Re-think innovation

Re-turn on investment

Re-circulate resources

Re-duce pollutants
Introduction to solution: Which problems does our solution address?

**SDG 6: Provide sanitation facilities, and encourage hygiene at every level.** We remove pathogens, xenobiotics, heavy metals and pollutants.

**SDG 9: Foster innovation and entrepreneurship.** Our Patent Pending solution is innovative, mobile and scalable.

**SDG 12: Agriculture is the biggest user of water.** Toxic waste and pollutants are disposed as landfill. We remove pollutants and heavy metals and we re-circulate phosphorus and carbon as a soil improver.

**SDG 13: Greenhouse gas emissions are now 50% higher than in 1990.** Using the carbon in our end product as a soil improver reduces CO2 emissions.

**SDG 7: Investing in clean energy sources, such as solar, wind and thermal.** We utilize the calorific value in sludge, turning it into thermal energy.
Applicability to retrofitting process - What do we do?

First we dry, using super heated steam, and then we pyrolyse the sludge.

The energy source is the organic content in the sludge. We utilize this calorific value in the sludge by burning the pyrolysis gasses. And excess thermal energy, for district- or local heating.

The end product is a biochar/soil improver with plant available phosphorus, and can be processed into activated carbon (filter material).
Impacts, What are the benefits?

- Pathogens and xenobiotics removed
- Sanitized, odorless, storage stable end product
- Fast ROI: 2-6 years
- Re-circulated resources
- Environmental pollutants removed
- Heavy metals removed or significantly reduced

<table>
<thead>
<tr>
<th>Element</th>
<th>Atom Number</th>
<th>Molar Mass</th>
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<tbody>
<tr>
<td>P</td>
<td>15</td>
<td>30.973762</td>
</tr>
<tr>
<td>As</td>
<td>33</td>
<td>74.92160</td>
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<tr>
<td>C</td>
<td>6</td>
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<td>K</td>
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<td>Cd</td>
<td>48</td>
<td>112.411</td>
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<tr>
<td>Microplastic</td>
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</tbody>
</table>

Aquagreen

Energy Consumed

- 100%
- 25%
- 80%

Regained

Excess energy
Business case; Return of Investment

The ROI is very dependant on:

- Income streams:
  - Usage of and price for excess energy
  - Current disposal cost
  - Price and type of bio char
  - Price and type of activated carbon
  - CSR/PR/Image Value
- Manufacturing cost/-site
- Dry matter content of sludge
- Calorific value
- Size of equipment/volume processed

The current selling price for 100 kW solutions in Norway, produced in Norway:

- Steam dryer CAD 575,000
- Integrated solution CAD 1,000,000
Who are our customers?

- Aqua Culture Industries
- Municipal Wastewater Treatment (MWWT)
- Biochemical Industries
- Food & Beverage Industries
- Agriculture Industries
- Special Requests
Integration roadmap: Next steps

• AquaGreen will form a Joint Venture in Hamilton/Toronto
  • To create jobs locally
  • To create more business locally
  • To increase tax payments
• AquaGreen will consider supplying the North American market from Canada
• AquaGreen supports **Future of Hamilton** by providing
  • A Smart and Sustainable Technology
  • A Circular economy solution
  • A fast Return On your Investment
Re-think innovation
Re-circulate resources
Re-duce pollutants
Re-turn on investment

Henning Schmidt-Petersen, Owner, AquaGreen | City of Hamilton | 14.09.2018
100 kW combined steam dryer and pyrolysis. MWWT Denmark
100 kW combined steam dryer and pyrolysis, VCS Odense

100 kW combined steam dryer and pyrolysis

Installed at Vandcenter Syd in Odense.

Finansing: Markedsmodningsfonden.

