



AquaGreen

Sludge Treatment

We turn a problem into a resource.

Re-turn on investment

Re-duce pollutants

Re-circulate resources

Re-think innovation

Henning Schmidt-Petersen, Owner, AquaGreen | City of Hamilton | 14.09.2018

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 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



SGD 7: Investing in clean energy sources, such as solar, wind and thermal.

We utilize the calorific value in sludge, turning it into thermal energy

SDG 12: Agriculture it 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

Applicability to retrofitting process - What do we do?

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



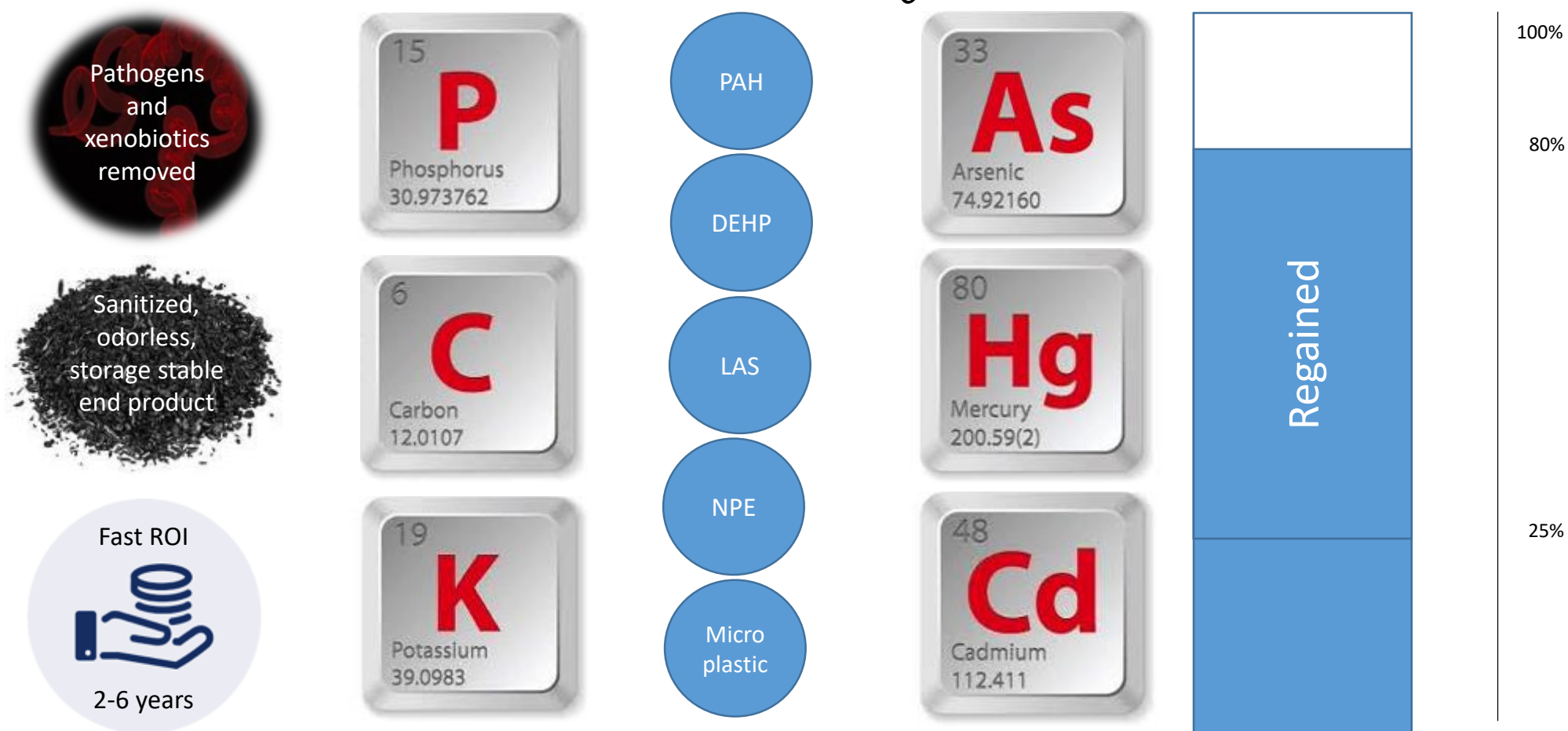
The energy source is the organic content in the sludge.

