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<i>Institution</i>	AVA-CO2 Schweiz AG
<i>Position</i>	General Manager at the German location, Karlsruhe
<i>Field of work</i>	Research on HTC-plants in pilot and demo size. Investigation of the economic and technological feasibility of the whole process chain of hydrothermal carbonisation technology.

Experience

About the feedstock, processing & conversion The feedstock for an HTC plant should preferably have comparable and consistent properties. We consider various feedstock types for our pilot scale plant, wood chips from forestry residues, urban green and grass, material from roadside cleaning and riverside cleaning, these feedstocks can theoretically be processed in our HTC plant. Although material from urban green and roadside cleaning has to be monitored very closely in terms of pollution with heavy metals.

During the conversion of the biomass, which is a hydrolysis of the biomass, the biomass is split in many new binding products and new compounds are generated. This requires specialized exhaust air systems. The Bundesimmissionsschutzgesetz (4 BImSchV für genehmigungsbedürftige Anlagen) (emission protection law) must be taken into account and followed. Regulatory limits for Water, Soil and Air need to be met.

The conversion product the biocoal can be activated to charcoal and can be deployed as exhaust air filter for micro pollutants e.g. in a sewage plant. For burning the coal, the production process is still too elaborate. Also the coal from waste products like sewage sludge, urban green and roadside cleaning would also be declared as waste product and not as fuel, therefore it is not allowed to be burned as fuel.

Legal regulations Policies Legal regulations concerning Water, Soil and Air and the Bundesimmissionsschutzgesetz (BImSchG) (emission protection law) have to be taken into account during storage, transport and handling both for feedstock and biocoal. This is depended on the biomass feedstock. During storage the biocoal needs to be monitored for the formation of dust as the dust is highly explosive. Transport takes place under safety regulations (Gefahrgutverordnung für Straße, Eisenbahn und Binnenschifffahrt) (dangerous goods regulation for streets, railway and inland navigation). Details need to be clarified with local authorities. Also the REACH regulation concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals applies. Product security, secure product disposal and no harm to humans and the environment must be ensured. The biomass and the product must be classified in the water hazard class. Depending on the class the material must be stored in bunkers, halls or containers which contain an extraction unit capable to generate a vacuum. Leakage must be contained. Even a wash system for the truck tyres can be



applied. In some cases the biomass is handled like hazardous material.

Regional Waste Management Concepts must be taken into account. E.g. permitted transportation mode can differ depending on the location of the plant (e.g. transport by truck or railway, how many truck loads are allowed per day). Amount of allowed exhaust gas and emissions are dependent on other plants that also operate in the region. The highest requirement is to keep the impact on the environment as low as possible.

Finances and finance tools

We have established cooperations with producers of the feedstock. E.g. for sewage sludge we receive a gate fee from the producer, on the other hand we have to guarantee its secure disposal.
 . In parallel to the development of an industrial business case, we also work on the implementation of sales markets. For example the cement industry is a customer where the biocoal is used as substitute of industrial soot. The Biocoal could also find application in the car industry during lack and paint production.

The operation and research of the HTC plant is financed by private investors, which are convinced from the technology and the gain it can bring for the future. Further financial support comes from research and development projects and programs like H2020.
 The whole process chain is investigated in projects like BioBoost and R3Water which received funding from FP7 and Horizon 2020. The projects investigate cost optimization and resource efficiency of the process chain.

Difficulties & barriers

Transport across European borders needs notification “Notifizierung” regulated in the Abfallverbringungsgesetz (AbfVerbrG) (waste shipment law).

Potential drivers & recommendations

Dissemination is a very important tool to broaden knowledge about the technology and the product and to gain public acceptance and attention from authorities.

Public support & good governance

Lobbyism of oil and gas industry needs to be stopped. a renewable energy strategy needs to be promoted more intensely.
 It needs a change of thinking in the society, towards an economical use of resources and less waste.
 We need to be more oriented towards a transfer of new technology than only having the profit in mind with old fashioned technologies. There is a high potential in new technology development, we need to give the evolvement a chance.

Public acceptance regarding harvesting, processing & conversion

We should offer people possibilities to rethink. E.g. why is waste after a complete conversion still handled as waste? After the carbonisation it should be handled as a regular fuel.

People are mostly concerned about the storage and transport of the



biomass or product. Compost, digestate, rot urban green and grass can lead to odour emissions. Also the combustion of the biocoal and their emissions is in peoples concern.

Good practices of cooperation & participation

Projects are published positively: e.g. Biocoal as substitute for bitumen felt, which results in positive CO2 certificates and recycling. Although an added value needs to be developed.

Good governance mechanisms

Dissemination and educational work should be intensified. It should be explained where the feedstock comes from what it is and how it is converted. What are possible pollutants, harmful substances and dangers in the process chain. Explain every step in the process chain including positive and negative outputs. It needs to be pointed out what are the gains and added value from the process chain.

Develop roadmaps and strategies jointly with the authorities. Work on enlightenment and support the creation of identification with the process chain and new technology.

Wider insight

Local politicians are interested in the new technologies but their actions are also strongly reliable on their personnel tendencies.
The public seems to be very open towards changes in the technologies and alternative production of energy. They favor a more ecological development

Messages

“It needs an open discourse with new technologies and involvement of the public in discussions. No propagation of lobbyism.”

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Interlink

[BioBoost](#)
[R3Water](#)

