



Autonomous Algae Harvesting

”The water is too poisonous to swim in”



Autonomy + Non-Fossil Fuel Energy = Sensible Cost of Algae Harvesting ?



Viktor Sundholm
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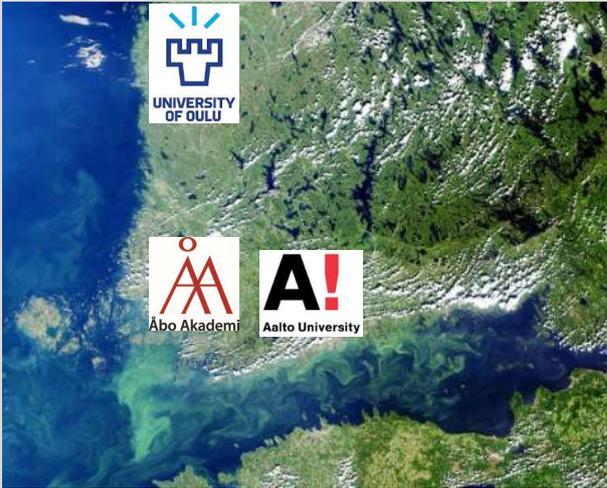
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Joonas Korhonen
Bachelors student in Environmental Technic



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PhD Student in Process Optimization






Lassi Mastomäki Werner Hämäläinen
Bachelors student in Mechanical Engineering
Future focus on Masters in Maritime Technology

Concept Executive Summary

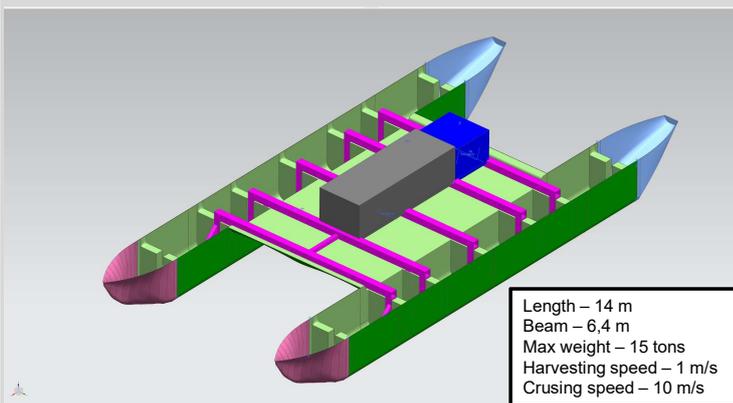


Harvesting Capacity: 3,6 – 7,2 ha/day

Potential income sources:

- Harbours and beeches - €
- Condominium payment - €
- City - €/ha harvested area
- State - €/kg harvested algae or nutrients
- Environmental foundations for funding

Technology Harvester & Autonomous Technology



Harvesting Technology

Max 200 l/s pump for harvesting and filter for separation



Autonomous Technology

Satellite feed for algae mapping

Sensor and camera for algae detection

GPS or focused navigation according to algae

Camera and radar combination or lidar to avoid collision

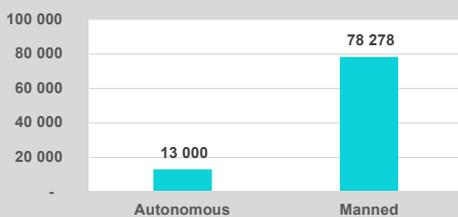


Energy Source

Battery pack with 12h charging interval for harvesting, and hybrid for cruising

Feasibility & Sensitivity

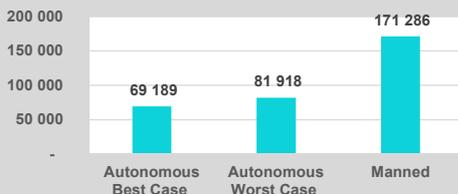
Operating Costs per Month
3 Harvesters



CapEx per harvester

60 000 € – 80 000 €

Total Costs per Season
3 Harvesters



Cost per harvested hectare

Current: 160 €/m² – 380 €/m²
 Potential: 27 €/m² – 32 €/m²



Cost per harvested algae

Current: 32 €/kg – 80 €/kg
 Potential: 0,9 €/kg – 1,05 €/kg

Next Steps



Closing Words

- Main conclusion - Autonomy and non-fossil fuel technology reduces the costs for algae harvesting to reasonable level
- Main income – protection of residence and tourism from bluegreen algae, and removed algae (and nutrients) from the Baltic Sea
- Flexibility and increased use
 - Algae and water quality research and monitoring
 - Pre-bloom harvesting
 - Harvesting of plastic
 - Harvesting in other seas during off-season
- Best potential use as raw material in medicine, cosmetics or superfoods (if possible)
- Research and reference for autonomous ship technology

Thank You!



Viktor Sundholm (M.Sc. Tech., Chemical Engineering)
 • PhD student in Industrial Management at Abo Akademi University
 • Main task: Overall concept and feasibility studies



Joonas Korhonen
 • Student in Energy and Environmental Technic at Aalto University
 • Main task: Energy sources for algae harvester and pump calculations



Pushpa Rani (MBA, Human Resource)
 • PhD student in International Business and Management at Oulu University
 • Main task: Income and funding for algae harvest



Lassi Mastomäki
 • Bachelors student in Mechanical Engineering at Aalto University, Masters level focus will be Maritime Technology
 • Main task: Algae harvesting catamaran enrgy sources and risk management



Markéta Micolajková-Alifov (M.Sc. Tech., Chemical Engineering)
 • PhD student in Process Optimization at Abo Akademi University
 • Main task: Evaluation of algae harvesting techniques and dimension the algae harvesting equipment for catamaran, and algae sensors



Werner Hämäläinen
 • Bachelors student in Mechanical Engineering at Aalto University, Masters level focus will be Maritime Technology
 • Main task: Algae harvesting catamaran hull design and general arrangement