

Characterization of the workplace, exposure(s) and the exposure agent(s)

Lecture 3

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Purpose, goal and outcomes of characterization

- Purpose
 - Collect and organize available information
 - workplace, workforce, exposure agents, etc.
- Goal
 - Have sufficient information to understand and assess exposure and evaluate health risk
- Outcome
 - Complete summary of available essential information.

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At a minimum we need information to answer the following questions

- What are the chemical, physical and biological agents in the work environment?
- What is the health effects associated with excessive exposure to the environmental agents?
- What are the Occupational Exposure Limits (OELS) for each agent?
- How is the workforce organized and staffed?

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At a minimum we need information to answer the following questions

- What are the significant sources of exposure?
- What are the processes and operations that have significant potential for worker exposure to the environmental agents?

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At a minimum we need information to answer the following questions

- What tasks and work practices pose a significant potential for worker exposure to environmental agents?
- What controls are in place?
- What is the functional state of LEV of other engineering controls?

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Elements and tools of characterization

- Workplace characterization
- Workforce characterization
- Identification and characterization of agents
- Characterization of existing controls
- Past assessments/results
- Historical exposure data
- Environmental emission data

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Workplace characterization

- Understand the process – on a macro as well as a micro level.
- Spend time getting to know what is going on
- Ask questions if you don't know – workers like to tell you about what they do

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Workplace characterization: Plant layout

- Doors & windows
- Fans
 - Wall, ceiling, personal man fans
- Flow of raw material, by-products & waste
- Maintenance shops
- Offices or control rooms
- Etc.....

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Workplace characterization: Find or make a process flow diagram

- Continuous, semi-continuous, and batch operations
- Identify equipment: reactors, filter presses, pumps, grinders, crushers, etc.
- Transfer methods for material entering or leaving the process: pipeline, trucks, railroad car, drumming, bagging, etc.

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Workplace characterization: Others factors

- Ventilation systems
- Open-top tanks, open sumps, trenches
- Use of PPE
- Maintenance and repair activities
- Document and watch how the job is done.
 - Different people do things differently. “head in the barrel” or “face in the work”

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Workforce characterization: Job classification

- Goal: understand the division of labor and work practices
- Plant roster
- Job descriptions
 - Union classifications
 - Cautions – can be vague or obsolete
- Worker and management interview
- Personal observation of work practices

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Workforce characterization: Job activities

- Review job activities to identify potential groups of workers having the same risk of exposure to an agent
- Observe and document job tasks for each job classification
- Record work activity and percent of time spent in each task

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Workforce characterization: Other factors

- Task analysis
 - JSA – Job Safety Analysis
 - Preliminary hazard analysis
- Number of workers
- Shifts and duration
- Work schedules
- Identify potential hazards associated with the job

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Identification and characterization of Agents: Goal

- Develop an inventory of all potentially hazardous chemical, physical and biological/botanical agents that are present
- Assess the risk potential of each agent
- Tie each agent to one or more work groups
 - Process/department
 - Job description
 - By task, if needed

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Identification of Agents: Chemical

- MSDS inventory should cover the greatest majority of chemical agents
 - raw materials, products, byproducts, additives, solvents, refractories, insulations, lubricants, coatings, resins, welding rods and compressed gases
- Identify the presence of process off-gases, by-products, waste products and products of pyrolysis or combustion

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Identification of Agents: Physical and Biological/Botanical

- Identify potentially hazardous physical and biological agents
- They include noise, ionizing radiation, microwave fields, laser radiation, hot environments
- Pathogenic microorganisms – anthrax, etc...
- Botanical – wood dust, poison ivy, etc....

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Characterization of Agents: Goal

- Gather information for each agent describing its.....
 - Use
 - Physical properties
 - Routes of exposure
 - Potential health effects
 - Pertinent OELs (occupational exposure limits)

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Characterization of Agents: Quantities and Physical Properties

- Approximate quantities or use rates
- Warehouse or production records are useful for finding bulk rates
- Environmental reports are a source of information on use rates

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Characterization of Agents: Quantities and Physical Properties

- Physical property data
- Particulate, gas/vapor or mixture
- Boiling points, vapor pressure, particle size distribution, specific gravity, density, etc.....
- Environmental temperature and humidity
- Frequency, wavelength, etc.....
- Species or variety

