

TØRKEHOTEL BIOMARINT RÅSTOFF, 17.02.16

Membranteknologi for Bærekraftigere BioMarin Raffinering og Av-vanning.

- | | |
|---------------------------|---------------------------------------|
| 1. DUE MILJØ; | Products and Applications |
| 2. MEMBRANE PROCESSING; | Refine BioMarine Materials |
| 3. LAB and PILOT TESTING; | Bring Possibilities to Manufacturing. |

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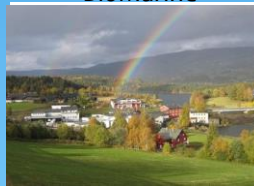
1. DUE MILJØ Business,

Processing Liquids and Environmental challenges into Sustainable Products.

We provide IPR Membrane Separator Technology that put Customer Molecules to Work !



BioMarine



Food/Feed

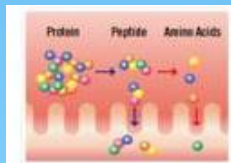


Pharma

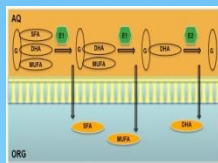
Bodø Sildoljefabrikk A/S



MMS
Membrane Systems



Separate Proteins, Lipids and...



PARTNERS

PRODUCTS

INDUSTRIES

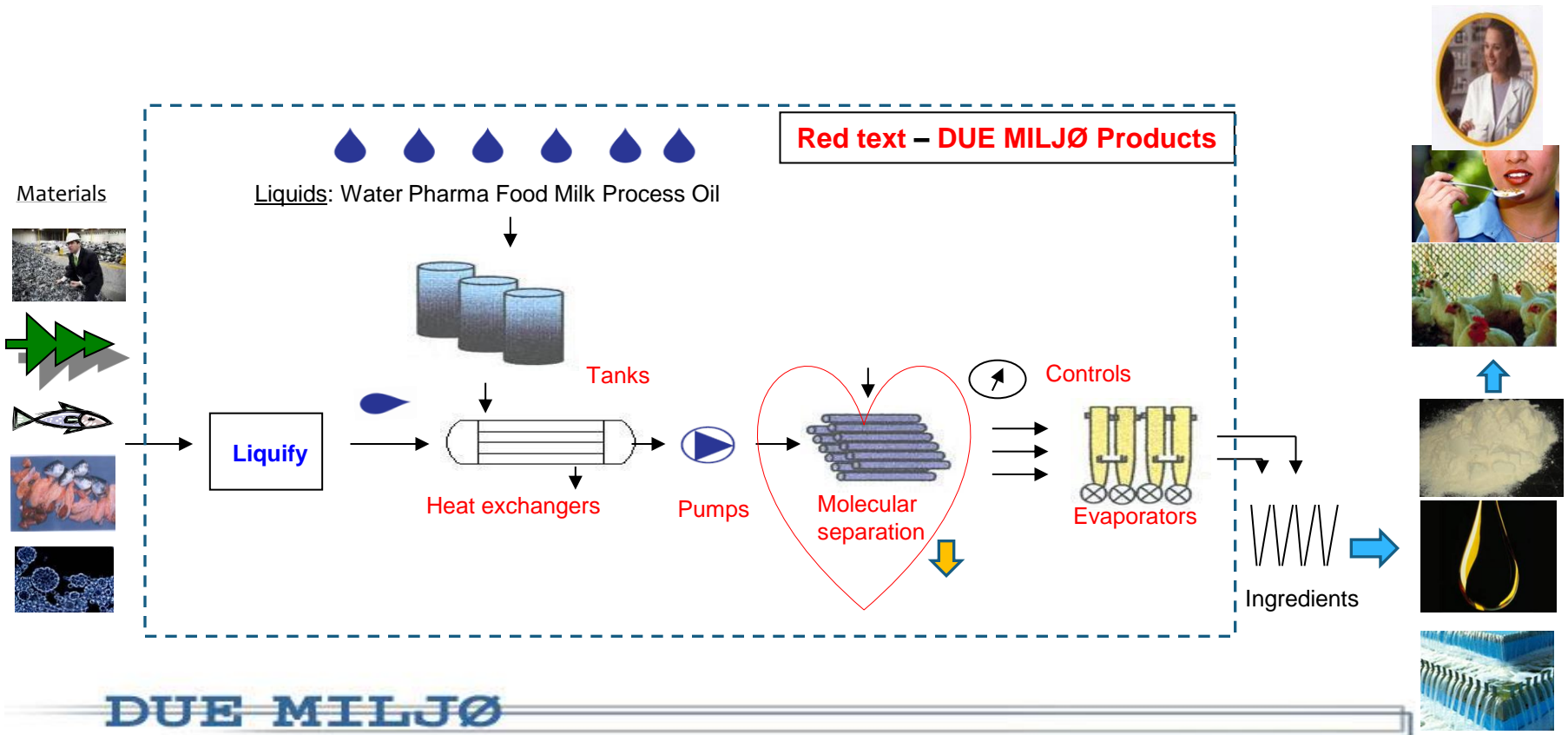
CUSTOMERS

DUE MILJØ

post@duemiljoe.no

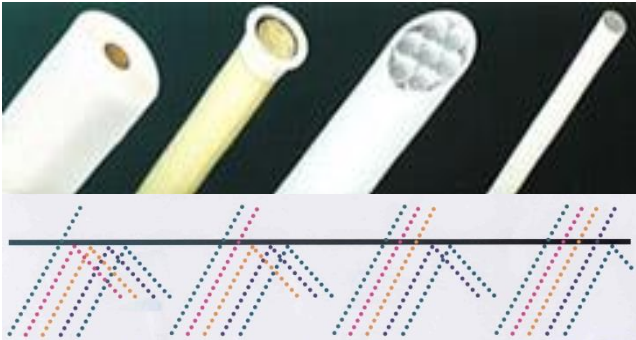
+47 22736850

