Fermentation

Equipment and expertise specifications

Our fermentation equipment

- 4 x 1L laboratory reactors
- 1 x 20 L pilot reaktor
- 1 x 200 L pilot reaktor
- Downstream process equipment (homogenizer, membrane filtration, centrifuge, etc.)

- Multiple processing units available at one location
- All units can be customized for tailored processes
- Food-grade approved
- Process developed and adapted for any biomass
- Minimal waste

DTI offers the following services and fermentation equipment

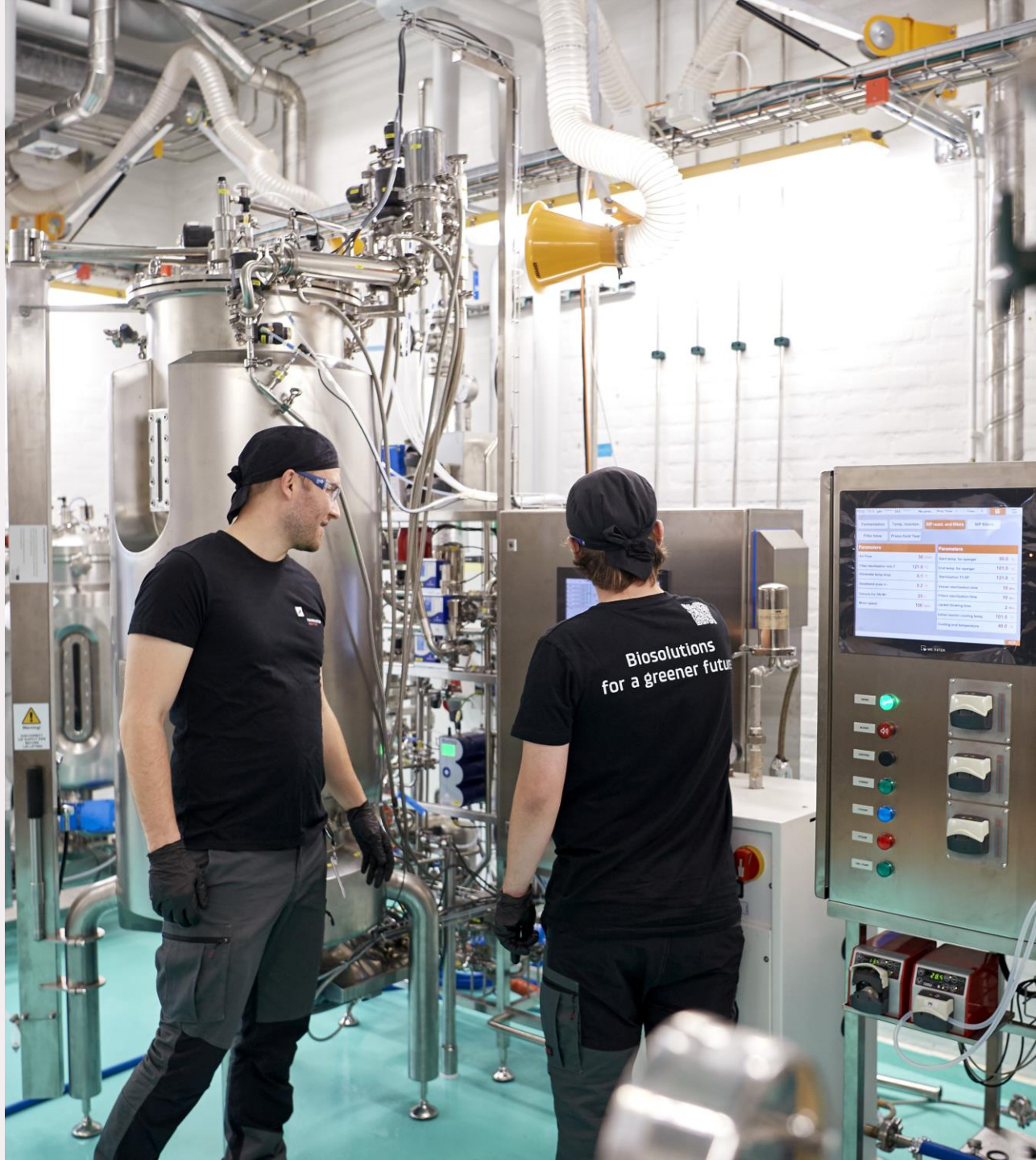
Fermenters

Homogenizer

Centrifuge

Filtration

Spray dryer



Fermenters

Seven fermenters with varying capacity from working volume 0,4 – 200

Automated fermentation, sterilization, heating and cooling processes

Aerobic and anaerobic cultivation:
Fungi, Bacteria, Microalgae and yeast

Gas:
Air, O2, N2, CO2 and H2

Sensors:
Temp, pH, DO, Foam

Precision and biomass fermentation

1 L fermentor

- 2 x twin fermenter setup
- The temperature control system is equipped with a Peltier element
- Gas supply controlled by MFC; microsparger; gas mixing chamber
- Variable speed, temperature, pH, and gas supply for optimization
- Sensors: temperature, pH, DO, foam

Working volume	0.4 - 0.7 L
MFC for Air flow rate (l/min)	Up to 2 L/min (2.8 VVM)
Co2 flow rate / o2 flow rate / n2 flowrate / H2 flowrate	0.3-1 (VVM) / 0.3-1 (VVM) / 0.3-1(VVM) / 0.3-1 (VVM)
Mixer type	Magnetic, 2xRushton
Mixer rotation speed (rpm)	40 – 2000 (rpm)
pH	0-14
Vessel Operating temperature (°C)	15 – 40 °C

