



Hyperthermics™

THE GREEN SHIFT REVOLUTION

Presenting person

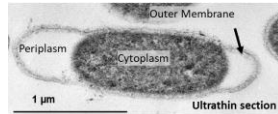
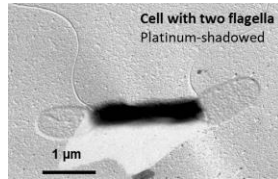
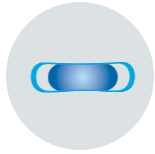
Stig Amdam, Sales Manager

- BBA Nord Universitetet, Marine Harvest-Academy, Business degree.
- Project Manager Marine Harvest Eggesbønes, advanced factory operation for fish processing
- Production & Sourcing Manager, Kongsberg Evotec AS.
- Project Manager, Kongsberg Evotec AS.
- Project Manager, Evomec AS.
- Plant Manager, Helkama Grepa AS.



Pioneering fermentation technology

Thermotoga - unique biotechnology



- Usage of living ancient organisms from volcanoes to transform biomass into renewable energy, in a fast and environmentally friendly way.
- Hyperthermics has developed the pioneering fermentation technology since 2006.

Data from continuous simulations and full-scale operation of the Hyperthermics process



Erik Norgaard,
R&D



Dr. Stefan Miller
CEO,
Hyperthermics
Regensburg
GmbH



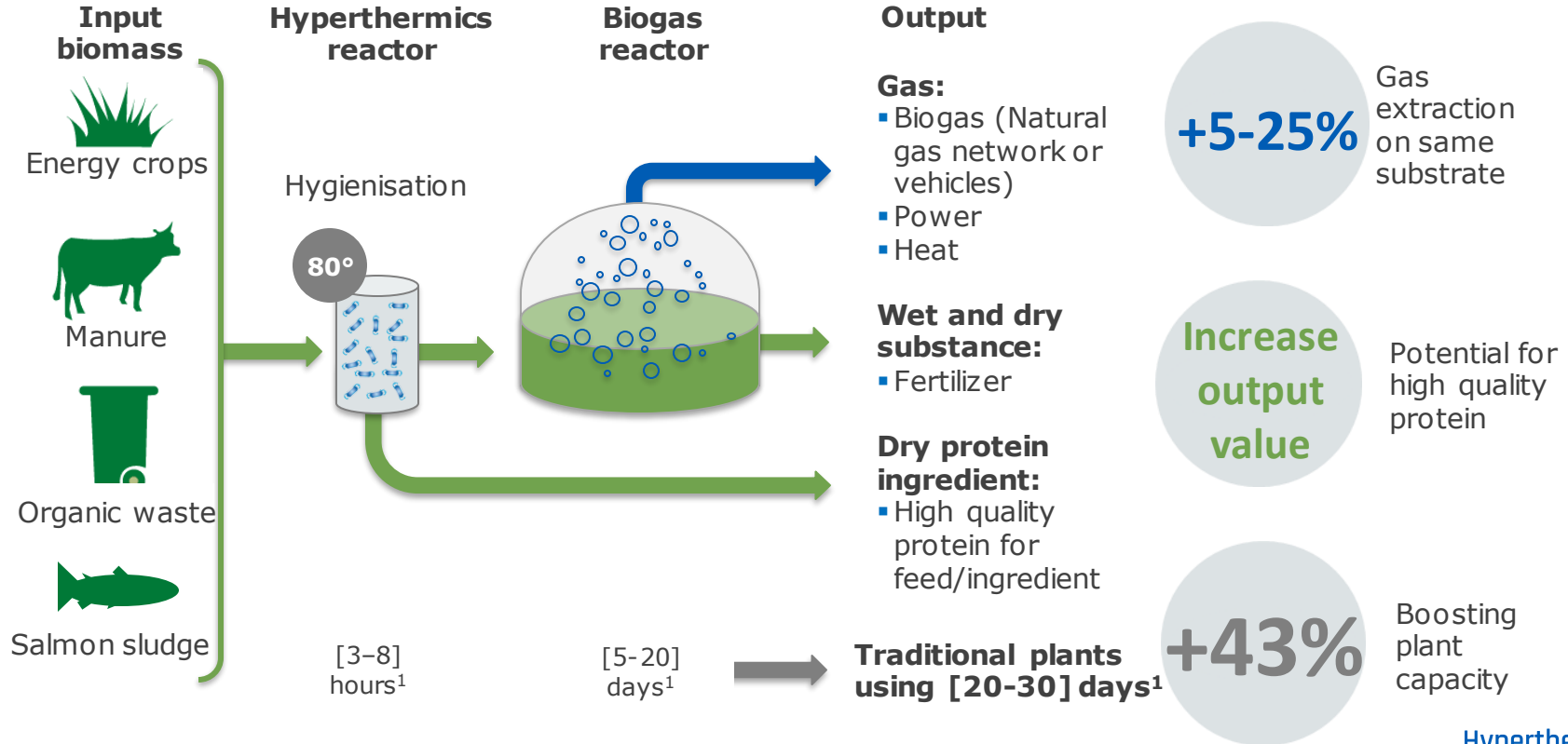
Leonardo
Torres,
Bioprocess
Engineer



Harald Nordal,
Bio strategist

- Hyperthermics data are available from continuous fermentations performed either in lab scale at the University of Regensburg or at NIBIO and a first data set from the full-scale pilot plant at Lindum/Drammen.
- Laboratories is located in Regensburg, Germany.
- Collaboration with University of Regensburg.

Increased output volume, value and plant capacity



1. Varies depending on type of input factor

The world's only full-scale plant with hyperthermophilic organisms

Full-scale operation / pilot plant at Lindum, Drammen (Norway)

