



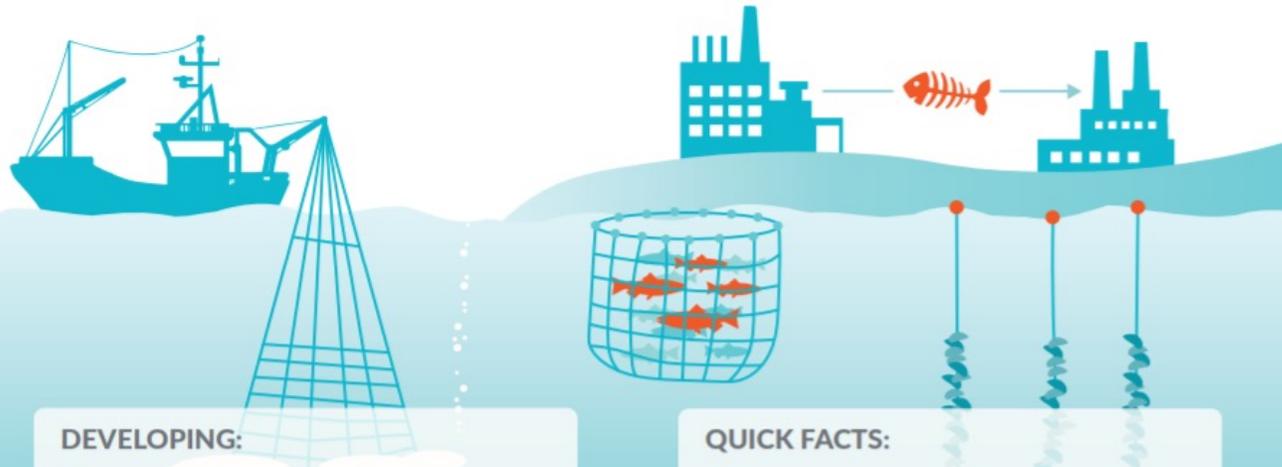
Optimal utilization of seafood side-streams through the design of new holistic process lines

Scaling up of savouring compounds from Mussel Cooking Side streams

Mónica Gutiérrez, David San Martín, Jone Ibarri & Bruno Iñarra



Optimal utilization of seafood side-streams through the design of new holistic process lines



DEVELOPING:

- Technology, infrastructure and logistics
- Efficient and sustainable supply systems for aquatic side-streams
- Nutritional ingredients such as proteins, peptides, savoury ingredients and mineral supplements

QUICK FACTS:

- Project duration: 1 May 2019 to 30 April 2023 → Extended until Sept 2023
- Funding: EC contribution € 3,2 million, overall budget € 4 million
- Consortium: 3 research institutes/universities, 1 industry cluster and 9 companies from Denmark, Sweden, Belgium, France & Spain

COORDINATOR



PARTNERS



THE CONTEXT:

The current exploitation of the aquatic resources is hampered by inefficiency as up to 70 % end up as low-value products or waste, unsustainable considering the rising population.

WaSeaBi OBJECTIVE:

Ensure that side-streams from aquaculture, fisheries and aquatic processing industries can be exploited for production of new products and ingredients. By **developing storage solutions, sorting technologies and decision tools** that will secure an efficient, sustainable supply system for valorization of these raw materials into marketable products.



