

Present Status of Biomass Energy Conversion Technologies in China

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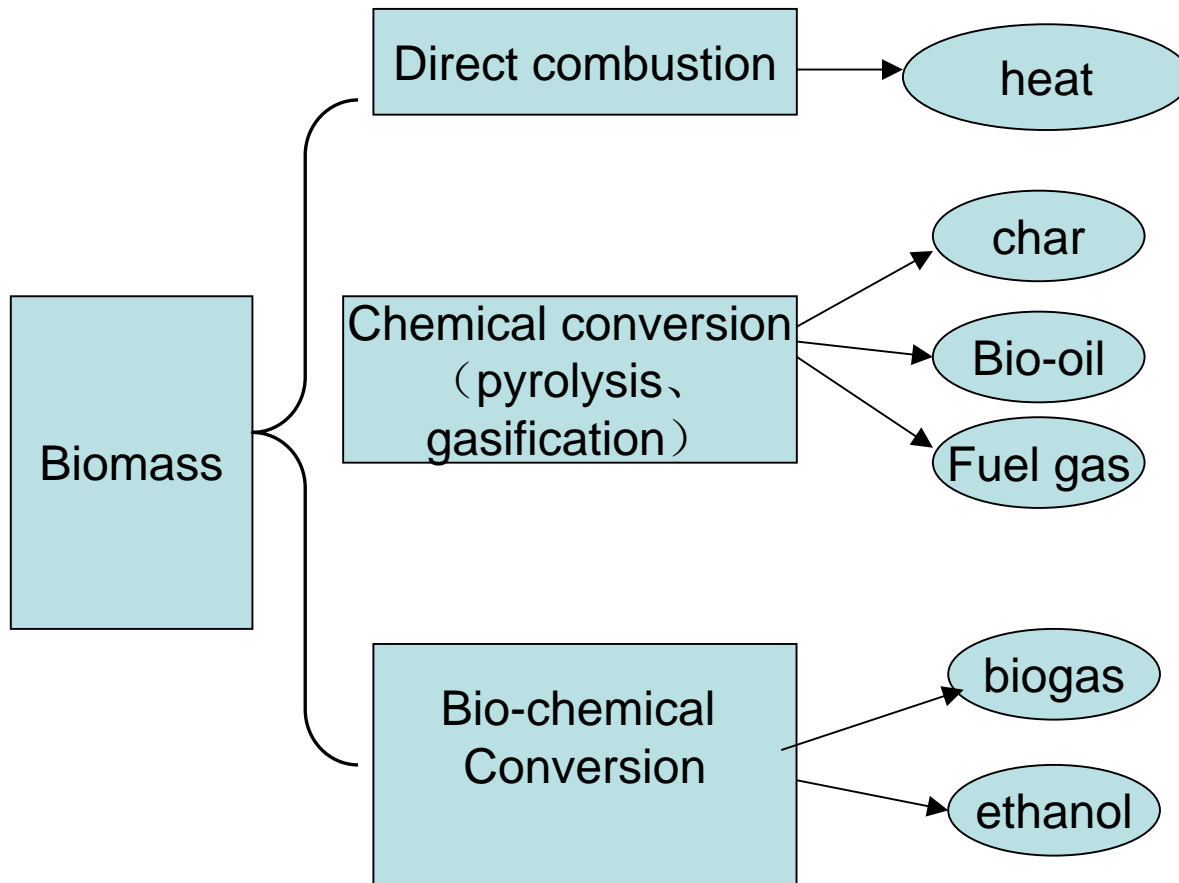
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Biomass energy conversion technologies



