

# 中国生物质能开发利用战略

## strategy of Bioenergy Development & Utilization in China

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China Society of Agricultural Engineering  
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# Biomass Resources

## **Agricultural residues :**

**Crop straw/Animal manure/**

**Agriculture byproducts processing residues**

**& waste water-From Foodstuff manufactory/**

**Abattoir /Alcohol -refinery /Sugar-refinery/**

**Paper mill ;**

**Forest residues : Forestry process residues ;**

**Energy plants : Firewood forest/Sugar Oil plant ;**

**Municipal solid waste**

# Obtainable Biomass Resources

- **Crop straw:** Year 2000, total output 526Mt  
(Rice/Corn/Wheat/Cole/Cotton are 477Mt)
- **Forest residues :** Year 2000, 31.34Mt
- **Firewood forest:** End of 1994 , Firewood forest land 4.29Mio. ha , occupy 3.34% of total forestry land of whole nation.
- **Firewood Consumption :** 1998 , 4.10Mm<sup>3</sup> /
  - 1999 , 3.88Mm<sup>3</sup>/2000, 3.28Mm<sup>3</sup>
- **Animal Manure :** 2002, 1500Mt
  - Pig dung 334Mt / Cattle dung 997Mt
  - Chicken manure 137Mt
- **2003 Biomass consumption in rural area**
  - **Total: 91.840.000 Coal Equivalent / year**

# Technology for bioenergy Utilization

## High efficiency Direct combustion :

- Wood saving stove  $\eta > 35\%$
- Boiler biomass combustion technology
- Densification for biomass brick
- Solid waste incineration technology

## ● Thermo chemistry conversion technology

- Wood carbonization technology
- Biomass gasification technology
- Biomass pyrolysis bio diesel

## Biomass biochemistry conversion technology

- Biowaste land fill for biogas and compost House- hold biogas digester technology
- Large and medium size anaerobic digestion technology

## ● Bioethanol & Biodiesel production technology

# Wood saving stove for house hold

Old

Wood stove

$\eta < 10\%$

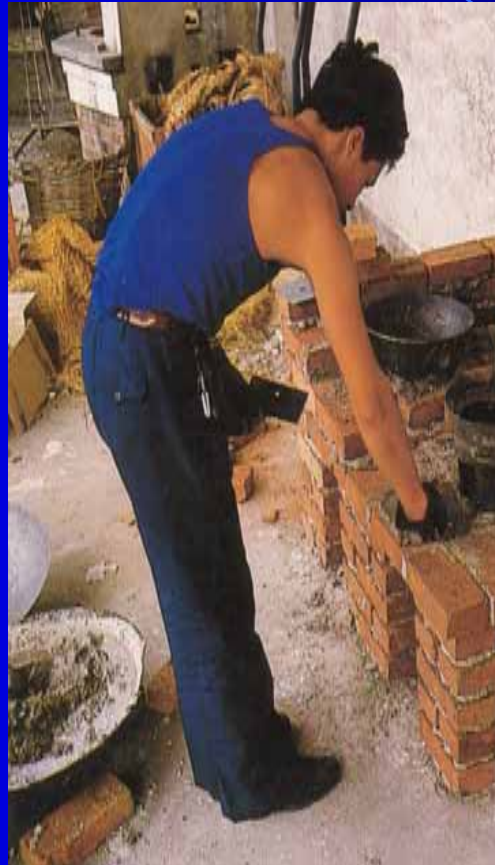
Wood saving  
stove

$\eta > 30\%$

Total :

189.000.000

in China



# High efficiency biofuel Boiler

Nominal heat supply  
(MW)

