CONTROLLING CHEMICAL HAZARDS

Guidance Sheet

SUBSTANCE SPECIFIC **BENZENE**

What is Benzene

Benzene is a clear, colorless liquid with a sweet odor. The odor threshold of benzene is around 60 parts per million (ppm). Benzene is extremely flammable. Its flash point is -110 C. Its flammable range is from 1.2 to 7.8 percent. (GS Flashpoints and GS Flammable Materials) The vapor is heavier than air, so it can spread long distances and ignite far from the source and flashback. The liquid is lighter than water and it floats on top of water if mixed.

Where is it Found

Crude oil and natural gas condensate contain benzene although the concentration varies greatly depending on the geology and location of the well site. Typically crude oils contain less than 1% benzene and natural gas condensates contain less than 6% benzene. Drilling and well servicing fluids may also contain benzene and can also become contaminated with benzene when they are recirculated down well. Process chemicals such as amines and glycols may become contaminated with benzene and other hydrocarbons. In certain situations benzene may be concentrated in hydrocarbon fluids from process equipment such as vapor recovery units (VRU's). Reservoir fluids such as produced water may be contaminated with benzene. Benzene and other hydrocarbons may be released from stacks, flares, hydrocarbon storage facilities, glycol dehydrators and other operations that involve crude oil or fuels.

The Risks
Health Effects

The effects on your health depend on how much benzene you are exposed to, and for how long. Immediate effects of high exposure can include:

- headache;
- nausea; and
- dizziness

Unconsciousness may occur if exposure is very high. Long-term exposure to benzene can result in serious blood disorders such as anemia (a low blood count that can make you tired and short of breath) and leukemia (a form of cancer).

Primary Routes of Exposure

Benzene can be absorbed into your body:

- if you breathe in air containing benzene vapor;
- through your skin; and
- if you swallow material containing benzene

Actions
Steps to Evaluate Risk

The risk to worker health increases with length of time exposed to benzene, the concentration in workplace materials and the amount of worker contact with materials containing the chemical. It is important to know how much of the chemical is present before you begin work. This information can usually be estimated from information found on the Safety Data Sheet and from previous chemical analysis done of condensates and crudes from the same production field or area. The type of work done will also have an impact on worker exposure and risk to health. Benzene has a very low legislated occupational exposure limit (OEL) because of its potential to cause cancer. This low OEL results in an increased the need for strict workplace controls and increases the chance of exceeding these limits.

The Controlling Chemical Hazards Guideline is designed to help you use this basic information to define the procedures and control approaches you need to follow to protect worker health and safety. Got to www.EnergySafetyCanada.com to gain assistance with controlling benzene exposures for your specific operation. In addition to the health risk there is a potential fire and explosion risk when working with any flammable materials (for more information see: GS Flashpoints and GS Flammable Materials)

Procedures

- Whenever possible, enclose operations (e.g., mixing and storage) as much as possible and ensure the equipment is vapor-tight.
- Can you reduce the need for people to be there by using automated systems to monitor the process?
- Can you time certain operations (e.g., blending operations) for a time when less people will be present?

Control Approaches

In order of preference there are four basic hazard control approaches: elimination/substitution; engineering controls (e.g. enclosing/containing the material or ventilation); administrative controls (e.g., safe work procedures); and personal protective equipment (GS Skin Contact, GS Respiratory Protective Equipment and GS PPE). All or just some of the approaches may be required to control worker exposure to benzene. The Controlling Chemical Hazards Guideline is designed to help you use this basic information to define the procedures and control approaches you need to follow to protect worker health and safety. Go to www.EnergySafetyCanada.com to gain assistance with controlling chemical hazards for your specific operation (GS General Guidance).

Facilities

Provide clean facilities: a washroom, showers, storage for clean and contaminated work clothing and a refreshment area.

Information Training and Supervision

Employer responsibilities:

- Provide information on the benzene containing materials that will be present at the workplace (e.g., Safety Data Sheets, previous analysis of fluids from the same or similar production fields)
- Consider elimination or substitution for a less hazardous substance. (e.g., a drilling or well servicing fluid that does not contain benzene)
- Installation of local ventilation hoods, enclosures around work processes and use of automatic systems to pump benzene or substances containing benzene from storage containers to process containers
- Use the Chemical Hazards Management System to define the required Safety Protocol for Chemical Management for the work you wish completed.

Supervisor responsibilities:

- Ensure the availability of the required Guidance Sheets for chemical management.
- Organize the work to limit the time workers are exposed to benzene
- Educating workers about the hazards of benzene, the controls defined in the hazard assessment and on the required chemical management process.
- Implementing good hygiene practices
- Implementing use and maintenance policies
- Implementing storage polices regarding hazardous materials
- Ensuring that unprotected workers are not in areas where products containing benzene are used
- Implementing spill response policies including the use of appropriate protective equipment and clothing.
- Ensuring the availability and use of personal protective equipment and ventilation equipment.

Worker responsibilities:

- Workers must participate in training and monitoring programs in the workplace
- Workers must not eat, drink or use tobacco products in areas where benzene or products containing benzene are used or stored. The hands and face should be washed before eating, drinking or smoking
- Workers must use and maintain all controls and equipment used to reduce exposure properly
- Workers must clean up of spills quickly and properly, using appropriate protective equipment and clothing.
- Workers must keep product containers tightly sealed when they are not in use.
- Workers must maintain and wear required personal protective equipment.

PRECAUTIONS YOU SHOULD TAKE

- ❒ Ask your employer about the risks, what precautions to take and what to do in an emergency.
- ❒ Follow the safe working procedures laid down by your employer.
- ❒ Avoid breathing in vapors containing benzene.
- ❒ Avoid getting liquids containing benzene on your skin.
- ❒ Use the ventilation equipment and personal protective equipment provided, e.g., gloves, respirators, goggles (GS PPE).
- ❒ Gloves should be made from materials which resist penetration by benzene. Natural rubber gloves should not be worn as rubber absorbs benzene (GS Gloves).
- ❒ Report to your employer or safety representative any damaged or defective ventilation systems or protective equipment.