




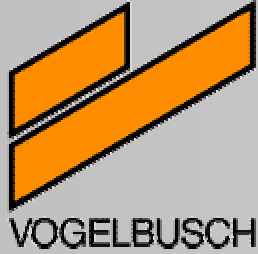
# Production of Biofuels

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

*Ing. Josef MODL*  
*Vogelbusch GmbH*

[www.vogelbusch.com](http://www.vogelbusch.com)

- 
1. .. *Introduction*
  2. .. *Why Bioethanol?*
  3. .. *Jilin Fuel Ethanol Project*
  4. .. *Conceptual Design*



# VB today

## *independent*

95 Personal employed  
at Vienna Headquarters  
(March 2004)

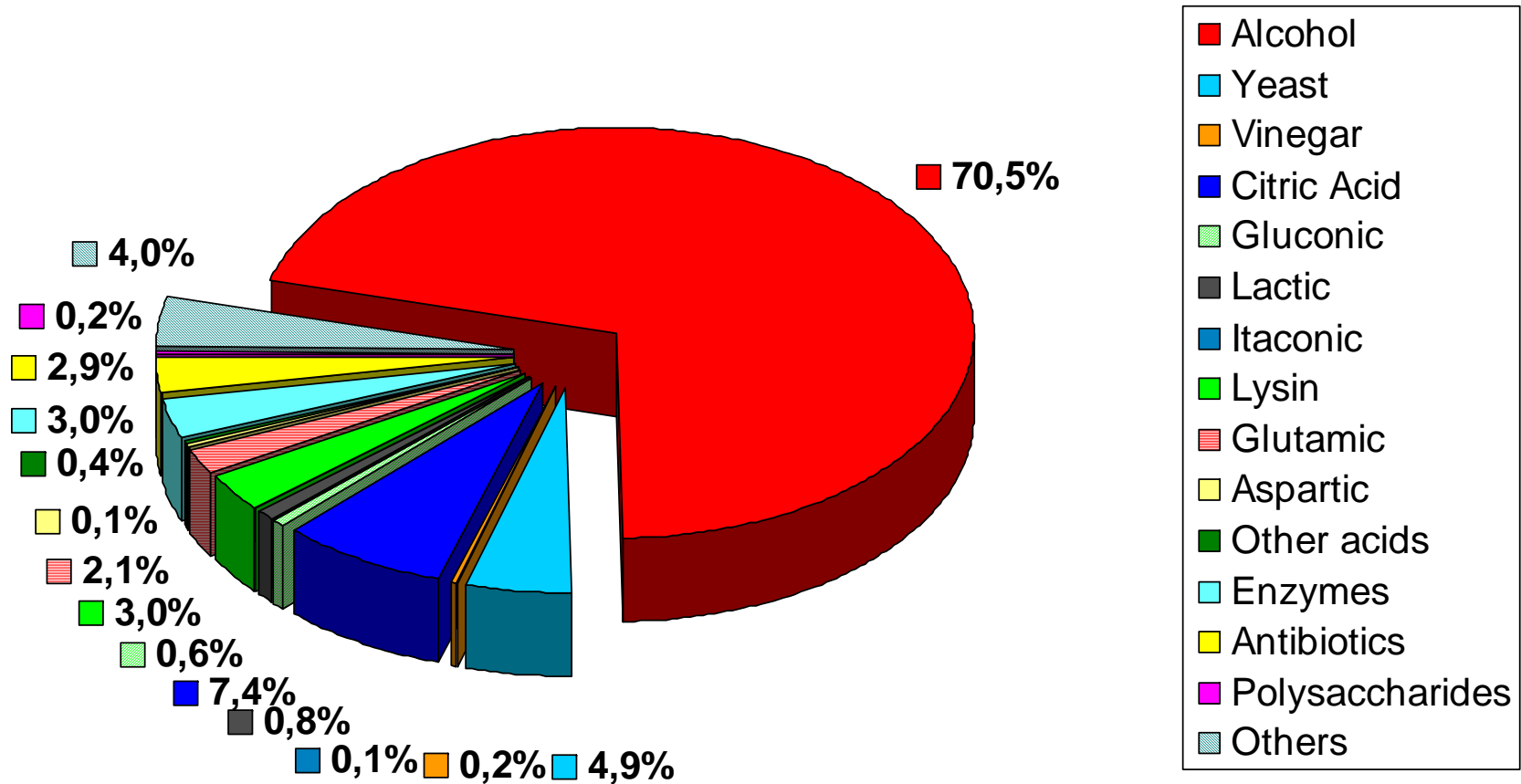
own R&D Laboratories

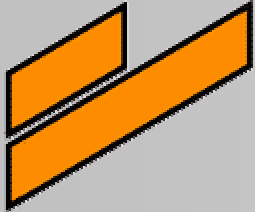
Branch Offices  
in Houston (1989) and  
Hong Kong (1990)



*About 8 mio lpd in production - 5.2 mio secured order*

# Biocommodity market values



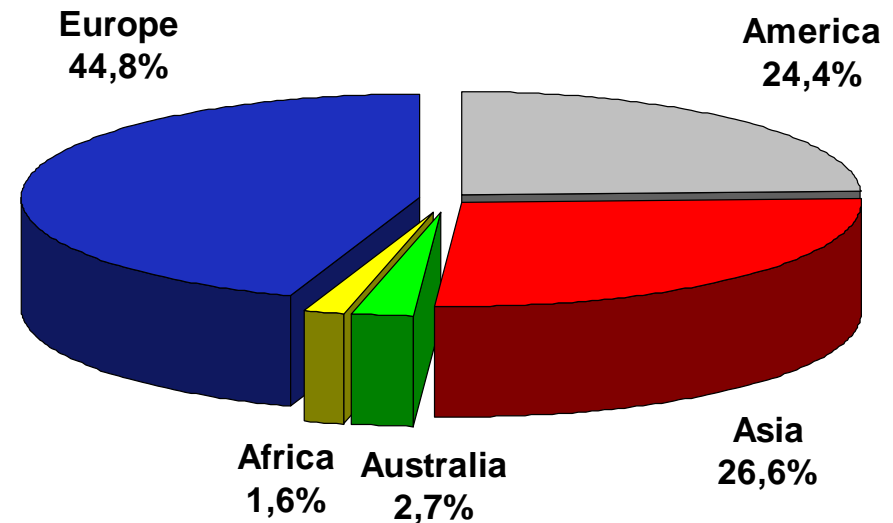
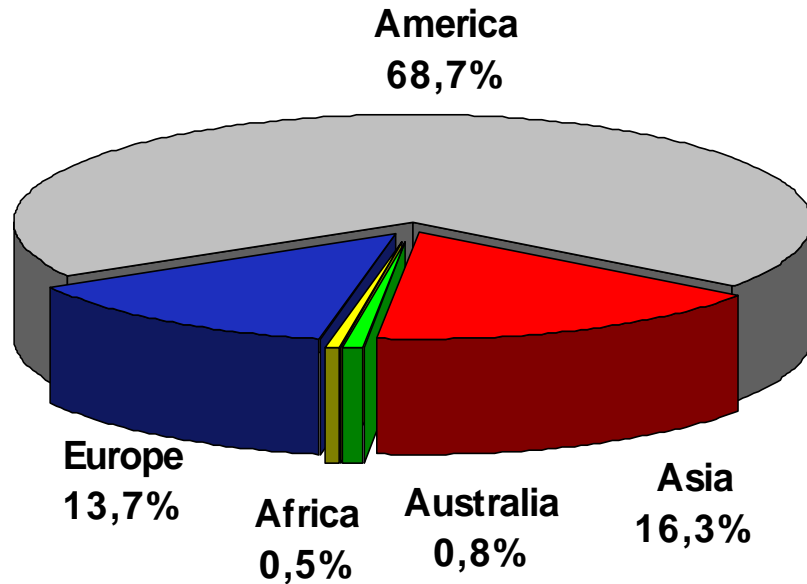