DUE MILJØ Focus: Industrial Molecular separation



DUE MILJØ coop with MMS, EMET, SEPROSYS, CFR and GE WPT, world leading Industrial Molecular Separation;

Principles & Analysis



+ Lab & Pilot Plants



= Complete Plants



RO, NF, UF and MF can separate:
Water, Salts, Sugars/amino acids,
Proteins/polysaccharids, Particles...

Chromatography and ED
separates < 1000 dalton and iones.

Lab. - and pilot tests, engineer, provide,
Instal and start up of Industrial plants.
We finance, operate and offer service.

MORE YIELD => LESS WASTE



DUE MILJØ

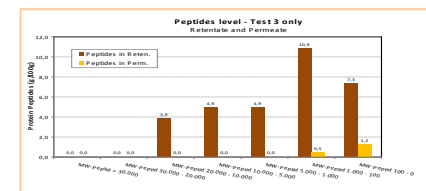
2. Membrane Processing to Refine BioMarine raw materials;

- * Process objective; Remove y, concentrate z,...
- * Needed: Analysis, molweight-distribution etc.
- * Process; Pre-treat, Step 1,2,? Post-treat,...



Components	%	% of solids	KGS
Protein	2.70	36.23%	540
Fines	0.80	10.73%	160
Oil	0.40	5.37%	80
Peptides	2.40	32.20%	480
Ash	0.50	6.71%	100
Salt	0.65	8.72%	130
TVN mg/l 250	0.00	0.04%	1
TS	7.45	100.00%	1491

