

## Annexure

### End Use and Detailed Specifications

Supply, installation, testing and commissioning of reactor tank, heat exchanger, high vacuum producing system and storage tank as per specifications

**End Use:** The above mentioned items will be used for pretreatment of high free fatty acid feedstock through glycerolysis reaction and will be equipped with biodiesel plant. Reactor will be used to perform the glycerolysis reaction at high temperature and pressure, heat exchanger will be used to condense the water and oil vapour during the reaction, high vacuum pump will be used to produce vacuum in the reactor and the storage tank will be used to store the final product.

#### **(A) Specifications of reactor tank:**

- (i) Reactor tank capacity 600 Ltrs,
- (ii) Operating Temp. 250 °C
- (iii) Material S.S-316, Thickness 5 mm
- (iv) Vacuum Gauge and Operating Vacuum Range 670-740 mm Hg
- (v) Thermal Fluid Heating Systems with heating controller
- (vi) Thermostat system with Control Panel
- (vii) Agitator (S.S-316 material Blades)
- (viii) Temperature Resistant Seals
- (ix) Feed pump (flow capacity of oil 30-40 Ltrs/minute, and working at room temperature) and accessories to connect with the inlet of the reactor (**at the top**)
- (x) Mechanical seal circulating pump (working temperature 250 °C) and accessories to connect the outlet & inlet of the reactor (**bottom & top**) and also to the storage tank.
- (xi) High Temperature Resistance Angle Valves **3 Pcs** (1 - feeding line, 2 - air outlet line during feeding and 3 - product outlet line at the bottom of the reactor) \*\*
- (xii) Thermal Insulation to prevent the heat loss, Leak-proof Joints and view glasses
- (xiii) A pipe (12 inch diameter and 1 meter length | S.S-316, thick ness 5mm) from the center of the reactor will be equipped to connect the heat exchanger.

**\*\* The product of the reactor tank will be evacuated and stored in the storage tank through pump which can handle hot (240 °C) oil / product**

**(B) Specifications of heat exchanger <sup>##</sup>**

- (i) Shell and tube type heat exchanger, vapor will be in shell and water cooled will be in tube
- (ii) Shell Material S.S-304, Shell thickness 5mm
- (iii) Tube material: Spiral Copper tube
- (iv) Vapor in temperature up to 250 °C, condensed liquid temperature 70 °C
- (v) Cooling capacity 50 Lit liquid per hour
- (vi) Drain Plug for Condensate
- (vii) Receiver unit (or dome) for condensed liquid (100 Lit capacity) at the bottom of heat exchanger, Material S.S-304, thickness 5mm

***<sup>##</sup> Heat exchanger will be connected through a pipe (12 inch diameter and 1 meter length) from the center of the reactor (S.S-316, thickness 5mm which can tolerate the Vacuum Range 670-740 mm Hg). A stand (similar height of the reactor) is required to fix the Heat exchanger just beside the reactor.***

**(C) Specifications of high vacuum producing system**

- (i) High vacuum producing system with Motor Capacity-5HP
- (ii) Should work with water vapor and able to remove the water vapor from the reactor
- (iii) Vacuum Range 670-740 mm Hg

**(D) Specifications of Storage tank:**

- (i) Storage Tank with Capacity-1000 Ltrs, cylindrical shape
- (ii) Storage Tank Material S.S-304 grade, Thickness 3 mm
- (iii) Storage Tank inlet (at the top) and outlet (at the bottom) should be Fitted with Valves