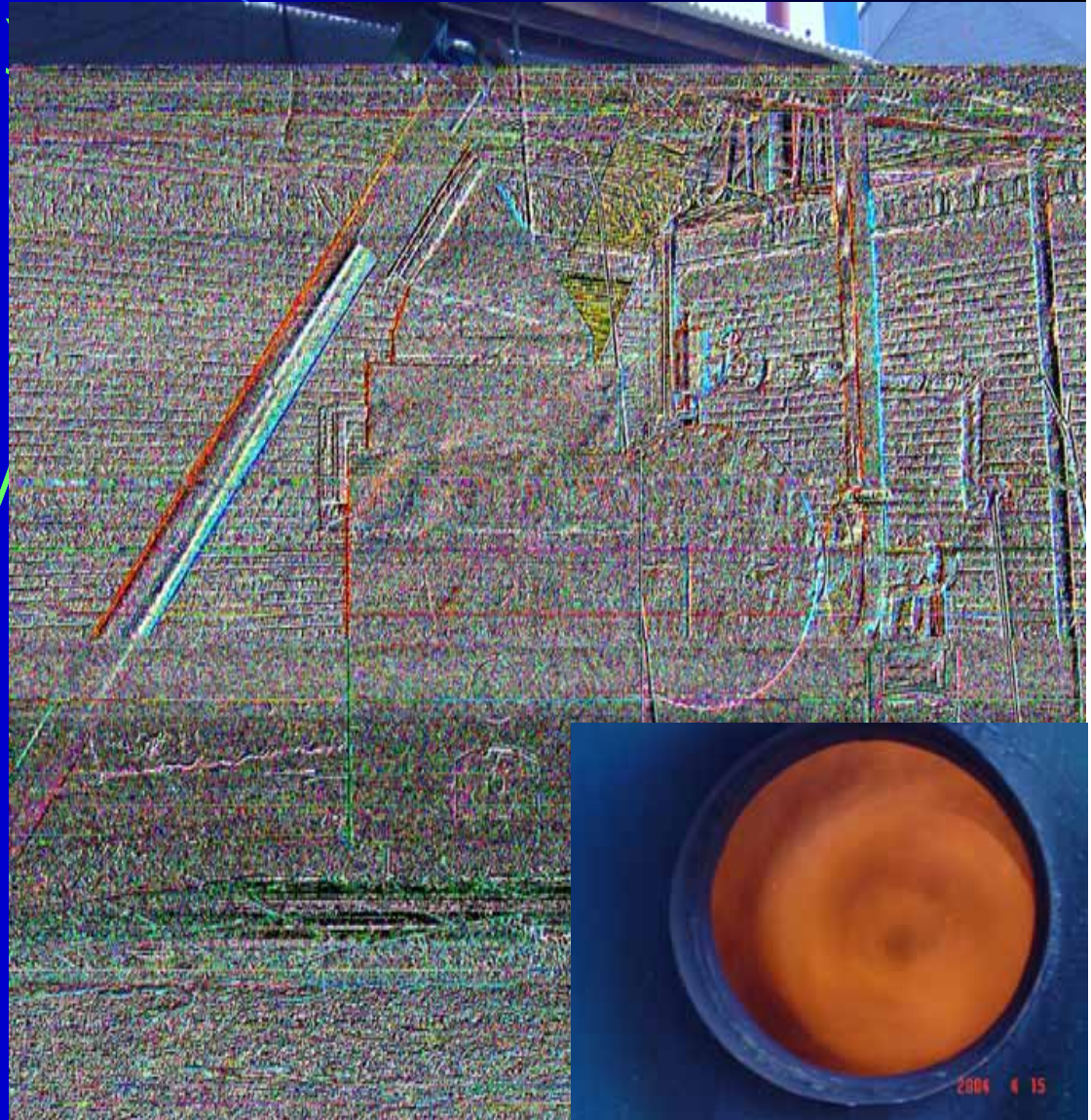
0.35-0.70-1.05-1.40

Biomass fuel:

Agricultural & Forestry  
residues

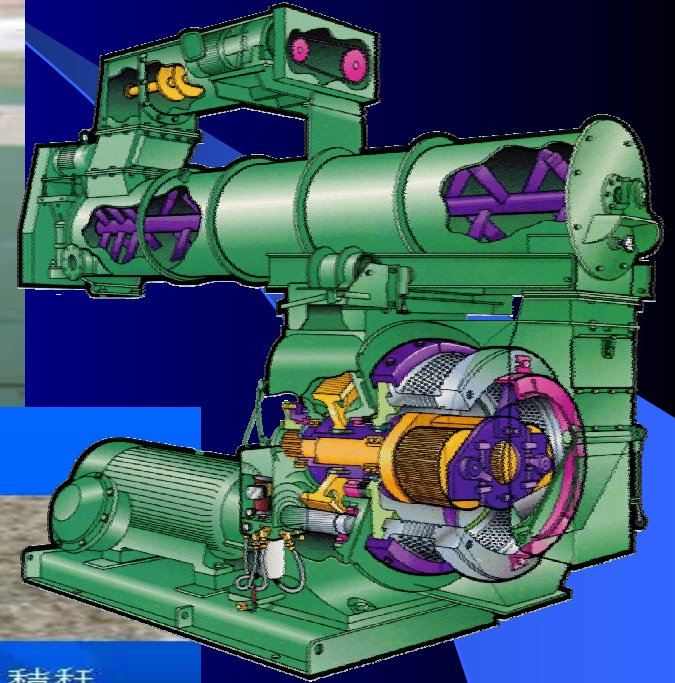
Water temperature  
in-/out - 90/70 ( °C )

> 65%



# Biomass Densification

Biomass bricks production 23175 ton / 2003



## CZSN技术产品



胶合板粉



红松木



柳枝稷



秸秆



胶合板颗粒



红松木颗粒



柳枝稷颗粒



秸秆颗粒

# Wood carbonization technology

Fuelgas  
supply  
3000m<sup>3</sup>/d

For 2000  
house hold  
using

Output

Biocharcoal  
3t/d

Tar 1t/d

Biomass fuel  
consumption  
10t/d





# Biomass gasification for house hold

**525**

**Biomass gasification  
stations in rural area  
for 106.676 house hold**

**Fuel gas output :**

**175Mm<sup>3</sup>**

**Straw Consumption :**

**1005.96 ton**

**( December 2003 )**



# Biomass gasification for electrification

Gas engine: 1.000kW

Biomass: wood  
sawdust;

Biomass  
consumption:  
1.25kg/kwh;  
30 ton/d

Biomass price:  
0.9\$/ton

Electricity cost :  
0.04\$/kWh



# Waste land fill for compost and incineration electricity

Solid waste  
land fill

200 t/d

Incineration  
Electricity

generator

200KW

Electricity cost

0.04\$/kWh



# House hold biogas digester



12.889.899

Small scale  
Biogas digester  
For House hold

Gas  
production :

4579.75Mm<sup>3</sup>  
/Year

(December 2003)