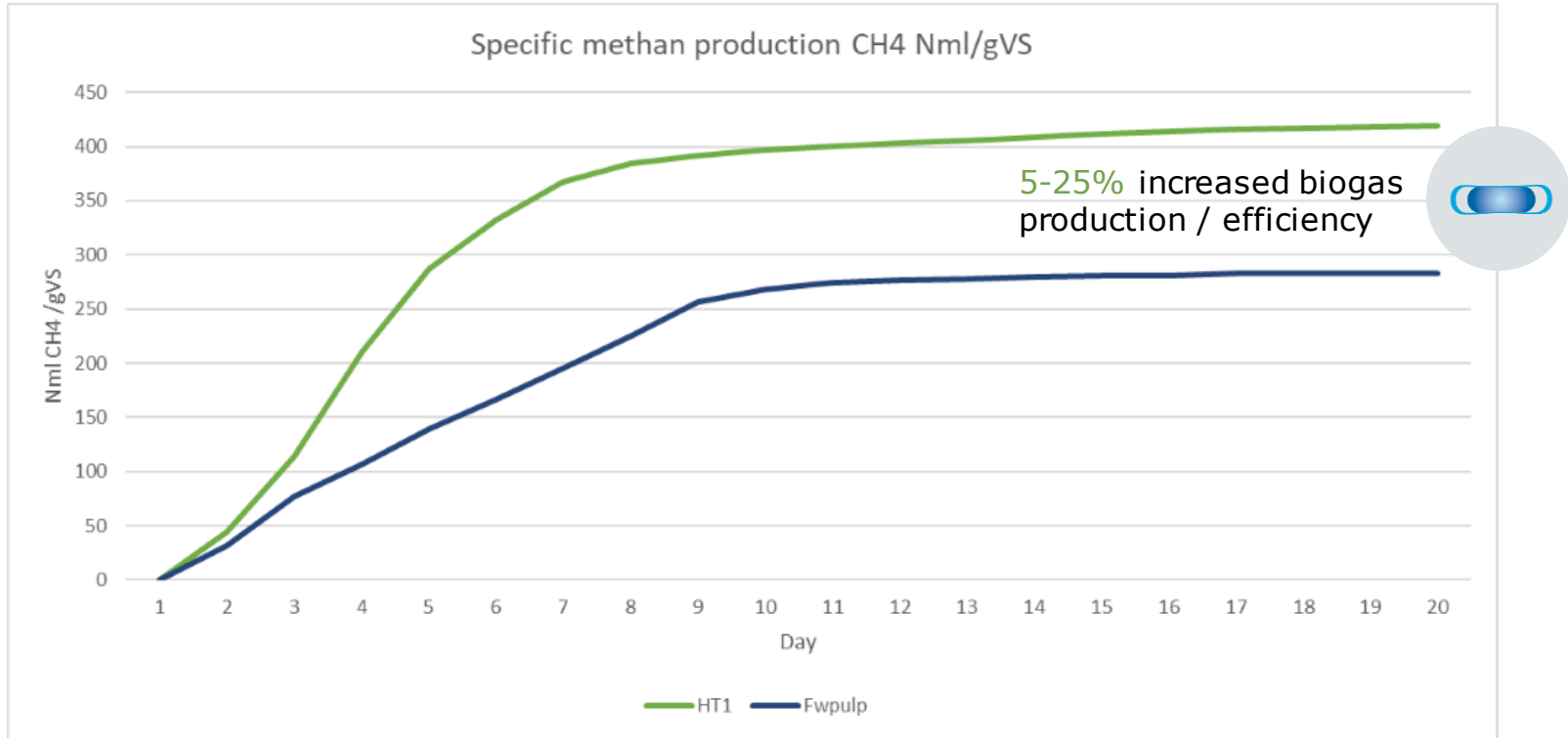


Hyperthermics at Lindum has since 2017 been operating on:

- Food waste
- Sewage sludge
- Pulper sludge
- Salmon sludge



High-speed process 5-25% increased production



Data based on full scale operation at Lindum, a Norwegian biogas facility with a capacity of 10.000 tonnes per year