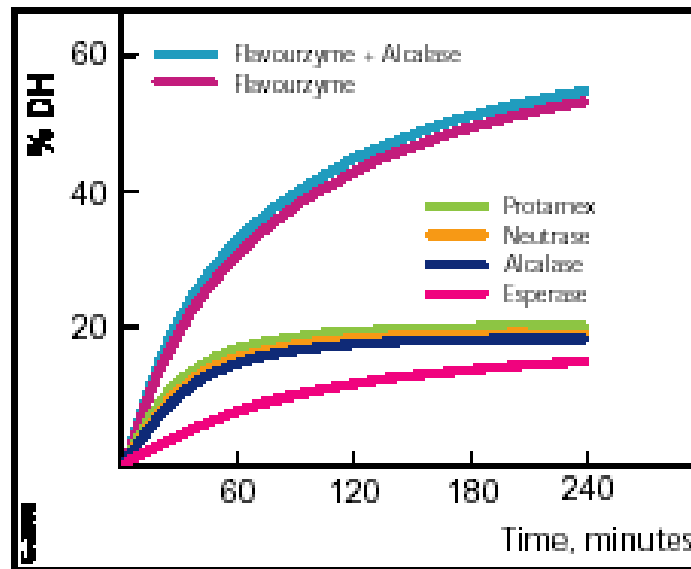
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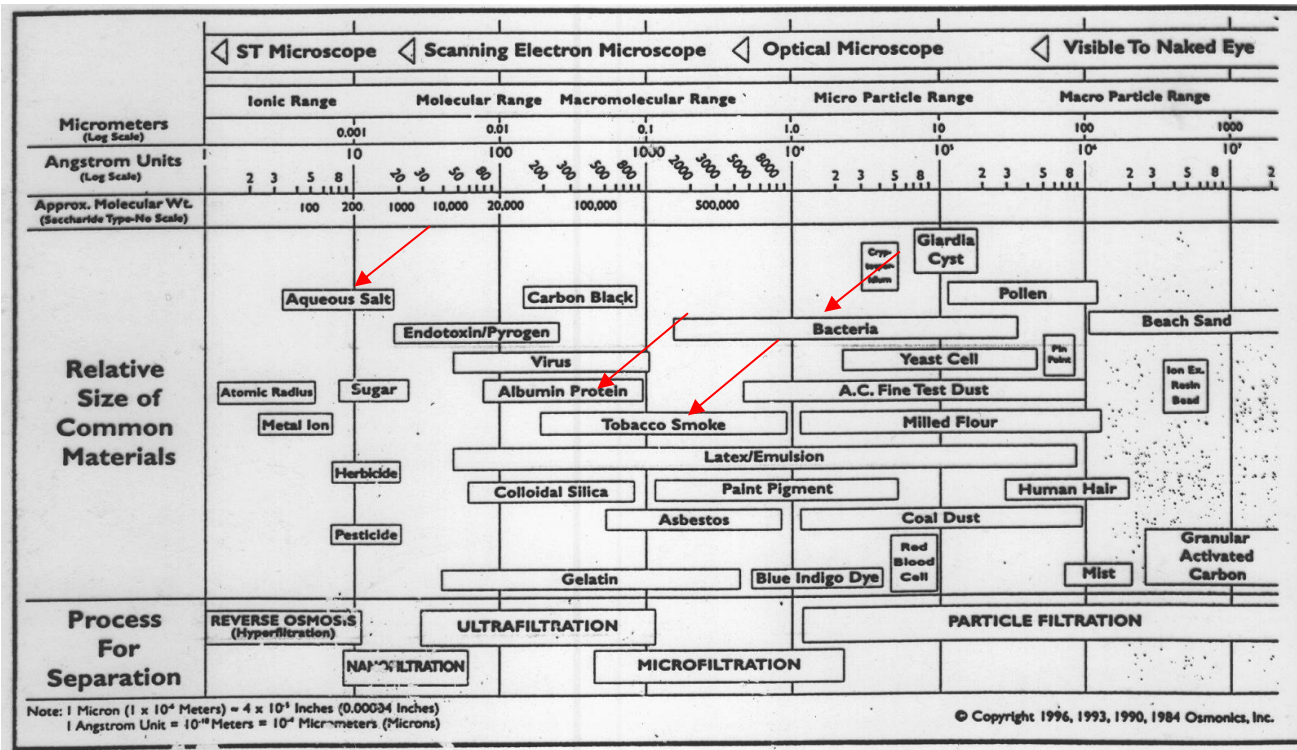
Molekylær fordeling

