

中国生物质能开发利用战略 strategy of Bioenergy Development & Utilization in China

**China Association of Rural Energy Industry
China Society of Agricultural Engineering
Beijing Taitiandi Energy Technology Ltd.**

2004. 11. 9. Chile

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 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, 4.10Mm³ /
● 1999, 3.88Mm³/2000, 3.28Mm³
- **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
- **Biomass 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



High efficiency biofuel Boiler

**Nominal heat supply
(MW)**

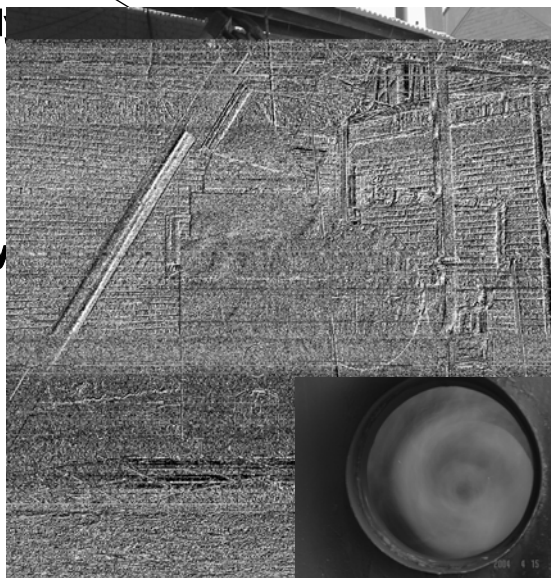
0.35-0.70-1.05-1.40

**Biomass fuel:
Agricultural & Forestry
residues**

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

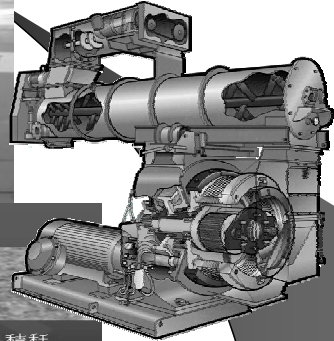
$$\eta > 65\%$$

●

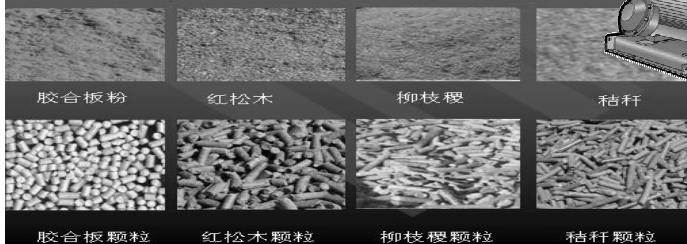


Biomass Densification

Biomass bricks production 23175 ton / 2003

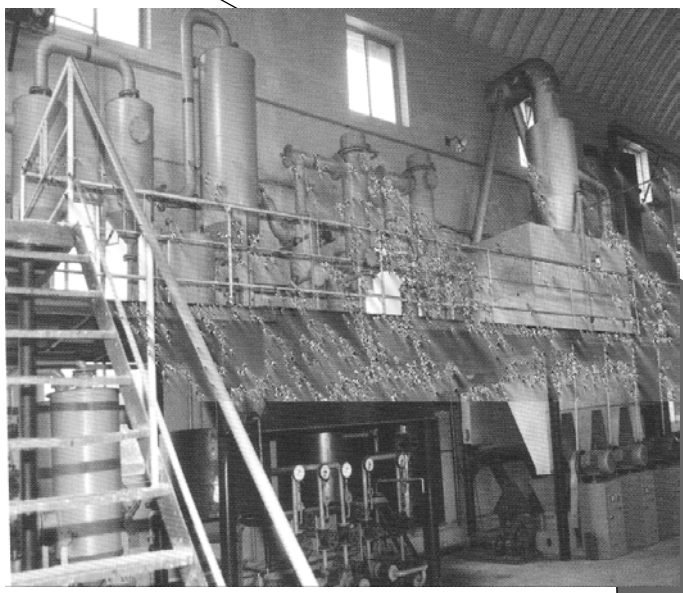


CZSN技术产品



Wood carbonization technology

Fuelgas supply
3000m³/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:

