Production of Biofuels

JILIN FUEL ETHANOL Co., LTD in operation since October 26, 2003

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www.vogelbusch.com
1. Introduction
2. Why Bioethanol?
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VB today

**independent**

95 Personal employed
at Vienna Headquarters
(March 2004)

own R&D Laboratories

Branch Offices
in Houston (1989) and
Hong Kong (1990)

*About 8 mio lpd in production - 5.2 mio secured order*
alcohol market situation
percentage based on market value

total alcohol market

- America: 68.7%
- Europe: 44.8%
- Asia: 16.3%
- Africa: 0.5%
- Australia: 0.8%
- Africa: 1.6%
- Australia: 2.7%
- Asia: 26.6%

total alcohol market **without fuel alcohol**
Change in EU greenhouse gas emissions acc. Kyoto protocol

- Business as usual
- with current policies
- with additional policies
- Kyoto target path

source: EU Commission 2003
Change in EU greenhouse gas emissions by sector and pollutant (1990-1999)

Source: BAFF
Decrease of CO₂ emissions - a challenge for automobile industry

- automobile industry has committed itself to decrease CO₂ emissions to 140 g/km by 2008 (approx. fuel consumption: 5.7 l/100km)
- Arthur D. Little: Further decrease to 120 g/km until 2012 causes additional costs of approx. € 4,000 /vehicle.

→ Biofuels are a valuable, alternative option for the automobile industry to reach the CO₂ emission targets and represent an inexpensive solution for consumers.
Renewable Energy Resources

Solid Energy-Resources
(waste wood, straw, agricultural waste, e.g. bagasse) direct incinerated or via thermal gasifying

Biogas – Anaerobic treatment of biological contaminated waste water

Bio-Fuel:

» Biodiesel – Methylester of fatty acids
   (most common raps seeds or waste oil)

» Bioethanol
   (starch, sugar)
Feedstocks

- **cellulose**
  - [Image of forest]
  - Question mark

- **starch**
  - wheat - barley - corn - potato - cassava – sweet potato

- **sugar**
  - cane molasses
  - beet molasses
  - syrups
  - juices

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**Application of fuel ethanol in EU**

- **bioethanol**
  - direct blends (E-5)
  - ternary blends gasoline/ETBE/ethanol
  - ETBE

- **standard for use of ethanol in motor fuels DIN EN 228**
  - Max ethanol content – 5.0 % (v/v)
  - Max. ether content (e.g. MTBE/ETBE) - 15.0 % (v/v)
  - Max. oxygen content – 2.7 % (m/m)
  - Max. steam pressure (summer) – 60 kPa

- **application therefore limited to ETBE and E-5 blends**

- **no change of these parameters with implementation of EURO IV Standard 2005**
Process Steps Overview

stillage drying
stillage evaporation
distillation/rectification/dehydration
fermentation
raw material preparation
Energy Saving - within the Process Steps

- Heat recovery in the raw material preparation
- Operation of the distillation / rectification as a multipressure column system
- Dehydration by molecular sieve technology
- Stillage evaporation as a multistage system
- Mechanical vapor recompression as an option for cheap electrical energy
Energy Saving - via Process Interconnections

- Stillage recycling to raw material preparation
- Using waste vapors from driers for final stillage concentration
- Using expansion vapors of steam condensates from distillation and driers for stillage evaporation
Conceptual Design

Saccharification
FLOWS

Fermentation
FLOWS

Destillation
FLOWS

Mole-Sieve
FLOWS
Fermentation
Destillation
Molecular Sieve
DDGS / Energy
Tradition of Ethanol Blends in the USA

But only in the 1970s ......

• Example: Ford Taurus flexible Fuel Vehicle 2003
Ladies & Gentleman—Thank You—
And see you in Jilin!
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