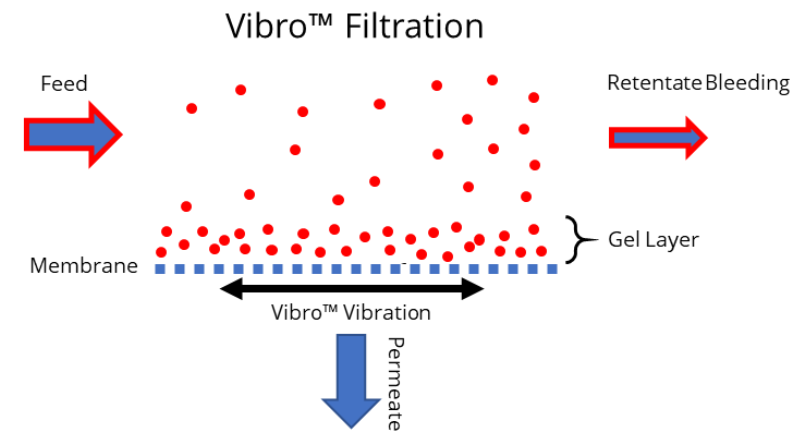
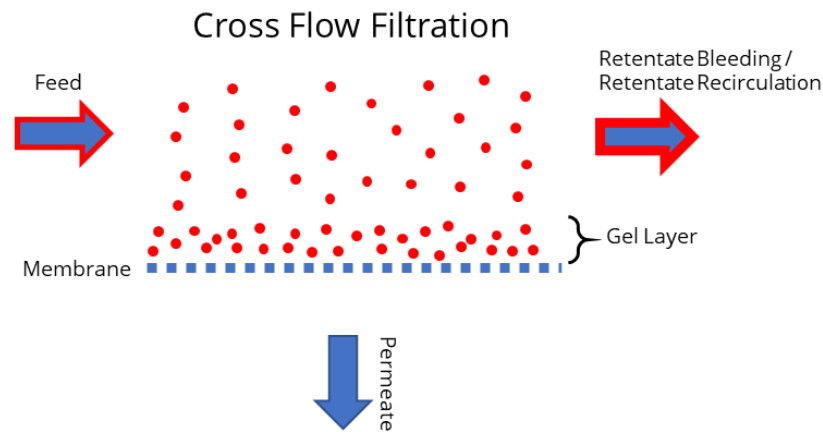


SANI Membranes

Disruptive filtration solutions



The SANI Membranes ApS Timeline

2013

Founded by H. Hjelmsmark



First pilot test at Arla 2015

2014 - 2015

Seed investment by SDTI

Proof of concept on Free Flow Plate™

Pilot testing in cross flow solutions



Pilot test at Alfa Laval 2015

2016 - 2017

SDTI bought out by Johs. Tandrup A/S

Production automated

3 full scale cross flow plants built

2018

Launch of Vibro™ filtration

Vibro™-LE won the FoodTech Award

Sale of Vibro™-LE and Vibro™-I

FoodTech Award 2018 ceremony for Vibro-LE

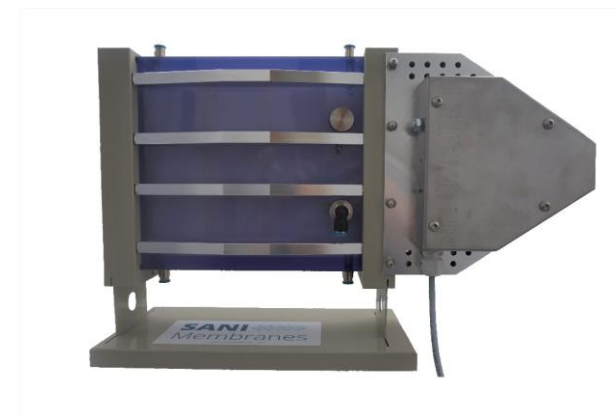


2019

First GMP and FDA compliant Vibro-I's

Growth of sales team

Production volume increased

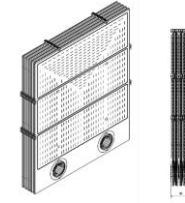


Technologies from SANI Membranes

Free Flow Plate™ technology

- Our core product

- New disruptive UF and MF membrane modules



Vibro™ technology

- Our core solution

- New Disruptive filtration process - utilizing the Free Flow Plate™ membrane modules



