



DANISH  
TECHNOLOGICAL  
INSTITUTE



# Equipment and expertise specifications

## Biorefining

# DTI offers the following services and refining equipment

Multiple process units available at one spot

All units are adaptable to fit customized process

Certified for food production

Process developed and adapted to every biomass

Minimal waste



- Stirred tanks
- Heat exchanger
- Decanter centrifuge (small)
- Wet mill
- Spray dryer
- Decanter centrifuge (big)
- Vibrating sieve
- Clarifier centrifuge
- Column chromatography
- Dry fractionation unit
- Membrane filtration
- SANI membrane

# Stirred tanks

Two reactor tanks with 800L capacity each.

Heating and cooling possible.

Stirring suitable for both liquids and viscous suspensions.

pH monitoring and adjustment.

Load cell for weighing contents.

- 100-800 L capacity
- 8-98 °C
- 0-50 RPM stirring speed



# Stirred tanks

## Two type of stirring



# Wet milling

- Colloidal and disc mills are available for milling of slurries and suspended solids.
- Can be used in combination with reactor tanks for continuous processing.
- 800 L/h capacity
- Colloidal mill MZ-100, particle size  $> 100\mu\text{m}$
- Perforated disc mill ML-150, various screens



# Decanter centrifuge

Solids-liquid separation by density.

Fast operation with high capacity.

Variable speed for yield optimization.

- Solid – liquid separation
- Up to 4.500 rpm (3500G)
- 305 Diameter
- 1000 L/h capacity



# Clarifier centrifuge

- High-capacity solids-liquid separation by density.
- Variable speed for yield optimization.
- Better separation efficiency than decanter centrifuge.
- Collecting smaller solid quantities
- Fine particle separation
- Max. 12.500 rpm (22700 G)
- 300 L/h



# Membrane filtration

- **Concentration** of dissolved components.
- Separation by **particle or molecular size**.
  - Microfiltration
  - Ultrafiltration
  - Nanofiltration
  - Reverse osmosis
- 70 L Minimum working volume
- Up to 1000 L/min



# SANI Membrane filtration

- Size fractionation and concentration of dissolved components.
- Lower tendency to clog due to shaking motion.
- Available in both laboratory and pilot scale.
  - Microfiltration
  - Ultrafiltration
- 25 L Minimum working volume
- Continuous operation 100 L/h



# Heat exchanger

Liquids can be heated directly in heat exchanger.

Contents in reactor tanks can be heated with steam from heat exchanger.

- Pasteurization and sterilization.
- Enzyme activation/inactivation.
- Bleaching.
- Heat precipitation.
- Up to 140 °C in heat exchanger
- Up to 100 °C in reactor tanks



# Column chromatography

- Separation of soluble components by different binding affinity to chromatography packing (e.g. resin beads).
- Useful for separation of similar sizes molecules where membrane separation is not possible.
- Multi-range UV detection
- Finer components (pigments, phenolics, proteins.)



# 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.



# Belt drying

## DryingMate belt dryer

The dryer is designed specifically for testdrying and smaller productions

The drying chamber is equipped with three inspection sections, wherein one can see the product all the way through the dryer.

- Air drying max 250 °C
- Capacity up to 50 kg/h
- Residence time min/max 10/40 min



# Disc Refiner

Pulp is refined homogeneously while it is circulating

All parts in contact with the refined material are made of non-corrosive materials like bronze and stainless steel

Refining chamber can be cooled by circulating cold water which protects samples from heat generated by refining

- The beater operates with a mass consistency from 2 to 8 % and has a continuous circulation chamber with a 50L capacity.
- The diameter is 300 mm. The distance between the discs can be adjusted between 0 and 9 mm.



# Ultra-high temperature processing (UHT)

Minimize the presence of microorganisms while equally minimizing the chemical changes within a product post processing.

UHT process, works with customers to ensure they optimize quality, efficiency and productivity by applying the best solution for a given application

- Food processing technology that almost sterilizes liquid food by heating it above 135 °C (275 °F) – the temperature required to kill many bacterial endospores – for 2 to 5 seconds

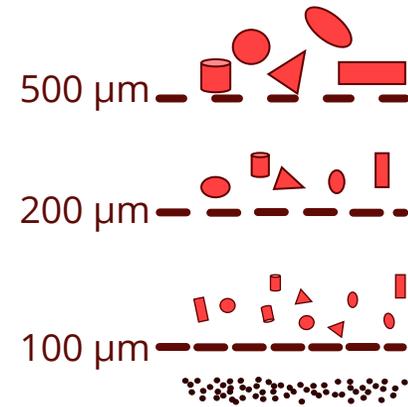


# Vibrating sieves

Shaking provides size separation for a wide range of dry materials.

Stackable sieves available in multiple sizes.

- Russell Compact Sieve®
- 100  $\mu\text{m}$  to 500 mm screens available



# Process example

