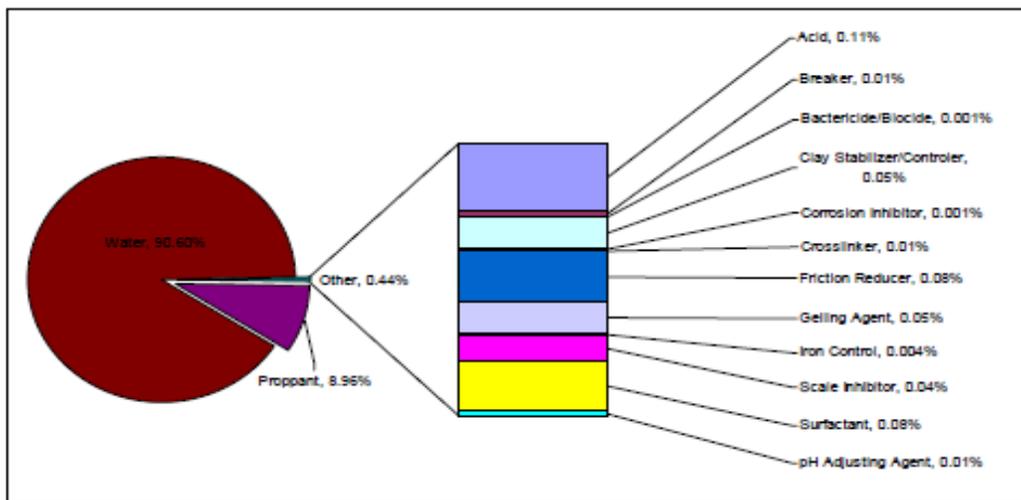


OPERATIONS SPECIFIC

HYDRAULIC FRACTURING OPERATIONS - FRACING

Hazards

The hazards that are present during hydraulic fracturing (fracing) operations depend on the types of materials being blended into the frac fluid and degree that these fluids are contained. Because fracing involves using very high pressures to fracture the formation with the fracing fluid, complete containment usually ensures minimal exposures to chemicals while processing is underway for most workers. However, the addition of additives in the blending area means that workers may be exposed to concentrated corrosive materials (e.g., hydrochloric acid) and some very toxic additives (e.g., biocides). Some commercial fluid blends also have added aromatic hydrocarbons (i.e., BTEX). The exact mix of materials used in the fracing fluid varies and depends on the type of formation being fractured. In addition to the blending area, flow back water will usually contain all of the initial additives plus some potentially flammable and toxic materials absorbed in the reservoir (e.g. production fluids and hydrogen sulphide). The setup and teardown of fracing equipment may result in direct contact with fracing fluids.



The high pressures involved (up to 10,000 psi) means that equipment must be maintained in top notch condition to prevent failure.

Access

Keep unnecessary people away from the work area. Ensure that no one is working close by downwind

Design & Equipment

- » Design the closed system to allow easy maintenance.
- » Ensure that seals, gaskets and valve packings are compatible with the materials being handled and suitable for the conditions of use (e.g., will not creep or crack at high temperature).
- » Ensure all pumps, pipes and couplings are to a suitable standard.
- » Ensure pipelines have sufficient flexibility to allow for thermal expansion.
- » Provide slip plates or valves to isolate sections of pipe from plant.
- » Provide arrangements for draining/flushing sections of pipe and for safe disposal of residues.
- » Provide precautions against static discharges.
- » Consider means of dealing with blockages, e.g. stream inlets or rodding eyes.
- » Minimize the number of branches and dead legs.
- » Ensure pipelines are all properly supported and protected from damage.

Pump:

- » Protect the pump against overheating and overpressure, (e.g., by the use of pressure relief valves).
- » Provide arrangements for draining and flushing the pump and for safe disposal of residues.
- » Make provision for the maintenance and replacement of the pump, e.g., by slip plates or isolation valves (GS Pump Maintenance).

Blending:

- » Automate blending area to minimize manual addition of additives.

- » Use local exhaust ventilation to reduce concentrations of airborne additives.
- » Consider using a less toxic additive to do the work.

Examination, Testing & Maintenance

- » Ensure all equipment used is maintained in good repair and efficient working order. Have the system thoroughly examined and tested at least once a year.
- » Adopt a “permit-to-work” system for all maintenance work.
- » Document and follow any special procedures that are needed before the system is opened or entered, e.g., purging or washing (GS Lock-out/Tag-out System).
- » Don’t enter any vessel until it is safe to do so. Check for hazardous or flammable substances and sufficient oxygen (between 19.5% and 22%). Note that entry or the work may give rise to a hazardous situation, (e. g., disturbing sludge, welding may deplete oxygen).
- » Check all the equipment once a week for signs of damage and repair when necessary.

Personal Protective Equipment

Respiratory Protective Equipment:

- » NIOSH approved P-95 (or P-99 or P-100) with combination organic vapor cartridge required in the blending area if appropriate local exhaust ventilation is unavailable.
- » Self-Contained Breathing Air: To be used when H₂S may exceed 10 ppm (GS H₂S and GS Respiratory Protective Equipment).

Other Personal Protective Equipment:

- » 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 fluids (GS Skin Contact and GS Gloves).

Cleaning & Housekeeping

- » Clean the work equipment and work area daily.
- » Spills are the major cause of dust or vapour in the workplace. Clean up all spills immediately (GS Spill Response).

Information Training and Supervision

Employer responsibilities:

- » Gather and provide safety data sheets on the chemicals that will be present at the workplace.
- » Use the Controlling Chemical Hazards Guideline to define the procedures and control approaches you need to follow to protect worker health and safety for the work you wish completed.

Supervisor responsibilities:

- » Ensure the availability of the required Guidance Sheets for chemical management.
- » Ensure the availability and use of appropriate protective equipment.
- » Complete and review with workers the chemical management process and the applicable Safety Data Sheets.
- » Review safe work procedures with workers before they start work.

Worker responsibilities:

- » Wear appropriate personal protective equipment.
- » Follow safe work procedures.
- » Ensure spills and leaks are quickly cleaned up.
- » Wash contaminated clothing before reuse.

PRECAUTIONS YOU SHOULD TAKE

- Look after your protective equipment. When not in use, keep it clean and store it in a clean, safe place.
- Keep your protective equipment clean and change it at recommended intervals or when it is damaged.
- Look for signs of damage, wear or poor operation of any equipment used. If you find any problems, tell your supervisor.
- Do not carry on working if you think there is a problem.
- Wash your hands before and after eating, drinking or using the bathroom.
- Clear up spills immediately.
- Contain or absorb spills with granules or mats. Dispose of spills safely.
- Use, maintain and store any PPE provided in accordance with instructions.