Transforming biomass into profitable products

Biogas - Bioactive biogas booster



Aquaculture - Energy recovery





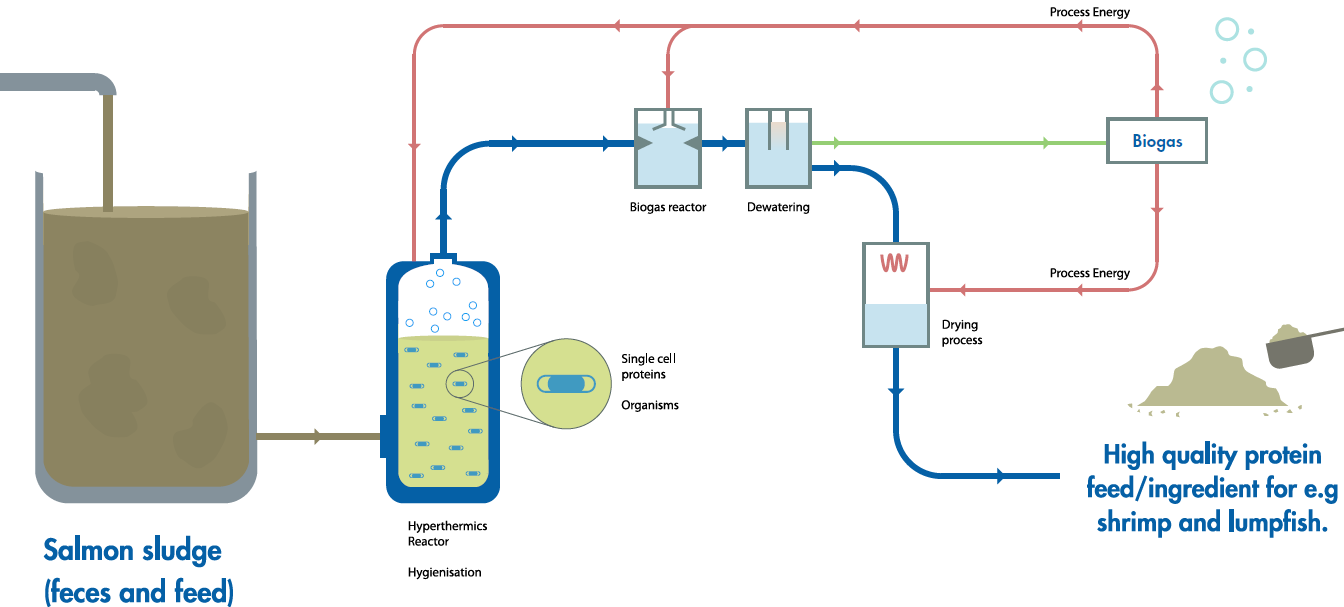
Biogas - Bioactive biogas booster

Transforming biomass into
renewable energy

High energy recovery plant

This plant reduces up to 70 % of powder biowaste compared to conventional drying solutions. Also, carbon footprint will be lower due to reduced transportation of biowaste.

- ▶ High energy recovery
- ▶ Operates in fresh and salt water
- ▶ Polymer-free solution
- ▶ 2.000 tonnes of fish sludge gives up to 1 GWh
- ▶ Biogas available within 4–6 days
- ▶ Reduction of biowaste with up to 70 %



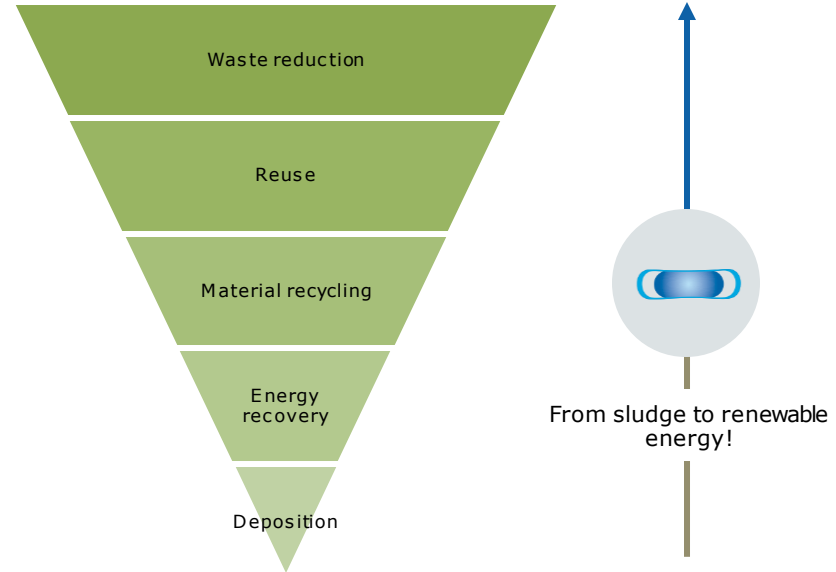


Aquaculture – Energy recovery and proteins

Transforming sludge into **renewable energy** and **high quality protein feed / ingredient**

From sludge to renewable energy!