Direct Combustion

- **Old fuel wood Stove**

- ☆ Heat efficiency is low. Less than 20%



- **Energy saving Stove and Mud bed**

- ☆ Heat efficiency is higher. More than 20~30%

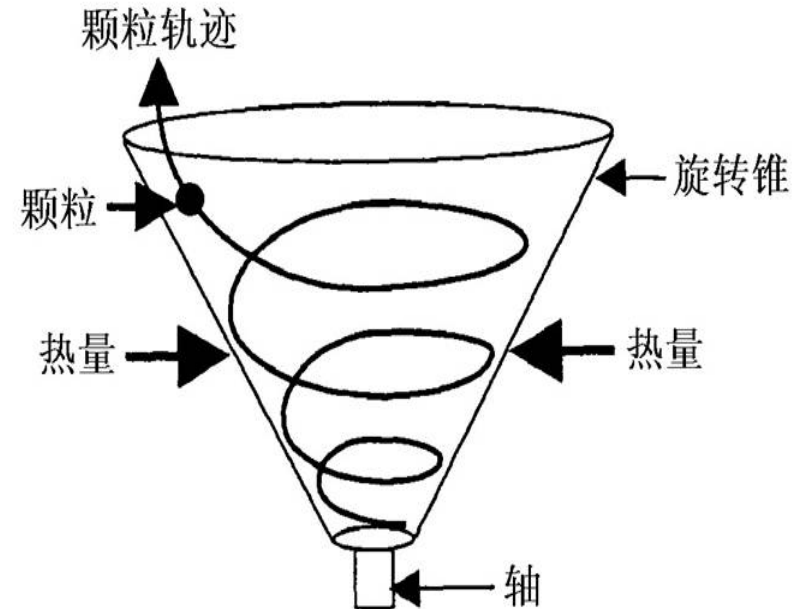


Pyrolysis research in SAU

Rotating Cone Reactor

【Characteristics】：

- Flash reaction:
solid residence time: 0.5 s
- Higher heating rate:
5000k/s
- Vapor residence time: 0.3 s
- Materials to be treated:
Biomass, coal, oil shake,
Polymer

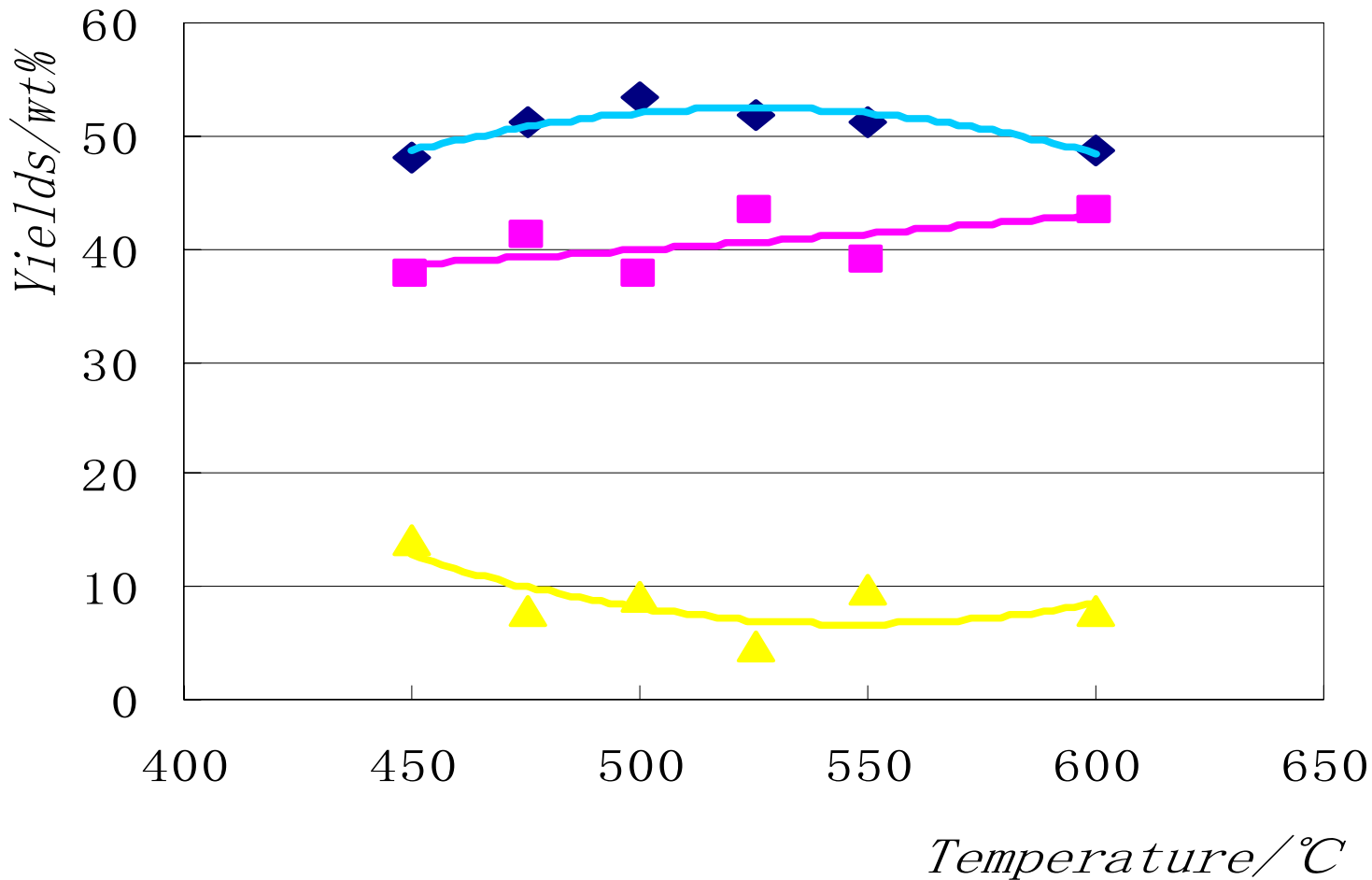


【Operation Parameters】 :

