

## SUBSTANCE SPECIFIC

## PRODUCTION FLUIDS

**What are Production Fluids**

Produced fluid is the fluid mixture of oil, gas and water in formation fluid that flows to the surface of an oil or gas well from a reservoir. Its consistency and composition varies greatly with the well. By produced fluid, there can be wells that produce oil, wells that produce oil and natural gas, or wells that only produce natural gas. Most will also produce water and many will also produce hydrogen sulphide gas.

**Where is it Found**

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. The hydrocarbons are then shipped for further processing and the produced water may be treated onsite or shipped elsewhere for processing. Onsite flares may be used to dispose of waste gases or they may also be injected into a disposal well. Production fluids may also be used as part of the production process; hydrostatic fracturing involves injecting clean or recycled (produced) water into the well and results in a mixture of flow back and produced water coming to the surface. Drilling mud may use recycled production fluids (water or hydrocarbons) as part of the intended mixture or may become contaminated with production fluids as part of the drilling process. During well servicing operations, recycled produced water may be used to kill a well and hydrocarbon production fluid components may be used to stimulate a well. 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. Workers involved in loading and transporting produced fluids for processing, recycling or treatment may also be exposed to these fluids. Hydrogen sulphide (H<sub>2</sub>S) is a common by-product of production and may be released when other production fluids are brought to surface.

**The Risks****Health Effects**

The effects on your health depend on how much chemical composition of the particular production 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 percentage 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 effect on health depends on how much and for how long you are exposed to these chemicals. The most commonly observed health effects of drilling fluids in humans are skin irritation and contact dermatitis (redness and swelling of skin 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 asphyxiate (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.

**Actions****Steps to Evaluate Risk**

The risk to worker health increases with quantity and type chemicals in produced 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 produced fluid you will be working with. This information can usually be estimated from information found on the Safety Data Sheet and from previous chemical analysis done of produced fluids from the same production field or area.

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](http://www.enform.ca) to gain assistance with controlling chemical exposures to the chemicals found in the produced fluid you are working with. In addition to the health risk there is a potential fire and explosion risk when working with any flammable materials (see: GS Flashpoints, GS Flammable Materials and GS Flame Resistant Clothing)

### Procedures

- » Monitor for hydrogen sulfide and flammable vapors (LEL/H<sub>2</sub>S meters) if either is suspected in the produced fluid you are working with.
- » Provide impervious clothing and gloves for direct contact with production fluids (GS Skin Contact and GS Gloves)
- » Ensure all workers in production areas use flame resistant clothing (GS Flame Resistant Clothing)

### Control Approaches

- » If you are working only with produced water and you are sure it does not contain hydrocarbons or hydrogen sulfide no special controls are required other than good hygiene practices.
- » If you suspect that hydrocarbons or hydrogen sulfide may be present, process streams involving produced fluid must be completely contained to prevent exposure (GS Breaking Containment).
- » 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).

### Information Training and Supervision

Employer responsibilities:

- » Provide information on the specific produced fluids that will be present at the workplace (i.e., Safety Data Sheets, previous analysis of fluids from the same or similar production fields)
- » Use the Controlling Chemical Hazards Guideline to define the required chemical management process for the work you wish completed.
- » Modify equipment to ensure complete containment of contaminated produced water, provide occupational hygienist and/or SCBA.
- » Provide clean facilities: a washroom, showers, storage for clean and contaminated work clothing and a refreshment area.

Supervisor responsibilities:

- » Provide the Guidance Sheets required by the Safety Protocol for Chemical Management.
- » Organize the work to limit the time workers are exposed to produced fluids.
- » Educating workers about the hazards of the produced water they will be working with and on the required chemical management process.
- » 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 (GS 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.