Efficient and Sustainable Supply Systems for Aquatic Side-Streams

Nutritional ingredients

Proteins, peptides, savoury ingredients and mineral supplements

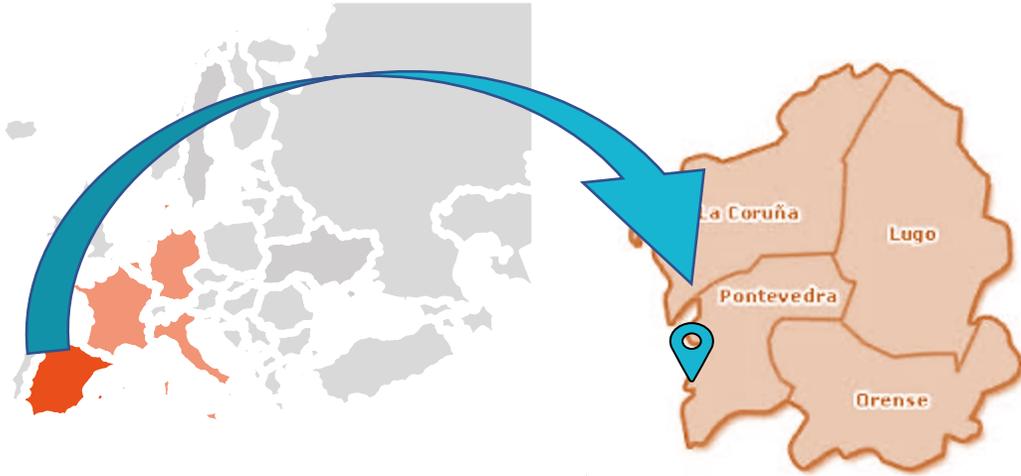
6 different side-streams:

Representing typical aquaculture, fisheries and aquatic processing industries in Europe:

Side-stream	Potential use
Solid side-stream from Cod industry	Food ingredient
Brine from salted Cod	Protein for reinjection/in-house use
Solids & process water from herring	Food ingredients
Salmon solids, mackerel, by-catches	Food & Feed ingredients
Mussel cooking water	Food ingredients (Savoury compounds)
Mussel shells	Food & Feed ingredients (mineral supplements)

WaSeaBi will take a whole chain perspective to succeed with **high quality production of:**

- Bioactive peptides for nutraceutical, food and feed application
- Protein-based food ingredients
- Savory ingredients and mineral supplements for food and feed



Some facts about mussel production:

- The EU is the **second largest producer** after
- In the north-West of Spain, the **annual production** of mussels is 200 000 tons (35 % of the world)
- The mussel processing requires large amounts of water for its processes.
- The water used is seawater, which is why large amounts of wasted-brine are generated.

