Combining industrial scale biosynfuel production with economic biomass logistics

Funded by:

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Sustainable biofuels „From Pilot to demonstration: case studies“
THE CONCEPT:

- **Energy density [GJ/m³]**
- **Straw 2**
- **Biosynfuel 25**
- **Diesel 36**

THE TECHNOLOGY:

- **Biomass**
  - Fast pyrolysis
  - Biosynfuel preparation
  - High pressure entrained flow gasification
  - Gas cleaning and conditioning
  - Fuel synthesis

**Transport radius**
- 25 km
- 250 km

**Regional intermediate fuel production**

**Centralized syngas- and synfuel production**

**MAIN FEATURES:**

- Large biosynfuel production capacities possible
- Agriculture and forestry participate in the value chain
- Use of any kind of dry lignocellulosic material
- Technologies already demonstrated/commercialized utilizing fossil fuels (e.g. LR Coker, MPG, Rectisol, Megamethanol, GTL.F1…..)
CRITICAL and CORE TECHNOLOGIES:

The principle technical feasibility of the critical process steps has been proven:

- Fast Pyrolysis in Process Development Units (15 kg/h)
- Entrained Flow Gasification in a 3-5 MW pilot gasifier (26 bar)
- With biosyncrudes prepared from a variety of biomass feeds

CORE TECHNOLOGIES and CHALLENGES:

- Fast pyrolysis to make it a - simple (cost and energy efficient)
  - robust (broad feedstock range)
- Pre-treatment: MOST CRITICAL! - multi-feed (changing feedstocks)
- High Pressure Entrained Flow Gasification up to 80 bars based on MPG technology - with hot gas cleaning
  - high pressure atomization of slurries containing solids
  - increasing energy efficiency, heat integration and recovery
  - slag recovery and recycling
- Synfuels via Fischer-Tropsch (GTL.F1…) are commercially available. Bioliq aims at the production of Biosynfuels via the methanol/DME route.
- R&D is to be performed for all processes!
**The bioliq® – PILOT PLANT:**

- Fast pyrolysis with twin screw mixing reactor (500 kg/h, 2 MW)
- Subsequent mixing of pyrolysis products by colloidal mixing
- High Pressure Entrained Flow Gasification up to 80 bar (2-5 MW)
- High pressure high temperature gas cleaning and conditioning
- Methanol/DME synthesis followed by Methanol /DME to Synfuel synthesis (2 MW, ~100 L/h biosynfuel)

### Actual project cost plan

<table>
<thead>
<tr>
<th>Pilot plant</th>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process</td>
<td>Fast pyrolysis</td>
<td>High pressure entrained flow gasification</td>
<td>Gas cleaning + Synthesis I</td>
<td>Synthesis II</td>
</tr>
<tr>
<td>Product</td>
<td>bioliqSynCrude®</td>
<td>Synthesis gas</td>
<td>Methanol DME</td>
<td>Synthetic Fuel</td>
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<tr>
<td>Realization</td>
<td>2008</td>
<td>2011</td>
<td>2012</td>
<td>2013</td>
</tr>
<tr>
<td>Cost (Inv.)</td>
<td>8,2 Mio.€</td>
<td>24,8 Mio.€</td>
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</tbody>
</table>
Road map for Pyrolysis Demo:
- Process demonstration first of all required for Fast Pyrolysis (10 t/h, 50 MW)
- Alternative Biosyncrude utilization options
- Planning and basic engineering demonstration unit
- Contracting and logistics for 50,000 t/a biomass and biosyncrude
- Detailed engineering and demo plant construction
- Commissioning

PARTNERS:
- Engineering and construction
- Feedstock supplier
- Plant investors / operator
- Product off-take / delivery

Conclusion:
- Demonstration of the complete bioliq-process chain
- Provide single process steps as modular units for other process chains as contribution for advanced decentralized / centralized solutions for large B-XTL industrial plants