- Biomass throughput: 50 kg/h
- Temperature: 500~700 °C
- Biomass (Sawdust or stalk) particle size: 0.2~1.0 mm
- Reactor temperature: 600 °C
- Cyclone temperature: 500 °C

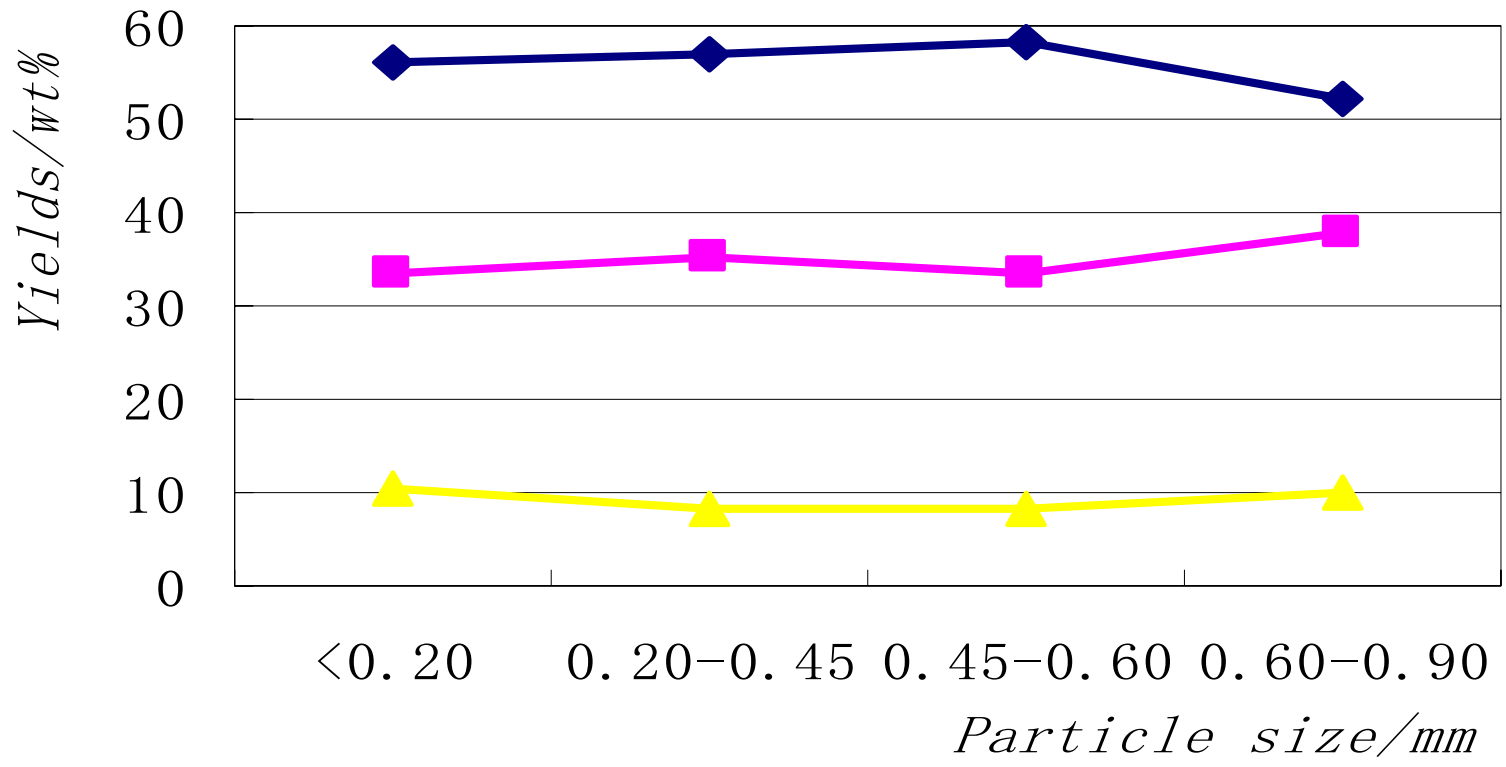
Results and Analysis

- Experimental results using fluidised bed reactor and analysis are as follows:



