CPU 25 000

Technical Description

1. Process and Features

CPU 25 000 (Compact Production Unit) is a complete methyl ester production technology with the capacities 25 000 tons of biodiesel per year, ready for start-up after connection to the external tanks such as settling tanks, dry-wash towers, tanks for methanol, oil, methyl ester and G-phase, compressed air, external ventilation lines and electric power.

The CPU features a continuous process system containing electronic proportioning systems, static mixers, propeller mixers-reactors, settling (buffer) tanks, vacuum distillation for removal and recycling of excess methanol. The purification of the methyl ester is carried out by an adsorbent combined with ion exchange resin beds.

2. Standard Processing

Under standard conditions the CPU will process 25 000 kg of feedstock oil into 25 000 kg of biodiesel, during uninterrupted operation. The performance of the CPU is measured under BDT standard process conditions using a low viscous (~ 25°C, < 40 mm^2/sec), fresh, degummed raw material (e.g. rape seed oil). The requirements for the proper running of CPU are as follows:

- minimum 1 bar pre-pressure from external oil tank or external pump
- compressed air supply permanent ≥ 7 bar at connector on CPU during operation
- stable supply of electricity
- ambient temperature in production hall 18°C to 30°C (higher temperatures should be discussed) min. 12 hours before starting the CPU and permanent during production
- oil processed at ~ 64°C in CPU
- methylate to be produced and added according to the BDT standard recipe

Divergent parameters or improper operation can cause lower yield, quality or cause damage to the CPU.

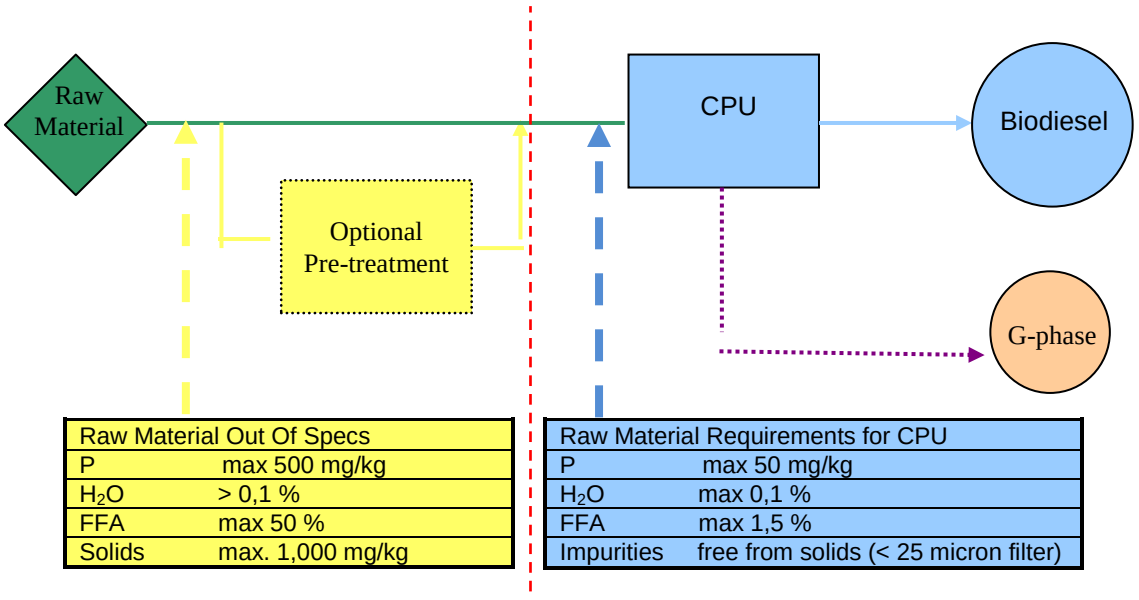
CPU 25 000 is a complex equipment utilizing triacylglycerol, contained in appropriate vegetable oil or animal fat, and methanol with the aim to produce fatty acid methylester (FAME). The process is catalysed by an alkoxide. Hence, the input materials are methanol and oils/fats, which meet the equipment producer specifications (see below). Potassium methoxide is the catalyst of choice, typically delivered as a 32 % concentrate. The production consists of the 2-stage transesterification in an alkaline environment followed by product purification and removal of excess methanol.

The following media can be found within the equipment:

- oil/fat (or any other source of triacylglycerol compatible in chemical composition)
- methanol CH_3OH
- potassium methoxide CH_3OK
- higher fatty acid methylester
- G-phase
- mixture of above mentioned materials in various concentrations depending on particular technological steps.

