

ENERGEA

biodiesel technology

**ENERGEA
CONTINUOUS
SKID MOUNTED
BIODIESEL INSTALLATION
WITH
FFA-ESTERIFICATION**



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General Information

The installation processes fats/oils (also waste vegetable oil) and animal fats in order to produce FAME or biodiesel. FAME is the main product. After its synthesis it is washed to reach the quality required by the producer (for ex. E-DIN 51606 or the future CEN standard). Some of these standards are however dependant on the raw material fed into the system (such as CFPP [cloud point], Oxidation stability, Phosphorus content, Sulfur content, iodine number, and the distribution of Fatty acids [important in European standards]) and can not be obtained through processing alone. There is presently no standard for biodiesel from animal fat. It is an exclusive product and suitable only for certain purposes.

The continuous transesterification is carried out in three stages, a pre-transesterification and two transesterifications using a high pressure process which is patent pending. This has the advantage that the fat/oil can be processed with an FFA content of up to 5%. After the second transesterification follows a washing with water and an acid wash.

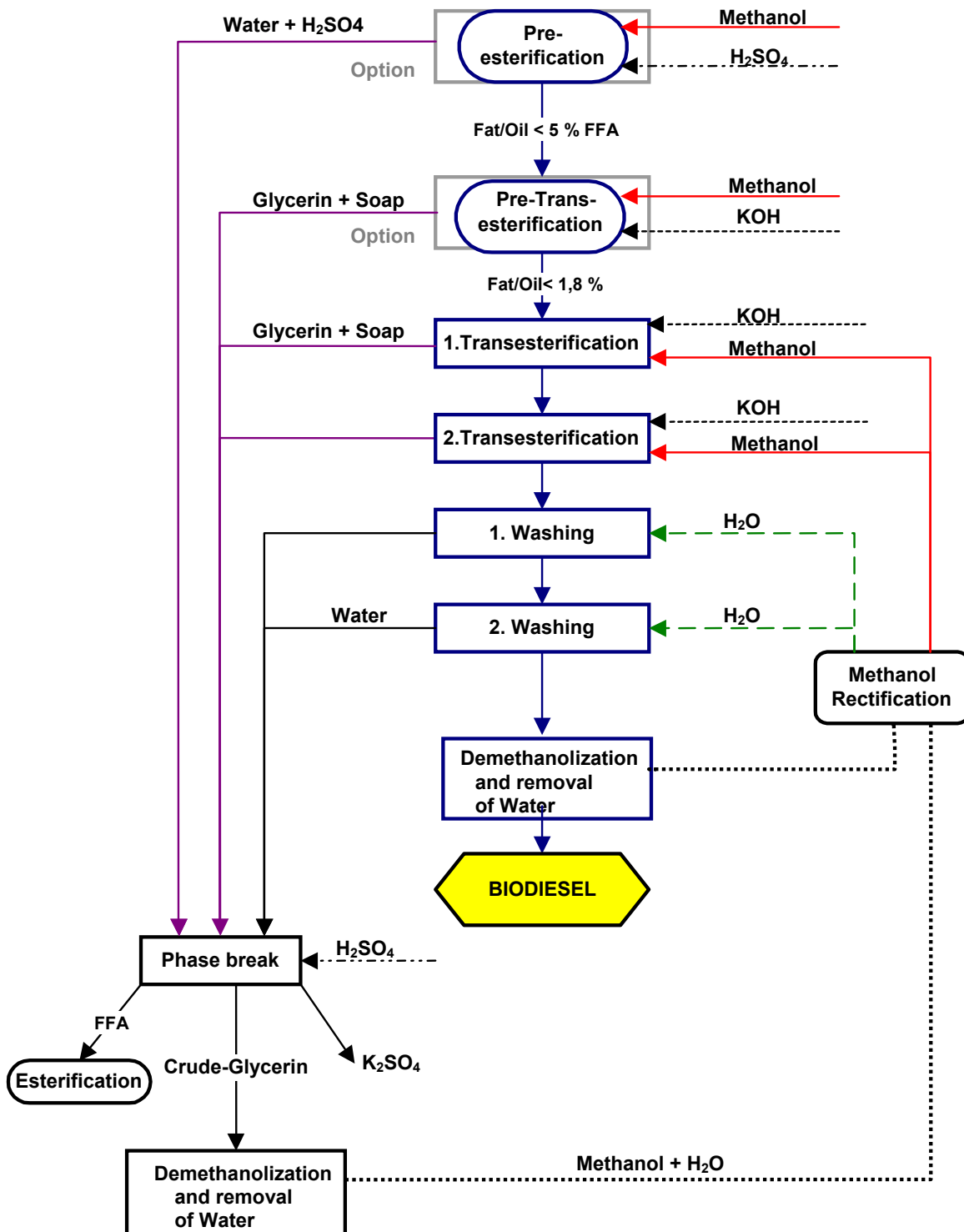
Between the transesterification and washing stages are continuous phase separators to separate the resulting glycerin-soap phase or the water-glycerin-soap phase. The synthesized FAME is then put through steamers to free it from methanol which has not reacted and from left over water. After a fine filtering the finished product can be treated if needed with winter additives or oxidation stabilizers (CEN-standards).

