REMOVAL, PROCESSING, TREATMENT

OF OILFIELD SLUDGE, DRILL CUTTINGS AND CHEMICAL WASTE
Oily waste is an inevitable by-product of oil production, primary processing, refining, petroleum storage tank farms and oil pipelines. The industry as a whole bears the responsibility of handling hazardous waste created to avoid environmental pollution. Despite the advances in technology, which have led to fewer waste products in refineries and elsewhere in the production cycle, large stockpiles of untreated waste remain in lagoons and ponds at most oil installations.
Oily waste is a by-product of many oil refinery process and operations, particularly in treating water from storage tanks and removing sludge from lagoons.

In addition to oil the waste can include a variety of different toxic chemicals, water and solid particles of various sizes.

The Argus Group offers:

› Survey of issues with oil-bearing wastes from refining, exploration and production and determination of the best solution from a commercial and technical point of view in accordance with prevailing ecological compliance norms.

› Design on a turn key basis including planning, certification, general construction, delivery and installation of equipment, start-up of equipment and training for a completely integrated program for clean-up of oil-bearing waste products.

› Training in the operation of the gathering and treatment systems.
› Supply of technology and equipment for removing oily wastes from petroleum storage tanks.
› Supply of equipment for clean up of storage tanks.
› Supply of equipment for operational removal of sludge from petroleum storage tanks and processing oily wastes into fractions on site.

› Turn key clean up of petroleum storage tanks.
› Drill cuttings waste clean up programmes.
› Programmes for clean up of soil contaminated by oil or chemicals.
› A survey of requirements and planning for rapid deployment in case of oil spills in accordance with local norms.
› Supply of oil spill clean up equipment.
› Training in oil spill clean up.
› Programmes for clean up and servicing of grids.
Oil sludge from ponds or tanks can be gathered using mechanical methods such as pumping, excavating and various combinations of the two.

At the outset of each project, our specialists will assess each specific situation. Their analysis leads to recommendations on the most effective methods to remove oily sludge from lagoons, ponds, etc and to draw up the requirements for equipment needed to assure the best treatment process to suit the particular type of sludge.

All equipment used and recommended by Argus Group specialists is explosion-proof and is powered by specially designed diesel hydraulic power sources. We make use of specially developed high-capacity pumps for transporting collected oily sludge over significant distances.

Special remote controlled suction dredgers are used to remove heavy sludge from beneath water. The dredgers have a built-in high capacity sludge pump which can operate at depths up to 5 metres.

Sludge can also be removed by a mechanical excavator and loaded into a special hopper or feed system on the treatment unit.

Any 360° excavator with sufficient reach and weight carrying capacity is suitable for this operation.

We offer a special rotating sieve bucket which can be fitted to any hydraulic excavator. This enables the heavy sludge to be excavated whilst the rotating sieve allows the water and fine solids to fall through.
Sludge Processing

Following centrifuge processing, the following remains:
› Oil on solids < 1.5%
› Oil in water < 0.5%
› Water in oil < 2%

The sludge-processing throughput is on the order of 15 m³/hour.

Processing the collected sludge is carried out by a variety of units depending on defining factors such as kinematic viscosity, oil content, how easily the given type of sludge separates, solids content and presence of any toxic chemicals.

Low solids “fresh sludges” are generally easier to separate and may require only centrifugation and no real pre-treatment to achieve the require degree of separation. In this case we would use a specially designed decanter centrifuge.

The sludge is fed into the centrifuge. The 3000 g centrifugal force generated in the unit splits the oil/water/sediment by density. The sediment is discharged through the cone end directly into a container placed under the machine.

It may be necessary to add a flocculant to assist with separation of more difficult sludges.

Sludges with high solids content and older sludges, which are more difficult to separate, are given a high level of pre-treatment prior to entering the centrifuge for final polishing.

In cases where sludges contain a greater amount of hard components such as stones, the heavy solids are fed to a High Solids Pre-treatment Unit (HSPU). Where the sludge is contaminated with a high solid content such as stones and debris the HSPU system will screen and remove the solids while heating and homogenizing the oil in preparation for centrifugation.