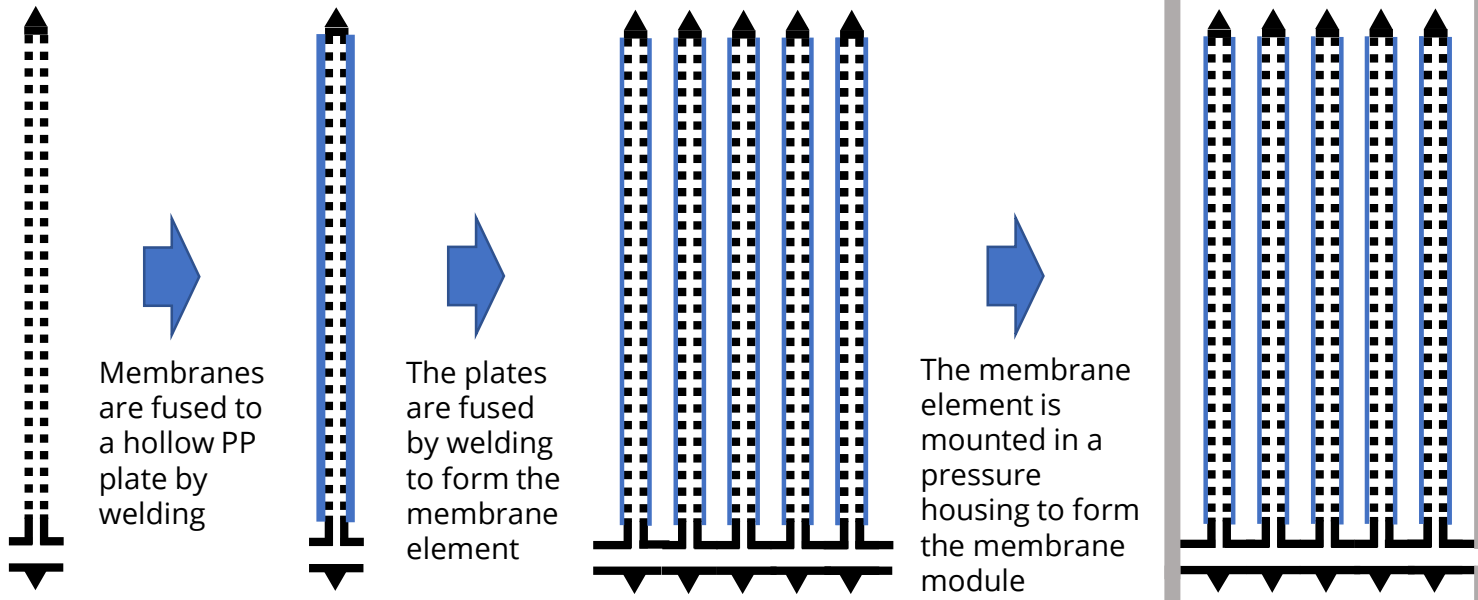
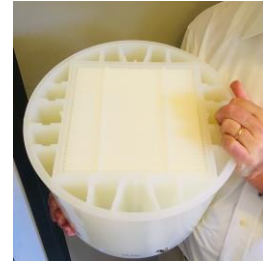
New Cross Flow solutions

- Our conservative solution

- Traditional, but new solution utilizing the Free Flow Plate™ membrane modules



The Free Flow Plate™ technology



- New patented membrane module design
- 100% polypropylene and membrane
- Organic flat sheet membranes are welded onto hollow PP plates
- The rigid membrane element is placed in a modular pressure housing
- All fusing is done by welding, No glues are used
- Individual permeate outlets from each module

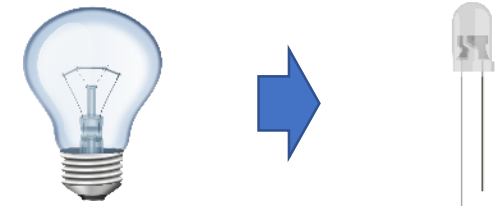


The Free Flow Plate™ technology

Unique **Operation** key features of the Free Flow Plate™ Module:

- Higher concentration, viscosity and solids load – 1,7mm free flow
- Sharper cut-off and optimal flux on all membrane area (5 KDa to 10 micron)
- Uniform and possibly very low TMP - leading to new MF and UF opportunities
- Energy efficient – minimized pressure loss reduces energy consumption by 30-90%
- 100% Drainable – no product loss
- 100% Homopolymer - fully recyclable

> **Energy efficient, higher concentration, sharper cut-off**



The Free Flow Plate™ technology

Unique **Sanitary** key features of the Free Flow Plate Module:

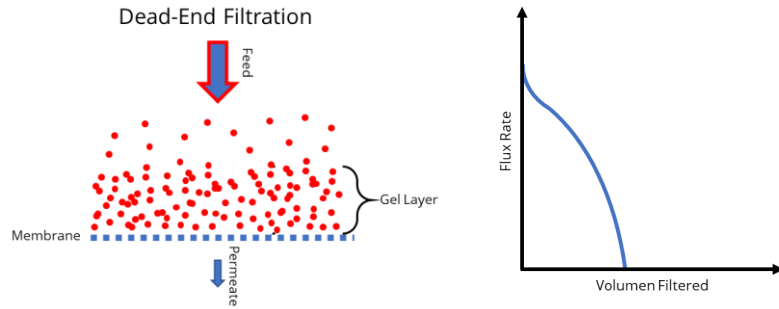
- Open and Clean design – Sanitary
- No feed or permeate spacers – Sanitary
- No flow dead areas - Sanitary
- 100% Drainable - faster CIP, reduced water & chemical consumption
- Permeate side can be CIP cleaned

> **Shorter cleaning time, less water & chemicals**

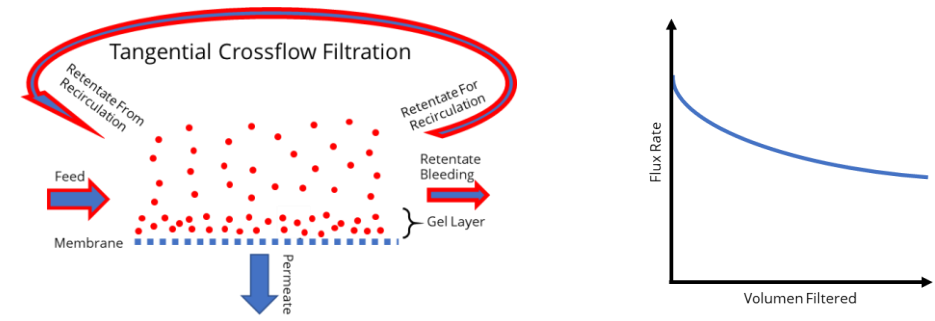


Filtration Principles

Basic Dead-End Filtration Non-continuous filtration



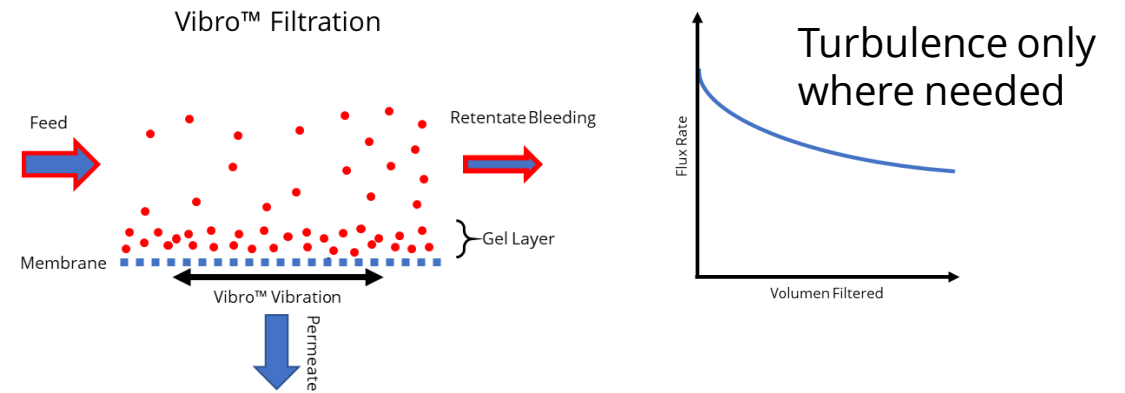
Traditional Cross Flow Filtration Turbulent pressurized feed keeps the fouling from growing.