VOGELBUSCH

# alcohol market situation

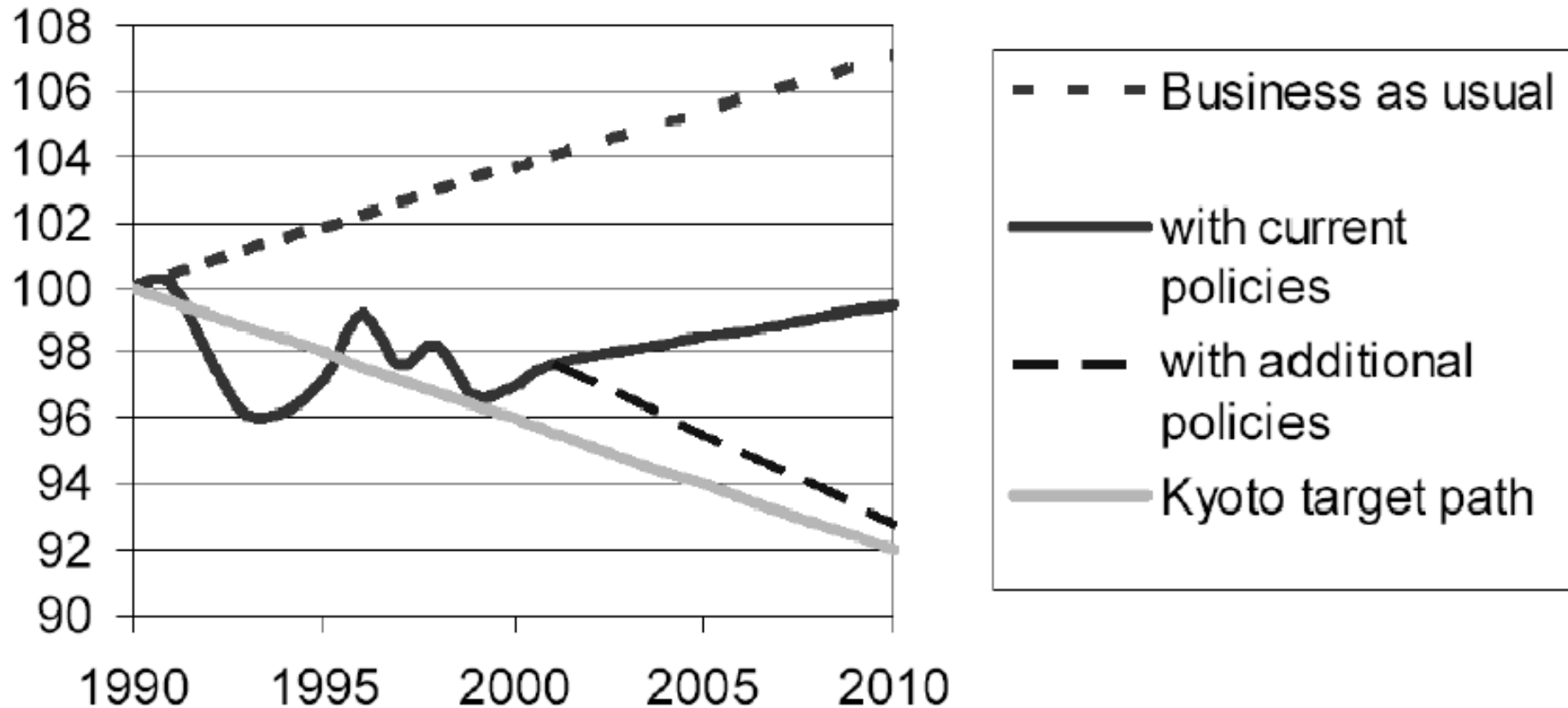
percentage based on market value

## total alcohol market

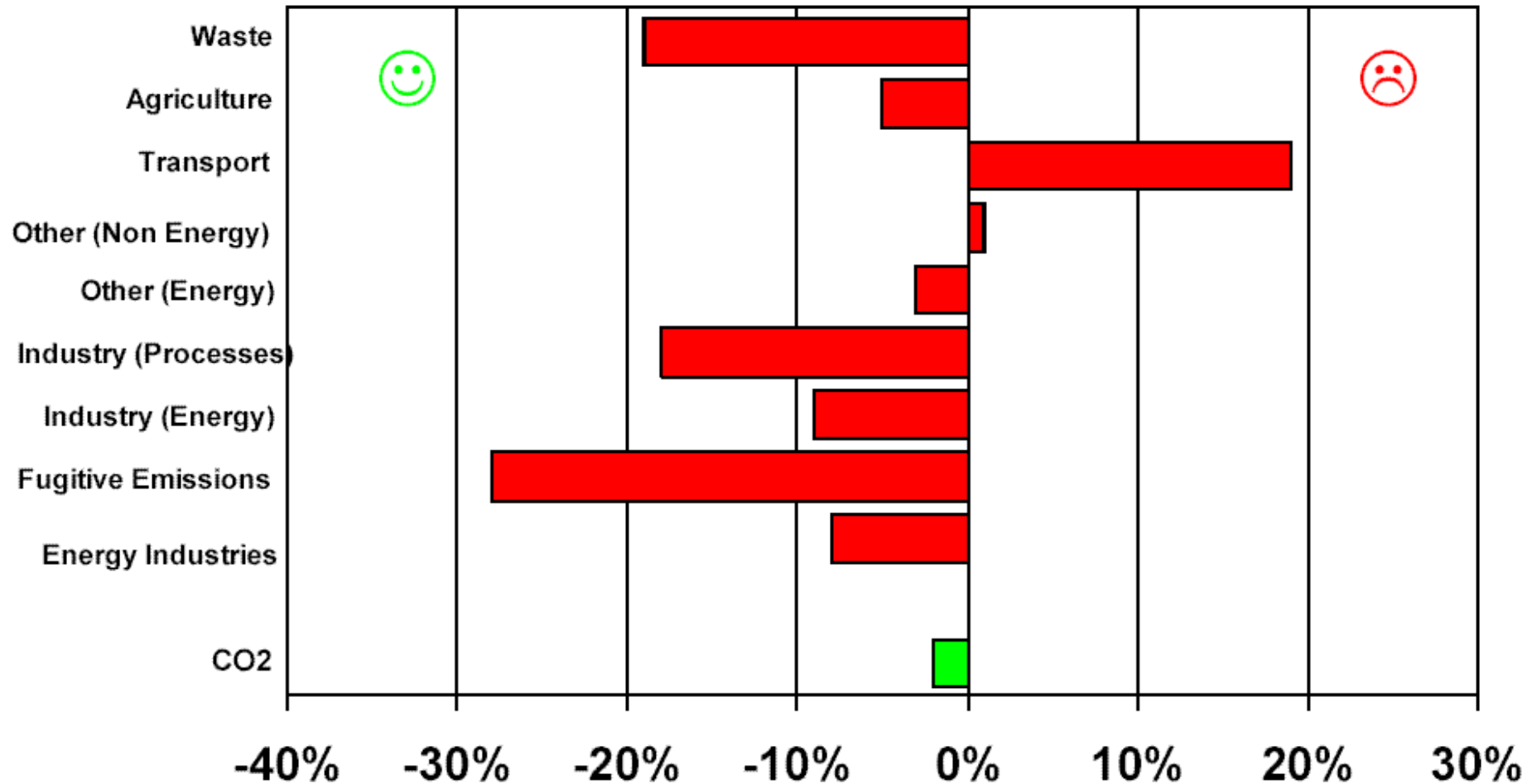


## total alcohol market without fuel alcohol

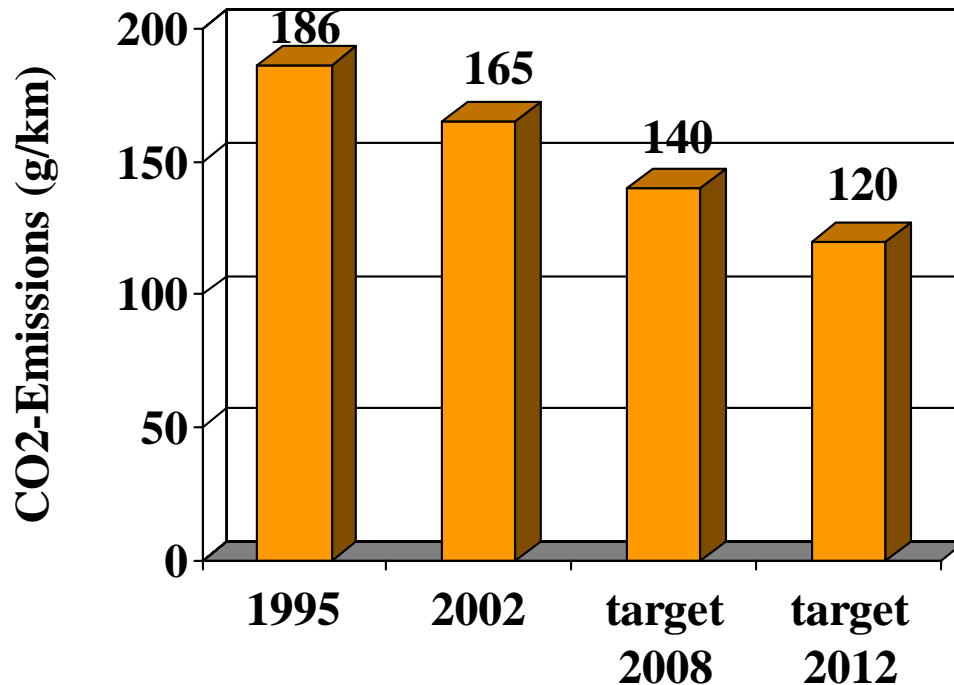
# Change in EU greenhouse gas emissions acc. Kyoto protocol



# Change