CPU Production

3. Process Overview



Raw Material Out Of Specs	
P	max 500 mg/kg
H_2O	> 0,1 %
FFA	max 50 %
Solids	max. 1,000 mg/kg

Raw Material Requirements for CPU	
P	max 50 mg/kg
H_2O	max 0,1 %
FFA	max 1,5 %
Impurities	free from solids (< 25 micron filter)

4. Raw Material

	Input
Multi-feedstock	oils and fats of vegetable and animal origin, used cooking oils
Temperature	> 35°C, liquid, low viscous (< 40 mm^2/sec) during operation (*)
Impurities	clean, free from solids (< 25 micron filter)
Other substances	free from other substances, namely emulsifiers, gums
Phosphorus	< 50 ppm
Transesterifiables	> 99.5%
Water	< 0.1%wt.
Acid Number / FFA	Acid No. < 3 mgKOH/g (i.e. max. FFA content ~1.5 %)

(*) 65°C for start up

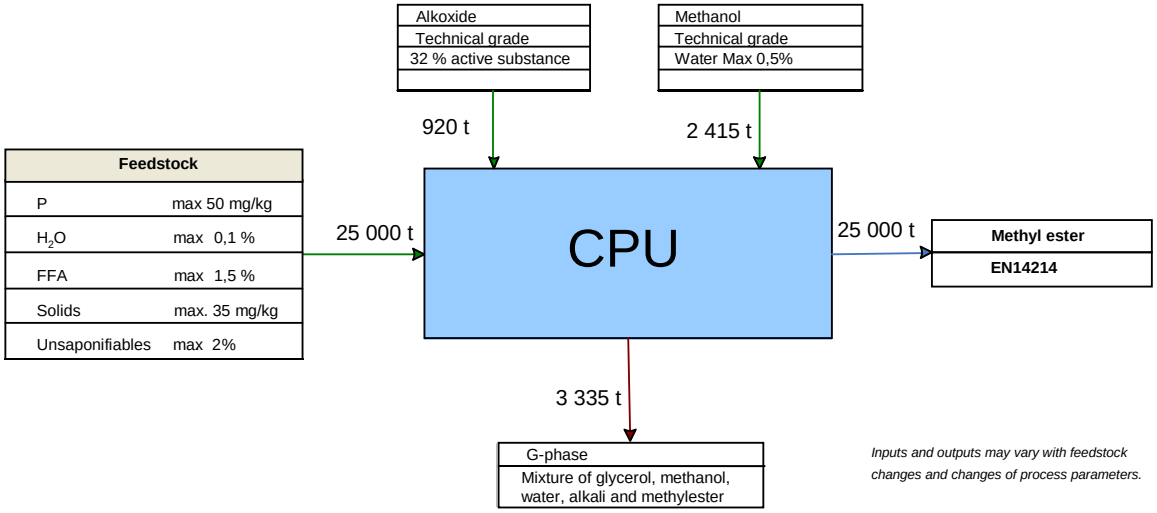
5. Utility Consumption Data per 25 000 t biodiesel

	Quantity per 25 000 t biodiesel	**Specification**
Feedstock oil	25 000 t	See Section 4 : Raw Material Spec
Compressed air for instrumentation	560 kNm^3	Dried, free of oil, 8 bar.g,
Electricity	120 kWh*	3x400 V, 50 Hz
Ion-Exchange Resin	10 t	
Adsorbent	55 t	

Catalysts Alkoxide	Methanol	2 415 t	Technical grade, pure, clean - max. 0,5 % water practically free from other substances
	Alkoxide	920 t	Potassium based alkoxide with 32 % catalyst (e.g. Degussa product KM32 or equal)

* Installed power requirements will vary depending on project capacity, please consult BDT for precise information concerning your individual project

6. Mass Balance



7. By-product

Medium	Quantity	Specification	
G-Phase 1,2	Approx. 13 wt % of the weight of the oil input	Glycerol Soaps Catalyst Methylester Methanol Water + other	65 – 70 % 9 – 12 % ~ 6 % 5 – 10 % 10 – 15 % ~ 0,7%

(The quality of G-phase is strongly dependent on the feedstock oil quality and other input media.)

8. Usage and Mode of Operation

The CPU is a standardized transesterification technology, which is the core processing element within the biodiesel plant. The CPU is designed for 24 hour / day operation by qualified personnel. The process parameters shall be monitored constantly and adjusted as required. Interrupted operation may affect product quality and production yield.

9. Connections

All gas or liquid connections are joined by BDT quick couplings in the specified size. The connection from BDT machines (CPU) to the peripherals (tanks, air, etc.) on project site must be made by the customer, using flexible hoses (included in scope of delivery).