How to Refine Raw Materials Functionalities

- Degree of hydrolysis (%DH)
- Solubility
- Water-holding capacity
- Antioxidant effects
- Emulsifying properties
- Foaming properties
- Fat absorption
- Sensory properties



Understand molecular size, form, loading etc. => Valuable Process



Membranteknologi løser mange BioMarine utfordringer;

Molecular Fractionation and Separation of BioMarin Proteins .



spiralwound_fl5.exe

See video:

www.duemiljoe.no

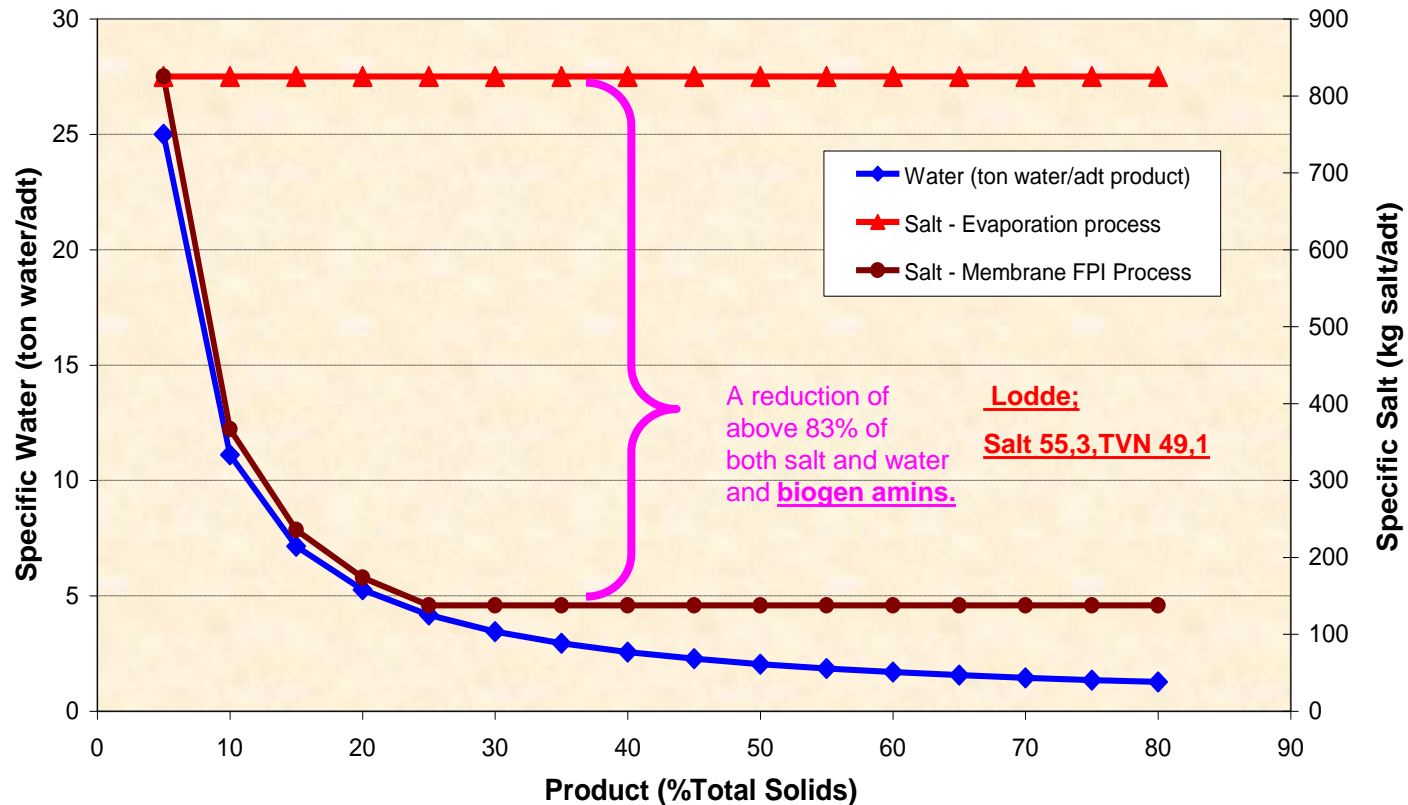
Membran teknologi gir redusert Vann, Salt, Biogene Aminer og Denaturering => + Produkt- verdi/volum

