of the WES
Tools for Estimation: Particulates

- Real time particulate monitoring
- Tyndall Effect
- Smoke Tubes (Extraction efficiency)
Tools for Estimation: Gases and Vapours

- Real time monitoring (Gas monitor and PiD)
- Colourimetric Tubes
- Smoke Tubes (Extraction efficiency)
Tools for Estimation: Noise

1m Rule

Sound Level Meter

IPhones and Apps
Tools for Estimation: Vibration

HSE Ready Reckoner
(http://www.hse.gov.uk/vibration/hav/readyreckoner.htm)

IPhone and Apps
Tools for Estimation: Thermal Stress

AIOH Basic Risk Assessment Apps: Thermal Risk

Malchaire (Dropbox)
http://www.deparisnet.be/DROPBOX.htm#eng
Exercise 3: Risk Assessment
Sampling Strategies: Similar Exposure Groups (SEGs)

• SEGs describe a group of people in a workplace with a similar exposure to a range of agents.
• By grouping people together you reduce the sampling required to determine the quantitative risk.
• SEGs are not final, they can and will change as the business or conditions changes.
• They are a tool to allow us to prioritise:
  • Controls
  • Monitoring
Exercise 4: SEGs
What are the top 3 at risk SEGs?
Deciding what to monitor?

- All hazards that are expected to exceed the WES should have further controls put in place.
- Monitoring should be used to assess the effectiveness of controls
- Those hazards that are expected to be greater than 50% of the WES should be assessed further by monitoring to quantify the actual risk.
- Ideally a Baseline sampling program should be implemented to give the organisation an accurate understanding of the health risks.
Only a personal exposure sample can be used to assess risk against a WES

- A Static sample can be used to:
  - Assess for the presence or composition of a contaminant in the atmosphere
  - Review the effectiveness of controls
Establishing Sample Plans

- Sample plans should reflect the risk for each SEG.
  - Example;
    - Risk = Moderate or above
    - Likelihood = Possible, Likely, Almost Certain
- A statistical relevant amount of samples should be planned
  - NIOSH Method
  - EN628
- What is feasible?
Health Risk Assessment Review

• A Health Risk Assessment should be regular reviewed including:
  • When operations change.
  • When a new product or process is introduced.
  • Baseline sampling is completed.

  Alternatively a periodic review is generally conducted every 12 months
What does the data mean?

• Converting sampling results to risk
  • Statistical Analysis
  • Reapply banding
Lessons to take away

• A health risk assessment is a great place to start for any organisation.
• It is the same process regardless of organisational size, processes or complexity.
• It allows an organisation to prioritise its health hazard controls.
• The Qualitative Assessment and Basic Characterisation is subjective. People will not agree with other people’s assessment.
• A Quantitative Assessment requires a statistically valid set of samples that determine exposure likelihood.