The stones and debris fall to the bottom of the HSPU holding area where a drag bar system removes them. The solids are then washed while passing over a vibrating screen before dropping into a discharge container.
The Thermal Desorption Unit (TDU) is an indirectly heated rotary drum, which is operated in a parallel flow configuration. The burner flame and exhaust gases do not come into contact with the contaminated material. The drum rotates within an insulated chamber, which can be heated by combination fuel burners capable of burning natural gas, fuel oil, syngas, or propane. As the drum rotates, the surface of the contaminated material exposed to the metal surface is continuously renewed which facilitates the transfer of heat from the heated chamber through the drum to the material. The material is heated to a sufficient temperature to volatilize the contaminants. This is achieved under anaerobic conditions thereby preventing oxidation of the hydrocarbons.

Gases produced throughout the process and water are treated to remove remaining hydrocarbons.

The whole process shown above is explosion proof and is delivered and operated as a complete system with control room and computer readout.

The system operates at a maximum temperature of 450°C but generally 380°C is sufficient for treatment purposes. The system essentially removes all oil from solids and water.

To enable final solids to be further treated to completely remove all traces of oils and chemicals and also to treat drill cuttings, Argus offer the latest available Thermal Desorption Technology.

Further Sludge Processing and Treatment of Drill Cuttings

The thermal desorption unit is also available as a trailer mounted package for use on remote sites.
We offer a complete service including civil works such as foundations, electrical and piping connections and installation, start up, servicing and operation of the equipment at site. Our services may include maintenance and supply of spare parts for the duration of our operation.
The first stage for effective treatment is the diffusion of oxygen into the rows to encourage growth and activity of microbes in an anaerobic environment.

The second stage is to irrigate and control the moisture when introducing water and nutritive elements during the aeration of the rows.

These two conditions are essential for enhancing growth of micro-organisms which attack hydrocarbons. For this purpose careful control of water and air input is essential.

Making use of state of the art technology and know how, the Argus Group offers a unique biological process and equipment for completely removing solids from oily sludge.

Solids with from 5 to 50% oil product contamination are subject to treatment.

The process is analogous to composting in agriculture in which stacks are turned to enhance microorganism growth.

Thirty to sixty days is the ideal amount of time required for full decomposition.

The process encompasses the formation of rows, introduction of nutrients, periodic water irrigation and daily oxygen diffusion with the aid of special equipment.

The chemical biological process is shown below.
We offer "Automated Chemostat Treatment" (ACT) as an innovative, breakthrough treatment to industrial wastewater treatment. It is specifically designed to reduce the volume of sludge generated in oily water treatment operations. It can be engineered to side stream or main line water streams where it can anticipate and prevent undesirable situations.

ACT functions as an add-on to wastewater treatment systems and:
› Minimizes sludge created in the process by up to 65%.
› Enables cost efficient capacity increases.
› Offers an optimal solution for storm waters.
› Allows separation of heavily contaminated streams and increases overall productivity.
› Provides an efficient way to break down and remove oil, phenols, PAH and other organics.

The patented process utilizes unique bioremediation technology to reduce hydrocarbons, TOC, COD and suspended solids from greasy and oily waters, leaving effluent of high quality meeting stringent industry standards.

ACT operates as a continuous flow reactor without using activated sludge. The bioreactor can be applied on-site (using the available infrastructure) due to its high flexibility in process modulation. This dramatically decreases operational and maintenance costs.
Floating Roof Tanks

Floating roof tanks are one of the most difficult and dangerous types of tanks to clean due to the volatile nature of the oil and sludge contained therein.

We offer a unique On-Line cleaning technology, which negates the need for human entry inside the tank.

First, oil is pumped out of the storage tank by means of high-capacity pumps. Then it is sent through a heat exchanger where the temperature is raised to the maximum, 55°C.

The system operates by drawing oil from the tank using a high flow pump, passing the product through a heat exchanger where the temperature is raised to a maximum 55 deg c. The heated oil is then pumped to the fluidic nozzle via a 150mm diameter flexible pipeline and specially designed support gantry. The oil is continuously circulated through the closed loop system for a set period of time. The nozzle rotates and sweeps the entire floor area of the tank, breaking up and re-suspending the sludge and wax with the fresh oil.

The basic system is shown in the schematic below:
Fixed Roof Oil Storage Tanks

The Argus Group offer a range of different equipment to remove sludge and wax from fixed roof or closed tanks.

