Transitioning to Safer Chemicals

Advanced Health Core

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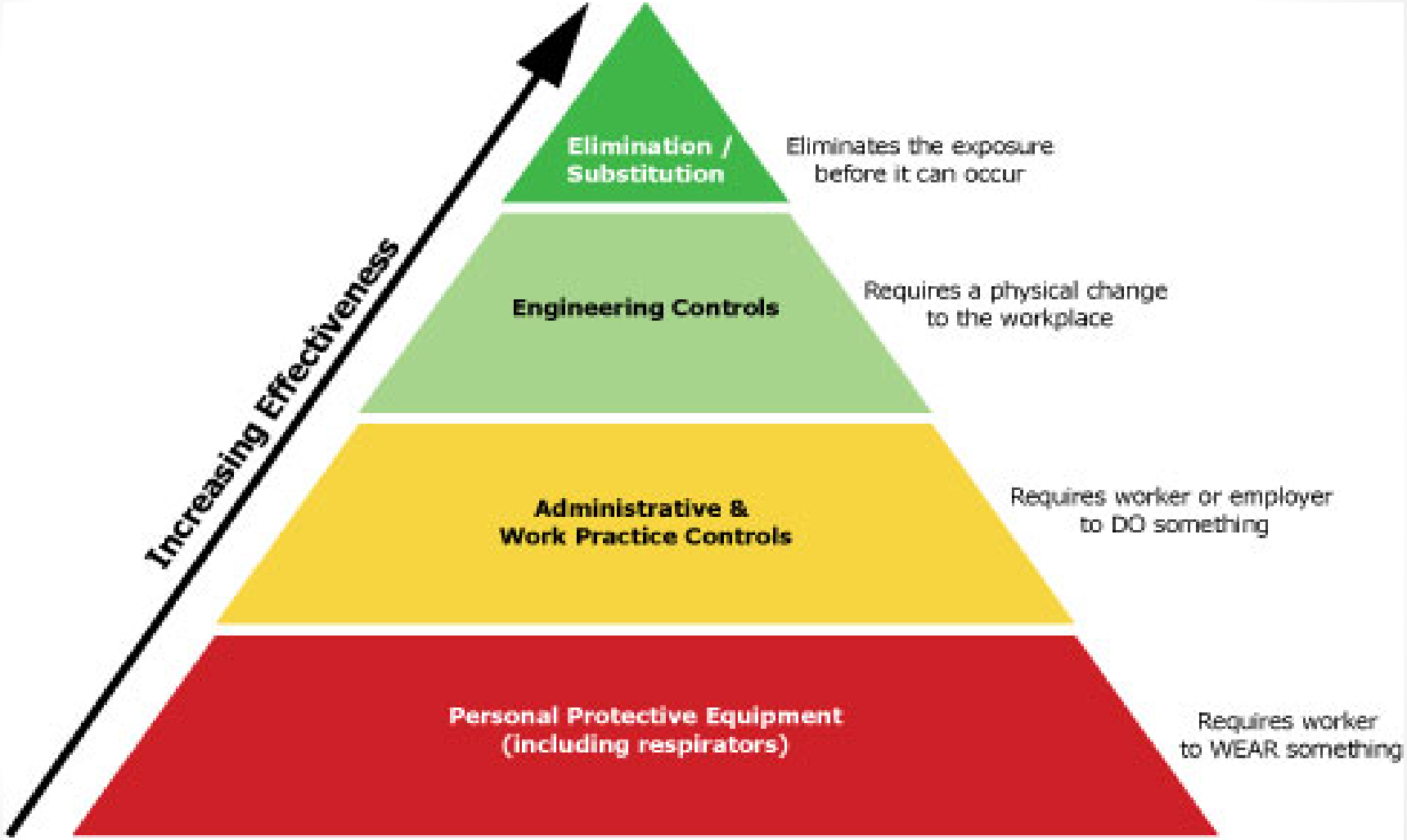
Why do we need to transition to safer chemicals?

- American workers use tens of thousands of chemicals every day.
- While many of these chemicals are suspected of being harmful, only a small number are regulated in the workplace.
- Workers suffer more than 190,000 illnesses and 50,000 deaths annually related to chemical exposures.
- Reducing or eliminating chemical hazards at the source is the best way to protect workers from chemically related injury and illness

Elimination and Substitution are Considered the Most Effective Means to Protect Workers



Why are less effective methods used more often?