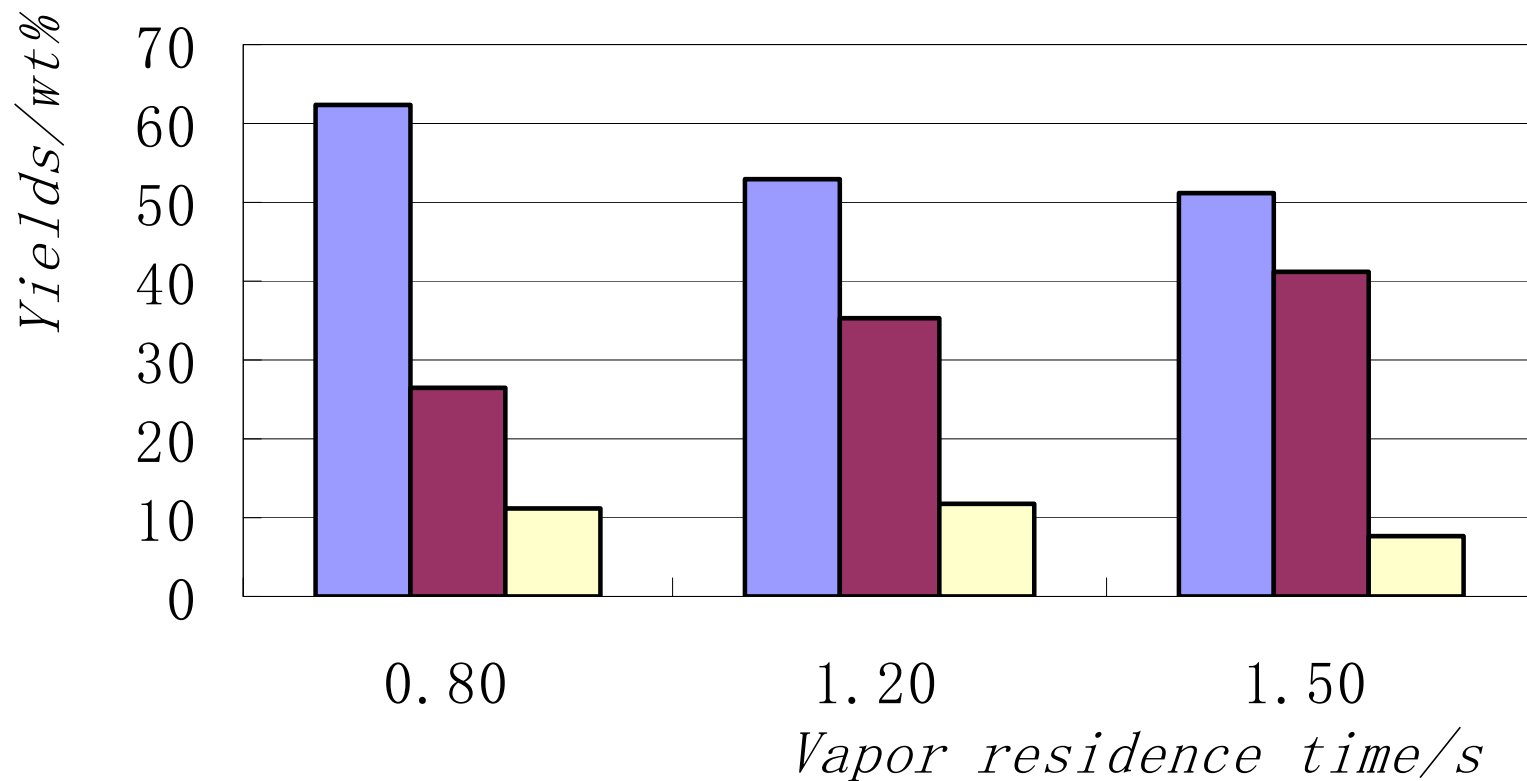
◆ Bio-oil ■ Non-condensable gases ▲ Char

Effect of temperature on yields of products from pyrolysis of sawdust for feed particle size of 0.6-0.9 mm