Project owner DANVA
100 kW Steam dryers, Norwegian customers
Energy balance drying and pyrolysing 7 m³ of sludge/hour

<table>
<thead>
<tr>
<th>Sludge</th>
<th>7m³/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry matter</td>
<td>0,5% dry mat</td>
</tr>
<tr>
<td>Dry matter</td>
<td>35Kg/h</td>
</tr>
</tbody>
</table>

| De-watering     | 25% dry mat |
| Wet sludge      | 140kg/h |

| Drying          | 99% Dry mat |
| Dry matter      | 35kg/h |
| Condensed water | 105Liter |
| Energy consumption | 95kWh |

| Burn value      | 16MJ/kg DM |
| Energy content  | 560MJ |
| Energy usage    | 21kWh |
| Bio char        | 16kg/h |

| Produced thermal energy | 156kWh |
| Consumed thermal energy | 116kWh |
| Residual energy        | 40kWh 26% |
| Regained thermal energy | 86kWh 55% |
| Excess thermal energy  | 126kWh 81% |
Who are our customers?
Who is AquaGreen?

AquaGreen is a **Technology company** within the Clean-Tech area.

Our **patent pending** technology has been developed together with **DTU**, we are located at the DTU Campus.

Our business model is to approach new markets in **Joint Ventures**. Our first Joint Venture, **AquaGreen Norway AS**, was established in 2017 to focus on the **Nordic Aquaculture Industry**.

Our second Joint Venture is under establishment in Germany focusing on **Municipal Waste Water Treatment** and **Biogas** in Northern Europe.
## How did we get started?

<table>
<thead>
<tr>
<th>Industry:</th>
<th>Country</th>
<th>Year</th>
<th>Status</th>
<th>Project total</th>
</tr>
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<tbody>
<tr>
<td><strong>Aquaculture Industry:</strong></td>
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<tr>
<td>• Det Grønne Iværksætterhus</td>
<td>Denmark</td>
<td>2015</td>
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<tr>
<td>• Innovasjon Norge (Melbu)</td>
<td>Norway</td>
<td>2015</td>
<td>Awarded</td>
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<tr>
<td>• InnoBooster</td>
<td>Denmark</td>
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<tr>
<td>• EuroStars</td>
<td>Norway/Denmark</td>
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<td>• Innovasjon Norge</td>
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<td><strong>Municipal Wastewater Treatment:</strong></td>
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<td></td>
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<td>• MUDP</td>
<td>Denmark</td>
<td>2016</td>
<td>Awarded</td>
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<td>• PCP 1 (DK)</td>
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<td>2016</td>
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<td>• PCP 2 (DK)</td>
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<td>2017</td>
<td>Awarded</td>
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<tr>
<td>• ViiRS</td>
<td>Denmark</td>
<td>2017</td>
<td>Awarded</td>
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<td>• MUPD</td>
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<td><strong>Others:</strong></td>
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<td>• Free Innovation</td>
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<td>• Inbiom</td>
<td>Denmark</td>
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<td>110.000</td>
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<tr>
<td>• Erhvervsstyrelsen</td>
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</table>
The key differentiating factors

- Fast Return on investment (2-6 years)
- Continuous Process
- Scalability, mobility (supplied in 20” containers)
- Efficiency (patent pending superheated steam technology)
- Process design (compact, simple and reliable)
- Process control (PLC, Autonomous operation)
The key differentiating factors

- Our end product is a marketable bio-char with plant available P
  - Odourless
  - Sanitized
  - Storage stable
  - Organic

- Carbon footprint improved
  - No incineration
  - No composting

- Weight is reduced with 90%

- The bio-char can be further upgraded to organic fertilizer and filter material
AquaGreens value proposition

**We Re-think Innovation**
- Scalable technology and compact design
- Autonomous operation
- Innovative energy utilization
- Environmentally friendly technology

**We Re-duce Volume and Pollutants**
- Sludge weight and volume is reduced
- Foreign environmental pollutants are reduced
- End product is sanitized, odourless and storage safe
- Pathogens are eliminated

**We Re-turn on Investment**
- Energy cost saving technology
- Production of excess thermal energy
- Reduction of sludge disposal costs
- End product is marketable biochar

**We Re-circulate Energy and Nutrients**
- Sustainable usage of embedded energy
- Steam converted to thermal energy
- Preservation of nutrients in biochar
- Phosphorus re-circulated
- Carbon as soil improver, CO2 emission reduced
Re-think innovation
Re-turn on investment
Re-circulate resources
Reduce pollutants

AquaGreen
Sludge Treatment
We turn a problem into a resource.