Biomethanation with the help of microbes

Nordic Baltic Bioenergy Conference, 29-31 March 2017,
Helsinki, Finland.

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Qvidja Kraft Ab

QVIDJA KRAFT

TOWARDS CARBON POSITIVE, CLEAN AND RENEWABLE ENERGY COST-EFFECTIVELY

Overview

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- Qvidja Kraft company introduction
- Climate change – new technologies and smart ideas demanded
- PtoG –present technologies have high capital cost and relative low efficiency
- Solid state biomethanation
- Syngas-to-biomethane technology – vast new sources for making biomethane

About Qvidja Kraft

Executive team

- **Ilkka Herlin, Chairman of the board, co-founder.**
- **Saara Kankaanrinta, Member of the board, co-founder.**
- **Pekka Heikkinen, CTO.**

- Qvidja Kraft AB is a Finnish renewable energy company founded by Ilkka Herlin and Saara Kankaanrinta.
- Founded in 2015
- Located in Parainen, Finland

Nutrient recycling, carbon fixing and emission-free food production

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The company's activity is to manufacture and sell syngas, biogas and biomethane, as well as combinations thereof. Also the further processing, developing and selling processes, or materials, know-how, methods and techniques related in different steps. The company also organizes seminars and other events related to the operation and make investments that support the sector.

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Who we are

Qvidja Kraft has a background deep in science

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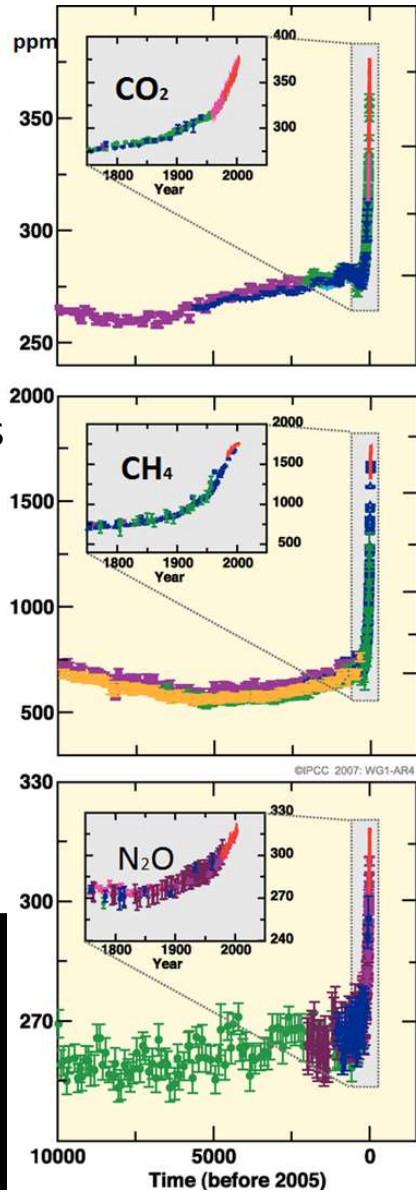
Climate change is one of the most urgent challenges of our time.

We need new technologies and smart ideas

- Global issues like environmental emissions and climate change, limited nutrient resources, and depleted fossil fuel reserves
- Transition to climate-neutral and resource-scarce societies - requires new centralized and decentralized solutions
- With renewable energy production increase, also the need for renewable energy storage grows - the current energy storage technologies have low capacity and high costs -> this has created a demand for the power to gas concept
- Energy security

Today, the EU spends more than €1 billion every day on importing energy!



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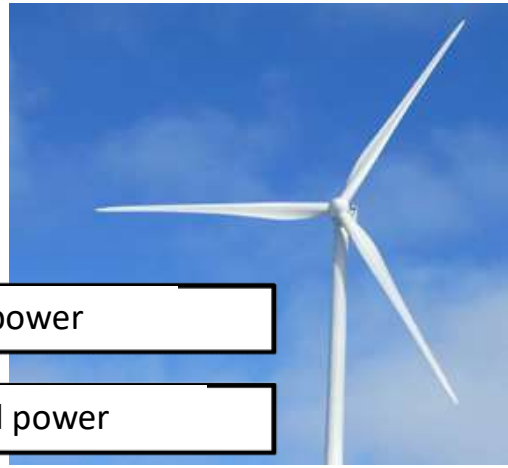
Power to gas

- power generated from renewable energy sources (RES), in particular from solar and wind, is affected by the intermittency of resources.
- In addition to intermittency, the temporal and spatial mismatch between availability of resources and energy demand (consumers) creates further challenges.
- P2G advantages: 1)high capacity, 2) long term storage, 3) diversification of the final products; gas produced may be used for heating, as a gaseous fuel for transport or be converted back to electricity when demand for electricity is high
- At present, P2G technologies have high capital cost and relative low efficiency.