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?



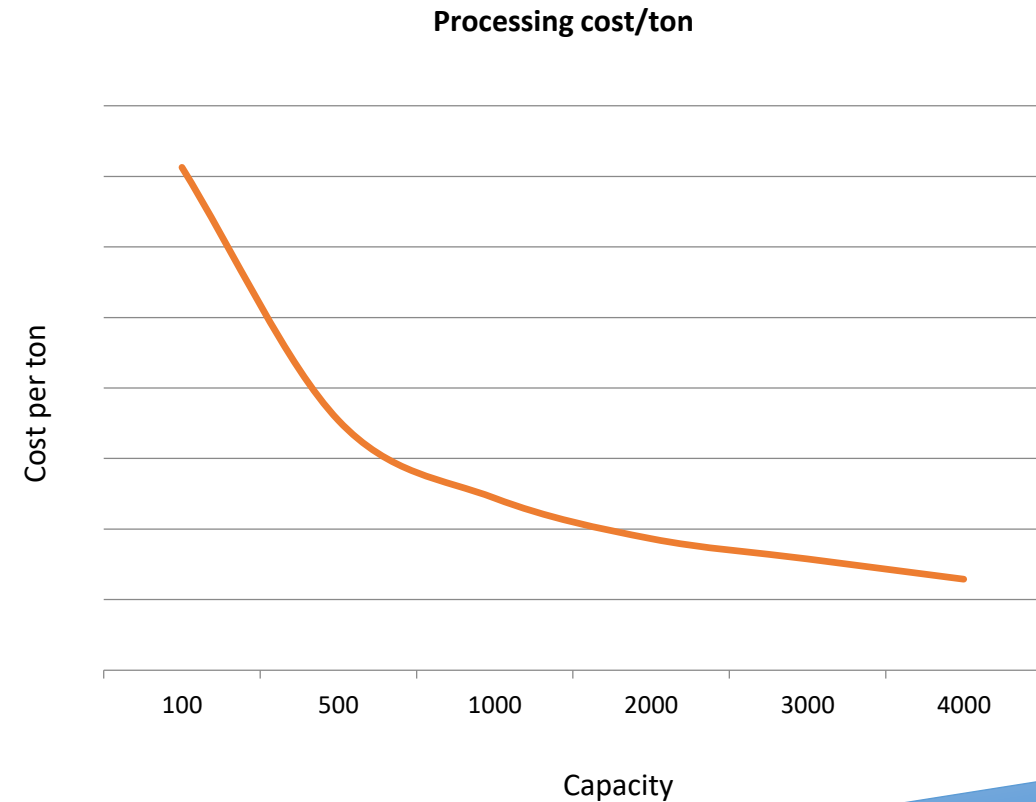
Business case; Return of Investment

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



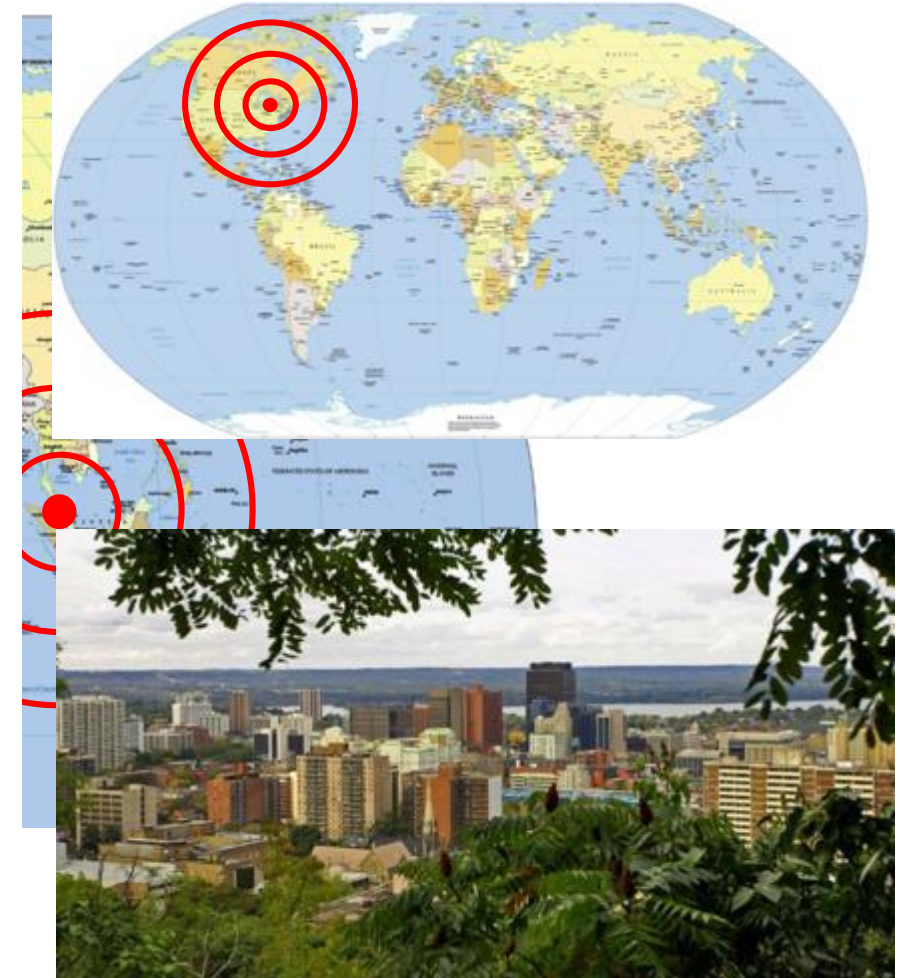
Indicative figures
Actual case specific figures have to be used

Who are our customers?



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





AquaGreen

Sludge Treatment

We turn a problem into a resource.