—◆— Bio-oil —■— Non-condensable gases —▲— Char

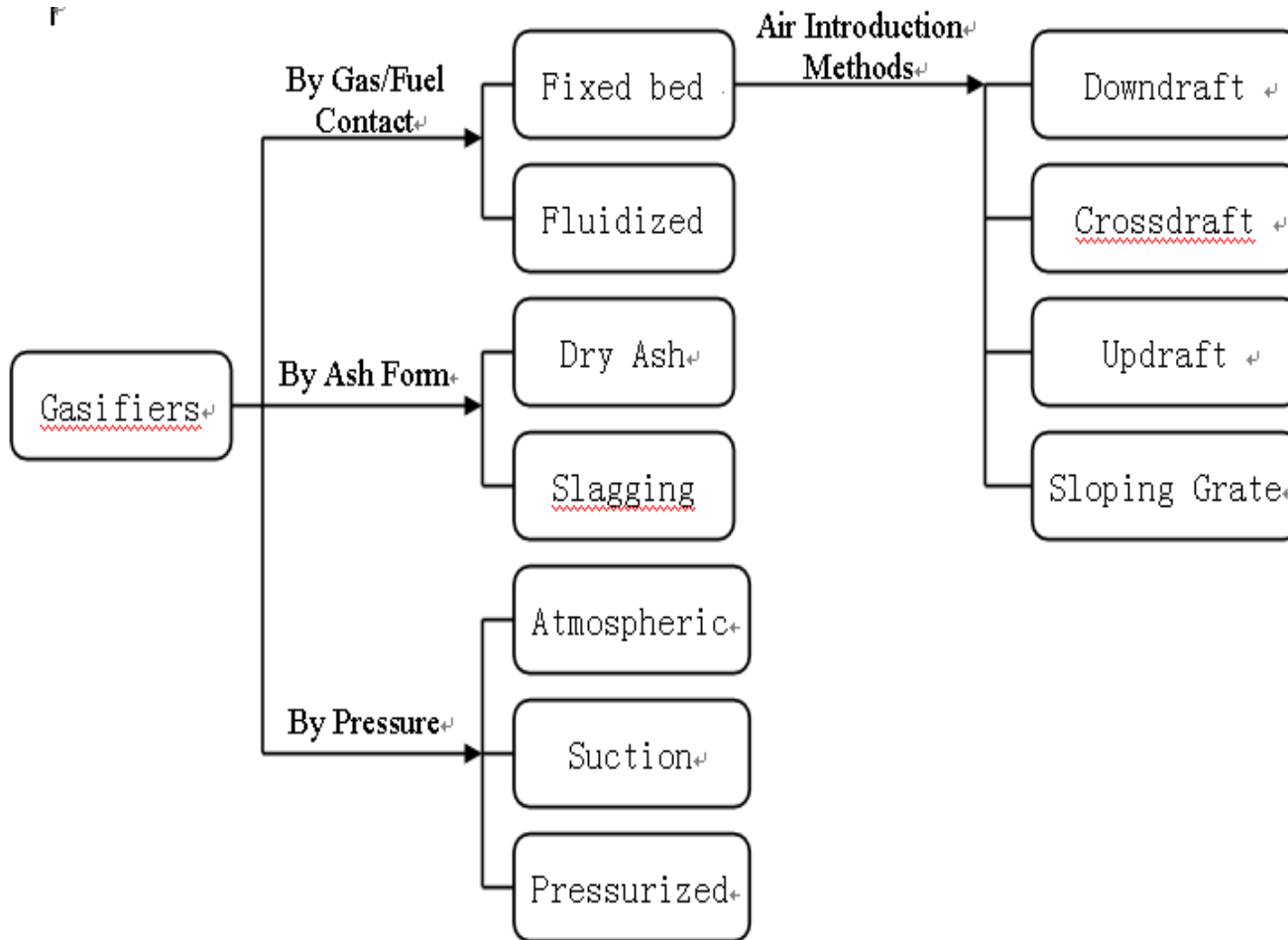
Effect of particle size on the yields of pyrolysis