Biomethane from carbon dioxide and hydrogen



Biogas plant

Industrial CO_2

Other CO_2 sources

CO_2 CO_2 CO_2

O_2 O_2 O_2

Electrolyser

electricity

e- e- e-

Solar power

wind power

Other renewable energy

H_2 H_2 H_2

$CO_2 + 4H_2 = CH_4 + 2H_2O$

CH_4 CH_4 CH_4

Biomethane

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No product purification required

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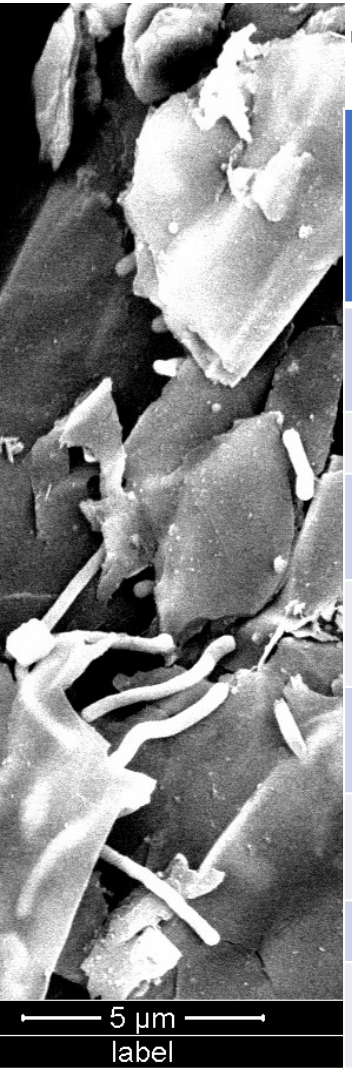
Solid state biomethanation (Qvidja Kraft technology) vs. other tehcnologies

