



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.

PROCESSING OF LIQUID AND HIGH-VISCOSITY OIL SLUDGE



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.



Oil-sludge treatment often involves liquid sludge, asphaltene-resin-paraffin deposits and oil-contaminated soil at the same site. For logistical reasons, soil may be stored with liquid and high-viscosity oil sludge. This configuration uses liquid sludge to form a pumpable suspension with soil or to blend with high-viscosity, asphaltene-rich oil sludge.

The three-module line treats liquid sludge and asphaltene-resin-paraffin deposits generated at refineries and oil-production sites. It is intended to reduce the repeated transfer of these deposits between oil-treatment facilities and sludge-disposal areas.

MODULE 2 — HYDROCAVITATION AND ACOUSTIC TREATMENT

Module 2 starts the liquid-sludge treatment line. The feed remains fluid under normal conditions. In a vertical extractor, it is blended with a light hydrocarbon stream, which may comprise emulsified oil, recovered oil product, liquid sludge with a pour point below -10°C , off-specification gas condensate or other liquid hydrocarbon waste.

The sludge passes through three treatment stages using acoustic systems and steam-jet hydrocavitation devices. Under specified operating conditions, the process breaks water–oil emulsions. Demulsifier is metered into the stream to improve phase separation. After each stage, the light-hydrocarbon concentrate is collected in a separate compartment; separated solids are collected automatically and sent to Module 6.

MODULE 6 — REMOVAL OF HYDROCARBONS FROM SEDIMENT AND SOIL

Module 6 starts the high-viscosity sludge treatment line. It receives bottom sediment, asphaltene-resin-paraffin deposits from sludge lagoons, aged oil sludge and soil slurry. In a vertical extractor, the feed is blended with a small amount of light hydrocarbon stream of the types described for Module 2.

Two stages treat the sediment and soil, and two treat the liquid fraction. After each solid-treatment stage, thickened soil undergoes hydrocavitation and steam-jet treatment. At the second stage, a vertical extractor applies a special solvent and other reagents. The liquid fraction likewise passes through two hydrocavitation and steam-jet stages.

The separated light-hydrocarbon concentrate is collected after each stage and sent to the liquid-waste treatment line in Module 2. After solvent treatment, a conveyor transfers thickened soil to Module 7 for final mechanical treatment.

MODULE 7 — SEDIMENT SETTLING AND DEWATERING

Module 7 receives solvent-bearing soil from the Module 6 conveyor. An acoustic disintegrator treats the thickened soil in a high-intensity acoustic field. According to the original specification, cavitation releases residual hydrocarbons from the soil into the gas phase. The resulting emulsion and soil pass through two hydrocavitation and steam-jet treatment stages. Residual water and hydrocarbons are sent to Module 2 for treatment.

TYPES OF WASTE TREATED

Oil-contaminated water; liquid oil sludge containing water-in-oil or oil-in-water emulsions in any proportion; oil sludge with a high content of mechanical impurities; and asphaltene-resin-paraffin deposits.



EQUIPMENT CONFIGURATION PROCESSING OF LIQUID AND HIGH-VISCOSITY OIL SLUDGE		
Module		
Module 2	18.0 t — Hydrocavitation and acoustic treatment (integrated feed preparation)	
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:	Liquid sludge	15 t/h
By feed category	High-viscosity oil sludge	5 t/h
	Soil and drill cuttings	5 t/h
Characteristics of waste accepted for treatment:	Hydrocarbons	Primary constituent
	Water	≤45%
	Soil	≤30%
Utility requirements at maximum processing load:	Electric power	55 kW
	Steam	1,500 kg/h
Consumables (indicative values, subject to confirmation):	Demulsifiers	250 g/t
	Flocculants	500 g/t
	Hydrocarbon blend	10 kg/t
	Solvent	10 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%
Achievable parameters for treated water:	Hydrocarbons	0.0005%
		5 mg/L