Illustrated difference between Evaporation vs a combination membrane / Evaporation plant; the patented FPI® Process.

Figures based on 5% feed and membrane conc.25%. The feed salt 33 g/L.

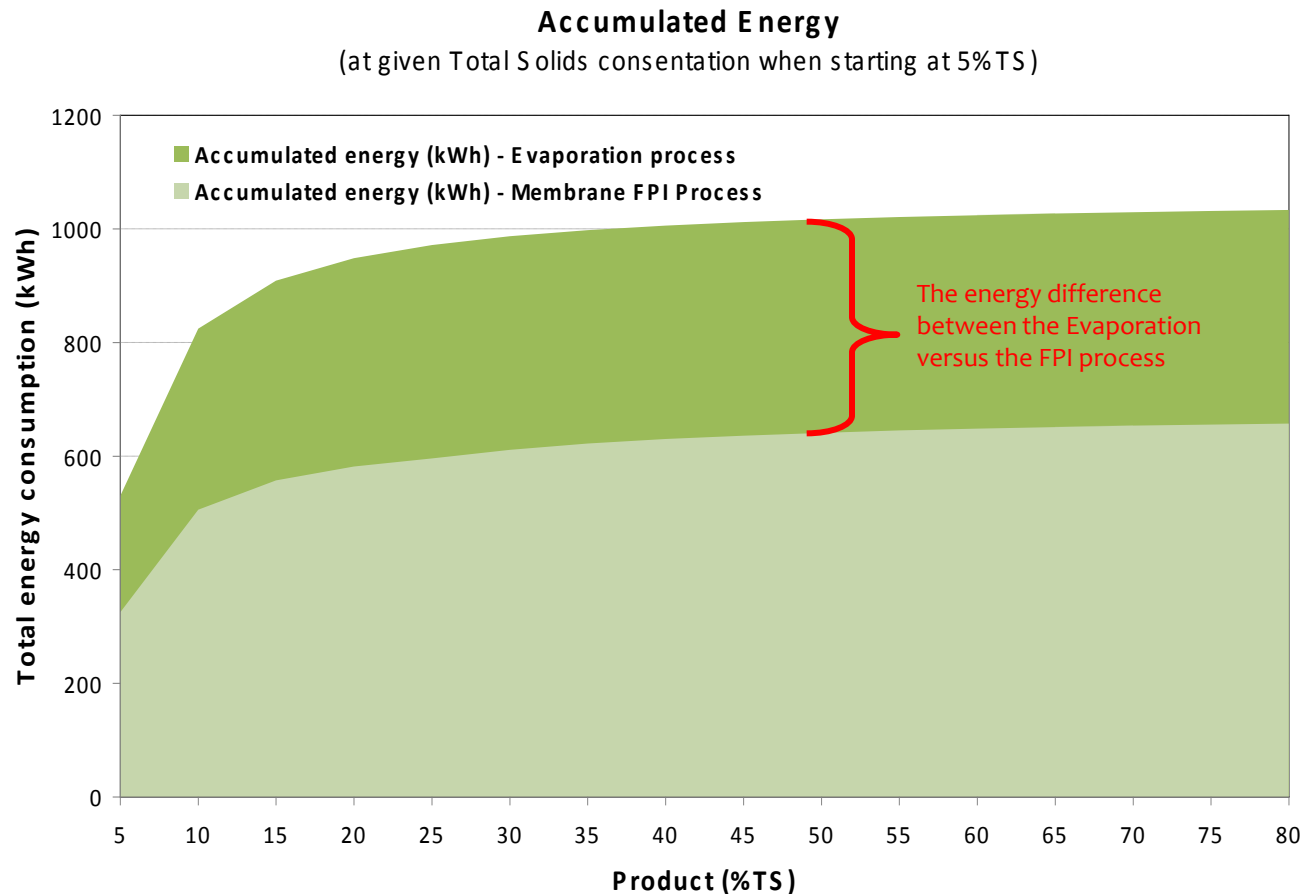
Level of Salt and Water through the fishmeal process