in EU greenhouse gas emissions by sector and pollutant (1990-1999)



# Decrease of CO<sub>2</sub> emissions - a challenge for automobile industry



- automobile industry has committed itself to decrease CO<sub>2</sub> 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 CO<sub>2</sub> emission targets and represent an inexpensive solution for consumers.



## 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 – Methylene ester of fatty acids  
(most common rapeseeds or waste oil)

✱ Bioethanol  
(starch, sugar)

# Feedstocks

## cellulose



?

## starch



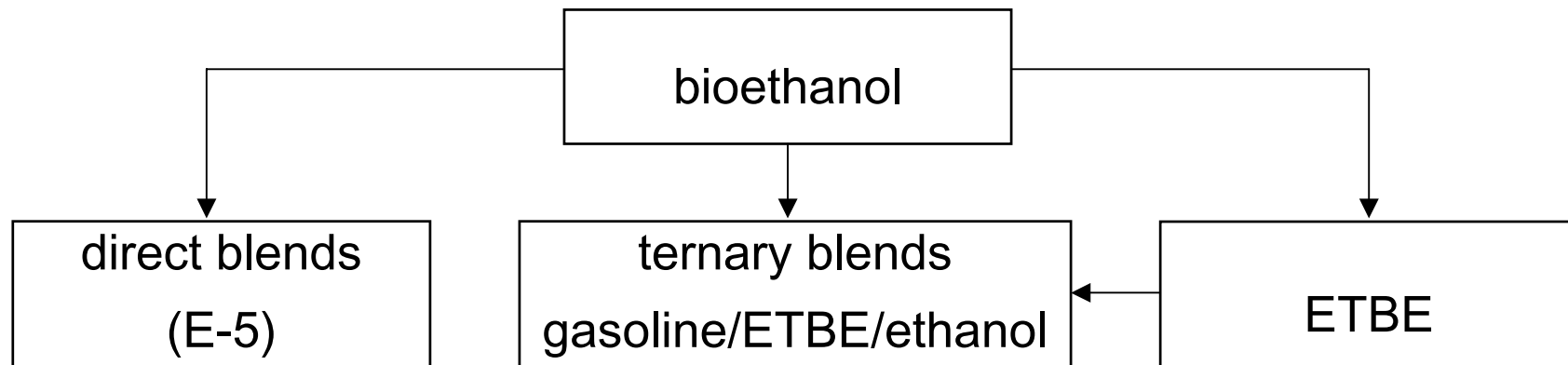
wheat - barley - corn -  
potato - cassava –  
sweet potato