10. Automation Concept of Project

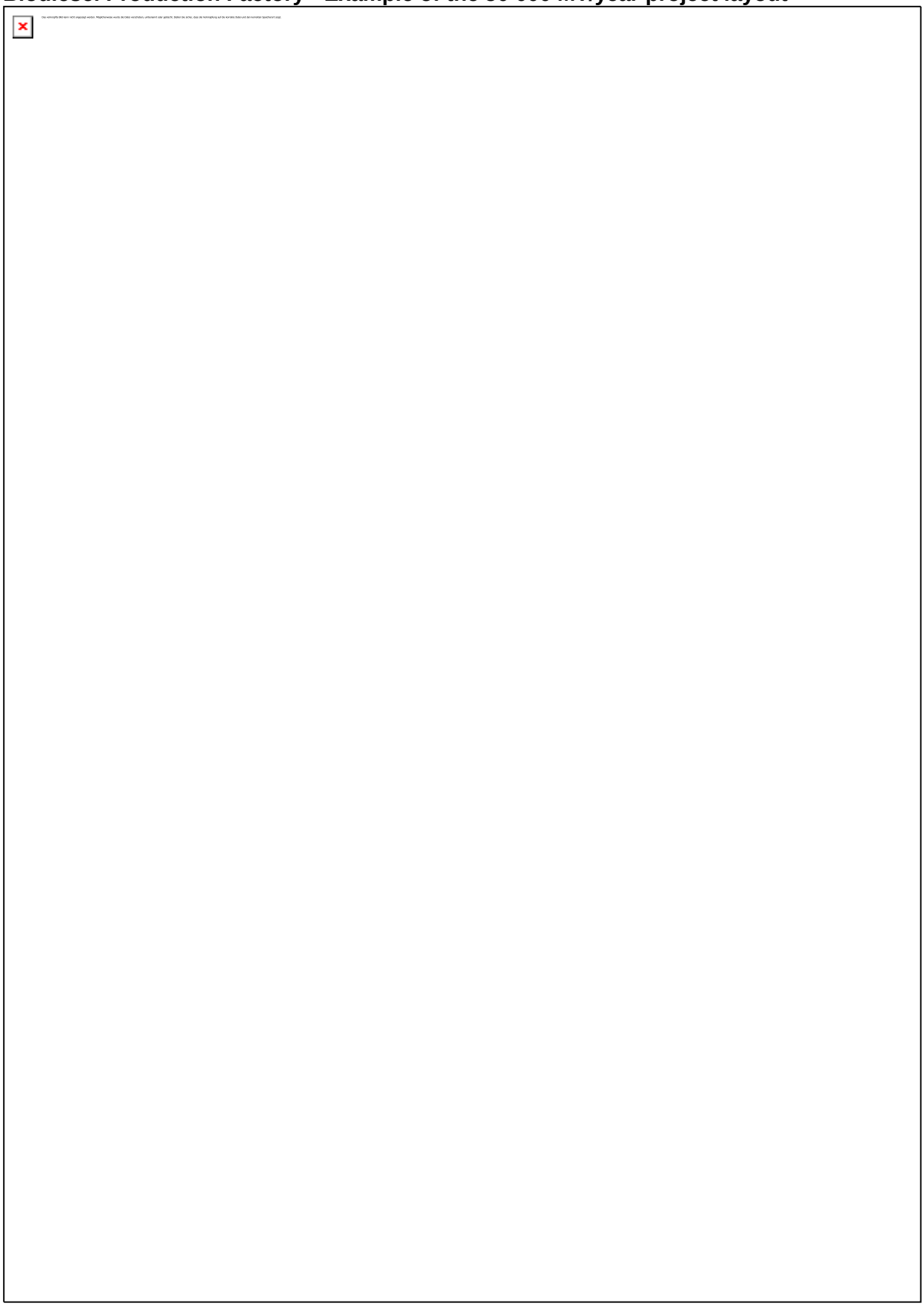
The CPU control system can be integrated into the overall project automation. The CPU operating and performance parameters can be monitored from the plant control room. BDT recommends a fully integrated control room to monitor all project related systems including the CPU, tank farm, pumps, etc.

All components are hermetically sealed or connected to ventilation, pressure tanks or pressurized tank-type reactors are used in CPU.

11. Remark

- All mentioned data are calculated for maximal flows under standard conditions. Results may vary if operated under conditions deviating from BDT standards and if feedstock qualities vary.
- All data are subject to change in case of technical requirements.
- All modifications to standard CPU module should be discussed prior to commencement of CPU construction.
- Main part of the CPU technology, placed in the Production Hall, is built as a tight system. Technological tanks accumulating methanol in CPU are pressure-less, atmospherically ventilated into the external environment outside the Production Hall. Therefore, the Production Hall requires normal safety level against explosive atmosphere. The part of the CPU technology that involves exchange and storage of spent material is situated in an individual separate compartment - Dry Wash Hall that has to fulfil higher degree of safety against the generation of explosive atmosphere.
- It is recommended that the client checks the local regulations for operating a biodiesel production project.

Biodiesel Production Factory - Example of the 50 000 MT/year project layout



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