Culture of mussels in rafts



Mussel harvest



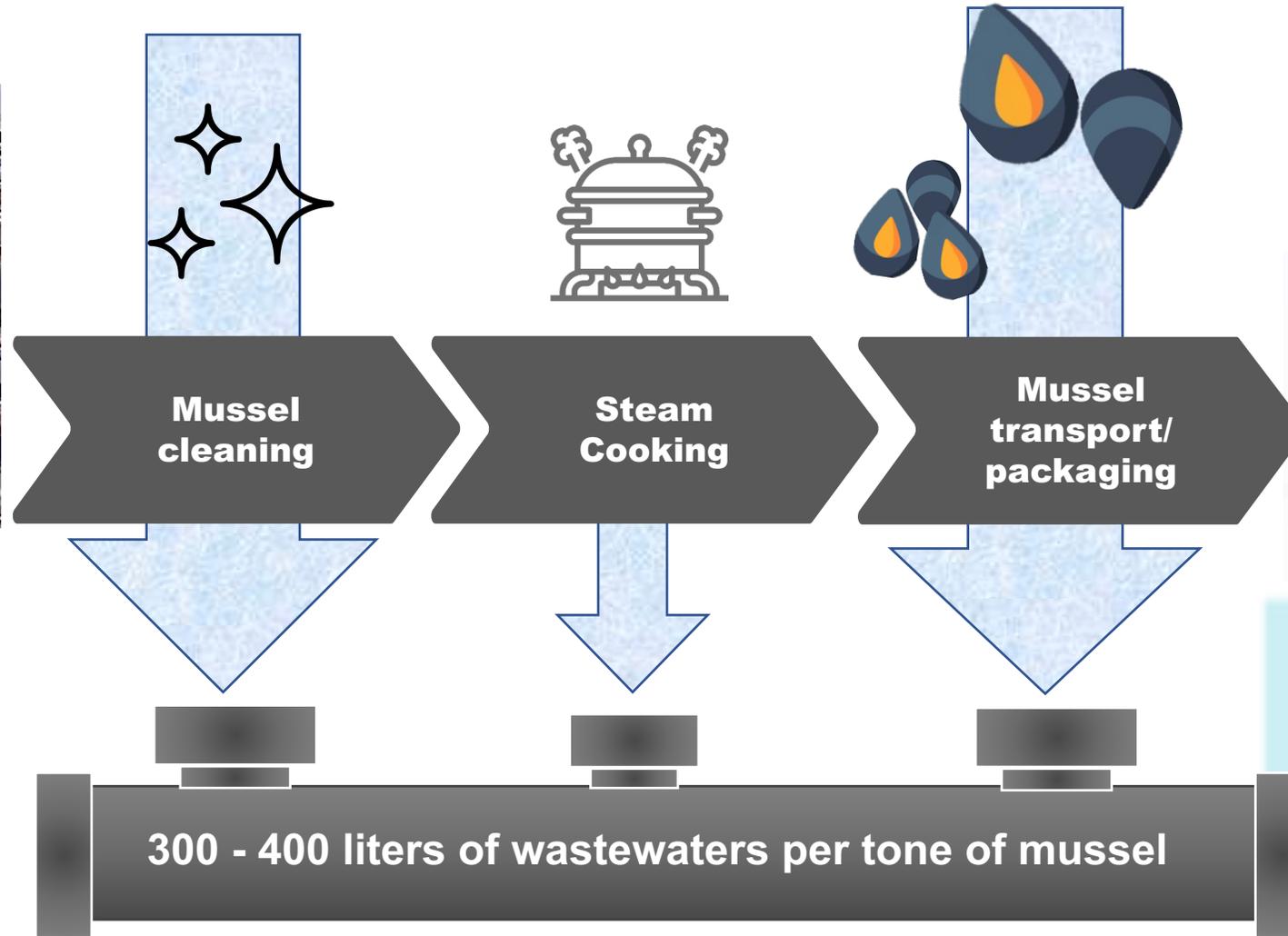
Production



Comercialization

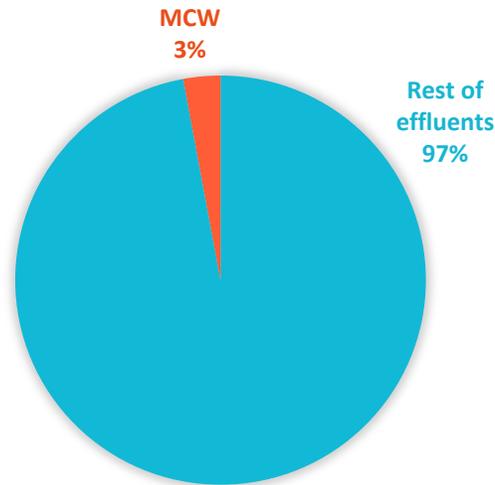


Mussel Processing

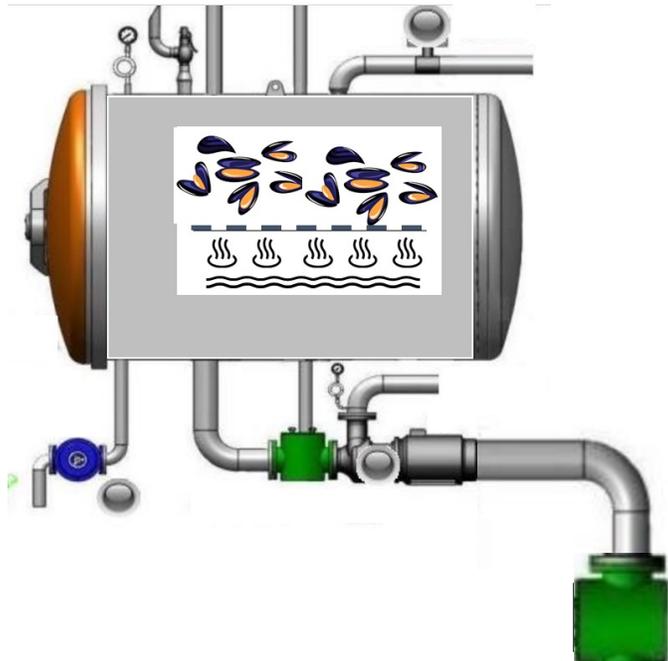
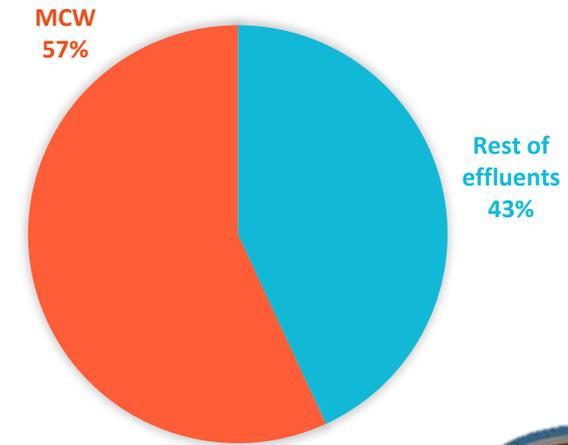