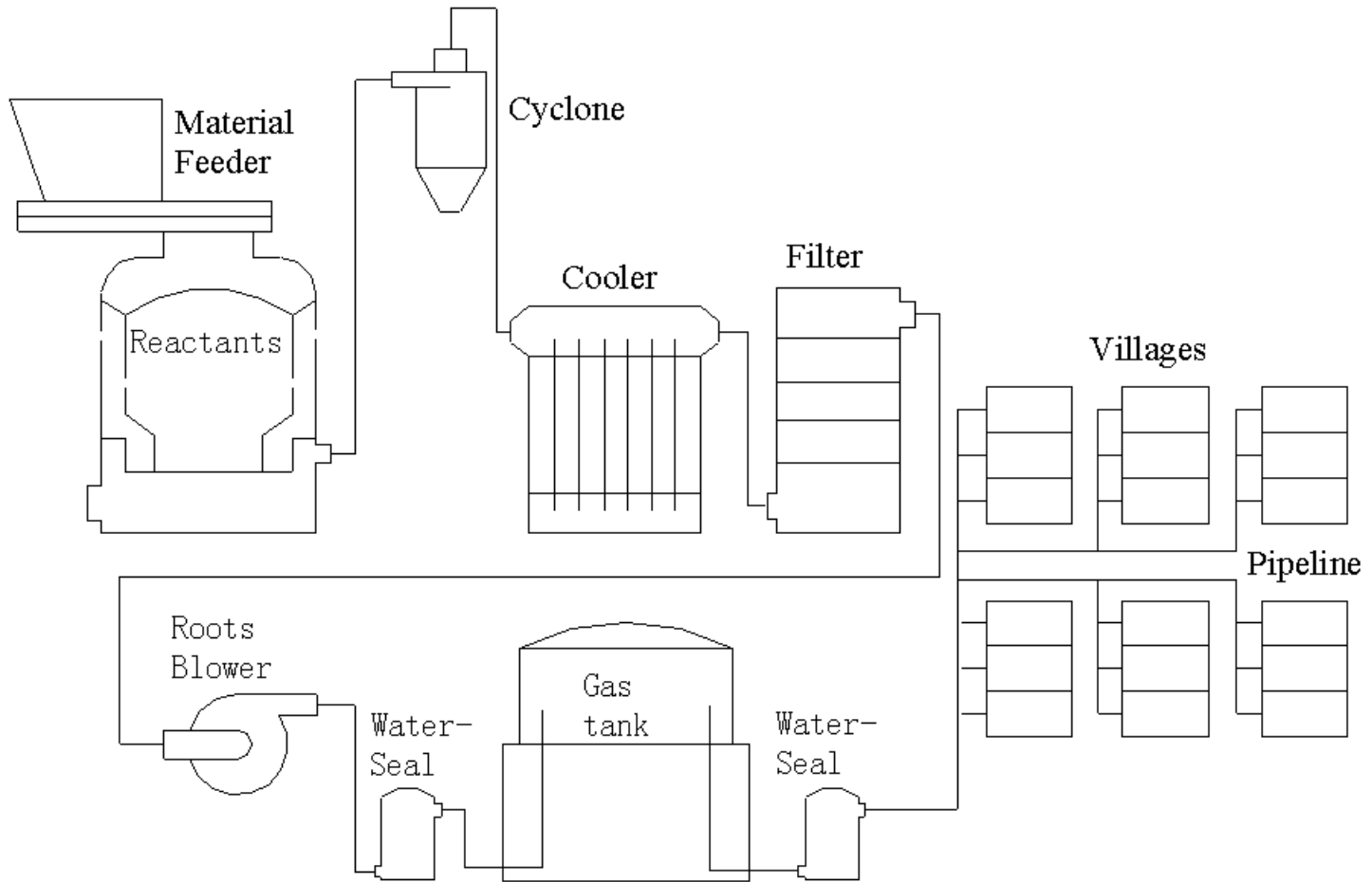
■ Bio-oil ■ Non-condensable gases ■ Char