Barriers to Elimination and Substitution

- **"We have always done it this way"**
- **Regulations rarely require substitution**
- **It costs money to change processes and some substitutes are more expensive than what they replace**
- **The cost of not substituting comes out of a different budget than the cost of substituting**
  - Treatment of chronic diseases, such as cancer, is paid for by health insurance (or Medicare or Workers' Comp in rare cases), while process changes come out of capital and operating budgets

Barriers to Elimination and Substitution

- Materials are generally chosen for their performance, quality and cost. Hazardous properties are often not considered.
- Engineers who design products and processes often don't know or think about which materials are hazardous
- Health and Safety folks are often not included at the design stage and may not know which safer substitutes will perform adequately

What are UAW workplaces doing to transition to safer alternatives?

- General Motors facilities have joint union-management hazardous material control committees that review chemicals and attempt to replace more hazardous ones with less hazardous ones that perform similarly.
- We negotiated contract language to eliminate exposures to carcinogens at an IPS facility, where more than fifty cancer cases have been reported, of which more than half are breast cancer
- In the 1990's Ford's Sheldon Road Facility replaced TCE (trichloroethylene), a suspected human carcinogen, with a water-based process

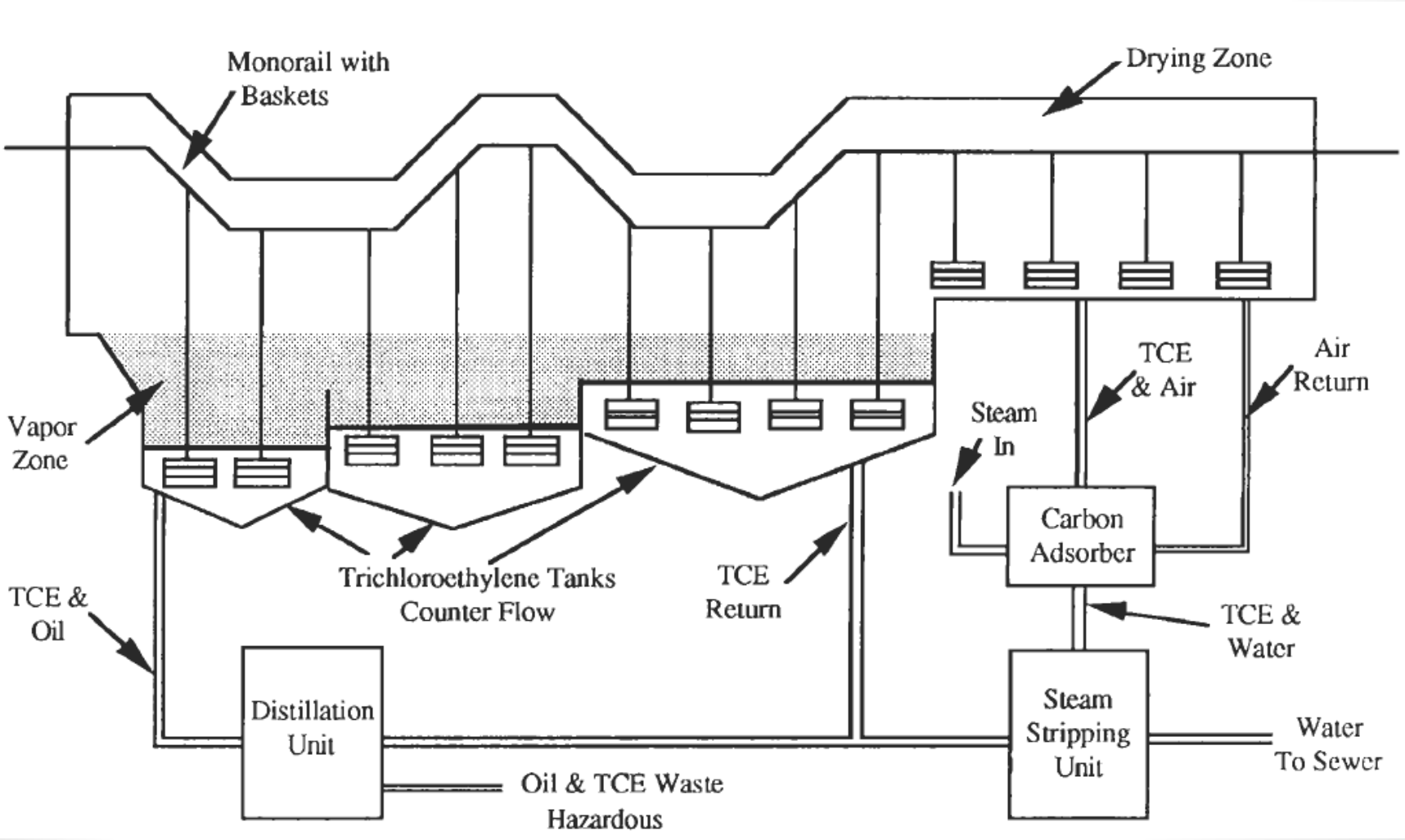
Replacement of TCE at Ford Sheldon Road Plant