Re-think innovation

Re-duce pollutants

Re-circulate resources

Re-turn on investment

100 kW combined steam dryer and pyrolysis. MWWT Denmark



100 kW combined steam dryer and pyrolysis, VCS Odense



100 kW combined
steamdryer and pyrolysis

Installed at Vandcenter Syd
in Odense.

Financing:
Markedsmodningsfonden.

Project owner
DANVA

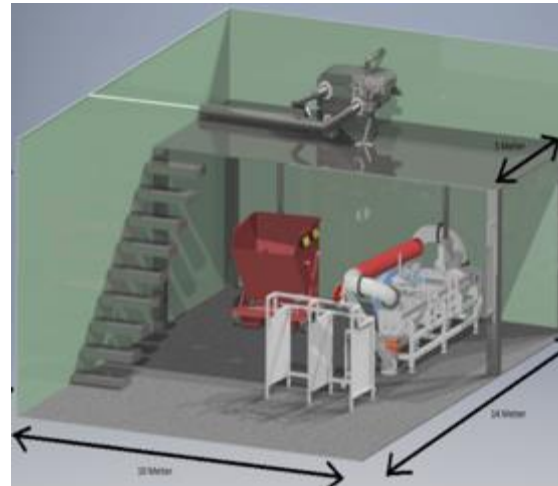
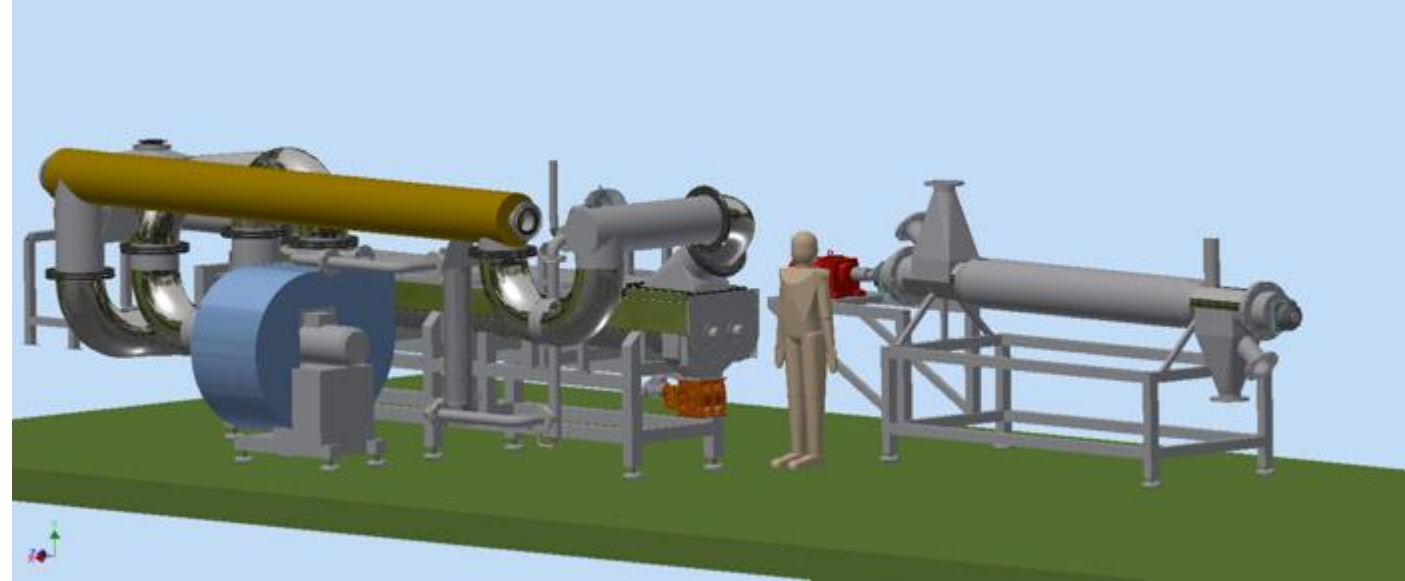