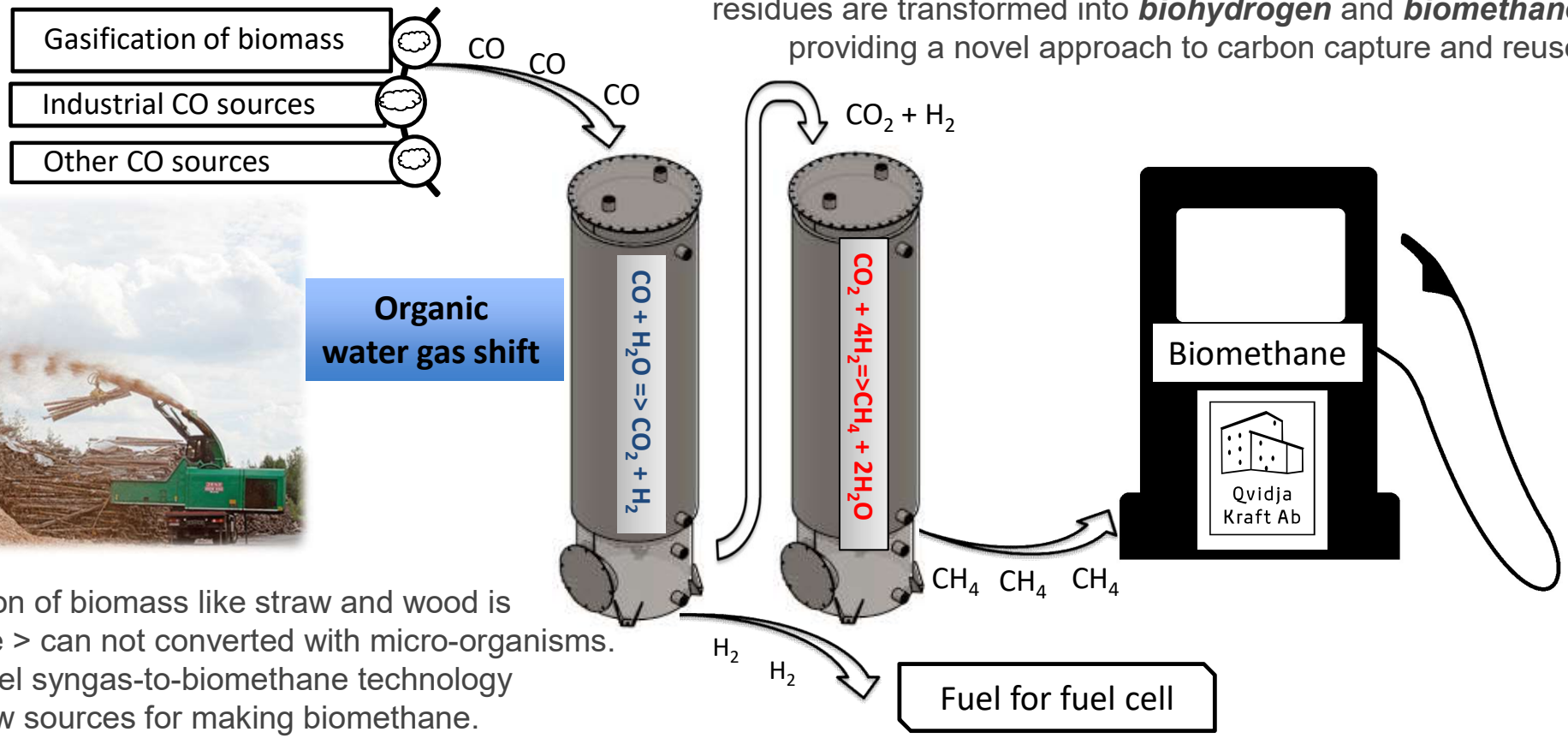


Parameter	Chemical	Biological liquid fermentation	Biological solid state (Qvidja Kraft)	Qvidja Kraft advantage
Conversion	chemical	biological, pure culture	biological, mixed culture	**Higher stability**
Operation temperature	300-400°C	60-65°C	50-55°C	**Lower temperature**
Operation pressure	high pressure	pressure is used and mixing	no pressure or mixing used	**Lower pressure**
Tolerance against contamination	low	High	high	**Raw biogas can be used a CO_2 source**
Product gas	CH_4 + side products	CH_4	CH_4	**No upgrading required**
Product purity	~92%	98-99%	98-99%	**No product purification required**
Energy efficiency	~50%	58%	~78-80%	**Lower operating costs**
System complexity	high	medium	low	**Lower capital costs, higher flexibility based on modules**

Biohydrogen and biomethane from wood

Gasification converts organic carbon containing materials into carbon monoxide, hydrogen and carbon dioxide.

Qvidja Kraft's process involves ***biological conversion*** of carbon to products through ***gas fermentation***. Carbon-rich ***waste gases*** and residues are transformed into ***biohydrogen*** and ***biomethane***, providing a novel approach to carbon capture and reuse.



A significant portion of biomass like straw and wood is poorly degradable > can not converted with micro-organisms. Qvidja Kraft's novel syngas-to-biomethane technology opens up vast new sources for making biomethane.

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Renewable energy sources available both in forest and agricultural sector

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- Forest management and wood harvesting produce copious amounts of thinning and other wood material that is not suitable for use as raw material in wood processing. Biomass gathered from knotter pulp and crown mass, small-sized trees, stumps and root stock is called forest chips.
- Agriculture offers several plant- and animal derived biomasses for the production of renewable energy. Manure, various animal-derived by-products and other organic material are the most common raw materials for biogas produced on farms and in rural enterprises. The use of plant tissue, like surplus forage and crop byproducts, in biogas production is on the increase.

Qvidja testing and operating environment

surplus forage, crop byproducts, etc.

Local utilization of side streams biomass

biogas

$CH_4 + CO_2$

Biogas plant
Organic material
> 40% CO_2 + 60% CH_4

Renewable energy

electricity

Hydrogen production

O_2

H_2

Logging waste wood etc.

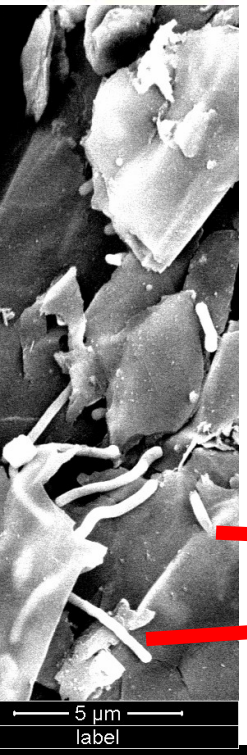
Utilization of forestry side streams

Gasifier
Organic matter>syngas

$CO+H_2+CO_2$

Gas cleaning unit

biomethane



Biological conversion

$4H_2+CO_2 \rightarrow CH_4+2H_2O$

Biological conversion

$CO+H2= > H_2+CO_2$

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Thank You!

Smart ideas and re-thinking – our concept to create new technologies

’think it differently, try it an otherway’

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