# **Large and medium size anaerobic digestion plant**

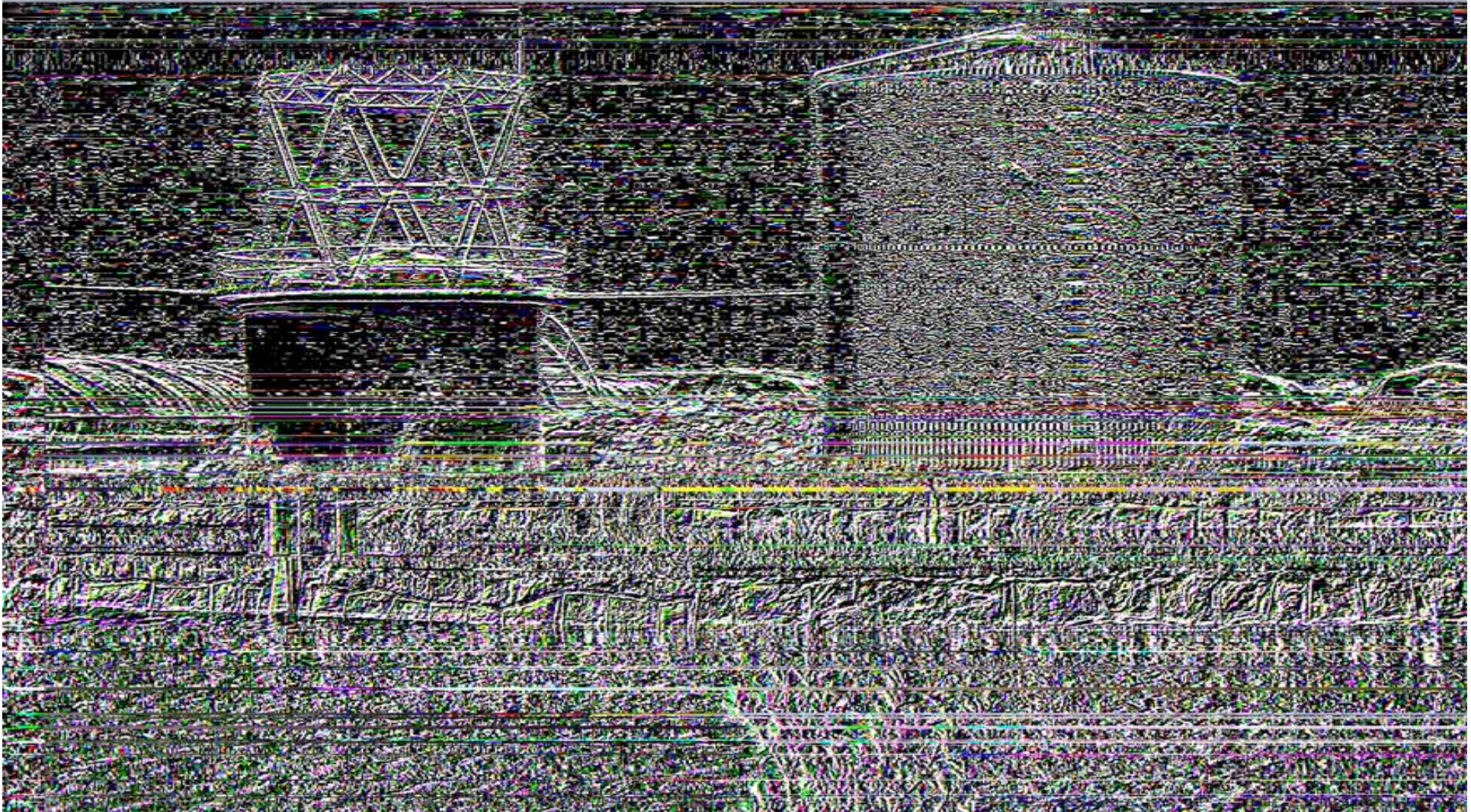
**2355 Large & medium size biogas plants  
operating in 2003**

**Biogas output 183.92Mm<sup>3</sup>**

**Capacity of electricity generation :  
6.338.063kwh**

**Biogas supply to 130.000 house hold**

# Biogas engineering of cattle farm



# Biogas engineering of alcohol factory



# Biogas engineering of pig farm





# Bioethanol Production

**Bioethanol  
output :**  
**300.000tons/y**

**Corn  
consumption :**  
**960.000ton/y**

**Cost: 550\$/ton**



# Sweet Sorghum is growing in Heilongjiang-2004



# " Chuntian # 2"

## Character

- Sweet sorghum

- Seeds

(State 863 Plan)