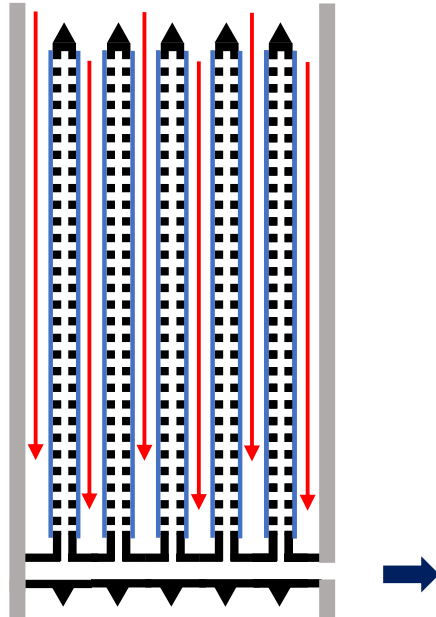
Vibro™ Filtration

Vibrating the membrane relative to the feed creates turbulence at the membrane surface and keeps the fouling from growing.

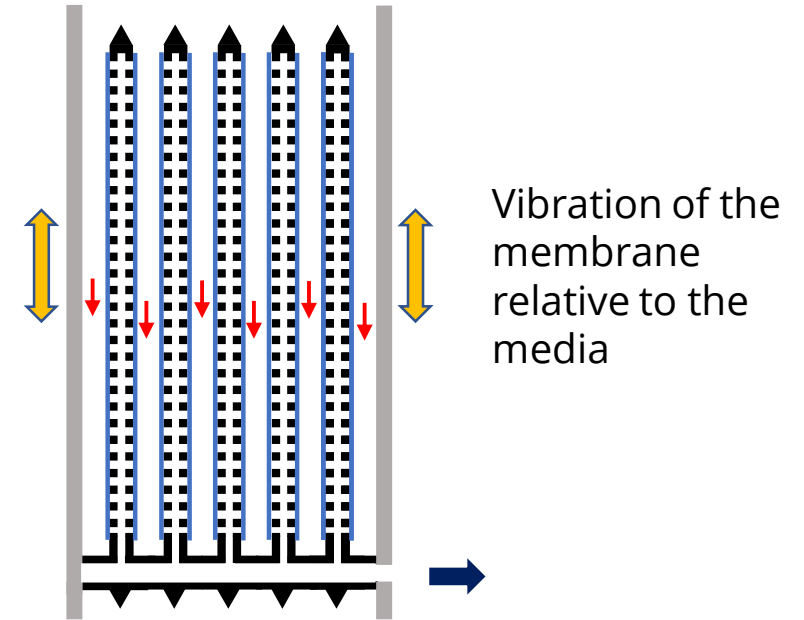
A new disruptive filtration principle by SANI Membranes



Cross Flow filtration vs. Vibro™ Filtration

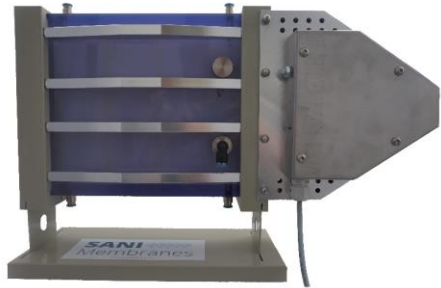


- Fast flow creates turbulence and pressure loss
- Circulation pump affects product and uses energy
- Energy extensive cooling is needed

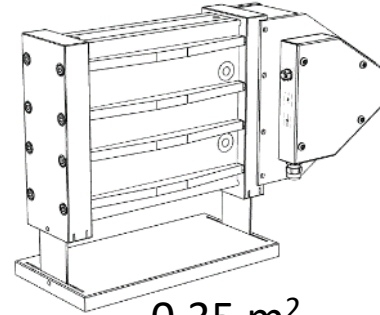


- Vibration creates turbulence on surfaces
- No pressure loss - uniform TMP
- Turbulence only where needed! – minimal cooling needed