Mussel processing wastewaters

% VOLUME OF EFFLUENTS



% COD LOAD

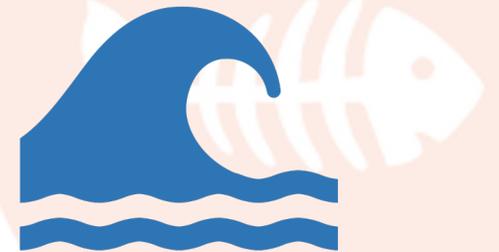


Sidestream from mussel cooking

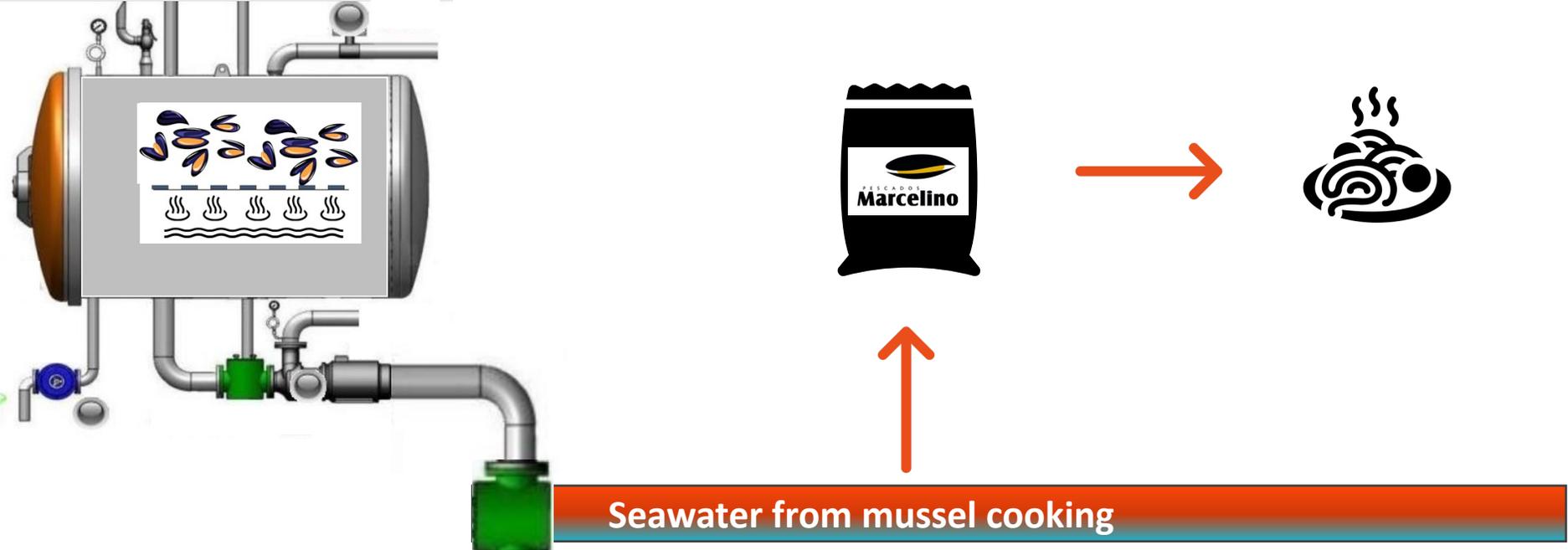
DQO = 22 000 – 100 000 mgO₂/l
SS = 250 – 700 mg/l