## sugar



cane molasses  
beet molasses  
syrups  
juices

# Application of fuel ethanol in EU



- 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

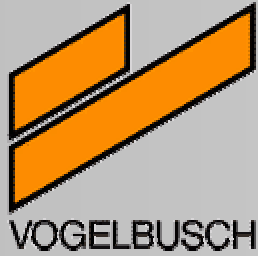
- **Heat recovery in the raw material preparation**
- **Operation of the distillation / rectification as a multipressure column system**
- **Dehydration by molecular sieve technology**
- **Stillage evaporation as a multistage system**
- **Mechanical vapor recompression as an option for cheap electrical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

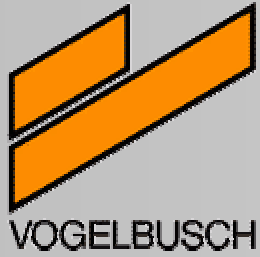




# Ground Breaking Ceremony

## September 2001



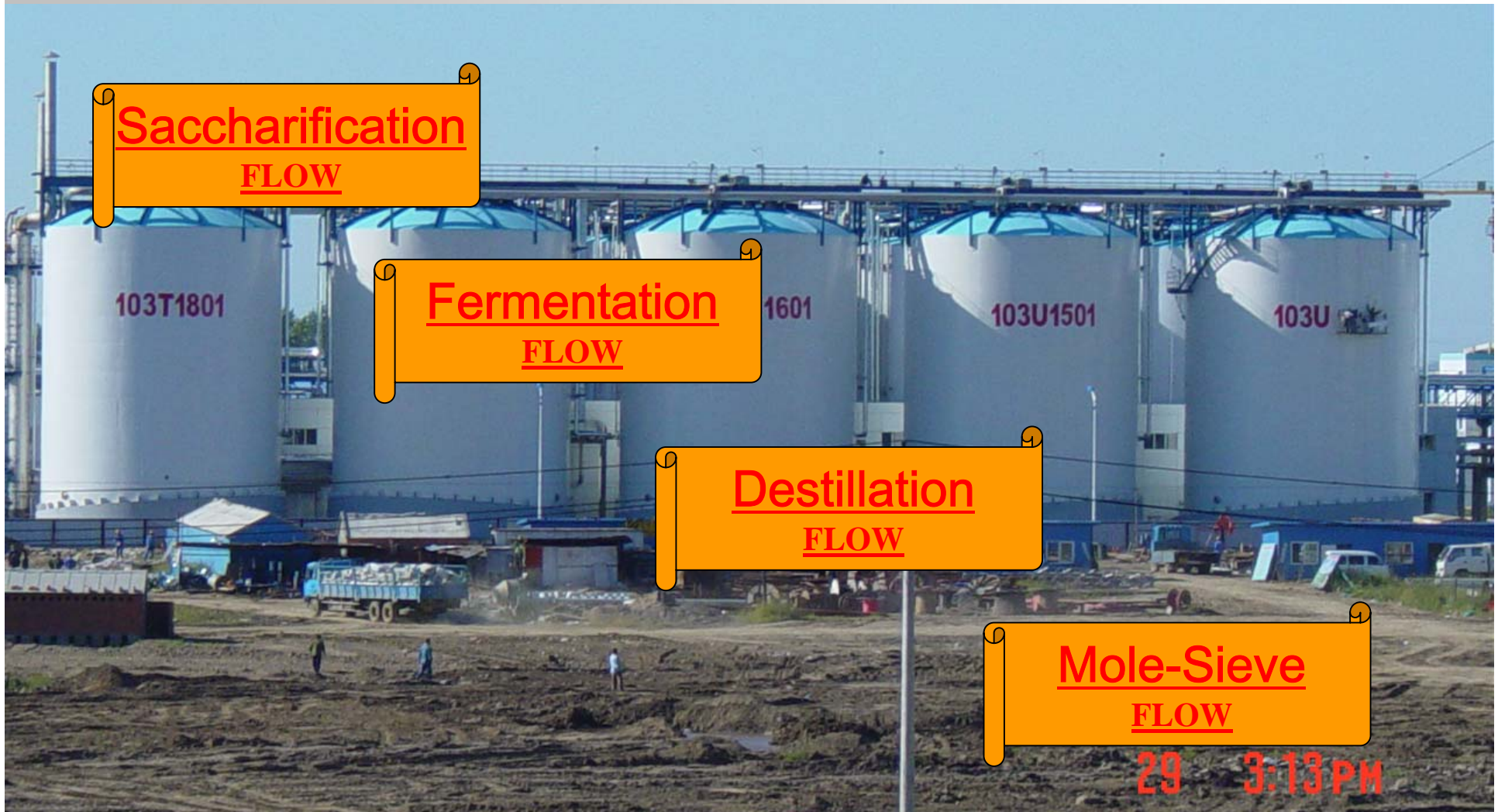


# Kick-off Meeting, Start of Construction





# Conceptual Design



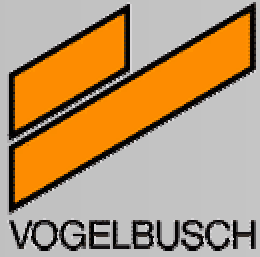