Vibro™ units for MF & UF

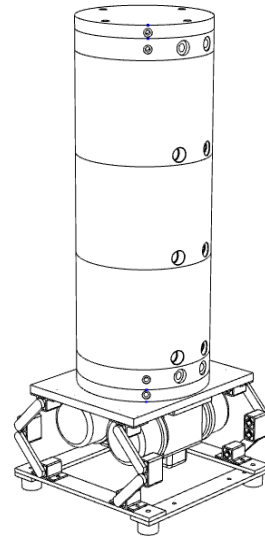


Vibro™-LE

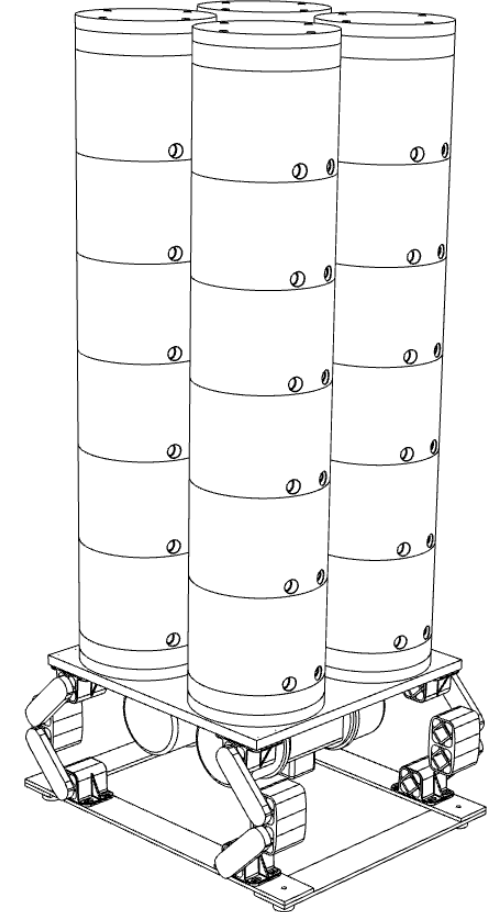
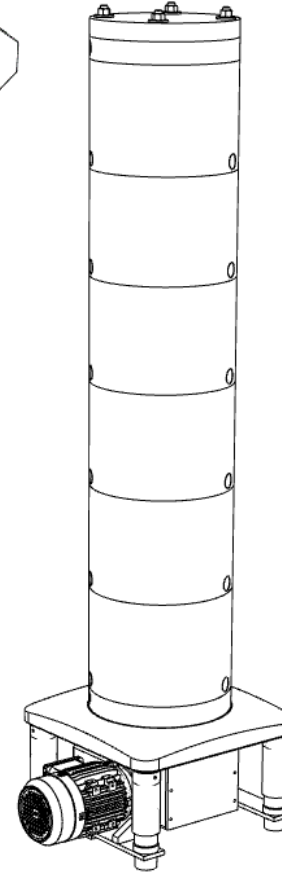