**Seawater from mussel cleaning,
product transport (conveyor-tray)
and factory cleaning**

DQO = 500 – 1 000 mgO₂/l
SS = 500 – 1 000 mg/l



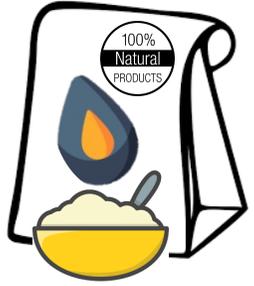
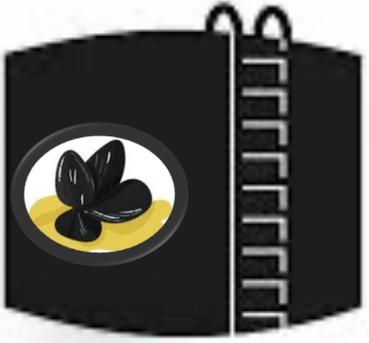
Mussel processing wastewaters



Seawater from mussel cleaning,
product transport (conveyor-tray)
and factory cleaning



MCW recovery



LAB Assays

- Controled conditions
- Variable study
- Separate Effects

Pilot Plant

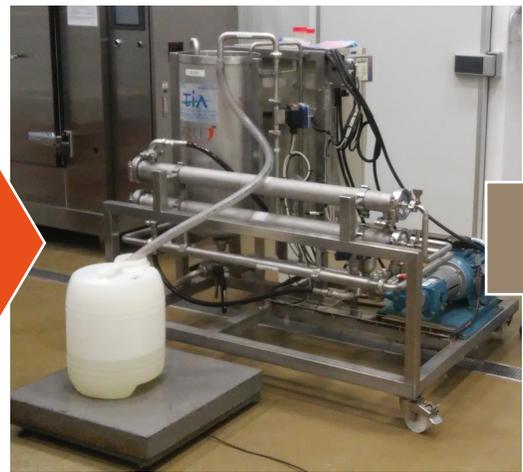
- Controled conditions
- Assays in optimal conditions
- Cross Effects

Semi industrial Pilot Plant

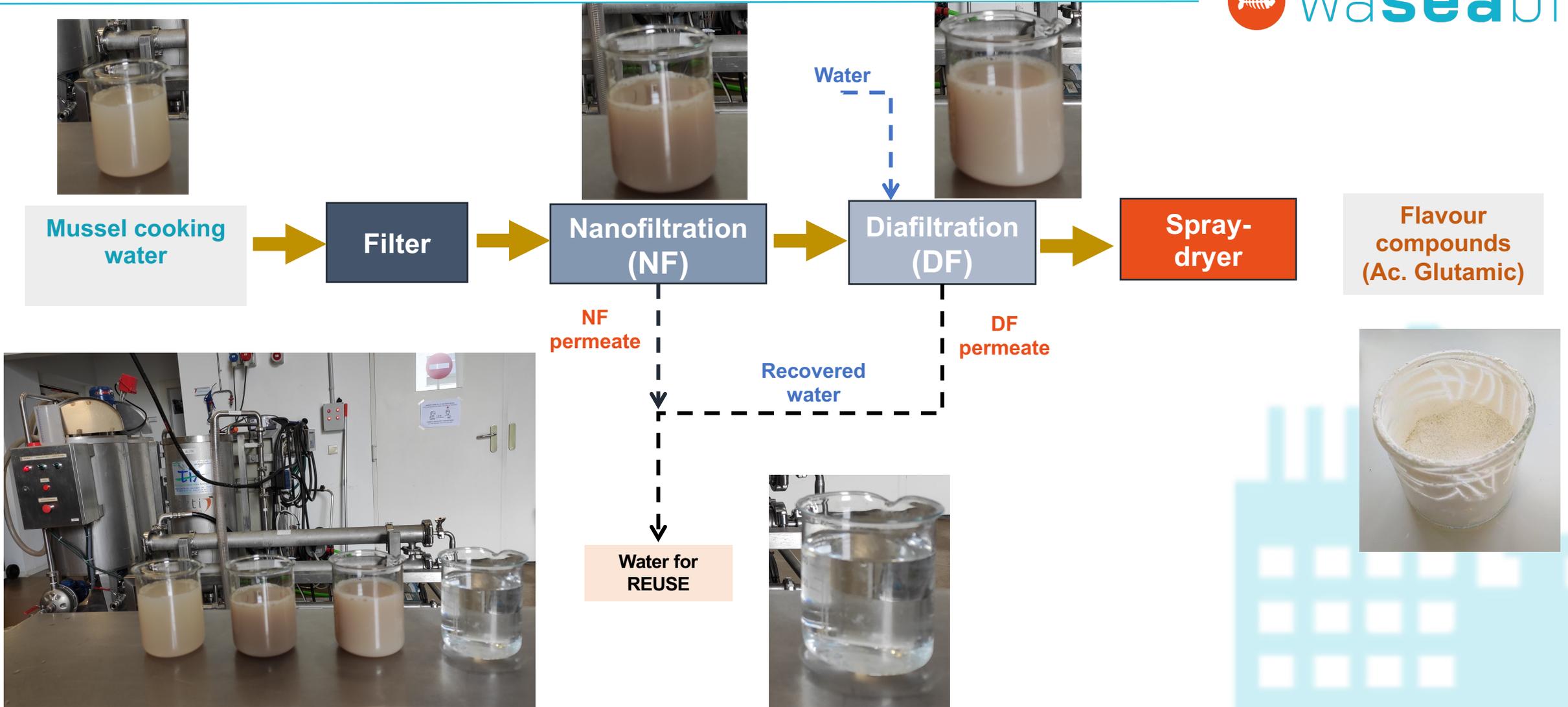
- Real conditions
- High variability
- Adjustment of conditions
- PID specifications