Animal fats or waste vegetable oils with a high FFA content (above 5%) are continuously esterified. After esterification the products are separated from the catalyst and the reaction water in a phase separator. From here the products are sent into the transesterification module for further processing.

The glycerin phase and wash water phases are put together and neutralized. The phases are separated per decanter. The FFA phase is added to the esterification, the crude glycerin phase is freed from methanol and put through steamers. The resulting potassium sulfate can be sold in its paste form as fertilizer. If needed, the potassium sulfate can be purified further and dried. The methanol retrieved from the FAME and from the crude glycerin is concentrated and reused.

There results no waste water as most of the process water is reused as washing water while a portion of it remains in the crude glycerin. The installation is designed to allow for an all-automatic continuous system and can be controlled with a central control- and monitoring-system.

THE PROCESS



Required raw material qualities:

- Vegetable oil:** - max. 20 ppm phosphor, filtered, 0.5% solids, (cold pressing or top removal of slime)
- Used vegetable oil:** - max.1% water, 0.5% solids, max 5% polymers, 30°C
- Additives:**
- Methanol 99,9 %
 - KOH (potassium hydroxide), technically, 90 - 92 %
 - Sulfuric acid (H₂SO₄), 95 - 97 %
 - Demineralized Water
- Products:**
- Biodiesel according to E DIN 51606, CEN
 - Crude glycerin (water removal according to desired energy use), up to 80 % purity possible
 - Potassium sulfate

BIODIESEL INSTALLATION

For waste or fresh vegetable oil/fat

Capacity per hr.	5.000 kg	2.500 kg
Capacity per day	120 t	60 t
Capacity per yr.	40.000 Tons	20.000 Tons

The installation consists of the following modules:

- 1. METHANOL-KOH-MIXING UNIT**
- 2. Continuous ENERGEA-TRANSESTERIFICATION MODULE - CTER-PROCESS**
- 3. STEAMER- and METHANOLRECOVERY MODULE**
- 4. GLYCERIN-SOAP-PHASE SEPARATION MODULE**
- 5. Continuous ENERGEA-ESTERIFICATION MODULE (CER-PROCESS)**

- Built into 5 x 20" Skids plus 1 x 40" Skid standing upright (ME-KOH mixing unit) and 1 x 40" Skid standing upright (evaporator)
- SPS for the registration and evaluation of the input impulses, periphery controls. Control hardware Siemens S7.
- Computerized visual display terminal with two control positions including server and run-time versions.
- External switch boxes, steel housing from RAL 7032, protection class IP54, wired to terminal and tested. Consists of main switch, motor protection, frequency converter, built-in SPS and including relays, control switches and lights.
- Documentation.

Required for process:

- Hot water 80°C
- Steam, saturated, 170°C
- Compressed air , 10 bar
- electricity 400 V.
- Water, demineralized
- Nitrogen

Required Chemicals

- Methanol max . 11% / Input oil
- KOH depending on FFA content in oil/fat from 1,1 % to 3,0 %
- H2SO4 depending on FFA content in oil/fat from 1,0 % to 2,8 %

Required Energy

(Approximate values, depending on input temp. and seasonal changes, per 1000 kg/h of fat/oil)

- electric 50 kW
- thermal (steam) 70 kW
- cooling, whole process 80 kW

We suggest a generator set, mobile, in container and run on biodiesel. Any surplus energy can be sold as bioelectricity. This requires app. 1.9% of your biodiesel produced.

We reserve the right to make any changes in the above description due to technical developments.

Minimum suggested storage (40,000 tons/year)

- 30 t KOH in Big-Bags
- 600 m³ oil storage (5 days requirement)
- 80 m³ methanol
- 30 m³ H₂SO₄
- 600 m³ biodiesel + 60 m³ crude glycerin
- 30 m³ Winter additive



Payment Conditions:

Delivery:	7 Months after order and decision on all technical details plus shipping
Payment:	30% on order 30% three months later; major parts 30% at delivery 10% at acceptance
Guarantee:	12 months, excepting parts subject to wear and improper use

This should give you an overview of our installation. Different variations up to 100.000 t / y and more are possible.

Prices on request.

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