0,35 m²

Vibro™-I



7,5; 15 and 20 m²

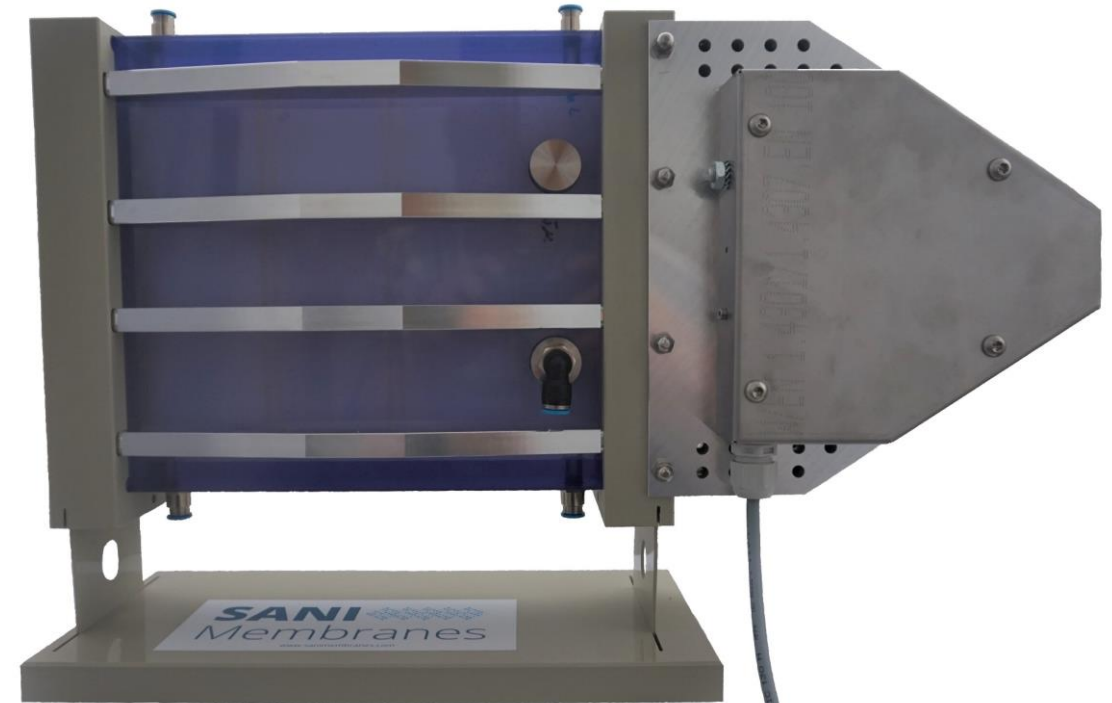


60 and 80 m²

The SANI Vibro™-LE

Disruptive in size, simplicity and process

- Benchtop system with **0,35 m²** membrane
- For all thinkable MF and UF applications
- Process development, membrane selection, CIP studies etc.
- Full observation membrane surfaces during operation
- Portable and easy to use. Start-up in 5 min.
- High viscosity, high concentration and high solids load
- Flexible feed systems with countless process possibilities: with or without feed pump, batch or continuous filtration, diafiltration etc.



Benchtop Vibro™-LE

Unique Vibro™ technology features

- **No Pressure Loss** – Reduces energy consumption by 50-90%
- **Turbulence only where needed** – Minimal cooling needed
- **Sharper cut-off** - 100% uniform TMP - leading to new MF and UF opportunities
- **Very low TMP is possible** – MF filtration with 0,1 bar TMP in the entire system
- **High concentrations, viscosities and solids loads**
- **Very gentle product handling** – No fast cross flow pump
- **One-pass concentration** - Optimal flux on all surface
- **Sanitary, small foot print, less pumping, easy maintenance, 100% drainable, no dead volumes etc. etc....**



The Free Flow Plate™ technology

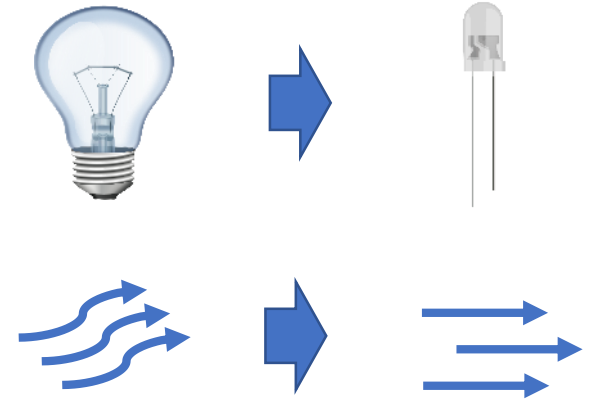
SANI Membranes has successfully pilot tested the following MF and UF applications:

- Protein fractionation
- Protein concentration
- Milk fractionation
- Skim milk concentration
- Beer clarification
- Beer recovery
- Bacteria removal
- Yeast removal
- Aquaculture intake
- Cell debris reduction
- Clarification of beverages
- Water cleaning
- Particulate removal
- Biomass fractionation and concentration



The Free Flow Plate™ technology

1. **Reduces energy** consumption
2. **New products** & New applications
3. **Improving cleanability** and inspection



The Future of MF and UF

More Filtration, Less Energy

Thank You!