175Mm³

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**

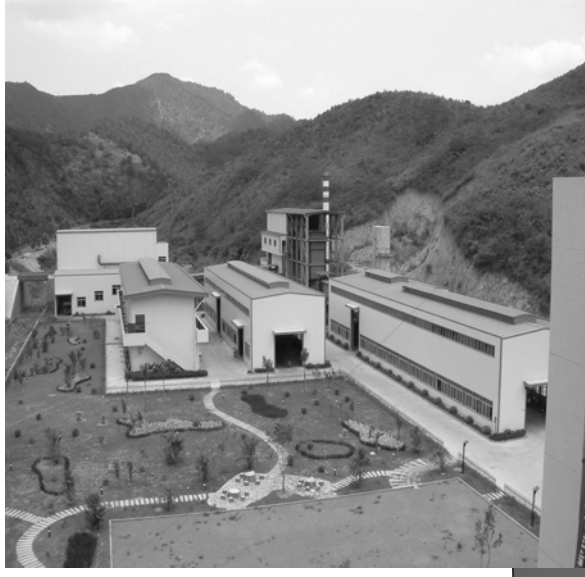
**Biomass price:
0.9\$/ton**

**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
:

4579.75Mm³
/Year

Large and medium size anaerobic digestion plant

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

Biogas output 183.92Mm³

**Capacity of electricity generation:
6.338.063kwh**

Biogas supply to 130.000 house hold

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**

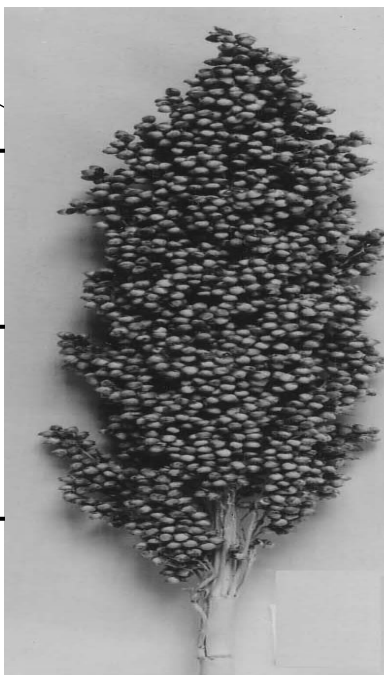
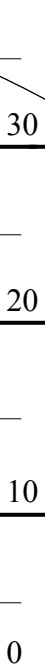


**“ Chuntian # 2”
Character**

● **Sweet
sorghum**

● **Seeds
(State 863 Plan)**

cm



Liquid fast fermentation equipment (State 863 plan)



Bioethanol Rectification Engineering

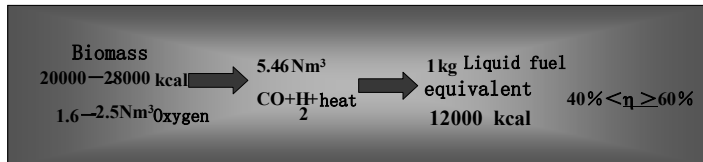
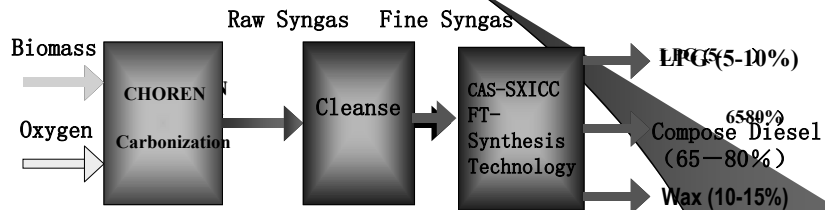
Cost: 350EURO/T



Waste residue of ethanol – raw material for BtL- Diesel

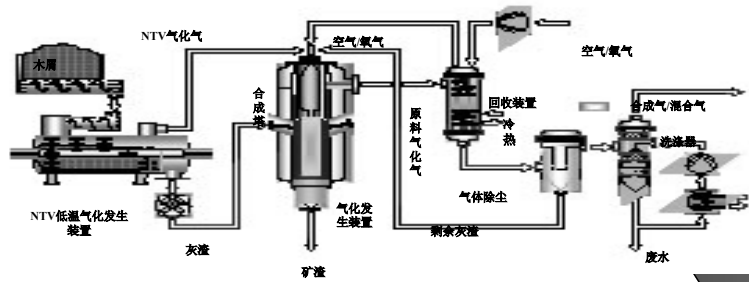


BtL- Diesel production technology



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**

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!