100 kW Steam dryers, Norwegian customers



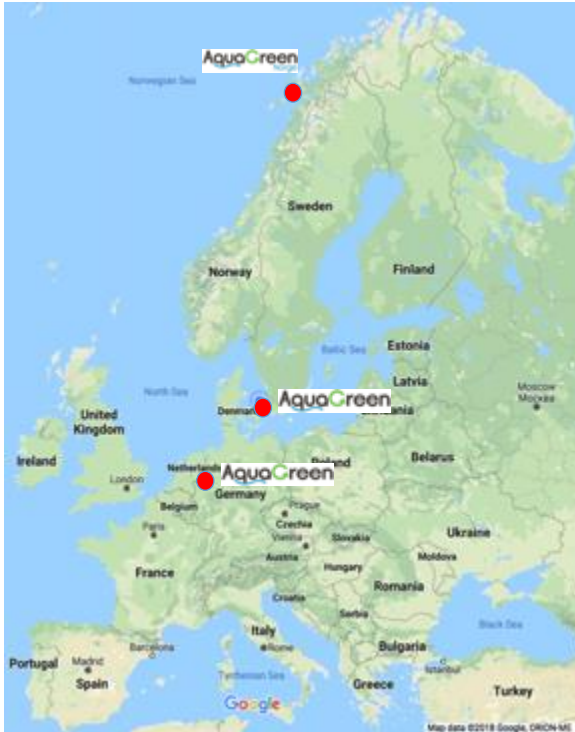
Energy balance drying and pyrolysing 7 m³ of sludge/hour

Sludge	7m³/h	
Dry matter	0,5% dry mat	
Dry matter	35Kg/h	
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	156kWh
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 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?

Industry:	Country	Year	Status	Project total
Aquaculture Industry:				10.495.000
• Det Grønne Iværksætterhus	Denmark	2015	Awarded	200.000
• Innovasjon Norge (Melbu)	Norway	2015	Awarded	320.000
• InnoBooster	Denmark	2016	Awarded	1.300.000
• EuroStars	Norway/Denmark	2016	Awarded	8.675.000
• Innovasjon Norge	Norway	2018	Pending	2.990.000
Municipal Wastewater Treatment:				11.672.000
• MUDP	Denmark	2016	Awarded	1.075.000
• PCP 1 (DK)	Denmark	2016	Awarded	216.000
• PCP 2 (DK)	Denmark	2017	Awarded	5.043.000
• ViIRS	Denmark	2017	Awarded	188.000
• MUPD	Denmark	2018	Awarded	5.150.000
Others:				2.030.000
• Free Innovation	Denmark	2018	Awarded	420.000
• Inbiom	Denmark	2018	Awarded	110.000
• Erhvervsstyrelsen	Denmark	2018	Awarded	1.500.000
Funding applied total			CAD 4.906.000	24.197.000
Funding awarded total			CAD 5.512.000	27.187.000