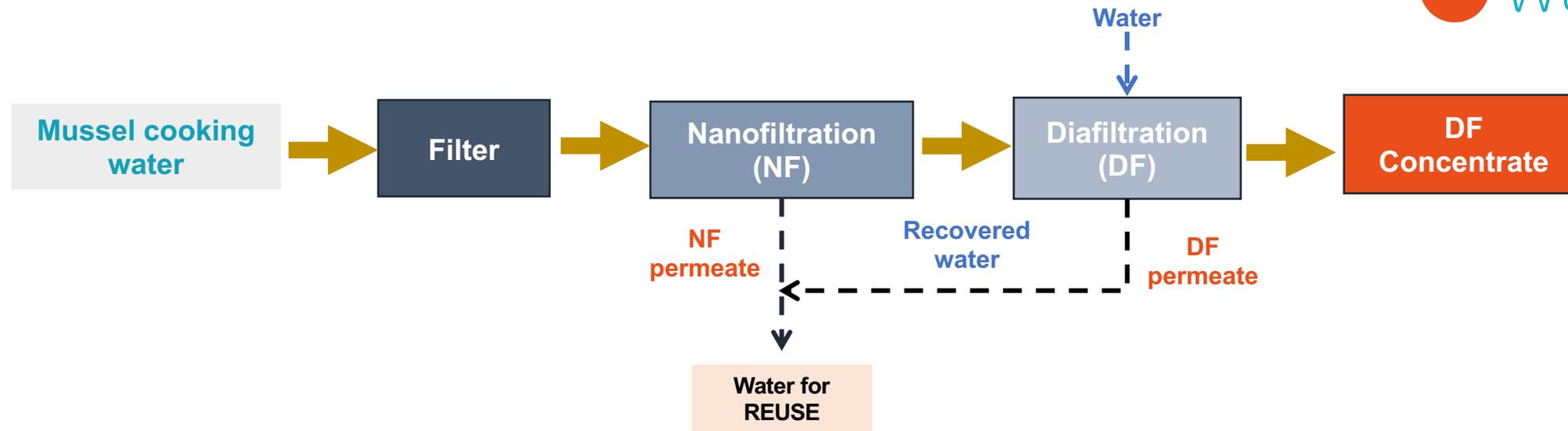
Industrial

- Installation
- Equipment Start up
- Final adjustmens / Operation



MCW Concentration





Different assays carried out in the scale-up in Mussel Facility

	Nanofiltration VCF	Diafiltration VCF
Assay 1	10	10
Assay 2	10	20
Assay 3	20	20

VCF = Volumetric Concentration Factor

RESULTS: Comparison between different performance parameters

	Assay 1 NF 10x - DF 10x	Assay 2 NF 10x - DF 20x	Assay 3 NF 20x - DF 20x
NF (VCF) – DF (VCF)			
Protein recovery (%)	0.53	0.67	0.56
Concentrate Volume l/m ³ MCW)	10	5	2.50
Energy (kWh/m ³ MCW)	21.42	17.12	21.51
Final effluent Vol. (m ³ /m ³ MCW)	1.98	1.95	1.49
COD in final effluent (mg O ₂ /l)	1013	856	854
CIP Reagents (€/ m ³ MCW)	128	121	136

