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Refinery Effluent Treatment – API Type Separator

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DWN: RCS DATE:



The WesTech **BioTreater™ Biological Treatment and Clarification System** combines a biological treatment system with clarification in a compact design utilizing common wall construction. The biological treatment is located at the periphery in a ring-shaped area while the clarification stage is in the central region. The treatment system is fully expandable for complete biological nutrient removal. The system can also be designed to incorporate aerobic sludge holding, flow equalization, post aeration and chlorine contact chamber.

Refinery Effluent Treatment

Oil refineries create large amounts of oily wastewater. The wastewater usually contains flammable material, so all equipment is covered and sealed. The air above the wastewater is displaced by nitrogen (nitrogen blanketed) so that fires or explosions cannot take place. The wastewater also may contain heavy metals such as cobalt, iron, copper, etc.

Oil/Water Separator

The first step in refinery wastewater treatment is an American Petroleum Institute (API) design oil/water separator. API requires a long and shallow rectangular concrete basin with width set by flow rate. WesTech has developed and sold circular oil/water separators built to API standards.

The oil/water separator creates a laminar flow that allows oil to rise to the top and solids to drop to the bottom. The solids are collected through various means and sent to a bottoms tank. The contents of the bottoms tank are then pumped to a filter press where free water and oil are removed. Polymer is usually added to the material flowing to the press to improve filtration.

The free oil is skimmed from the oil/water separator and flows over a weir to an oil recovery tank. The recovered oil is then pumped back to the process.

Dissolved Gas Flotation

The wastewater flows from the oil/water separator to an equalization tank. Polymer is added to the wastewater as it is pumped to a dissolved gas flotation (DGF) unit. Some of the effluent from the DGF flows through a pressurization skid where a gas is dissolved in the water under pressure.

The water with dissolved gas is recycled back to the DGF. The DGF is not pressurized, so the recycle flow releases most of the dissolved gas which creates bubbles. The bubbles flow up through the wastewater and collect any oil that is present. The gas and oil floats to the top of the water where the bubbles burst and the oil is released to float. This “float” is skimmed and flows to the oil recovery tank.

Biotreater

The wastewater then flows to a biotreater where bacteria consume the bulk of the remaining hydrocarbons. Sludge is created as the bacteria grow and must be removed from the system. Part of the sludge is recycled back to the front of the system (recycled activated sludge) and the rest is sent to sludge digestion (waste activated sludge).

Dissolved Air Flotation

Effluent from the sludge digester is pumped to a dissolved air flotation (DAF) unit. Some of the effluent from the DAF flows through a pressurization skid where a gas is dissolved in the water under pressure. This water with dissolved air is recycled back to the DAF. Bubbles are formed that then float the sludge to the top of the DAF. The sludge is skimmed and pumped to a belt filter for drying and disposal. Treated wastewater flows to a sump where it is recycled back to the plant processes.