CONFIDENTIAL



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)

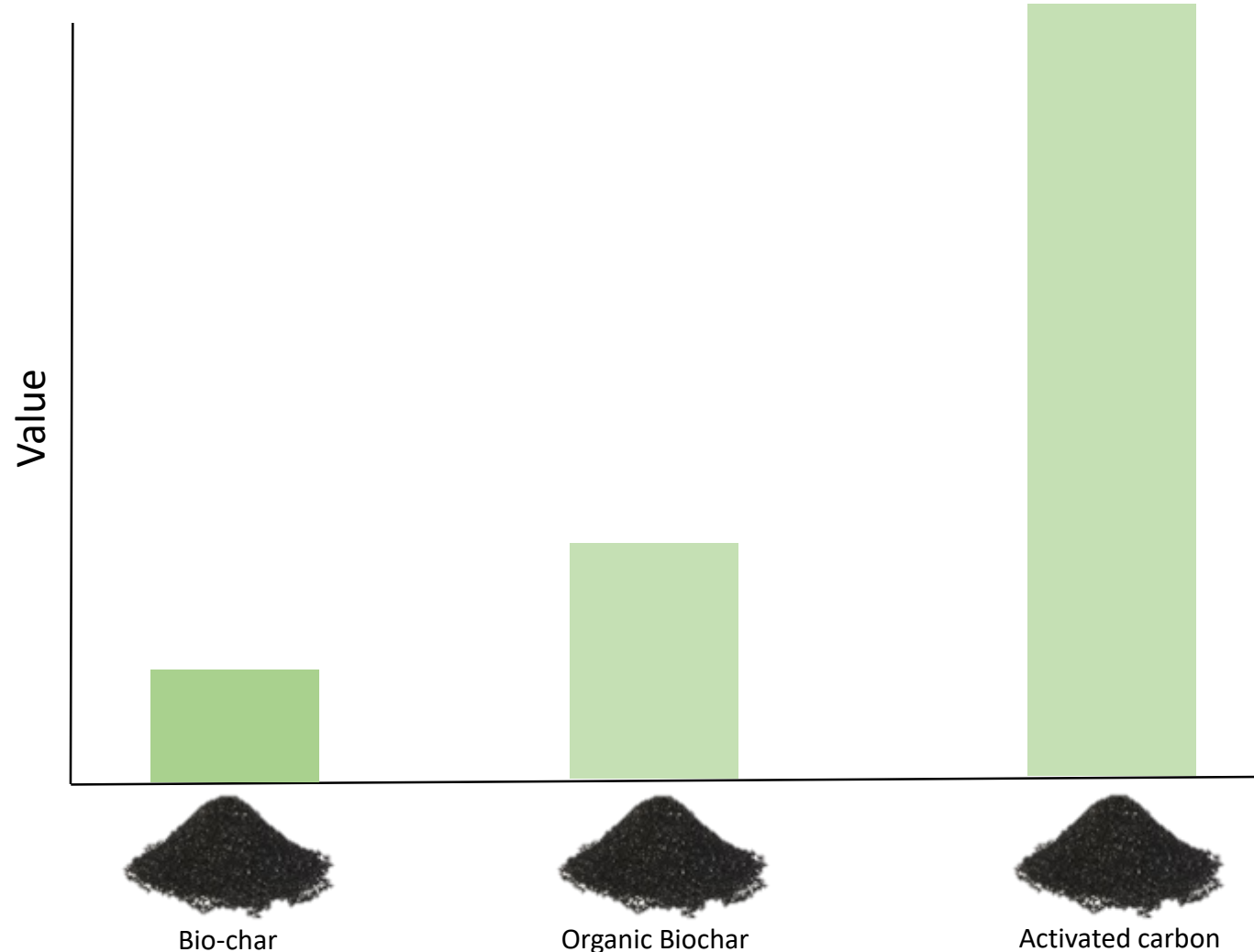
Process control (PLC, Autonomous operation)

High

Very High

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 Ensure Attractive 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-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-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





AquaGreen

Sludge Treatment

We turn a problem into a resource.

Re-duce pollutants

Re-circulate resources

Re-turn on investment

Re-think innovation