CSTRPP PILOT PLANT
CONTINUOUS STIRRED TANK REACTOR

This “Owner Configured” Computerized and automatic pilot plant is based on a CSTR (from 100cc up to 4L and many different alternatives) and the operation is supported by many optional devices as MFC’s, pumps, pre-heaters, separators, pressure control systems. Customer can design his own pilot plant using for it so many options as required for his operation needed, using for it a configuration sheet. Technology applied is at the top worldwide. Standarized system becomes short production delivery time and confidence on his performances. The Plant will be High Pressure Certified PED/97/23/EC.

MAIN FEATURES

Gases
Until six (n) continuous gases feed lines to reactor. Flow control system by Mass Flow Controllers (Bronkhost High-Tech), including manual valves, check valves, fitting and accessories (P&ID diagram). Gases line preheating system including temperature control loop can be installed.

Liquids
Up to two liquid feed lines can be installed as standard. Pumps can be selected for micro-flow (HPLC from Gilson) or standard process pumps (Dosapro) for different pressures and flows. Relief valves for calibration, check valves, manometers and usual safety devices will be installed. Liquid lines preheating/evaporating systems can be selected.

Stirred Tank Reactor
A stirred tank reactor from Autoclave Engineers, Magne drive agitator, is the main device of the plant. MOC (SS316, Hastelloy C,…), P@T and volume will be selected by the customer using the configuration sheet. All safety or operational devices as manometers rupture disk, safety valve and vent valves or sample valves will be included. Also other extra options can be selected. Motor is 3PH but it operates with 1PH 220VAC.

The temperature control system for reactor, by electrical oven (220 VAC) and alarm cooling system is included. Reaction temperature is measured inside the reactor through a type K thermocouple. Power control is based on Phase Angle Control (PAC) voltage supply. Overtemperature alarm is also included.

Wax Collector at high pressure
Fisher-Tropsch reactions (GTL) can be conducted at this CSTR pilot plant using the waxes SS316 temperature controlled separator system and an optional switching valve for avoid plugging at the liquid outlet filter. This L/G separator system includes level control based on a differential pressure meter and liquid outlet control valve, also includes heating tracing lines. Also weight scale can be selected on the configuration sheet for real time acquisition on computer.

The Two Liquid phases–Gas Separator at high pressure
A SS316 liquid1-liquid2-gas patented separator system with no dead volume, allows L/G separation even when water and hydrocarbons are obtained simultaneously at reactor outlet. Level dead volume is nearly 1cc for each liquid phase, which implies real time liquid outlet, no accumulation. Level control system includes liquid outlet control valve for each liquid outlet. Two models (L/G or L/L/G) can be selected by the user. Type of temperature control also can be selected. One or two weight scales for real time acquisition on computer can be selected. Pressure control system for the reactor or , when a fractionation is needed, two different pressure controllers for reactor and separators can be selected. Pressure control is based on the patented PID Eng&Tech microregulation servocontrolled valve (at this brochure). Overpressure interlocks with feeding and oven are installed.

Computer System
Control system based on distributed PID controllers and remote computerized supervision and automation (for process recipes). PC and Process@ software is included. Engineering and documentation is shared with Microactivity reactor, 15 years worldwide experienced.
CONTINUOUS STIRRED TANK REACTOR BASED PILOT PLANT

PED/97/23/EC
High Pressure Certification

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| CSTRPP | T | P | G | n | MFC | PH | L1 | F1 | E1 | L2 | F2 | E2 | CSTR | VLV | V | AE | LM | M | G | C | S1 | W | WW | S2 | S | TCI | W1 | PC | F |
|--------|---|---|---|---|-----|----|----|----|----|----|----|----|------|------|----|----|----|---|---|---|----|----|----|----|---|----|----|---|----|----|---|

Type of MFCs:
- Standard (up to 100 bar)
- VaryP (up to 400 bar)

Type of pump:
- No pump
- Gilson 5 cc/m 600 bar
- Gilson 10 cc/m 600 bar
- Gilson 25 cc/m 280 bar
- Dosapro 40 cc/m 480 bar
- Dosapro 95 cc/m 390 bar
- Dosapro 170 cc/m 200 bar

Type of valve:
- Inlet switching valve
- Reactor bypass valve

CSTR Volume:
- 100 ml Ø=46mm, L=70mm
- 300 ml Ø=46mm, L=170mm
- 500 ml Ø=46mm, L=116mm
- 1 L Ø=76mm, L=221mm
- 2 L Ø=76mm, L=221mm
- 4 L Ø=76mm, L=312mm

Autoclave Type:
- ZipperClave (151 bar@232ºC)
- Eze-Seal (227 bar@454ºC)
- Bolted Closure (400 bar@343ºC)
- Bolted Closure HT (350 bar@510ºC)
- Special executions

Seal (gasket):
- Metal
- BunaN
- Ethilene-Prop
- PTFE
- Viton
- Kalrez
- SS316
- Hast C
- Inconel

Cooling:
- Refrigeration coil

Separator:
- Without separator
- With separator (up to 2 l)

Temp. Control:
- Without temperature control
- With temperature control (-5) (optional)

Other details:
- Manual elevator
- Manual Screw jack

Additional information:
- Max Temp is function of sealing elastomer MOC

Software:
- PROCESS@ SOFTWARE
- CONFIGURATION SHEET

Diagram:
- CSTR PILOT PLANT P&I DIAGRAM