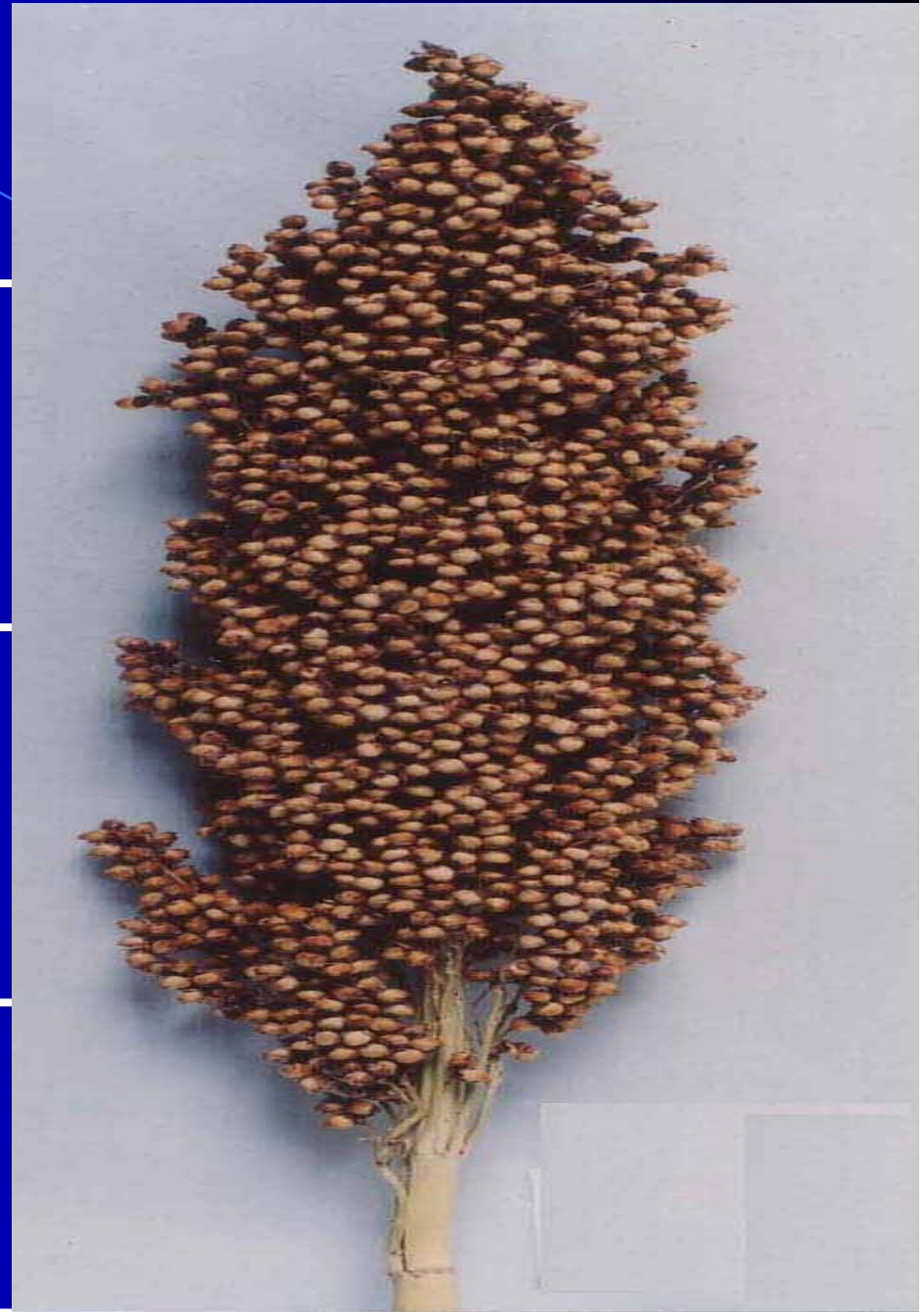
cm

30

20

10

0



# Liquid fast fermentation equipment (State 863 plan)



# Bioethanol