



Closing seminar

Oulu 18.9.2014

ECOFOSTER GROUP Ltd.



This project is co-funded by the European Union,
the Russian Federation and the Republic of Finland.

Background for the project:

- 1. Earlier cooperation with Karelian organisations**
- 2. Knowledge of environmental challenges**
- 3. Information of the growth of fish farming**
- 4. Global trends on bioenergy and aquatic resources utilization**
- 5. Wish to examine new business tasks**
- 6. Interest to make waste to useful products**



Aquarel Piloting:

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1. Practical testing how the biological co-stream can be processed to energy / fuel / other valuable raw material
2. Main idea to change a status of waste material to valuable raw materials or energy
3. Simple method was selected to be tested due to the fact that more developed methods and technologies are not easily available for piloting/testing



Aquarel Piloting:

In the AQUAREL project pilot the fish oil was separated from the fish processing side streams. Produced fish oil can further be utilized in bio-diesel or animal feed production. The decision to produce fish oil as an end product was based on existing market demand and profitability calculations. The production of bio energy i.e. biodiesel currently is not economically profitable and there are lack of demand for biodiesel in Karelia. Additionally an essential aspect having an impact on the end product selection was the identified business associate with whom the project shared common interests.

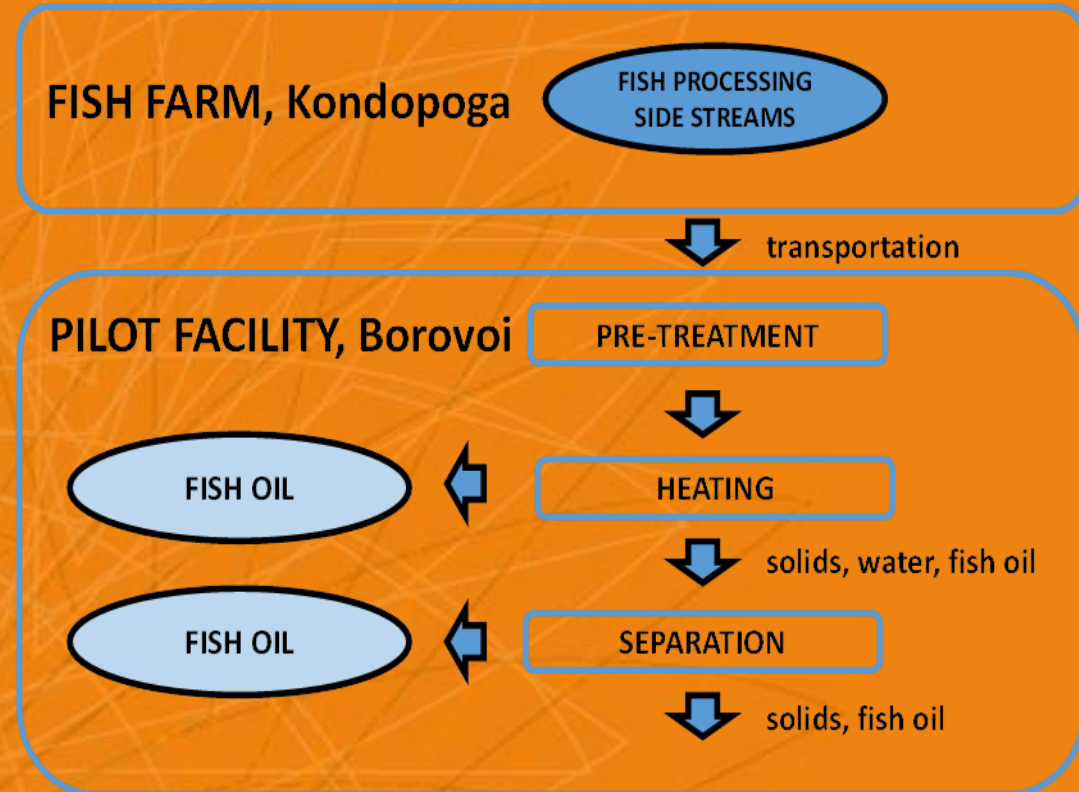
The purpose of the pilot was to confirm the functionality of the transportation logistics and the fish oil production process.



