

Petroleum Waste to Fuel: Process Brief

The SUSTECH Process for conversion of the petroleum waste to fuel, contains the following steps.

1. Heavy Hydrocarbon preheating and Filtration (required for sludge and wastes)

Sludge being a semi solid material, is not easily pumpable due to high viscosity. Therefore, it is necessary to preheat the sludge to reduce the viscosity of the same for making it pumpable. The sludge once made flowable is taken through filters for segregating debris such as cotton, leather, plastic, stones etc. The filtered sludge is taken for subsequent processing.

The heated sludge is passed through specially designed Gyro Filters to remove debris as well as a major portion of solid particles such as sands, silts, scales etc. The Sludge is also pre-treated with proprietary chemicals to aid in dewatering the same. Thus, a major portion of water in emulsion is also removed before the sludge is taken to further processing. Thus, the pre-conditioned sludge will have minimum percentage of water and sediments.

The above is also true for other petroleum wastes such as slop oils, contaminated soils.

2. Pyrolysis and Catalytic conversion

The molten heavy hydrocarbons such as sludge and Vacuum resid are then pumped into airtight reactors. The reactor is initially purged with Nitrogen to create a flame proof environment. The liquid is then heated to app 250 °C to 350 °C. The reactors are insulated with a highly temperature resistant and flame proof, ceramic wool insulation and cladded with stainless steel cladding.

3. Reaction in Vessel

The mixture is heated and the reaction in the presence of the Catalyst will form light hydrocarbon vapors. However, the vapors are emanated from heavier long hydrocarbon chains and similar to polymers in structure. The catalyst helps to regroup the molecules to form light gases, which are then evacuated to the condensers.

4. Vapor condensation

The mixture of condensable and non-condensable gases from the catalytic converter is force fed into a dual condenser system where the light factions, middle distillates are condensed and recovered as fuel.



5. Condensate to tankage

The condensate from the dual condensers is collected into the storage tanks. The product at this stage is free from solid particles and water.

6. Non-condensable for re-ignition

The condensable fractions are condensed and the non-condensable form is evacuated and mixed with air to act as fuel for feeding the burners.

7. Waste reclamation

The waste from the system consists of two phases, Solid phase and a gas phase. Solid phase consists of charred coal along with a minor portion of sand and other particles from the sludge. However, if Vacuum Resid is used as a feed stock, then the solid residue is Pet Coke, which has a resale value.

Oil Recovery from Sludge

The tank bottom sludge normally consists of approximately 60% hydrocarbon content and the balance being sand, silica and water. Hydrocarbon content in the sludge may vary and the yield is approximately 95% and more of the hydrocarbon content in the sludge.

For example, each ton of sludge produces 660 liters of Diesel equivalent based on 60 % hydrocarbon content in the sludge. Normally the hydrocarbon recovery rate is in excess of 95% of the hydrocarbon content in the sludge.

Oil Recovery from Vacuum Resid

When Vacuum Resid is processed in the SUSTECH system, it had been observed that 70% of the Vacuum Resid is converted into Light hydrocarbons such as Naphtha, Gasoline, kerosene, Diesel etc. The mixed fuel consisting of the aforementioned constituents can be in-fed into the distillation columns along with the rest of the feed stock and the recovery rate of the refinery is boosted by almost 21% considering the fact that Vacuum Resid is app. 30% of the refinery input. The balance 30% of the Vacuum Resid ends up as Pet Coke. Pet coke once again has commercial value and can be sold.

Sludge from petroleum refinery introduced in the SUSTECH machine



Process



Extracted fuel and flame test



Por un planeta saludable / For a healthier planet.

