

OPERATIONS SPECIFIC

DEALING WITH UNKNOWN FLUIDS

Hazards

Occasionally situations arise on oil and gas sites where unknown fluids are present at the worksite as a result of an accidental spill or release from an unknown source or a new unexpected production fluid encountered while drilling or servicing a well. The hazard associated with these fluids depends on the composition of the chemicals in the fluid mixture and the amount of contact workers have with the fluid.

All gas and oil wells are intended to produce hydrocarbon fluids. Onsite separators divide the mixture coming to surface into produced water, raw natural gas, natural gas condensate, and crude oil. Well stimulation chemicals pumped down hole are usually brought back to surface along with production fluids, some increase the toxicity of fluids brought to surface. Hydrogen sulphide (H₂S) is a common by-product of production and may be released when other production fluids are brought to surface.

Until testing demonstrates otherwise, workers should assume that any unknown oilfield fluid is both toxic and flammable.

The Risks**Health Effects**

The effects on your health depend on how much chemical composition of the particular fluids. In general, the hazard associated with a fluid increases with the percentage of aromatic hydrocarbons (such as benzene, toluene, ethyl benzene and xylene (BETX)) and hydrogen sulfide. Natural gas condensates often have a high fraction of aromatic hydrocarbons. Raw natural gas from sour wells will have high concentrations of hydrogen sulfide. Even in sweet wells hydrogen sulphide gas may have been dissolved in the water or other production fluids underground and become free when it is brought to surface.

The most commonly observed health effects in workers are skin irritation and contact dermatitis (redness and swelling of skin tissue).

Workers exposed to oil mist for prolonged and repeated periods may suffer from cough and phlegm and may have an increased risk of lung fibrosis (scarring and thickening of lung tissue). Breathing in of high concentrations of hydrocarbon vapor may result in headache, nausea, dizziness, a feeling of tiredness, lack of coordination, and problems with attention and memory. 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). Hydrogen sulphide is both an irritant (a material that causes redness and swelling) and a chemical asphyxiant (a material that prevents oxygen from getting to the brain). High concentrations can cause shock, seizures, inability to breathe, extremely rapid unconsciousness, coma and death. Effects can occur within a few breaths, and possibly a single breath.

Most hydrocarbons are flammable and many float on water; producing a risk of fire or explosion.

Primary Routes of Exposure

Contaminants in produced fluids can be absorbed into your body:

- » if you breathe in air containing vapor; or gases;
- » through your skin; and
- » if you swallow material containing the contaminant.

Access Control

- » Restrict access only to authorized staff that have been trained and equipped to work safely.

Actions**Steps to Evaluate Risk**

The risk to worker health increases with quantity and type chemicals in the fluid, the length of time exposed and the amount of worker contact with the material. The first step is to determine the composition of the fluid you will be working with. First try to find the source of the fluid to determine if there is any likelihood of hydrocarbons or hydrogen sulfide being present in the mixture. If it is impossible to determine the source of the fluid, the assumption should be made that it is both toxic and flammable.

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.enform.ca to gain assistance with controlling chemical exposures to the chemicals found in the unknown fluids you are working with. In addition to the health

risk there is a potential fire and explosion risk when working with any flammable materials (GS Flashpoints and GS Flammable Materials)

Procedures

- » Monitor for hydrogen sulfide and flammable vapors (LEL/H2S meters) if either is suspected in the fluid you are working with (GS H2S Gas Monitors).
- » Provide dilution and/or local exhaust ventilation to bring hydrocarbon concentrations in air below 20% of the lower explosive limit and hydrogen sulfide levels below 10 ppm if the fluid is not contained.

Control Approaches

- » If you suspect that hydrocarbons or hydrogen sulfide may be present, process streams involving unknown fluids must be completely contained to prevent exposure to workers.
- » If you cannot ensure containment of all an occupational hygiene specialist must be called to evaluate the risk to workers and to define specific control measures.
- » If a specialist is not available to evaluate the risk to uncontained production fluids use Self Contained Breathing Apparatus (SCBA) must be used (GS Respiratory Protective Equipment).

Other Personal Protective Equipment

- » Personal H2S and LEL Monitor: To be worn at all times if hydrocarbons or hydrogen sulphide are suspected (GS H2S Gas Monitors).
- » Fire Retardant Coveralls: To be worn at all times (GS Flame Resistant Clothing).
- » Chemical resistant gloves, clothing, boots and eye protection (goggles) are required if direct contact with fluid (GS Skin Contact and GS Gloves).

Information Training and Supervision

Employer responsibilities:

- » Modify equipment to ensure complete containment of unknown fluids, provide occupational hygienist and/or SCBA.
- » Undertake chemical analysis to determine components of the fluid.
- » Provide clean facilities: a washroom, showers, storage for clean and contaminated work clothing and a refreshment area.

Supervisor responsibilities:

- » Provide the required Guidance Sheets for chemical management.
- » Organize the work to limit the time workers are exposed to produced fluids.
- » Educating workers about the hazards of the unknown fluids they will be working with and the proper chemical management.
- » Implementing good hygiene practices and storage policies regarding hazardous materials.
- » Ensuring that unprotected workers are not in areas where uncontained production fluids are present.
- » Implementing spill response policies including the use of appropriate protective equipment and clothing.

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 contaminated produced water is present. 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.

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 getting liquids containing hydrocarbons on your skin.
- Use the personal protective equipment provided, i.e., SCBA, gloves, masks, goggles (see PPE).
- Gloves should be made from materials which resist penetration by hydrocarbons. Natural rubber gloves should not be worn as rubber absorbs many hydrocarbons (GS Gloves).
- Report to your employer or safety representative any damaged or leaking equipment or protective equipment.