

OPERATIONS SPECIFIC

MUD PITS (TANKS)

Hazards

Personnel working over or around the mud pits can be exposed to high humidity, mist and vapors resulting from the very warm drilling fluid forming condensate on contact with the cooler atmosphere. When using oil based mud systems the mist will largely be oil mist while with water based mud systems will produce water mist along with dissolved additives unless the mud becomes contaminated with production fluids. The health effects of a particular mud system vary depending on the mixture of chemicals in the initial fluid and the degree it gets contaminated with production fluids. The more hazardous muds have higher percentages of aromatic hydrocarbons which can vary from <0.5 % to 35%. Older oil-based mud systems used diesel as their main component and had higher fractions of aromatic hydrocarbons including benzene, toluene, ethyl benzene and xylene (BETX). All drilling muds, even more modern drilling fluids, can become contaminated with aromatics and hydrogen sulphide down hole; increasing their toxicity. Workers may be exposed to drilling fluids either by inhaling mists and vapors or by skin contact. The chance of higher exposures occurs when:

- » washing with high-pressure guns using a hydrocarbon-based fluid;
- » cleaning mud pits;
- » working on top of mud pits; and
- » transferring mud pit fluids

In addition to the chemical hazards, the risk fire and explosion will increase with the flammability of the fluids used or produced and the risk of slips and falls increase when surfaces get covered in drilling mud or other fluids.

Access

Only allow access to the area by authorized staff that have been trained and equipped to work safely.

Equipment & Procedures

- » Select the least hazardous drilling mud system required to complete the work. Ensure it has:
 - a flash point of 610 C or higher and
 - few volatile and toxic components (selecting a water based fluid or hydrocarbon based one with an aniline point greater than 650 C will help ensure few aromatic hydrocarbons)
- » Consider the potential for drilling mud to be contaminated with production fluids. If the formation or reservoir has a history of producing hydrogen sulfide or volatile natural gas condensates, small amounts of contamination can quickly produce high concentrations in air above unenclosed or unventilated mud pits.
- » Maintain equipment regularly to eliminate leaks and clean spills promptly to reduce worker exposure to the mud (GS Spill Response).
- » Eliminate all ignition sources from area.
- » Every effort should be made to reduce the generation of airborne mist by spray or splash discharges, etc.
- » As far as possible, enclose the mud tank in a local exhaust ventilation (LEV) enclosure if being used for oil based drilling fluids or if contamination with production fluids is likely (GS Oil-Based Mud Systems)
- » Where open, fit mud tanks with lids and covers to maximize enclosure.
- » The use of a high-pressure wash gun with oil for cleaning should be kept to minimum and only oils with a high flash point (GS Flashpoints) and minimum light end components should be used. Mineral oil is recommended. The use of diesel fuel as a washing fluid in pressure wash guns is not recommended.
- » Wash guns should be equipped with triggers to minimize air contamination and wasted fluids when wash guns are unattended.
- » Ventilation fans should be used when necessary to prevent the build-up of hydrocarbon vapors in enclosed or semi-enclosed areas. Fan motors should be explosion-proof, and fan blades should be made of a non-sparking material.
- » If using flammable drilling fluids monitor mud operating temperature to ensure it stays 100 C below flash point of fluids used.

Personal Protective Equipment

Respiratory Protective Equipment:

- » Self-Contained Breathing Air: To be used when H₂S may exceed 10 ppm or if oxygen levels may be below 19.5% (GS H₂S and GS Respiratory Protective Equipment).
- » NIOSH approved P-95 (or P-99 or P-100) with combination organic vapor cartridge required for oil based mud systems while cleaning tanks or working on top of poorly ventilated or unenclosed tanks unless occupational hygiene monitoring demonstrates mist and vapor concentrations are less than 50% of occupational exposure limit.

Other Personal Protective Equipment:

- » Personal H₂S Monitor: To be worn at all times (including truck drivers) (GS H₂S Gas Monitors).
- » Lower Explosive Limit and Oxygen Monitors if entry into mud tanks is required.
- » 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 drilling fluids that contain hydrocarbons (GS Skin Contact and GS Gloves).

Cleaning & Housekeeping

- » Keep all work areas neat and free from debris.
- » Clean up chemical spills promptly.

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 proper 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

- 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.
- Read and understand safety data sheets for all chemicals you will be working with.
- Use the personal protective equipment provided, i.e., respiratory protection and impervious clothing.
- Don't enter any area that may contain H₂S or lack oxygen before it has been tested.
- Report to your employer or safety representative any damaged or defective ventilation systems or protective equipment.

Appendix 1 Mud Pits potential exposure to chemicals (excerpt from IPIECA Drilling fluids and health risk management)

General influencing factors: ambient temperature; indoors or outdoors; space and layout of the work area; general or local exhaust ventilation; Health and safety culture of the workforce, e.g. PPE discipline.

Task	Purpose	Exposure duration	Type of exposure	Influencing factors
Use of tanks	<ul style="list-style-type: none"> Storage of bulk fluids 	<ul style="list-style-type: none"> Continuous 	<ul style="list-style-type: none"> Inhalation of vapor/mist 	<ul style="list-style-type: none"> Temperature of fluid Fluid surface area exposed Design and size of pits Workplace design
Manual pit cleaning	<ul style="list-style-type: none"> Removal of fluids/solids and cleaning of tank interior surfaces manually 	<ul style="list-style-type: none"> Continuous during cleaning operations 	<ul style="list-style-type: none"> Splashes, contact with contaminated surfaces, inhalation of vapor/mist 	<ul style="list-style-type: none"> Temperature Ergonomics Confined spaces Cleaning equipment design and operating methods Lighting
Automated pit cleaning	<ul style="list-style-type: none"> Removal of fluids/solids and cleaning of tank interior surfaces mechanically 	<ul style="list-style-type: none"> Limited to set up or removal of equipment 	<ul style="list-style-type: none"> Contact with contaminated surfaces, inhalation of vapor/mist 	<ul style="list-style-type: none"> Configuration of the tank Tank design Cleaning equipment design
Pit transfers or circulating	<ul style="list-style-type: none"> Movement of bulk fluids between pits, possibly using flexible hoses and pumps Agitation of fluid within tank 	<ul style="list-style-type: none"> Limited to connection and transfer time 	<ul style="list-style-type: none"> Contact with contaminated surfaces, inhalation of vapor/mist. Potential for splashing 	<ul style="list-style-type: none"> Transfer/agitation equipment design Operating methods Tank design Ergonomics