Rectification Engineering

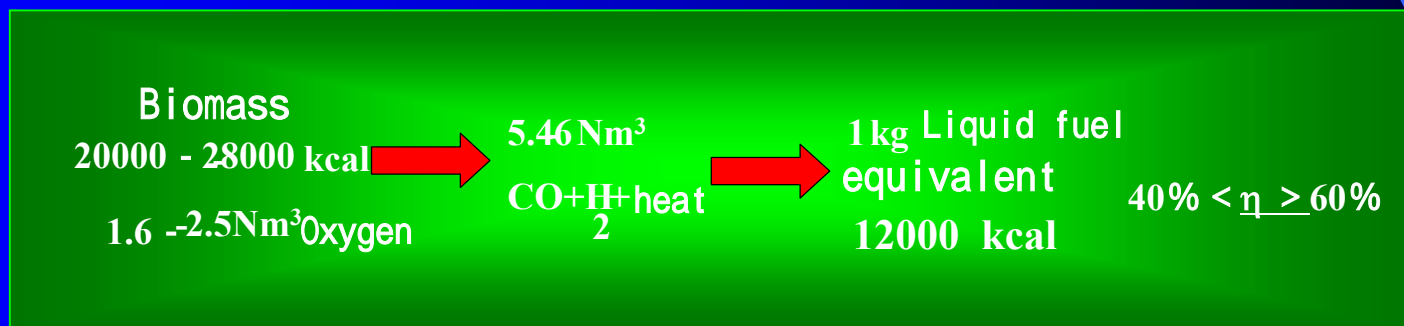
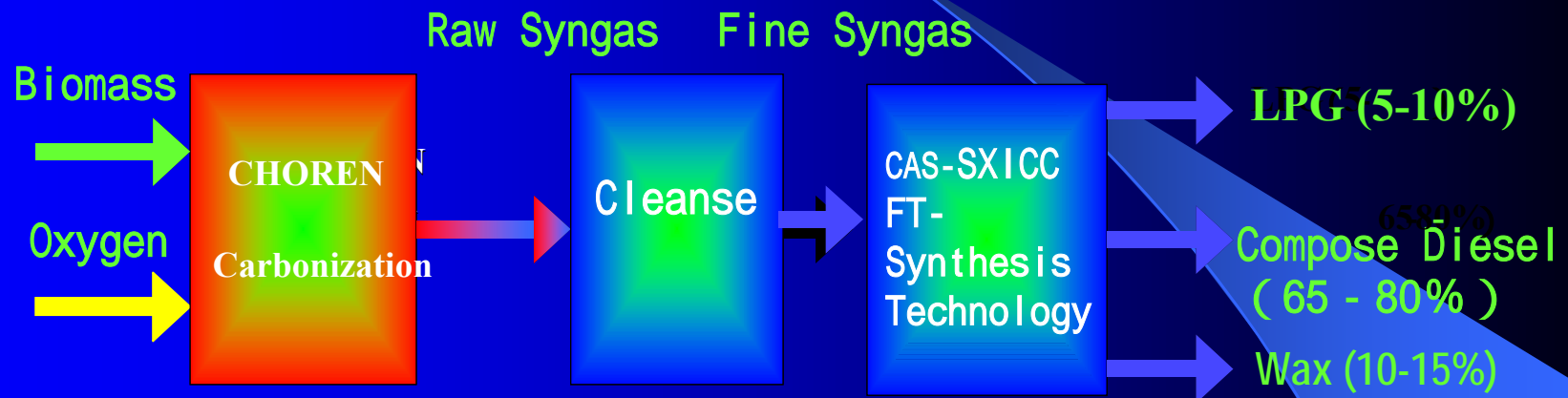
**Cost: 350EURO/T**