Pilot process definition (1/4)

Figure 1. Pilot process steps.

In the pilot process the fish side streams are first heated in a heating unit. The oil phase on top of the heating unit is removed after which the rest of the mass is crushed and pumped to the fish oil separation unit. In separation unit the fish waste is separated into two (2) phases by gravity; solids including the water and oil.



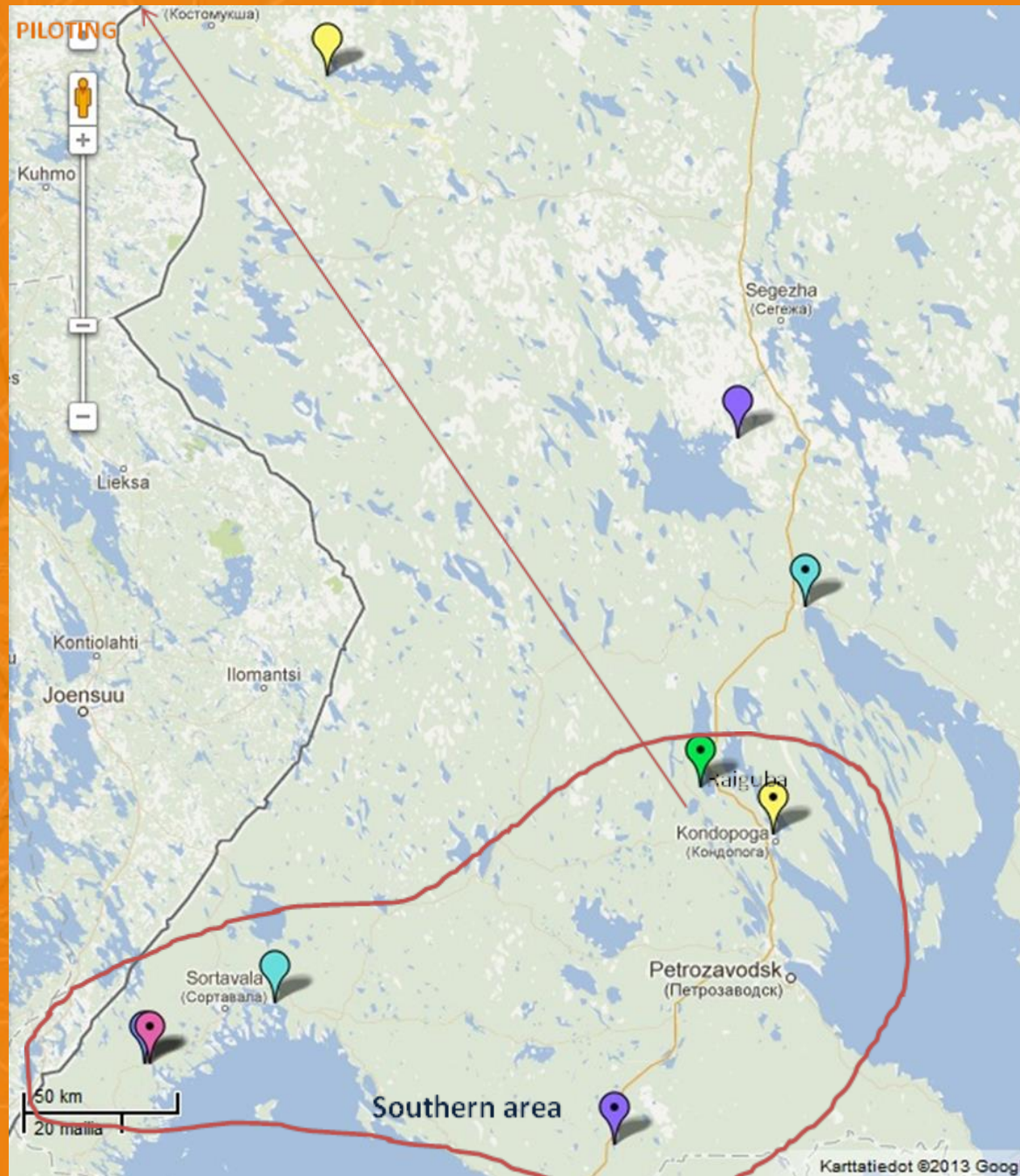
The process piloted was a batch process, designed to manage 250kg of side steam per batch. For each of the pilot run, the key process parameters were changed; heating temperature and time, with or without the pre-treatment and separation time.