Comparing a Evaporation vs a Membrane FPI Process



Membran teknologi gir og bedre ENØK, Klimagassutslipp og Plass-økonomi enn Inndamper alene

The FPI® consumes 1/3 less energy than Evaporation when feed TS 5% and final TS 80%.

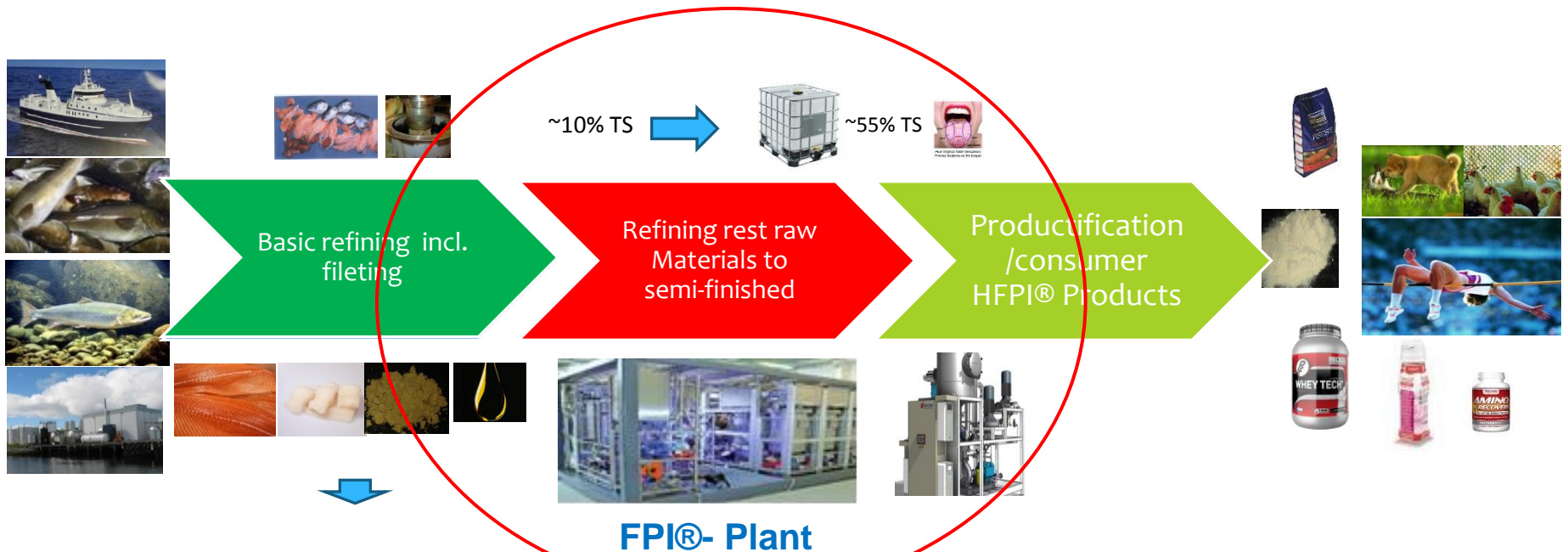


Typisk Protein Membran Fabrikk – Syd- Amerikansk FPI® Lisens



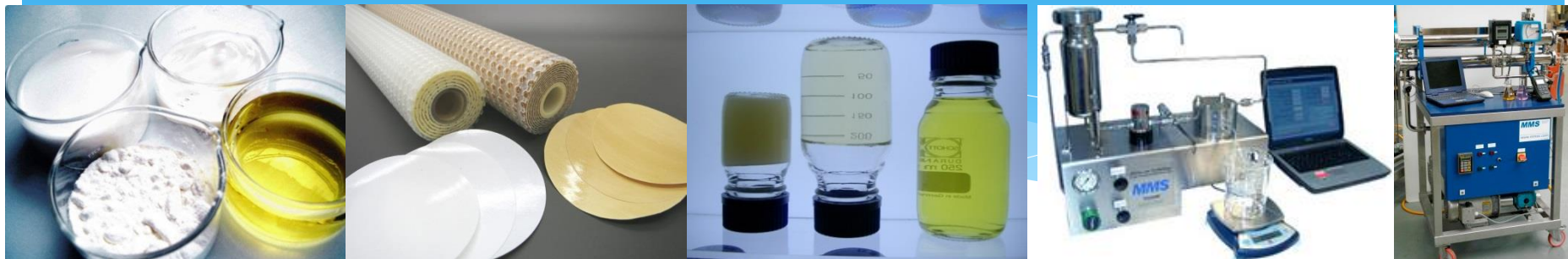
New Membrane Technology gives New Value Chains

- * Seafood Processors provided with FPI®- plants to refine Fresh BioMarine Rest/
Raw Materials to Semi-finished HFPI Proteins & Peptides, Oils, other Ingredients
to
- * Productifiers/Distributors as advanced Ingredients for Value-added
Human nutrition/functional food and Animal/Pet feed.





3. DUE MILJØ offer Analysis, Lab and Pilot Tests to Plants



BioMarine Fractionation- Lab. Tests

1. Lab.Report: Acidified

December 2015



Membrane Filtration Systems – Lab Tests



Membrane Cell

For screening of up to 3 different membranes

Key Features Triple System

- Rapid screening of up to three polymer flat sheet membranes simultaneously