Production of Mussel savoury compounds



Mussel Cooking Water



MCW concentrate



MCW permeate

MCW powder composition



- Moisture 3 %

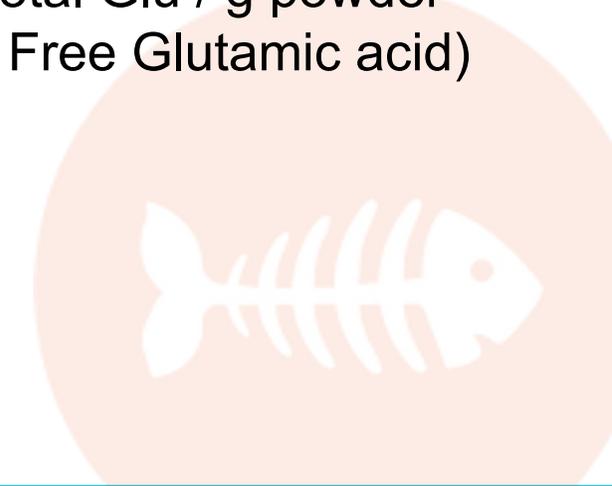


PROTEIN

- Protein > 50 %



- 20 mg Total Glu / g powder
(60% of Free Glutamic acid)



Market applications

PROCESSED FOOD INGREDIENT

- Fish & Seafood savor
- Umami flavor



MCW powder

PET FOOD

- Anti-inflammatory properties
- Seafood flavor



BEAUTY & COSMETICS

- MAP (Mussel adhesive protein)
Skin regeneration
- Nutraceutical ingredients



Conclusions

-  A solution for a seafood side-streams recovery was developed and implemented from lab-scale to industrial scale-up
-  The main pollution flow was separated and valorized to avoid the organic matter contamination in the final effluent. Treated brine can be discharged to the sea within the regulatory frame or reused.
 - The water recovered from the NF and DF processes had the hygienical conditions to use for cleaning purposes in the factory
-  **New protein source was obtained for savory ingredient industry**

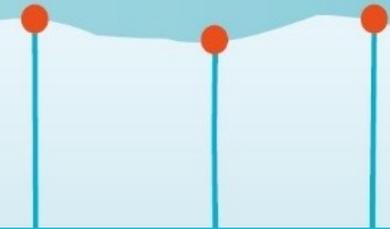
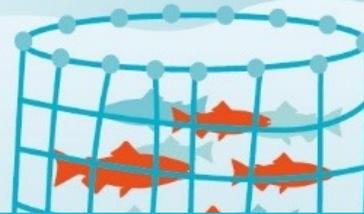
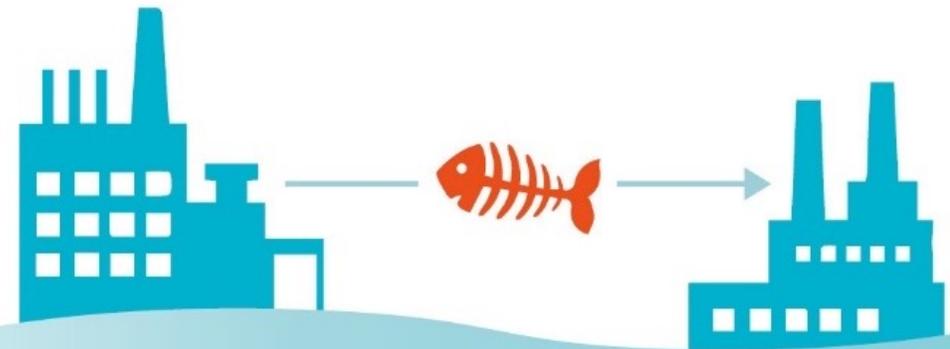




Thank you!
Any questions?

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This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 837726. The JU receives support from the European Union's Horizon 2020 research and innovation programme and the Bio Based Industries Consortium. This output reflects only the author's view and the JU cannot be held responsible for any use that may be made of the information it contains