- **The Sheldon Road Plant manufactured aluminum radiators and heater cores. It assembled heating and cooling units for vehicles.**
- **Oils were used in stamping parts to get the desired shape and fit.**
- **The process deposited aluminum and dirt particles along with a surface oil residue.**

TCE at Sheldon Road

- During assembly, heat exchangers are brazed to form an aluminum film which joins the different components of the part. To be brazed properly, the part must be as free of contamination as possible.
- Degreasing was required to decontaminate the part.
- TCE vapors were used to remove the oils and other contaminants from the part.

TCE Vapor Degreaser



Sheldon Road: Reasons for Replacing TCE

- Toxicity
- Environmental Compliance Costs:
  - At the time, TCE degreasers accounted for a substantial portion of the entire company's chlorinated solvent emissions.
- Production Costs
- Incompatibility with new brazing process

Sheldon Road: Project Team

The project team included representatives from:

- plant management,
- hourly employees (UAW),
- manufacturing engineering staff,
- environmental and safety engineering and research laboratory
- staffs,
- the State of Michigan,
- the local community, and
- the suppliers.

Sheldon Road Plant: Candidates for Alternatives

A dozen cleaners were evaluated for the use with a water-based process to replace TCE. The cleaners were divided into groups based on their pH, a measure of acidity or alkalinity. The three groups were:

- **Strong alkaline cleaners (pH > 13)**
- **Moderate/mild alkaline cleaners**

  (7 < pH < 13)
- **Acidic cleaners (pH < 7)**

Sheldon Road:
Assessing Performance of Alternatives

The cleaners' performance was measured using the following parameters:

1. Oxide layer thickness- An oxide layer inhibits the brazing process; therefore cleaners which promoted oxide growth were eliminated.
2. Residual carbon contamination -This offers a measure of the amount of oil removed from the part. All cleaners tested exceeded the level of cleanliness provided by the TCE vapor degreaser.
3. Aluminum surface attack - Etching removes a portion of the aluminum cladding, which can adversely affect brazing; therefore this property was kept to a minimum.

Sheldon Road:
Assessing Performance of Alternatives

4. Surface wetability - Surface wetability offers a measure of how well water-based brazing materials will work. All attempts were made to maximize this parameter.

5. Oil rejection and treatability - All cleaners were evaluated to ensure that they formed unstable emulsions with the oil so that the oil could be recovered.

6. The cleaners had to be dischargeable to the sewer system without further treatment.

Testing showed that the moderate alkaline cleaners provided the best part quality.