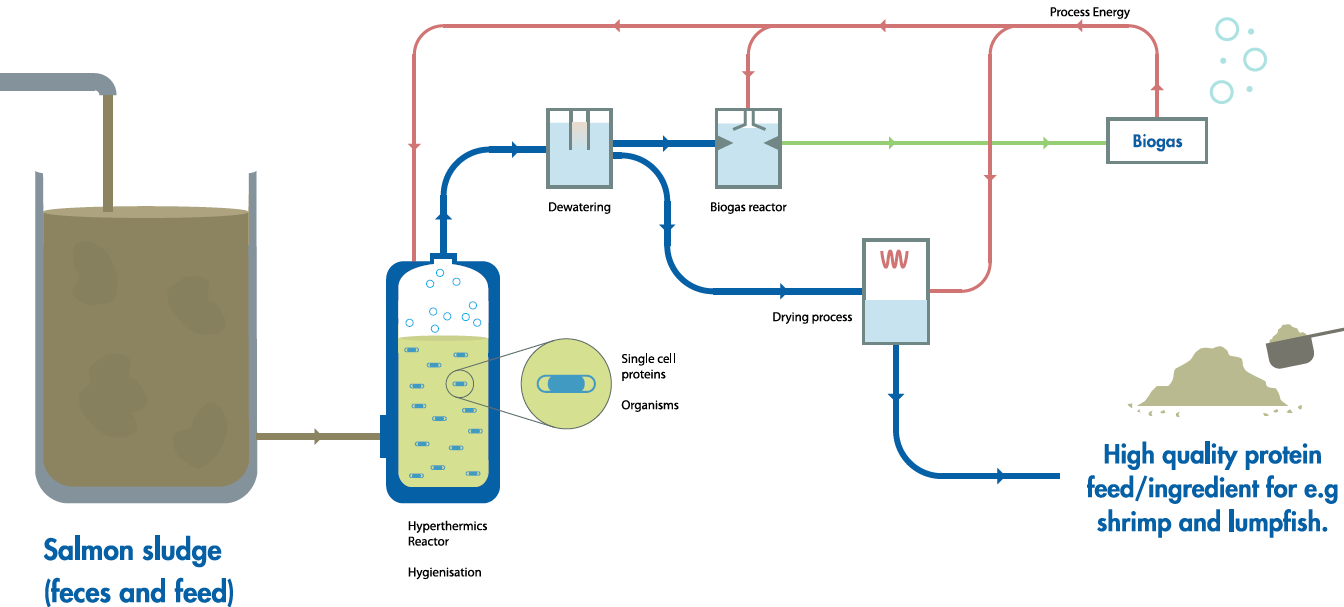
- **Convert the salmon sludge to energy on site**
- **Reduced energy cost**
- Convert the salmon sludge to a high-quality ingredient
- Move from gate-fee to profit from waste (faeces and feed)
- Hygienise the salmon sludge
- Increased profitability



Fast energy recovery plant

This plant has very low carbon footprint and produces biogas in only 24 hours. The biowaste can be used as feed ingredient.

- ▶ Instant energy recovery
- ▶ Operates in fresh and salt water
- ▶ Polymer-free solution
- ▶ Biogas available within 24 hours
- ▶ Very small footprint
- ▶ Biowaste can be used as feed ingredient



Hyperthermics creating sustainable results

Reduced methane emissions

By the use of biogas reactors for the digestion process of salmon sludge instead of composting at land or sea, methane emissions are reduced by 70-80%.



Fast forward biogas production

Bioactive treatment increase digestion capacity in existing biogas reactors by reduced retention time in digestion process.



Salt biomass

Sludge from farmed salmon has more energy potential than livestock feces. Hyperthermics is the only system to handle salt biomass, which has high heat capacity and good heat transfer properties.



No use of Polymer

Uses mechanical cleaning / separation, and no polymer additives in the production process.



Less waste to handle

Reducing above 85% of the water content in the sludge, then removing over 70% of the dry matter, causing less waste.



Less transport

Less waste means transport is reduced from one truck load a day to one a week.



Business Model Canvas

Positioning

The green shift revolution



Offering clients in the biogas and aquaculture segment a unique biotechnology that transform biomass into profitable and sustainable products faster.

Prioritized markets

Biogas - Bioactive biogas booster



Transforming biomass into **renewable energy**

Aquaculture - Stand alone unit

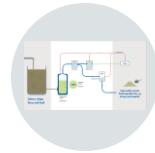


Transforming sludge into **renewable energy** and **high quality feed/ingredient**

Sales and income model

Client partnership

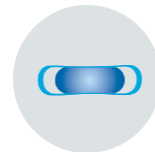
Sales through 1: 1 dialogue, focusing on the clients profit-potential and environmental benefits.



In the start-up phase:
Extended responsibility for investing in and operation of equipment, with associated income and costs.



Long term 1 - One-off sales:
One-off sales of Hyperthermics plants. See product / capacity range.



Long term 2 - Repeating income:
License revenue hyperthermophilic organisms.

Summary – Key advantages

- High energy conversion from a small footprint
- Lower energy cost – reuse of green energy
- Lower transportation cost
- Low carbon footprint by less transportation
- Handles all types of biomass, including from salt water
- Polymer-free process
- Hygenised and stabilised biomass

Highly scalable – Tailored solutions



Example: Fast Energy Recovery Plant 2x25tonnes DM 12%/day)



Example: High Energy Recovery Plant (2x7,5tonnes DM12%/day)



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