REACTION 1

STREAM 04

STREAM 01

TRANSDUCER

IP 02

TC01

IP 02

TC01

TT 01

LT 01

IP 01

LC 01

CSTR 01

(JACKETED)

Valve 01

STREAM 08

STREAM 02

Valve 02

Valve 03

R1

STREAM 03

HYDROCYCLONE

STREAM 05

STREAM 07

TO REACTION 2

TT 02

STREAM 06

REACTION 2

STREAM 09

STREAM 04

STREAM 01

IP 02

TC01

IP 02

TC01

TT 01

LT 01

IP 01

LC 01

CSTR 02

(JACKETED)

TRANSDUCER

STREAM 08

Valve 01

STREAM 02

Valve 02

Valve 03

R2

STREAM 03

HYDROCYCLONE

STREAM 05

STREAM 07

STREAM 06

TT 02

FROM REACTION 1 STREAM 7

ESTERIFIED BIO DIESEL

Symbols

Material Streamline

Level Transmitter

LT

Signal Streamline

Level Controller

LC

Electrical Signal

Current-to-Pneumatic Transducer

IP

Pneumatic Signal

Temperature Transmitter

TT

Valve

Temperature Controller

TC

Catalyst streamline

Pump

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Streamline | STREAM 01 | STREAM 02 | STREAM 03 | STREAM 04 | STREAM 05 | STREAM 06 | STREAM 07 | STREAM 08 | STREAM 09 |
| Material Reaction 1 | Waste Cooking oil (a) + Methanol (b) | Steam | Cooling water | Cooling water after process | Methyl Ester(c) + Water (d) + Methanol (b)+ Oil (e) | UNREACTED REACTANT | Methyl Ester(c) + Water (d) + Methanol (b)+ Oil (e) | Sulphuric Acid | N/A |
| Material Reaction 2 | Triglyceride (a)  | Steam | Cooling water | Cooling water after process | FAME (c) + Gycerol(d) | Gycerol(d) | FAME (c) | Potassium Hyrdroxide | Methanol |
| Contribution | Feed | Heater | Cooling agent in | Cooling agent out | Product | Recycled | Product | Catalyst | Feed |
| Temperature (°C) | 25 | 100 | 25 | \* | 60 | 60 | 60 | 25 | 25 |
| Pressure(atm) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Amount reaction 1 (kg/s) | 5.9a + 118b | - | - | - | 5.78c + 5.78d + 112.22b + 0.12e |  | 5.78c + 5.78d + 112.22b + 0.12e | N/A | N/A |
| Amount reaction 2 (kg/s) | 5.78a | - | - | - | 5.66c + 5.56d |  |  | N/A | 34.68b |

Where “\*“and “-“is depending on STREAM 05 temperature.