Bioraffinerien planen
Anforderungen und Erfolgsfaktoren aus technischer Sicht

Fachveranstaltung
Holz in der Bioökonomie = Bioraffinerie!? 

Straubing, 24.10.2019
Dr. Michael Duetsch
Total sales 2018: EUR 10.5 billion

19,000 employees – 46 countries – 54 production plants
Sustainable forestry preserves forests and increases carbon sinks

WE PLANT

100 trees per minute

WE PLANT

50 million trees in a year
Renewable alternatives for fossil-based materials

- Low-emission energy
- Wood products
- Fibre products
- Biomolecule products

Examples:
- Biofuels
- Biochemicals
Demand outlook for sustainable chemicals continues to strengthen along with the battle against climate change

Efficient use of renewable materials and energy
Renewable and recyclable products
Innovations and new businesses
Successful ecological and economical implementation of biorefineries requires a broad feedstock platform.
WOOD AS RAW MATERIAL FOR BIOREFINERIES
UPM BIOFUELS
Driving cleaner traffic
UPM Lappeenranta Biorefinery

The world’s first biorefinery producing wood-based renewable diesel and naphtha

179M€ UPM investment

100,000 t/a production capacity

250 Direct and indirect employees

200 UPM patents and applications
Crude Tall Oil (CTO) – a residue of pulp making process as raw material

- Residue of pulping process
- No increase in harvesting or land use
- Outside food value chain

PULPING PROCESS

PRIMARY PRODUCT
Pulp for paper making

ENERGY

RESIDUE STREAM
Crude tall oil must be removed from the chemical cycle to secure pulping process functionality

2%

48%

50%
UPM renewable diesel and naphtha production process

**CRUDE TALL OIL**
A residue of chemical pulping process containing natural extractive components of wood.

**PRETREATMENT**
Crude Tall Oil is purified: salts, impurities, solid particles and water are removed.

**HYDROTREATMENT**
Pretreated Crude Tall Oil is fed together with make-up and recycled hydrogen to the reactor where the chemical structure is modified. Reaction water is separated and directed to waste water treatment.

**FRACTIONATION**
Remaining hydrogen sulfide and uncondensable gases are removed. The remaining liquid is distilled to separate renewable diesel.

**RENEWABLE DIESEL**
High quality advanced biofuel suitable for all diesel engines.

**RENEWABLE NAPHTHA**
Advanced renewable biocomponent for gasoline or raw material for bioplastics.
UPM BioVerno biofuels and biomaterials – uniquely sustainability certified

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100% Renewable raw material
80% Less fossil CO$_2$ emissions
Arla Finland brings 40 million fully wood-based packages into supermarket

• Arla moves to 100% wood-based cartons in 2019
•Launching more environmentally-friendly packaging to reflect consumer demand has been a shared goal of Arla, Elopak and UPM
• Reduces packaging’s carbon footprint by 15-20% and need for fossil plastics by 180 000 kg/a
• Fully recyclable packages
Investing in new innovations

UPM Biofuels is **studying** opportunities for a possible biorefinery in Kotka, Finland

- Environmental impact assessment completed
- The potential **second UPM biorefinery** would
  - produce approximately 500,000 tonnes of advanced biofuels for transportation
  - use several new sustainable feedstocks, e.g. solid wood biomass and **Brassica Carinata**
  - use conversion of solid biomass and hydrotreatment technology

*Brassica Carinata is a sequential crop growing in South America. It produces non-edible oil suitable for biofuels’ feedstock and protein for animal feed.*
THE BIOCHEMICALS INITIATIVE
The biochemicals refinery is based on sustainable biomass and efficient conversion technologies.

**STEP 1: SUGAR PULPING**
Disintegrating wood into sugars and lignin.

**STEP 2: CHEMICAL CONVERSION**
Conversion of sugars to MEG and MPG and lignin to functional fillers.

- Sugars
- Monopropylene glycol
- Monopropylene glycol
- Renewable functional filler

Drop-in alternatives for conventional glycols

Replacement of carbon blacks and silicas

Scope of UPM’s biochemicals plant

Wood
Residues from saw mills
Pulp wood
Forests cover 1/3\textsuperscript{rd} of German land area; beech wood is a sustainable choice for biorefineries

Beech is the \textit{natural wood species} in Germany

9\% increase of beech stock by 2052

>60\% of harvested hardwood is burned
Two attractive sites for potential investment under investigation

Selection criteria:
Customer proximity  Existing infrastructure  Professional site management  On-site utilities  Wood availability  Innovation friendly environment

Industrial Park Höchst, Germany
Leuna Chemical Complex; Germany
Renewable glycols are sustainable drop-in solutions for demanding end-use segments

- **Monoethylene glycol**
  - Ingredient for sustainable polyester fibers and packaging materials
  - Demand: >30 million tons/a

- **Monopropylene glycol**
  - Versatile component for demanding resins and technical liquids
  - Demand: >2 million tons/a
Aiming higher with UPM’s new functional filler generation

- renewable feedstock
- non-toxic & non-hazardous
- long-term biodegradable
- ~25% reduced weight
- high purity
- non-conductive

Rubber tyres, profiles and hoses
Status and next steps for the German biochemicals refinery

- Basic engineering studies finalized
- Concluding of commercial studies and ongoing
- Afterwards starting UPM's regular process of analyzing and preparing an investment decision