

# Challenges and opportunities

If biomass is to replace oil, the biomass industry needs to move on from just energy production. Intelligent multiple usage is the way forward.



Carel Callembach presenting Ingrepo's strategy. The company produces biomass from algae.

Photo: Torsten Thomas

**A** 100 % use of biomass for different products makes more sense than just producing energy alone. When oil is refined, over 200 products are produced", said Professor An-Ping Zeng from the Hamburg University of Technology. During the three-day International Energy Farming Congress in mid-March in Papenburg, North Germany, Zeng presented the preliminary results from a pilot plant for the combined production of biogas, ethanol, biodiesel and bulk chemicals, i.e. substances produced in amounts greater than 10,000 t. His European Union-funded project makes ethanol from biomass and converts the glycerine produced as a result into biodiesel. However, the main focus of the project is the production of the chemical 1,3-propanediol (PDO). PDO is an important basic material for the textile and synthetic material industry. "The pilot plant is working very effectively. There are no organic substances left over at the end of the process. The biodiesel and ethanol produced are the waste products, so to speak", he explained. Zeng sees the results as groundbreaking and mentioned that the technique could in principle be transferred to biogas plants.

## Green biorefineries

Michael Gass from the Swiss company Biowert AG presented one of the first green, industrial-scale biorefineries in the world. The plant has been producing biogas, electricity and products for the construction industry for nearly two years. The biorefinery only uses perennial pasture grass. Before the grass is fermented, the fibrous cellulose is separated out and subsequently processed into synthetic material and insulating material. "Electricity is generated from the remaining grass manure which is fed together with food and fat leftovers into the biogas plant and the waste heat is used to dry the cellulose fibres", said Michael Gass. "We produce approximately 5,000 t of cellulose fibre a year. Compared to the production of

biogas only, the income is three times higher and this accounts for 70 % of total revenue."

The Dutch company Ingrepo BV has been working with algae and organic waste products since 2001. Using the AlgaePro concept,

Ingrepo is currently developing a process to manufacture products for the food industry. "We've tried out a lot of different methods and now understand which algae cultures are best suited for the large-scale, cost-effective production of biomass", said Carel Callembach, Ingrepo's Managing Director. Ingrepo only uses sewage that has been enriched with organic waste. He explained that a 10 ha area of water produced a yearly output of approximately 450 t dried biomass. This was approximately twice the amount that would be expected when using soil. The algae are refined to produce ethanol, biogas, unsaturated fatty acids and vitamins or pigments. The remaining biomass can be sold as animal food or fertilizer. "The waste products from the Netherlands alone would be enough to cover 20 % of energy requirements", he said. This concept could be particularly interesting for larger cities as the algae pools produce no unpleasant odours. "Huge amounts of sewage and waste products are produced in cities", said Callembach.

Dr. Francis Eppelin from the Oklahoma State University explained that the United States was facing particular problems when it came to fuel supplies. By the year 2020, America is supposed to produce 79 trillion litres of ethanol and the mixing of ethanol with fuel is to amount to 10 %. Up to now, overall consumption amounts to only 2.9 %. It is therefore planned to increase the production of ethanol from organic cellulose. This will mainly involve using perennial grasses. As part of the Department of Energy, the National Renewable Energy Laboratory (NREL) has announced a target production cost of no more than US\$39 for one ton of dry matter – and is financing a substantial research programme to this end. As a result, it is hoped that one litre of ethanol produced from cellulose will cost a maximum of US\$ 0.28.

Torsten Thomas

### Further information:

Biowert AG: [biowertag.com](http://biowertag.com)

Hamburg University of Technology: [www.tu-harburg.de/ibb](http://www.tu-harburg.de/ibb)

Ingrepo BV: [www.ingrepro.nl](http://www.ingrepro.nl)