**Effect of vapor residence time on the the yields of
pyrolysis products at temperature of 500°C**

Gasification



Classification of Gasifiers



Technological process of XFF type fixed-bed gasifier system

The Tech- index of XFF System

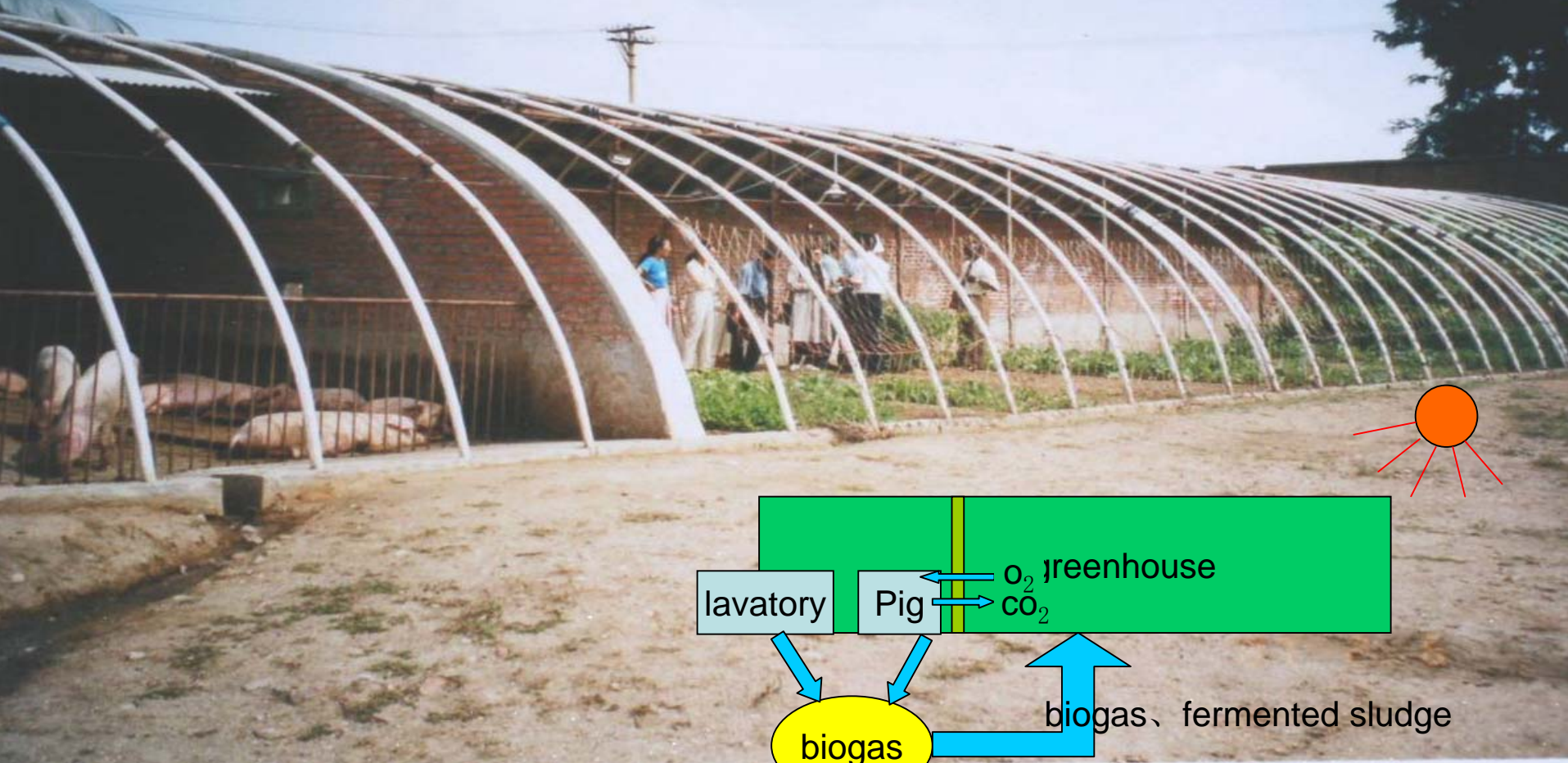
Model of unit	XFF-1000	XFF-2500	XFF-600
Power output (mJ/h)	1000	2500	600
Gas yield (m ³ /h)	200	500	120
Heat value (kJ/m ³)	5000	5000	5000
Gas-rate(%)	72%	72%	72%
Tar content(mg/m ³)	20	20	20

Biogas technology in SAU

Energy/animal/Vegetable
/fertilizer/environment integrated
system is widely extended in northern
China。

- Small type biogas reactor
- Middle and large scale biogas reactor

Small type biogas digester



Biogas digester built in Shenyang Agri. Uni.