20 L fermentor

- Gas supply controlled by MFC; ring sparger; gas mixing chamber
- Variable speed, temperature, pH, and gas supply for optimization
- Sensors: temperature, pH, DO, foam
- Possibility of fed batch with two different feed medias

Working volume	8 – 28 L
MFC for Air flow rate (l/min)	1,2 - 60 L/min (2 VVM)
Co2 flow rate / o2 flow rate / n2 flowrate / H2 flowrate	0.3-1 (VVM) / 0.3-1 (VVM) / 0.3-1(VVM) / 0.3-1 (VVM)
Mixer type	Bottom mounted 3x Rushton
Mixer rotation speed (rpm)	40-600 (rpm)
pH	0-14
Vessel Operating temperature (°C)	5-135 °C

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200 L fermentor

- Gas supply controlled by MFC; ring sparger; gas mixing chamber
- Variable speed, temperature, pH, and gas supply for optimization
- Sensors: temperature, pH, DO, foam
- Possibility of fed batch with two different feed medias

Working volume	40 – 225 L
MFC for Air flow rate (l/min)	9 – 450 L/min (2 VVM)
Co2 flow rate / o2 flow rate / n2 flowrate / H2 flowrate	0.3-1 (VVM) / 0.3-1 (VVM) / 0.3-1(VVM) / 0.3-1 (VVM)
Mixer type	Bottom mounted 3x Rushton
Mixer rotation speed (rpm)	40-600 (rpm)
pH	0-14
Vessel Operating temperature (°C)	5-135 °C

Homogenizer

It is well suited to a variety of applications including ultra-high pressure or severe duty applications. The design enables many products to be processed and the modular construction provides flexibility.

Modular hygienic design consisting of a 3-piece valve housing and 3 – 5 individual cylinders.

