IBUS

Integrated Biomass Utilisation Systems

Best Basis for Biorefineries

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Inbicon A/S

new name for **Elsam Biosystems A/S**

Integrated Biomass Conversion

Founded 2003 by
Elsam A/S (now Dong Energy A/S) and
Holm Christensen Biosystemer ApS

for commercialisation of the IBUS concept

The IBUS concept

1. Integrated utilisation of sugar/starch and lignocellulosic feedstocks

- Most crops comprises both sugar or starch and lignocellulose
- Lower cost from field to plant
- More biomass can be collected within a given area
- Substantial process synergies

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The Ibus concept

2. Integrated production of bioethanol and electricity

- Electricity generation looses 55-65 % of the input energy as heat
- Ethanol fermentation looses 3-5 % of the input energy as heat
- The huge loss of heat energy from the global electricity generation can be used to cover the demand for heat energy of the future fuel ethanol production

Co-production is the solution

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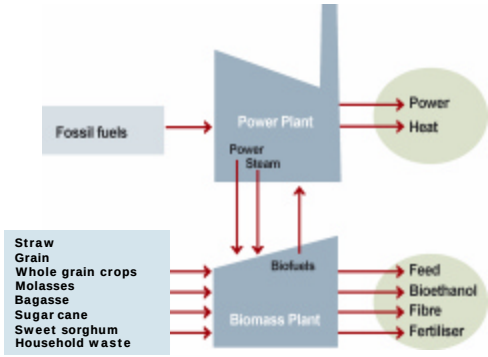
The IBUS concept



Surplus steam



High quality solid biofuel

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Main results from the EU project: Co-production of Biofuels

- The IBUS pretreatment can work at high gravity without chemicals
- Fast (5-10 hours), high gravity (30-40 % d.m.) liquefaction at low enzyme concentration (3-4 FPU/g)
- Effective high gravity fermentation (SSF) of more than 80% of cellulose to ethanol by yeast
- Yeast fermentation can be carried out in the presence of lignin
- See more at www.bioethanol.info

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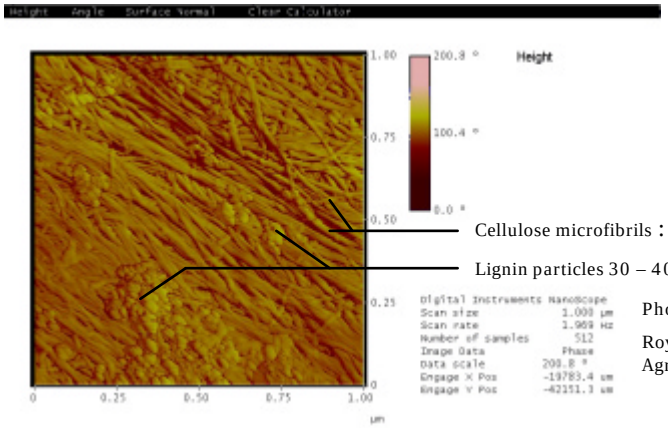
IBUS pretreatment removes lignin as nano-particles



Cellulose microfibrils : 10 – 30 nanometer

Lignin particles 30 – 40 nanometer

Photo:

Royal Veterinary and Agricultural University

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IBUS – Low energy cost

- Low price, 4 bar steam from electricity generation

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- The lignin fraction can cover the process energy required for conversion of the straw and a similar quantity of grain

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IBUS – long term sustainability

- Use of low pressure steam from electricity generation means energy without CO2 emission
- Recycling of plant nutrients (nitrogen, phosphorus, potassium and microminerals)
- Recycling of process water and condensates means no waste water
- Drying with superheated steam means no VOC emission

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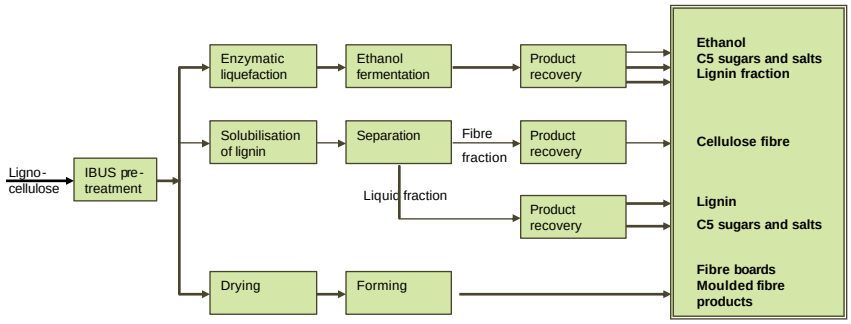
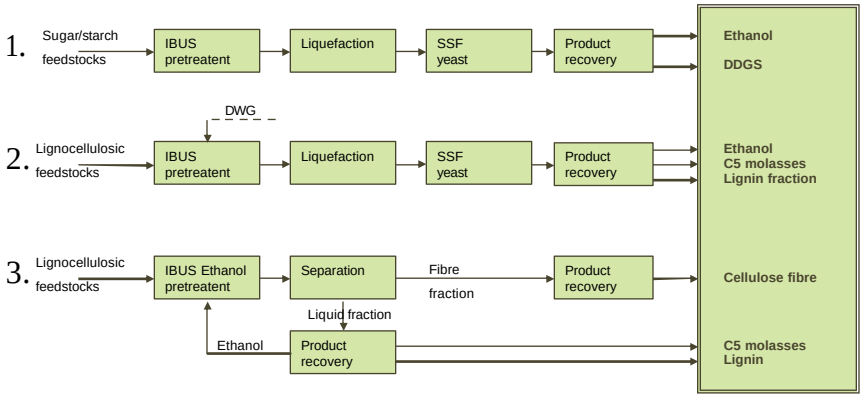
IBUS – best basis for biorefineries



Stepwise implementation of biorefineries



IBUS – R & D

Lab scale 10 kg/h of straw	Pretreatment	Risoe National Laboratory
	Hydrolysis and fermentation	The Royal Veterinary and Agricultural University
Pilot scale 100 kg/h of straw	Particle generation, pretreatment, liquefaction, fermentation, product recovery	Dong Energy A/S
Pilot scale 1000 kg/h of straw	Particle generation, pretreatment	Dong Energy A/S
Process Innovation	From field to fuel	Holm Christensen Biosystemer ApS
Demonstration plant 4 t/h of straw d.m. + 4 t/h of grain d.m.	Fully integrated IBUS plant located at one of Dong Energy's Power Plants (Kalundborg) Planned start of production: ultimo 2009	Inbicon A/S

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