Aqueous Degreasing System to Replace TCE

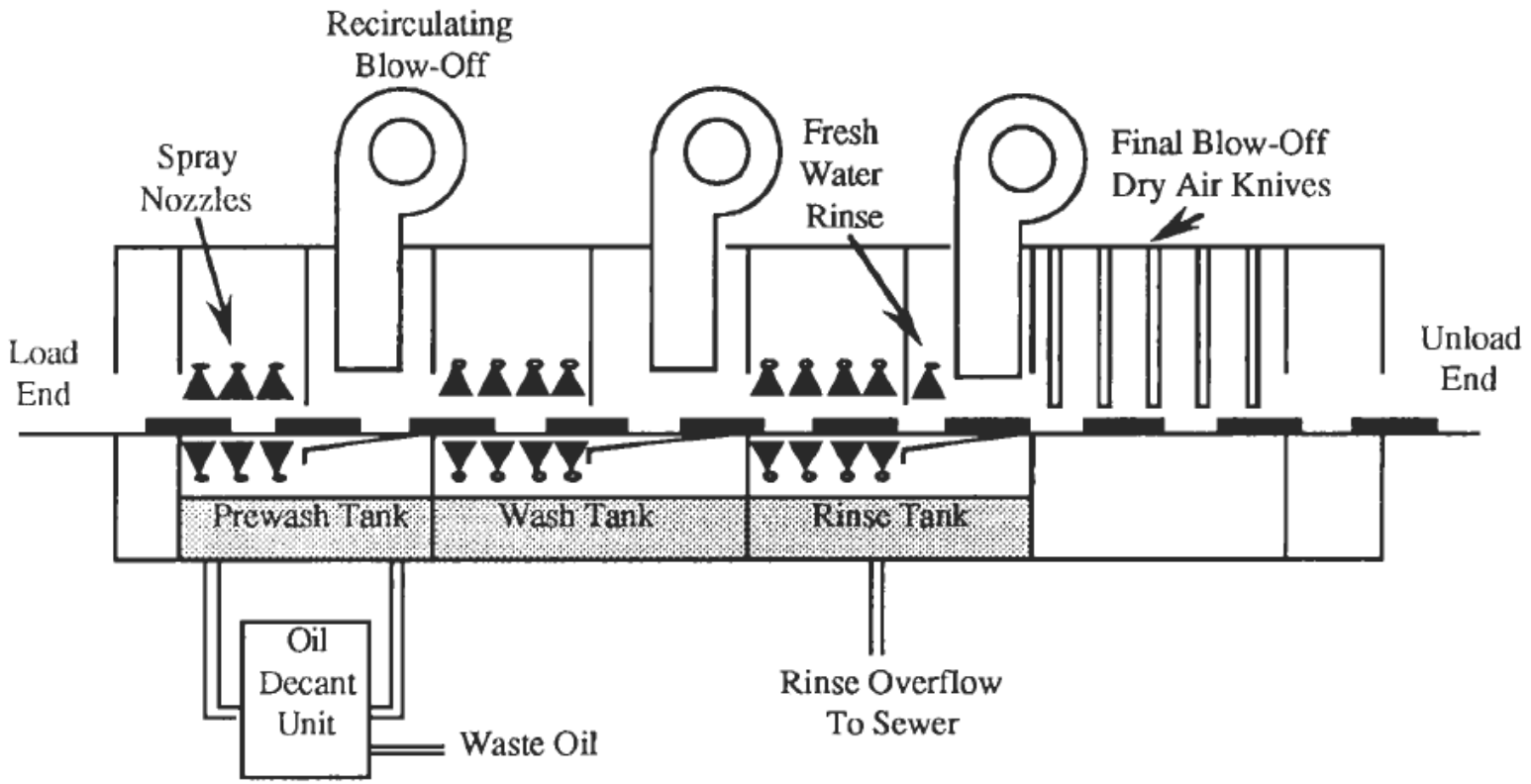


Figure 2. Pilot Aqueous Degreaser System

How Can Your Workplace Make the Transition?

Step 1: Form a Team to Develop a Plan

- **How will workers be involved?**
- **Who should be involved in planning and setting goals?**
- **What goals should be included in the plan?**

  (e.g. eliminate carcinogens or reduce toxic use by a certain percentage in a set number of years)
- **What policies, tasks, responsibilities, deadlines should be included in the plan?**
- **What information should you be aware of in developing the plan?**
- **(How) will external stakeholders be involved?**

Step 1: Form a Team to Develop a Plan

Can you get management to commit to a comprehensive plan to transition to safer alternatives?

- If not, will they commit to transitioning away from the most hazardous substances in your workplace?
- If neither, consider making safer alternatives a health and safety demand in your next contract negotiations. The Health & Safety Department can help you negotiate the language.

Step 1: Form a Team to Develop a Plan

Can your health and safety committee make AND implement a plan?

- Does it have the training it needs?

  (If not training is available from the Health and Safety Department)

- Are the right people on it?
  - **Transitioning to safer alternatives requires:**
    - knowledge of the hazardous properties of substances being used and potential alternatives, and
    - knowledge of the properties of chemicals required in order to produce products or services that customers will buy

Step 1: Form a Team to Develop a Plan

People who may not sit on health and safety committees need to be involved including:

- Those with knowledge of materials science and/or process and product design
- Those with authority to approve and/or require process and/or product changes
- Those with authority to spend money

Step 2: Examine Current Chemical Use

For each chemical, consider:

- Where is the chemical being used?
- What function does the chemical perform?
- Is the chemical necessary in the process or product?
  - Could the chemical be eliminated without damaging performance?
- What are the hazards associated with the chemical and how could its use harm workers?
- How are workers potentially exposed to the chemical**?**

Step 2: Examine Current Chemical Use

To identify priorities, consider:

- What potential chemical exposures to workers are of greatest concern?
- Could a chemical or process change help improve workplace safety and health?
- Are the identified priorities consistent with the work plan for transitioning to safer chemicals?

