



This equipment package includes descriptions of the process lines, the technologies used, and the overall equipment configuration. Processing parameters and conditions are presented in summary form. A process material balance and a list of consumables for a specific process line must be developed through laboratory testing based on the information provided by the customer in the technical specification.

FINE TREATMENT OF DRILLING SLUDGE AND OIL-CONTAMINATED SOIL



Mobile configuration: Each plant module may be fitted with a semitrailer of suitable load capacity for transport on public roads. The plant may also be fitted with equipment for unloading some modules from their transport vehicles during operation.

Time required to prepare the equipment for transport: 1 day.

Stationary configuration: The equipment is supplied with the utility connections needed to link the modules, taking into account possible placement constraints at an industrial site. No transport vehicles are included, but all modules remain mobile.

Time required to prepare the equipment for transport: 2 days.



Treating soil contaminated by oil or petroleum-product spills, and cleaning, decontaminating and oxidizing drilling sludge, are major challenges in industrial environmental management.

This fine-treatment configuration combines three mobile modules (5, 6 and 7) into one process line for waste consisting mainly of soil. The process comprises seven treatment stages.

MODULE 5 — SOIL PREPARATION FOR TREATMENT

Treatment begins in Module 5, which prepares a pumpable slurry from bottom sediment and soil excavated from a sludge lagoon. The receiving and feeding unit crushes and heats the material, screens out stumps and boulders, and feeds it by open screw into an active drum 2 m in diameter.

Steam-jet hydrocavitators and acoustic systems operate in the active zone, while a blending component is added to the feed. Their combined action liquefies hydrocarbon clumps and washes stones. A pump transfers the prepared slurry to Module 6.

MODULE 6 — REMOVAL OF HYDROCARBONS FROM SEDIMENT AND SOIL

Module 6 receives the slurry prepared in Module 5. At the inlet, bottom sediment, asphaltene-resin-paraffin deposits and drilling sludge are blended in a vertical extractor with a small amount of a light hydrocarbon stream. Examples include emulsified crude oil, oil recovered from traps, liquid oil sludge with a pour point below -10°C , off-specification gas condensate and other liquid hydrocarbon waste.

The module has two stages for treating the solid sediment and two for the liquid fraction. After each solid-treatment stage, thickened soil is withdrawn and subjected to hydrocavitation treatment. At the second stage, it enters a vertical extractor for treatment with a special solvent and other reagents.

The liquid fraction passes through two stages of hydrocavitation treatment using a hydrocavitation field and steam-jet hydrocavitators. After each stage, the light hydrocarbon concentrate is collected in a dedicated compartment and withdrawn as a recovered product. The solvent-treated soil is discharged in thickened form by conveyor for final mechanical treatment in Module 7.

MODULE 7 — SEDIMENT SETTLING AND DEWATERING

Module 7 receives soil containing solvent from the Module 6 conveyor. An acoustic disintegrator removes residual hydrocarbons from the thickened soil using an intense acoustic field. Residual hydrocarbons and the water–oil emulsion pass through two further stages of hydrocavitation and steam-jet treatment.

Each treatment stage has acoustic systems. The acoustic field greatly increases the rate at which drilling-fluid and drilled-rock constituents dissolve in water. It also accelerates dissolution of atmospheric oxygen in the water until saturation is reached.

Solids pass from one stage to the next in thickened form. According to the source specification, this markedly reduces residual chemical reagents in the treated solids and results in 100% oxidation of the washed solids.

TYPES OF WASTE TREATED

Drilling fluids; drilling sludge; unoxidized drill cuttings; aged oil sludge with high concentrations of asphaltene-resin-paraffin deposits; and oil-contaminated soil.



EQUIPMENT CONFIGURATION		
Module	FINE TREATMENT OF DRILLING SLUDGE AND OIL-CONTAMINATED SOIL	
Module 5	6.5 t — Soil preparation for treatment (heating and blending oil-contaminated soil)	
Module 6	12.0 t — Removal of oil products from sediment and soil (integrated sediment treatment)	
Module 7	10.5 t — Sediment settling and dewatering (water treatment and final sediment treatment)	
Design processing capacity:	Thick sludge (slurry)	5 t/h
<i>Rated throughput by feedstock type</i>	Soil and drill cuttings	8 t/h
Feed composition accepted for treatment:	Hydrocarbons	No limit
	Water	No limit
	Soil	Predominant
Utility requirements at maximum processing load:	Electric power	45 kW
	Steam	1,200 kg/h
Consumables (indicative values, subject to confirmation):	Demulsifiers	250 g/t
	Flocculants	500 g/t
	Blending	7 kg/t
	components	7 kg/t
	Solvents	7 kg/t
Achievable parameters for treated hydrocarbon concentrate:	Water	1–5%
	Mechanical impurities	0.1–0.5%
Achievable parameters for treated soil:	Hydrocarbons	0.05–0.1%
	Oxidation of washed solids	100%
	Removal of water-soluble	100%
	components	
Achievable parameters for treated water:	Hydrocarbons	0.0005% 5 mg/L