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Characterization of Agents: Health effects data and OELs

- Must know enough about the agent to differentiate acceptable and unacceptable levels of exposure
- Sources of information include
 - Material Safety Data Sheets (MSDSs)
 - Textbooks that summarize the epidemiological and toxicological literature
 - Professional and scientific literature

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Characterization of Agents: Health effects data and OELs

- Occupational Exposure Limit (OEL) is the limit selected or established by the IH for the purpose of judging exposure profiles to be either acceptable or unacceptable
- OELs generally come from one or more of the following categories:
 - Regulatory OELs,
 - Authoritative OELs,
 - Internal OELs, or
 - Working OELs

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Characterization of Agents: Health effects data and OELs

- Regulatory OEL
 - set and enforced by governmental agencies
- Authoritative OEL
 - set and recommended by credible organizations, such as the ACGIH (i.e. TLVs and BEIs, the AIHA (i.e. WEELS) and the NIOSH (i.e. RELS)

Note: Authoritative or regulatory OELs exist for only about 600 of the 70,000 chemicals used in industry

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Characterization of Agents: Health effects data and OELs

- Some private organizations develop internal OELs
 - May initiate testing or may request that the manufacture of the substance perform toxicological studies
 - Many chemical manufacturers have established OELs for their products

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Characterization of Agents: Health effects data and OELs

- Working OEL
 - In the absence of a formal OEL from a regulatory, authoritative or internal source, the IH must identify a "working OEL" to differentiate acceptable from unacceptable exposures
 - A "working OEL" is an informal limit created in the course of performing an exposure assessment – not a job for a single IH

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Characterization of existing controls

- Type
 - Guarding
 - General ventilation
 - Local exhaust ventilation
 - Hood types
 - Fan
 - General state of the system
 - etc
- Age

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Characterization of existing controls

- Condition
 - Worker have a way of undoing controls because they often feel the controls interfere with their work
- Preventive maintenance program
 - Do maintenance personal know the design parameters for the control measures?
 - Do they replace control system components correctly?
 - Are critical system components on hand?

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Past in-plant assessments / results

- Review past sampling reports
- Review original design specifications of controls, such as:
 - Static pressure requirements
 - Fan RPM
 - Acoustical power of equipment
 - Noise reduction requirements on enclosures
 - Etc, etc, etc.....

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Other sources of data on potential types and levels of exposure

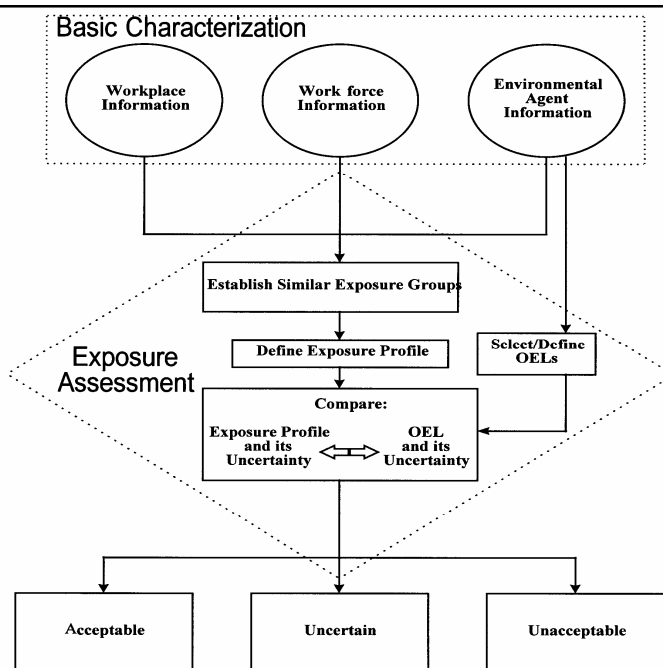
- Scientific / professional literature
 - AIHA Journal
 - Applied Occupational and Environmental Hygiene
 - Etc, etc.....
- AIHA conference
- NIOSH Health Hazard Evaluations (HHE)
- World Health Organization
- Etc, etc, etc,.....

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Closing thought on characterization

- You can't know too much about the plant and the production processes, the controls used, the workforce and the exposure agents involved
- The more you know the better and more specific you can make your evaluation and recommendations – bottom line making you more valuable to workers and the company

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