# Synfuels China and its Development in advanced CTL Process Technologies

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## Main points

- About Synfuels China
- Fischer-Tropsch development
- Commercial projects planning

# About Synfuels China

The Fischer-Tropsch synthesis R&D team in ICC of CAS, Synfuels China was funded in 2006.

(1) Supporting demon projects, and exploring commercial size projects

(2) Continuous research and development in novel FTS related tech.

(3) Manufacturing and supplying FTS catalysts

Team size: 200 staff

Research: 60 Engineering design: 60 Pilot plant: 20

Catalyst factory 60

# First Car Fueled by 100% F-T Super Clean Diesel

- EU III / 2.0L diesel engine
  Volks Wagen CADDY SDI 2.0
- Economic fuel consumption ~4.5 L /100 km
- Cetane No. > 70
- Clean fuels from COAL, extremely low S and N
- EU IV emission limit

**Oil Source:**
**Synfuels China**
**R&D Base**

- Attracting direction meeting China's demands for fuel alternatives
- F-T is one of the most fundamental coal conversion projects being initialized.

# Technological development

focusing on:

- ‘Perfect’ catalysts in a slurry process
- New routes to produce FTS catalysts
- Slurry reactor and specifics
- Development of crude wax purification process
- Development of special machine for separation of wax from catalyst containing slurry (catalyst content: 10%~35% wt)
- FTS processes and flowsheeting and integration
- Reduction processes
- Product chain integration

# Major Progresses: Low temperature slurry Fischer-Tropsch

Industrial optimization of catalyst and the process 2005-2006

Lab scale 1000 hour tests

- catalyst ICC-IA➔ICC-IB iron based
- 245-250 $^{o}$C, $P_{CO+H2}$= 20 bar P=30 bar
- Productivity: kg$C_{3+}$/(kg cat h) 0.3-0.4
- Selectivity(wt%): $CH_4$ 4-5% $C_2$-$C_4$ 10% $C_{5+}$>85%

  Oxygenates in water 5%, acids 0.8%

# Major Progresses: High temperature slurry Fischer-Tropsch

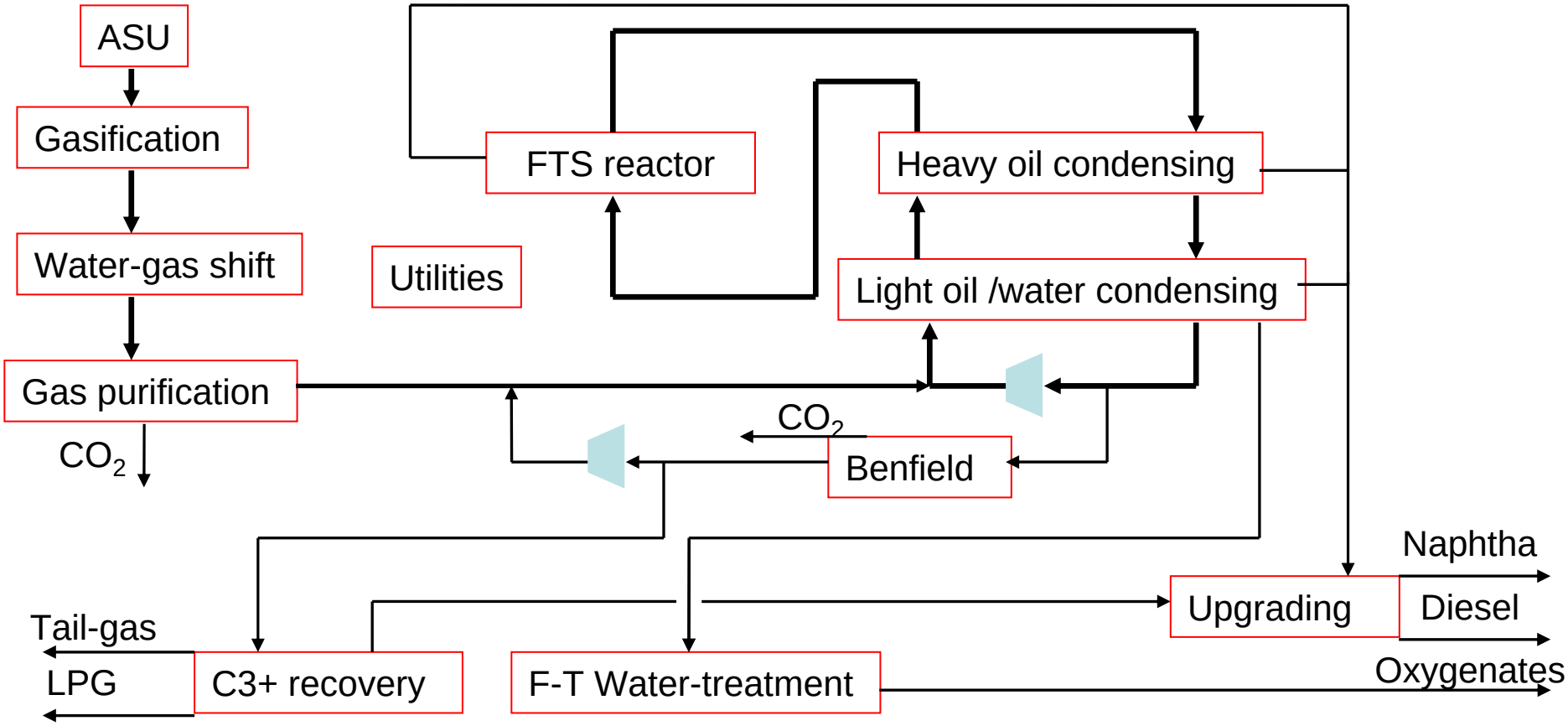
Industrial catalyst optimization 2005-2006 2006 preliminary test in pilot

Lab scale tests are going on Well prepared pilot test from this May

- catalyst ICC-II A iron based new structure introduced
- 265-290 $^{o}$C, $P_{CO+H2}$= 20 bar P=30 bar
- Productivity: kg$C_{3+}$/(kg cat h) 0.6-0.8
- Selectivity(wt%): $CH_4$ <4% $C_2$-$C_4$ 6-10% $C_{5+}$>85-90 %

  Oxygenates in water 4.0%, acids <1%

# Major Progresses: Demo plant design and commissioning



# Major Progresses: Demo plant design and commissioning

Two scales of reactor: 5.3 m 5.8 m ID

| | | | | | |
|---|---|---|---|---|---|
| Capacity: | 5.3 m | 22t/h | Max | 25 t/h | $C_{3+}$ recoverable |
| | 5.8m | 22-24 t/h | Max | 30 t/h | $C_{3+}$ recoverable |

Operation conditions: 240-290 $^{o}$C, 30 bar

Capital investment Demo-I: 2.2 billion RMB

Demo-II: 2.7 billion RMB + ammonia co-production

Demo-III: 1.0 billion RMB modified syngas unit

Starting-up of demo-plants: one in 2008, two in 2009

# Major Progresses: Commercial project planning

## Project selection

Sizes of 60000-150000 b/d

Four candidate projects in China

Two candidate projects (international)

All are entering pre-evaluation stage

Major index: (High temperature slurry FTS)

Fuel production only mode: efficiency above 42%

Water consumption between 10-15 ton/ton oil

$CO_2$ condensed to 98.8% (Potential for small oil field exploration)

Coal consumption(6000kg/kg): less than 4.5 ton/ton oil

# Thanks for your attention