Saccharification  
FLOW

Fermentation  
FLOW

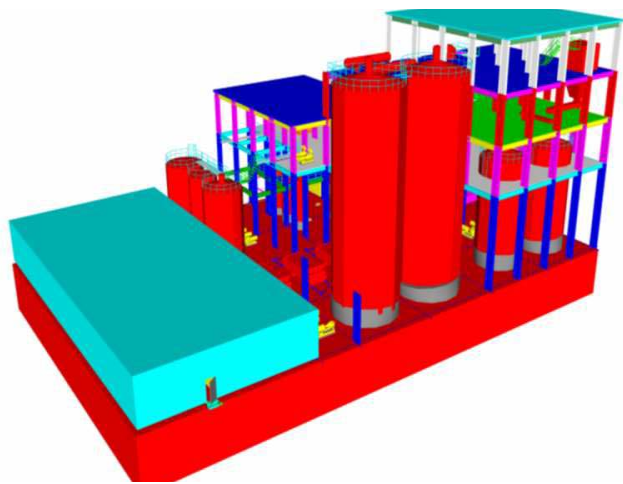
Distillation  
FLOW

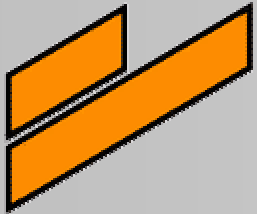
Mole-Sieve  
FLOW

29 3:13 PM



# Liquifaction - Saccharification





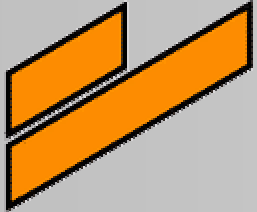
VOGELBUSCH

# Fermentation



# Distillation

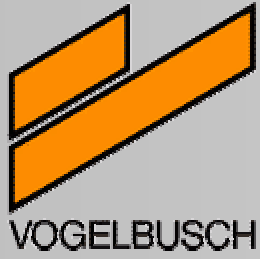




VOGELBUSCH

# Molecular Sieve





# DDGS / Energy



# Tradition of Ethanol Blends in the USA



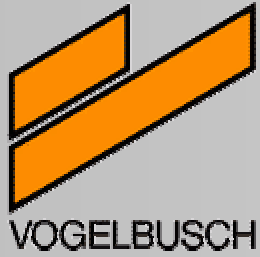
*Henry Ford  
and Fuel Ethanol*

*Ford Model  
T 1908 -1925*

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

- Example: Ford Taurus flexible Fuel Vehicle 2003





*Ladies & Gentleman—Thank You—  
And see you in Filin!*



**VOGELBUSCH GmbH**  
**Vogelbusch U.S.A. Inc.**  
**Vogelbusch Hong Kong Ltd.**



gan bei

