



Aqueous Cleaning of Drilling Cuttings

Drill cuttings

Drill cuttings arise from drilling exploration wells, new production wells and workovers on producing wells. They contain agglomerates of rock fragments, oils, hydrocarbons, salts, drilling muds and other chemicals, some of which are hazardous and toxic. The chemistry of many modern oil-based drilling muds is formulated to remain stable under the high temperature and pressure conditions present during drilling.

Conventional cleaning techniques

Current techniques used to clean and decontaminate drill cuttings prior to disposal are energy intensive and costly: e.g. by thermal desorption using hammer mills or drying at temperatures of 350°C or higher. High pressure washing systems and various surfactant formulations have been used for cleaning drill cuttings, with limited success, because these systems were either unable to separate the agglomerates and release crude oil particulates or they created large volumes of difficult to manage secondary waste.

Aqueous cavitation scrubbing cleaning

Global Advantech Resources' aqueous drill cuttings cleaning systems combine several stages of proven technologies to achieve proven physical and electrochemical technology with innovative chemistry to build systems, which efficiently clean and remediate drill cuttings from wells drilled using oil-based muds/fluids. These systems utilise:

- Hydrodynamic cavitation scrubbing to separate adhering and adsorbed oil and hydrocarbons from drill cutting particulates (see TDS4805)
- Electrocoagulation cells to remove hydrocarbons, suspended particulates, most organic compounds, heavy metals, etc., from the process solution, enabling it to be recycled many times through

the cleaning process (see TDS4801)

- Chemistry to increase the rate of release of adsorbed oils and hydrocarbons from the cutting particulates

Applications

Global Advantech's cavitation scrubbing systems are designed to maximise generation of hydrodynamic cavitation using water pumped at high pressure. Applications for cavitation scrubbing systems:

- Soil washing to separate and recover hydrocarbons from heavily contaminated soil and sand, e.g. at old oil refineries and storage depots, engineering works, former gasworks, on beaches after crude oil spills offshore.
- Cleaning and recovering base and synthetic oils from exploration/production well drill cuttings, solids produced during well workovers, etc.
- Separation of fine particulates from aggregates in clay extraction.

Technology

Global Advantech's cavitation scrubbing The features and benefits of Global Advantech Resources' aqueous systems for cleaning and decontamination of drill cuttings include:

- Mobile and static plant configurations available
- Treatment throughput capacities: 1 tonne per hour to 20+ tonnes per hour



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- Oil/hydrocarbon reduction to <1/0% and two cleaning passes to 0.2%-0.5%, depending upon porosity of rock fragments
- Non-thermal processing – ambient temperature operation, therefore substantially lower energy consumption (<20%) compared to thermal desorption plant with similar processing capacity
- Low environmental impact, with minimal emissions
- Use available water supplies for operation - fresh, brackish or seawater
- 75% lower capital costs and 80% lower operating costs compared to thermal desorption plant with similar processing capacity
- All process water recycled - treated to remove dissolved/emulsified oils, suspended ultra-fines, heavy metals, etc.
- Water/process solution treatment plant to remove suspended solids, heavy metals and dissolved/emulsified hydrocarbons, etc. This enables the water/process solution to be continually recycled through the system. Global Advantech Resources' uses a combination of water treatment



technologies, including electrocoagulation. (See TDS4801)

- Sub-systems to drain and dry cleaned solids and recycle collected water/process solution residues.
- Chemical formulations available for pre-treatment of solids materials and to increase rate of demulsification.
- Mobile systems available built into standard ISO-dimensioned frames/containers with integral bunds to prevent accidental release of process solution to the local environment.

Comparison between aqueous cleaning and thermal desorption using a hammer mill

	Global Advantech Resources' Cavitation Scrubbing System (5 tonne/hour)	Thermal Desorption Hammer Mill (3 tonne/hour max.)
Plant throughput	5 tonne/hour	3 tonne/hour, 0% moisture content 1 tonne/hour, 15% moisture content
Energy requirement	160KW (peak electricity demand)	750KW diesel engine + 250KW electricity demand)
Oil recovery	Most, no degradation	Most, with thermal degradation
Emissions control for combustion products/plant exhaust	Aqueous system therefore none required	Required
Carbon footprint	Low	Very high
Environmental impact	Minimal	Very high
Freshwater requirement	Uses fresh or seawater	Required cooling, emissions abatement
Water treatment system	Integrated	Separate water treatment system
ATEX Zoned configurations	Yes	No
Building requirements	Self-contained in ISO frames/containers, integral bunds	Building/pad with concrete floor/base and steel supports
Operating costs	Low	High
Maintenance costs	Low	High