Pilot process definition (2/4)

The pilot included the following process steps (Figure 1):

1. Collection. Fish processing side streams are collected from the fish processing company located in Kondopoga. The side streams are in transportation containers.

2. Transportation. Side stream containers are transported to pilot facility in Borovoi, around 500 km northwest from Kondopoga.



Pilot process definition (3

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/4)

3. Pre-treatment. The side streams are treated to decrease the particle size.

4. Heating. Side streams are heated in target temperature for specified time.

5. Removing the oil phase. The fish oil on top of the heating unit is removed and collected to oil canister.



Pilot process definition (4/4)

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6. Crushing. The rest of the heated mass is crushed by a crushing pump and pumped to separation unit.

7. Separation. The oil phase is separated from protein and solid phase by gravity in an insulated separation unit.

8. Removing the oil phase. The fish oil on top of the separation unit is removed and collected to oil canister.

9. Removing the protein and solid phase. The protein and solid are stored to transportation containers for further utilization



Results

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According to the pilot experience, producing fish oil from fish processing side streams is an easy and relatively simple production process. For a small scale process, also the equipment investment stay moderate.

When the heating temperature increases beyond ~50oC most of the side streams are smelt. That makes the crushing after the heating unnecessary. Instead crushing the side streams before the heating will speed up the heating decreasing the overall processing time.

Even if the production process itself is not complicated, the operative management of small-scale fish oil production unit requires dedicated resources and separate facilities. Process parameters need to be monitored. The transportation, storage and moving the side stream, solids and fish oil require specific equipment and containers to ensure smooth operations and to meet hygiene requirements. For the same purpose, also cleaning the process equipment and facilities require special focus.

In the pilot, the side streams were transported for 500km distance to the pilot facility. The pilot was conducted during the summer time, so the road conditions did not cause any surprises. However, long transportation distance creates a risk outside the summer time. On the other hand, the pilot confirmed the location of the waste management unit do not need to be besides the fish farmers assuming the transportation equipment are appropriate.

The cold chain need to be robust during the whole side stream management process. That creates the basis for meeting the hygiene requirements.

Conclusions

Producing fish oil from fish processing side streams is an easy and relatively simple production process generating a valuable end product.

Even if the fish oil production process is not complicated, the operative management of small-scale fish oil production unit requires dedicated resources and separate facilities due to e.g. hygiene requirements.

Managing the side streams is not a core business for fish farmers. There is clearly a business opportunity for an actor, who would manage the fish processing side streams in the Republic of Karelia. Efficient and economically profitable fish oil production requires centralized production unit which processing capacity would cover the side streams from the majority of the fish farmers. Managing the side streams should cover the dead fish as well, to create a comprehensive waste management solution. Even if the dead fish would require a separate management process.

The optimum location for the fish waste processing unit is in the middle of the fish farms or at least close to one of the main roads. Another issue to be considered when locating the processing unit is that side streams collection from the fish farms is reasonable to be organized on a daily basis to eliminate the need for storing them at the farms.

Aquarel piloting activity, implementation:

- **Culmentor Oy, Oulu, as Aquarel project partner**
- **Ecofoster Group Oy, Oulu, as Aquarel project partner**
- **Vilia Ltd, Kostamuksha, as Aquarel project partner**
- **AlHola Co.Ltd, Selected as piloting machinery supplier / lessee**
- **Rainbow Trout guts from Kondopoga / RaiGuba fishery**
- **Transportation of fresh guts by minivan to Borovoi plant**
- **Immediate heat process after transporting the material**

Thank you!

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Kiitos !

Спасибо!

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