Approaches to reducing toluene diisocyanate exposure in a petrochemical laboratory

Cho young-nam

South Korea

E-mail: yn2000@kosha.net / 82-62-9498-776

Korea Occupational Safety and Health Agency
Background

- Toluene diisocyanate is a possible human carcinogen
- Workers at petrochemical laboratories are exposed to TDI
- Assessment reactions to exposure in laboratories have not been conducted
- To reduce human exposure to toluene diisocyanate in petrochemical laboratories
Material Safety Data Sheets

- Exposure Limits: C 0.02 ppm (0.14 mg/m³)
- Potential Occupational Carcinogens
- Original (SCP) IDLH: 10 ppm
- LEL: . . 0.9% (10% LEL, 900 ppm)
Potential Health Effects

- Short term effects
- Long term effects
- Skin contact
- Symptoms & Target organs
NIOSH Recommendations

- Respirator
- Fire and Explosion Measures
- Accidental Realease Measures
- Handling and Storage
NIOSH Recommendations

- Personal Protection and Sanitation
  - Prevent Skin Contact & Eye Contact
  - Frostbite
  - Eye Wash
  - Quick Drench
NIOSH Recommendations

- First aid
  - Inhalation
  - Skin & Eye Contact
  - Ingestion
Sampling Equipment & Reagents

- Sampling pumps [1 to 2L/min]
- Sampler, Impinger [tryptamine/DMSO:20mL]
- Calibrator
- Appropriately sized tubing
Sampling Locations

- Personal Samples
  : Samples gathered from workers

- Area Samples
  : Near by chemical hume hoods
Process

- Sampling

- Sample Preparation

- Calibrations and Quality control
Process

- Measurement
- Calibrations
- Evaluation of Method
Sampling Frequency

- Personal Samples; 8 Workers
- Area Samples; 4 Areas
- Sample Collected at 6 hours
## Results

- **Personal Samples**

<table>
<thead>
<tr>
<th>No.</th>
<th>Sample name</th>
<th>A work contents /measurement position.</th>
<th>Concentration (ppb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>An environmental analysis</td>
<td>0.007</td>
</tr>
<tr>
<td>2</td>
<td>F</td>
<td>An environmental analysis</td>
<td>0.008</td>
</tr>
<tr>
<td>3</td>
<td>H</td>
<td>An environmental analysis</td>
<td>0.013</td>
</tr>
</tbody>
</table>
## Results

### Personal Samples

<table>
<thead>
<tr>
<th>No.</th>
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<th>concentration(ppb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B</td>
<td>TDI analysis</td>
<td>0.014</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>TDI, DNT analysis</td>
<td>0.072</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>TDI analysis</td>
<td>0.044</td>
</tr>
<tr>
<td>4</td>
<td>E</td>
<td>TDI analysis</td>
<td>0.255</td>
</tr>
<tr>
<td>5</td>
<td>G</td>
<td>TDI analysis</td>
<td>0.003</td>
</tr>
</tbody>
</table>
## Results

### Area Samples

<table>
<thead>
<tr>
<th>No.</th>
<th>Sample name</th>
<th>A work contents /measurement position.</th>
<th>concentration (ppb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Area</td>
<td>T-E testing bench ED-A Hood scale adjacency</td>
<td>0.919</td>
</tr>
<tr>
<td>2</td>
<td>Area</td>
<td>T-E testing bench ED-A Hood stirring adjacency</td>
<td>0.109</td>
</tr>
<tr>
<td>3</td>
<td>Area</td>
<td>H-H Hood TDI-solvent Around waste</td>
<td>2.034</td>
</tr>
<tr>
<td>4</td>
<td>Area</td>
<td>T-D testing bench entrance direction.</td>
<td>0.017</td>
</tr>
</tbody>
</table>
Results

- Personal Samples: 0.007 ~ 0.255 ppb

- Area Samples: 0.017 ~ 2.034 ppb

- The highest exposure level is taken from the area sample
Conclusions

- Exposure levels are well below the TLVs

- Chemical hygiene plan should be implemented

- Chemical hoods should be inspected
Acknowledgement

- Chun hong-jin:
- Manager, KOSHA,
- Occupational Safety and Health Research Institute