# Waste residue of ethanol – raw material for BtL- Diesel

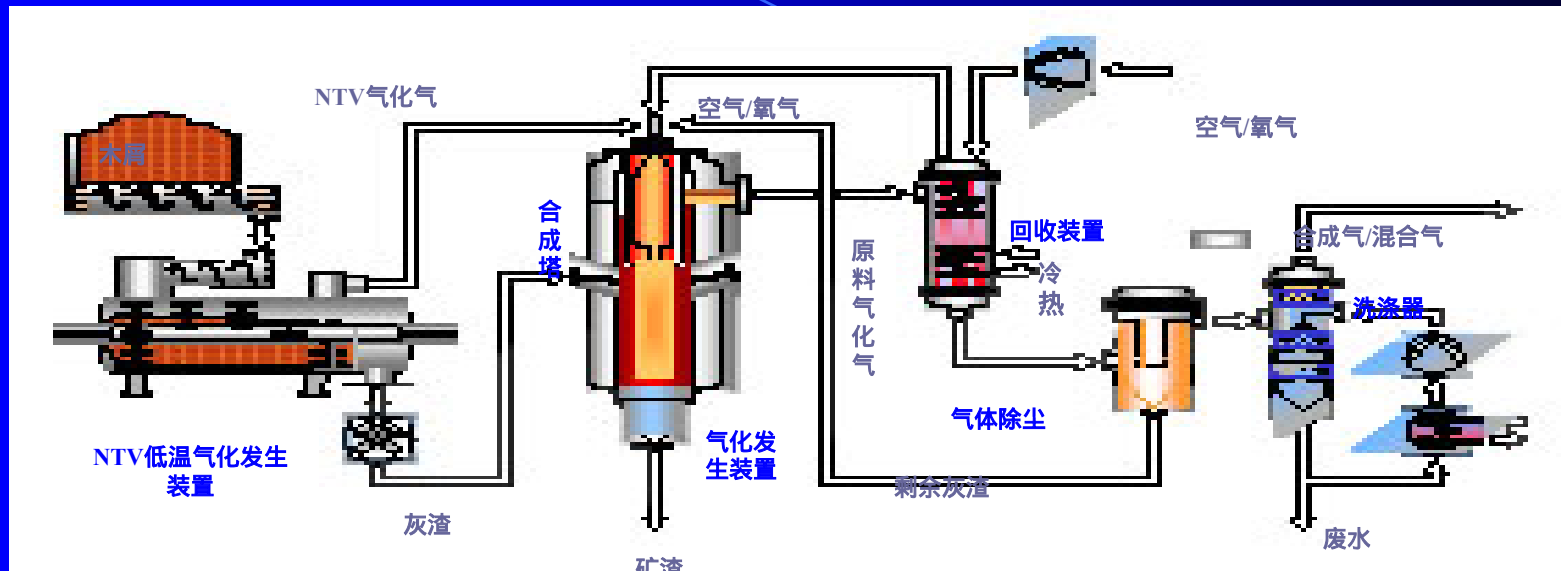


# BtL- Diesel production technology

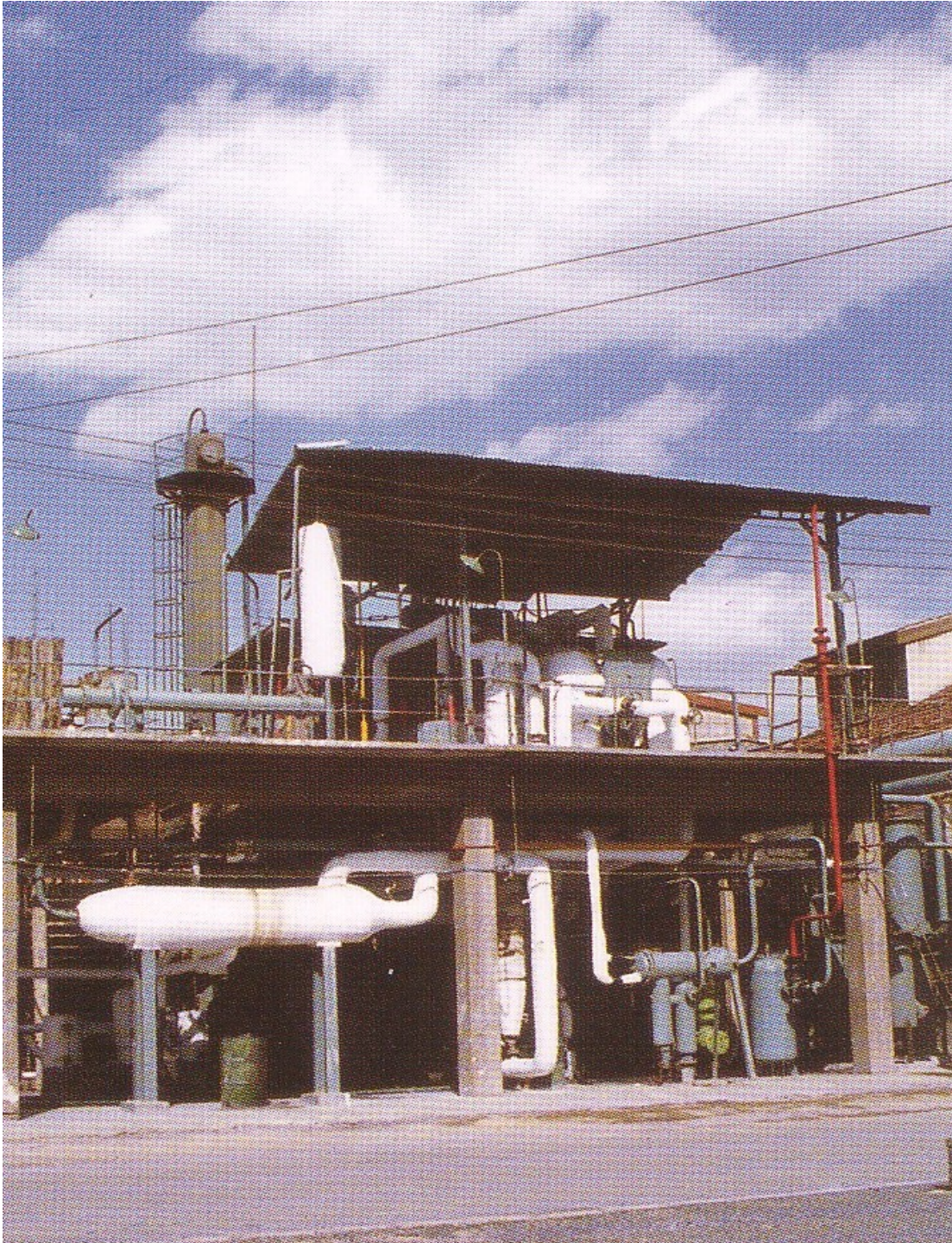


# BtL-Diesel technology of CHOREN GERMANY

BtL- Diesel: 15.000tons/y forestry residue consumption: 75.000/y







**State 863 plan  
project  
Coal&Biomass  
liquefaction  
technology  
China  
Cost:450 EURO/T**

# NEW PROJECT

TTD / 4E Ltd./ICC & CHOREN / WIP

Chinese & German cooperation

10.000t/y Bioethanol make of sweet sorghum

15.000t/y BtL-Diesel production from Ethanol  
Residue

in Heilongjiang and Shandong provinces



# Policy of renewable energy development in China

- According to local conditions
- First of all: Energy savings
- To supplement different kinds of energy with each other
- Integrated Utilization
- Seeking Synergy & Benefits

# State plan for developing the energy industry

State Committee of Development & Reform Issuance in 2003 :

Medium long term development plan of renewable energy

Biomass electricity :

2002 - 50MW

2010 - 2.000MW

2020 - 14.000MW

Bioliquidfuel

2010 - 5.000.000ton/y

2020 - 10.000.000ton/y

# Areas of future projects

- **Area plan and evaluation of biomass resources**

**Technology of biomass conversion evaluation**

**Policy and Strategy research**

**Strengthen ability of bioenergy development**

- **Bioenergy project demonstration**

# **Resources, Technology and Policy Evaluation**

- Biomass- Energy Potential Assessment and**
  - Choice of Biomass Conversion Technology**
- Role of Biomass- Energy in CDM- Projects and development of possible Projects**
- Policies to encourage Industrialization of Biomass Energy Conversion**

# Competence Development

- **Institutionalization for ability construction**
- **Education and Dissemination**

# **Construction of Demonstration Project 2005-2010-2020**

- **Biogas Technology : Biogas Power Generation with the aim of Grid- Connection Demonstration ;**
- **MW- Class Straw direct- combustion and Co- Generation Demonstration Projects ;**
- **Biomass Power Generation via Gasification on Village - Level and MW- Class Demonstration Projects**
- **Demonstration Project for the Ethanol Production from Sweet Sorghum : Annual Output of 10.000 tons/y Ethanol and integrated Utilization Demonstration Project ;**
- **Demonstration Project for Biodiesel : Inputs mainly consist of Oil - containing Plants and Agricultural waste.**
- **Ethanol & BtL - Demonstration Project**





Thank you!