Component: Lavatory, Pig house, biogas digester, greenhouse

Function: Integration of Plant, animal, biogas, solar energy

Bio-ethanol research in SAU

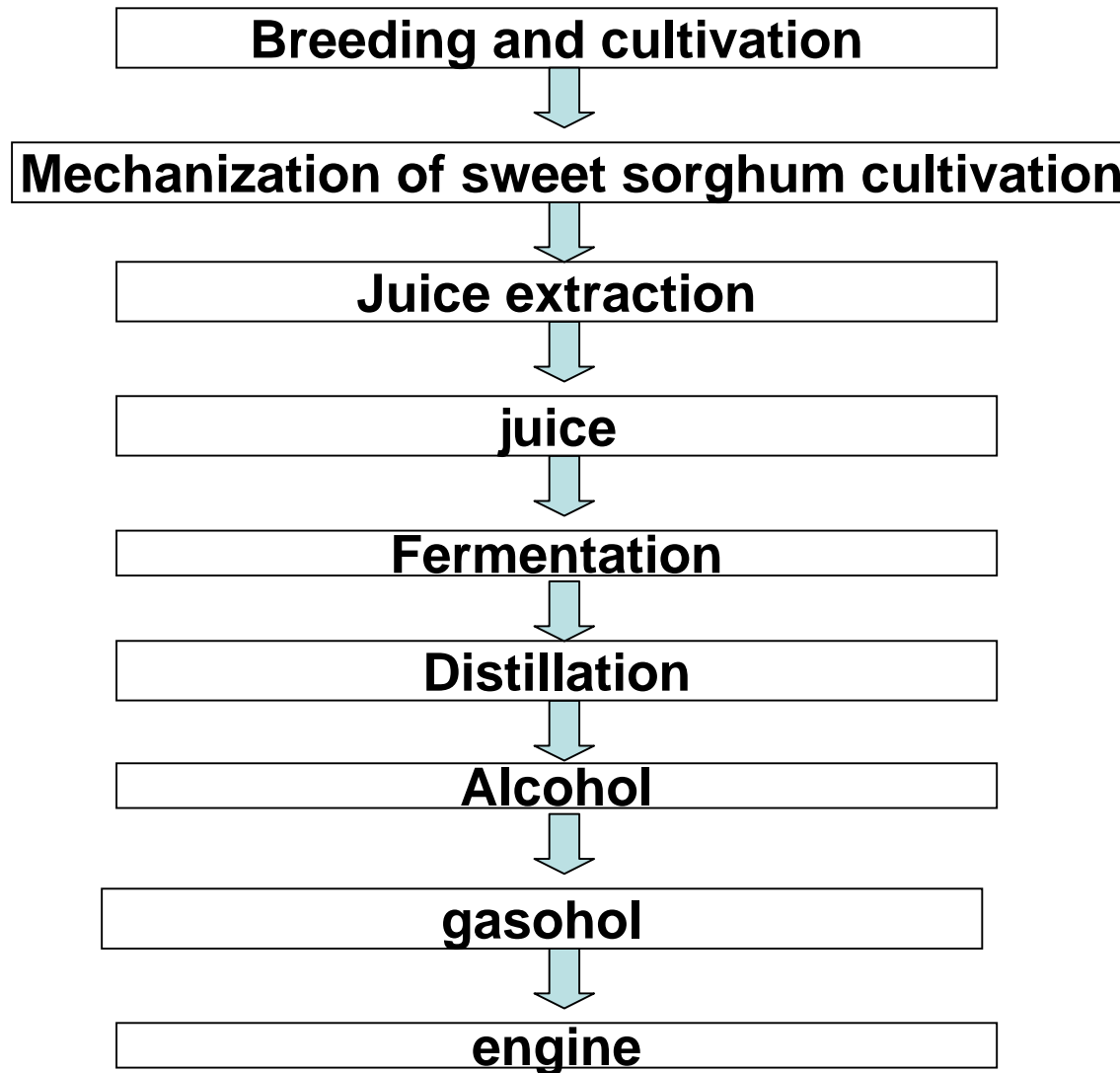
△ Raw materials:

Starch

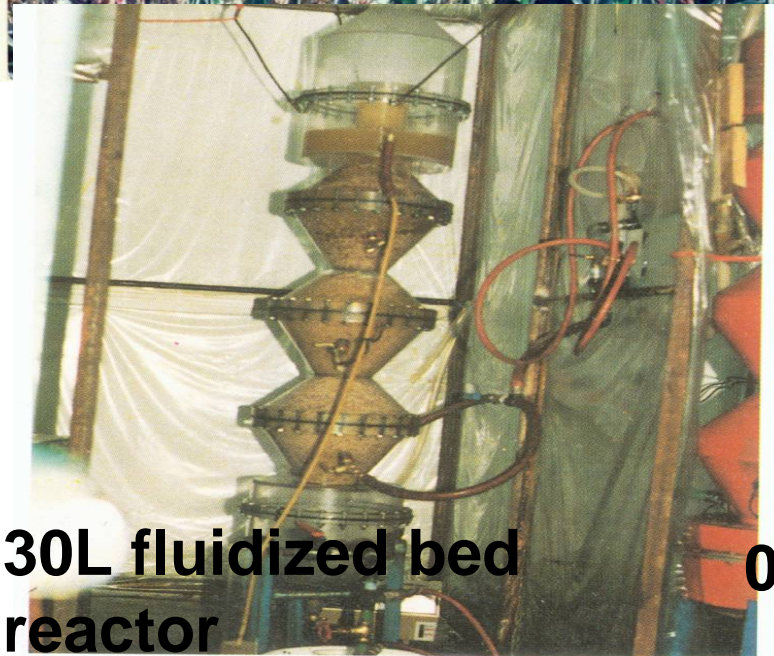
Sugar

Lignocellulose

Technological process of refining bio-ethanol from juice of sweet sorghum



Alcohol production from juice of sweet sorghum in SAU



30L fluidized bed reactor

0.45t/d fluidized bed reactor

**Yield of stem 50t/hm², Grain yield 5t/hm²,
Juice alcohol yield 1.5t/hm²**



ASIATIC





Participants



MoA



ERI



ICT

WP5: Liaoning case study,
coordinated by Professor Liu
Ronghou, SAU

Conclusion

Different conversion technologies can treat different types of raw materials, and different product can be obtained, there are both advantages and disadvantages for any conversion technology. Therefore, adequate conversion technology should be chosen according to concrete conditions in order to promote commercialization of biomass energy.

Thank you !