Step 3: Identify Alternatives

- Are there chemical alternatives that have been implemented in similar applications?
- Are there material changes or process changes that could replace the use of hazardous chemicals?
- Are there other businesses seeking safer alternatives similar chemical uses and/or processes?
  - Are there opportunities to collaborate?

Step 4: Assess & Compare Alternatives

To prioritize alternatives for further assessment, consider:

- What are the performance requirements of the chemical or process?
- *Do specific alternatives present a high risk to worker safety and health?*

When assessing and comparing alternatives, consider:

- What health and safety criteria (toxicological and physical properties) need to be compared?
- *When using the alternative, will workers experience any changes to the use of engineering controls, administrative controls, and PPE?*
- *Will workers experience changes in exposure when using the alternative?*
- *Will these changes present new/different hazards to workers?*
- What performance criteria need to be compared?
- What costs need to be compared?

Assessing Alternatives for Hazards

Acute Health Hazards

- Acute toxicity
- Eye damage
- Skin damage
- Sensitization (e.g., skin, respiratory)

Chronic Health Hazards

- Carcinogenicity
- Mutagenicity/Genotoxicity
- Reproductive Toxicity
- Developmental Toxicity
- Endocrine Disruption
- Neurotoxicity
- Immune System Effects

Safety Hazards

- Corrosivity
- Flammability
- Reactivity
- Explosivity
- Oxidizing properties
- Pyrophoric properties

Assessing Alternatives for Performance

- Durability
- Longevity
- Maintenance requirements
- Energy consumption
- Equipment requirements
- Tensile strength
- Tear strength
- Compressibility
- Flame retardancy
- Accuracy
- Resistance to shock/vibration
- Noise level
- Operating temperature

Costs and Benefits of Alternatives

Direct Costs

- Capital expenditures
- Operating costs
- Material costs
- Maintenance costs

Indirect Costs

- Supervision and administrative costs
- Regulatory compliance costs
- Worker health and safety costs (PPE, lost employee time, etc.)
- Waste management expenditures, including hazardous waste disposal costs
- Insurance, rent, taxes

Liability Costs

- Penalties and fines
- Personal injury
- Worker Compensation
- Property damage
- Clean-up costs
- Natural resources damage

Benefits

- Increased sales due to improved product quality, enhanced public image, consumer trust in greener products, or other effects
- Reduced health maintenance costs due to a safer work environment
- Improved worker productivity due to cleaner working conditions
- Increased worker productivity due to improved employee relations

Step 5: Select a Safer Alternative

- What are the advantages and disadvantages of each alternative with regard to hazard, performance, and cost?
- What trade-offs exist for each alternative?
- How should the various criteria and impacts be weighed to select alternatives that best enhance worker safety and health?
- Are there other considerations to weigh when determining the best option (energy use, water use, environmental impacts, hazardous waste management, upstream or downstream hazards to workers, etc.)?

Step 6: Pilot the Alternative

- Does the alternative perform well?
- Does the alternative change working conditions?
- What training do workers need to safely and effectively use the alternative?
- Are there any unforeseen effects or trade-offs of using the alternative?
- Is there a secure supply of the alternative?
- How could the alternative be implemented on a larger scale?

Step 7: Implement and Evaluate the Alternative

- Are workers benefiting from using the alternative?
- Have customers, supply chain partners, or others provided any feedback?
- How can the use of the alternative be improved?

UAW Health and Safety Department Services Available

- ✓Provide assistance/guidance with any H&S Issue
- ✓Provide Training for Local and Worksite
- ✓Assist identifying hazards (Site walk around)
- ✓"FREE" to Regions, Locals and Worksites
- ✓Questions ? **Call: 313-926-5563 UAW H&S Dept.**

UAW Protocol for Assistance/Training

- ➔**Local President** requests through International Representative
- ➔**International Representative** requests through Regional Director
- ➔**Regional Director** requests through H&S Department Director
- ➔**H&S Department Director** assigns H&S Department Representative
- ➔**H&S Department Representative** contacts International Representative to get contact person at worksite
- ➔**Service Provided**

Thanks to our funder!

National Institute of Environmental Health Sciences Hazardous Waste Worker Education and Training Grant:
This material was developed under Grant Number: *5 US45 ES006180-23* from the National Institute of Environmental Health Sciences.