After removal the sludge is transferred to the HSPU treatment unit and centrifuged and/or subjected to thermal desorption as described above (see page 3-4).

Hydro-Dozer Hydraulic Powered

Hydraulically operated, mini-dozer, which is able to enter into confined spaces such as oil or oil product storage tanks. The dozer can be disassembled completely to fit through a standard tank man-way entry and reassembled inside the tank.

The dozer is operated by remote control avoiding the need for human entry. It is able to move inside the tank breaking up the heavy sludge banks and works in tandem with one of our purpose-made sludge pumps.

The Mini Dozer is complete with a range of options which allows it to be operated in a range of modes, either manually or by remote control:

› Mini Dozer for in tank entry, breaking up sludge banks.
› Mini Dozer for working in restricted areas such as beneath pipelines.
› Hydro-dredger for working under water up to 5 metres deep to remove sludge.
**Rotary Lobe Sludge Pump**

Heavy-duty high performance pump with high capacity and solids handling capability, able to handle solids up to 100mm diameter. The pump is able to remove sludge right down to the tank bottom due to the design of the suction pipe on the pump.

It can be linked to the mini-dozer or work independently.

It is powered by a double diesel hydraulic power pack.

**Hydro Suction Dredger**

This remote controlled Hydro-Dredger is capable of operating under water or oil up to a depth of 5 metres. The dredger suction head is connected to a high capacity screw pump and suction pipe controlled by a hydraulically operated remote console.

The unit is attached to a high capacity screw pump, which enables high volume flow of a maximum 110 m³/hr with up to 85m delivery head.

The unit can be powered by a suitable hydraulic power source such as the dual power pack unit.

Argus personnel are trained to operate the specified equipment to remove even waxy sludge from a tank employing methods and safe working practices corresponding to the strictest international standards.
The Argus Group offers a unique, patented system for determining the volume of oil sludge in a tank, which replaces the inaccurate manual dipping method.

The system can accurately locate, map and quantify the levels of sludge in floating roof crude oil tanks while they are still in service.

This technology has been well proven within refineries throughout the world and results have been validated by the customer on a regular basis.

The Sludge Profiler for Oil Tanks (SPOT) has been designed to accurately locate and quantify sludge build up in the bottom of floating roof crude oil storage tanks. The system is based on sonar and during a 360° sweep 240,000 soundings are used to assess the sludge build up.

The sonar head is linked to a computerized station where a constant read out is available. This provides continuously updated three-dimensional grid plots of the profile of the sludge in the bottom of the tank an accurate sludge volume (within +/- 5%).

The system is intrinsically safe, as it is a totally sealed vessel that is completely nitrogen filled. The system has an automatic power shut down mechanism where if the pressure should drop the power to the system is cut off.

The SPOT system has full BASEEFA/ATEX certification.
In identifying the location and height of sludge banks in crude storage tanks, maintenance programmes can be prioritised, stock control can be improved, and representative samples can be taken from the sludge banks identified in the tank.

When landing floating roofs, they can be at risk when large sludge banks are present, in using SPOT system the risk of damage can be reduced. Mixer running patterns can also be monitored by using the system on a regular basis.

Scanning is performed without taking the storage tank out of operation.

The equipment requires a 4” (102 mm) internal diameter entry position into the crude. Therefore, roof legs, man- ways, vents or dip hatches etc could be used.

The survey is carried out with the tank full of oil, which eliminates the potential confined space problems, which can be associated with working on floating roofs in their lowered position.

Normally between one and three entry positions are all that is required to survey a tank with a diameter of up to 100m, eliminating the need to remove large numbers of roof legs.
Turnkey Projects

The Argus Group offers to carry out the complete tank inspection and sludge removal/tank cleaning service on a turnkey basis.

- Audit of wastewater treatment facilities.
- Tank Survey of sludge volume and 3-D plot of sludge profile.
- Sludge re-suspension and removal in floating roof, fixed roof or open roof tanks.
- Treatment of sludge at tank side.
- Feasibility study and risk assessment.
- Removal of oil products with minimum water content in the pumped product.

- Computerised analysis of sludge build-up in oil storage tanks.
- Treatment of oily waste to local environmental standards.
- Treatment of drill cuttings.
- Training.
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