Plunger Lubrication System: Aseptic

Capacity	80 L/h (adjustable)
Pressure	14,500 PSI / 1000 Bar (adjustable)
Minimum batch volume	20 L*
Working temperature	15 – 30 °C
L/H	500 - 1000
Hydraulic Valve Activation (HVA)	2-phase
Cylinder design	Ceramic

Centrifuge (multipurpose separator)

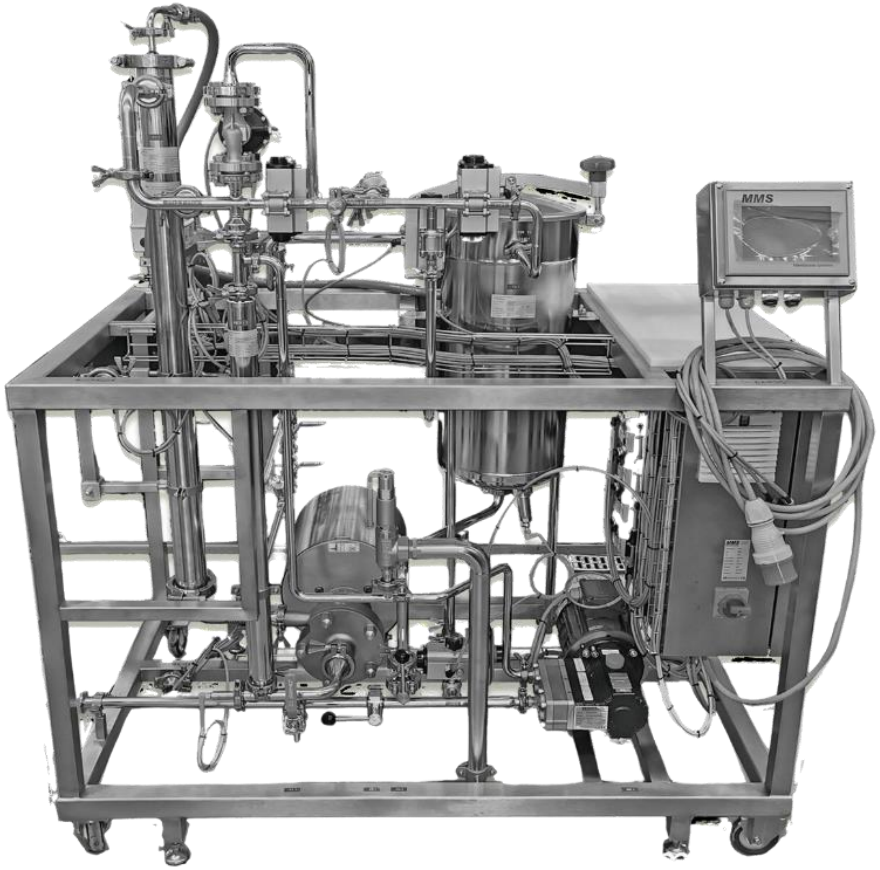
Various processes: Separation – concentration - cleaning, clarification with hydraulic seal - purification and bacterial clarification processes.

Concentrator type	heavy liquid phase is the main part of incoming stream (example milk skimmer)
Purifier type	light liquid phase is the main part of incoming stream (example butter oil purifier)
Clarifier type with hydraulic seal	any kind of clarification (milk, juices, oils, fermentation broths etc)
Clarifier type with internal recirculation	milk bacteria clarifier
Flowrate	100 – 3000 L/H
Solids chamber	1.7L
Bowl speed	11,000 rpm

Filtration

- Ceramic membrane system
- Microfiltration
- Ultrafiltration
- Microfiltration /Ultrafiltration (MF/UF) pilot unit which is installed with ceramic elements for aseptic clarification of fermentation broth.

Intended use	Liquid food products and aqueous solutions
Woking temp.	15-50 °C
Menbrane Area	2.45 m2
CIP tank volume	35 l
Working pressure	~0.5 - 5bar
Working temperature	5 - 80 °C (limitations due to membrane possible, heating/cooling water required)
Feed pump flow rate	Batch operation: ~1 - 4 m3/h @ 5bar
Circulation pump flow rate	Up to 40 m3/h @ 2 bar



Spray dryer

- Drying of final powdered product from solutions.
- Internal or external spraying nozzle and heated air for gentle drying process. Other nozzle systems (e.g. rotary atomizer) can be installed.
- Cyclone and bag filter catches particles
- 5-10 L/h
- Nozzle according to product properties
- Adjustable temperature.