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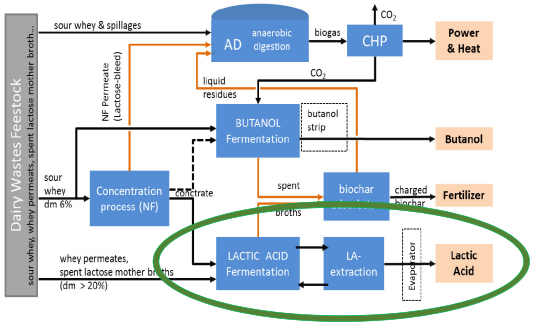
# Upstream Processing of Lactose whey for bulk chemicals and energy production

(an ongoing ERA-NET Bioenergy – project)

This project will develop and assess new membrane technology for valorising dairy wastes and in particular sour lactose whey for sustainable production of lactic acid (LA) within the ERA-NET-project:




Lactic acid could be used for poly-lactic acid (PLA) plastic products, which are compostable (reduction of plastic waste). However, in conventional lactic acid production additional chemicals are required (e.g. for pH-adjustment):

**1 ton of lactic acid = 1 ton of gypsum**

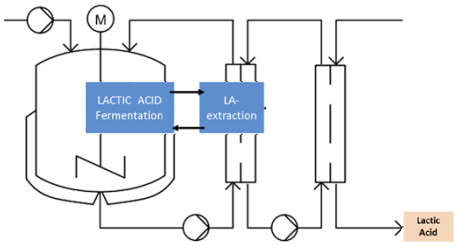
LA is precipiated with $Ca(OH)_2$ and released after fermentation with sulfuric acid - by forming equal amount of gypsum. Additonally, the LA extraction generates (stable) emulsions which needs to be separated with centrifuges in order to obtain a clear LA solution.

This generates both higher investment costs and energy demand for the operation.

Using membrane contactors (delivered from swiss start-up company “MemO3 GmbH”) LA can be extracted in-situ from the fermentation broth.

This approach is promising due to:

- a reduced amount of working steps
- **no additional chemicals** (savings of ~450 kg $Ca(OH)_2$ and 500 kg $H_2SO_4$ per ton lactic acid)
- **energy savings** (two centrifuges with each about 15-20 kWh $m^{-3}$ and one mixing unit with about 5-7 kWh $m^{-3}$).

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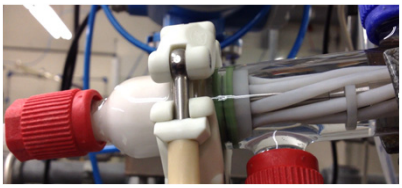
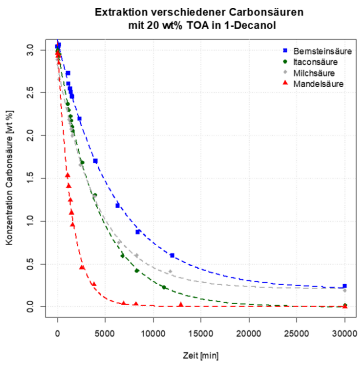


- emulsion-free extraction
- clear LA extract
- no centrifuge
- no chemicals

Project started with delay (Covid-19) in III/2020.

From former experimental work, proof of concept for emulsion-free extraction (no energy demanding mixing/settling/centrifugation required) could be shown for

- ✓ Lactic acid
- ✓ Mandelic acid
- ✓ Itanconic acid
- ✓ Succinic acid




Next steps:

Project partner $MemO_3$ GmbH provides us with dedicated membrane modules for

- •Extraction with model solutions
- •Extraction with industrial process streams (TRL 4-5)

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