- Speed control of circulation pump for variable membrane crossflow velocity
- Cooling/heating jacket on tank for temperature regulation



Typical test Volumes and Times

- Lab. tests 10-20 kg 1 - 3 weeks
- Pilot tests 1 - 5 m³ 2 - 5 weeks



DUE MILJØ AS

Lab. Test Results



Feed

Retentate

Permeate



Feed

Retentat

Permeate

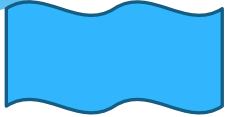
MF1
Permeate

VCR 8

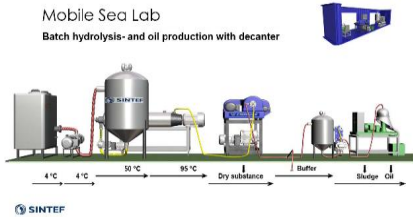
Flatsheet z kDa

Pilot tests

1. Pretreatment



2 Hydrolysis



3 Membranfiltration



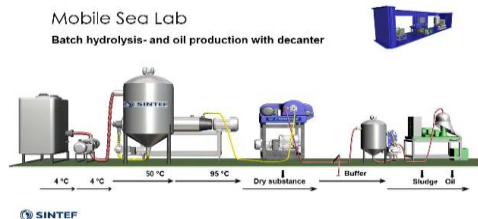
4 Evaporate/Dry



Then DEMO or Factory Manufacturing of Ingredients

1. Hydrolysis +
2. Membran separation +
3. Dewater /Stickwater

Raw materials owner



Stick-/Process Water or
By-catch/Cuttings/HG
Hydrolyse, Silage or
other at Refiner



DEMO/Factory Membran Container



Rental/Own Evaporator
+ Drier at Refiner/Contractor

Users of
Ingredients

BioMarine Refining => Increased BioMarine Ingredients for Nutrition

(SJØ = LAND PRODUKSJON – I DAG UTGJØR SJØ KUN 3% AV WW ERNÆRING)

