

Synfuels China Technologies

For Heavy Oil Upgrading and CTL

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- ◆ **Synfuels China (SFC) methodology**
- ◆ **SFC multistage liquefaction technology**
- ◆ **SFC High Temperature Slurry Fisher-Tropsch Process (HTSFTP) Technology**
- ◆ **SFC integrated processes**

SFC Background



Synfuels China (SFC)



SYNFUELS CHINA

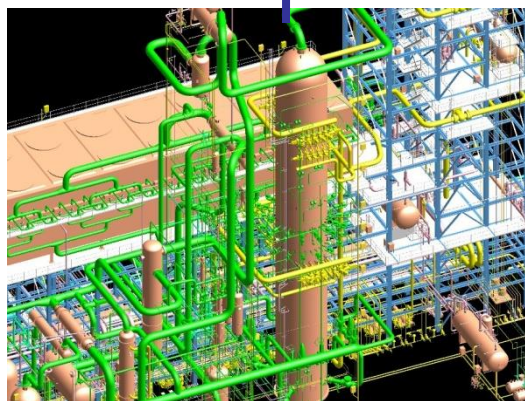
- Established in 2006
- Registered Capital: 1b RMB

- PhD 41 & Mater 121
- Staff 950



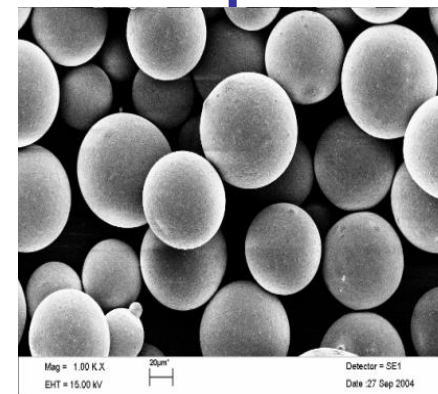
SFC R&D Centre
Beijing & Taiyuan

- more than 80 patents



SFC Engineering Co., Ltd. Beijing

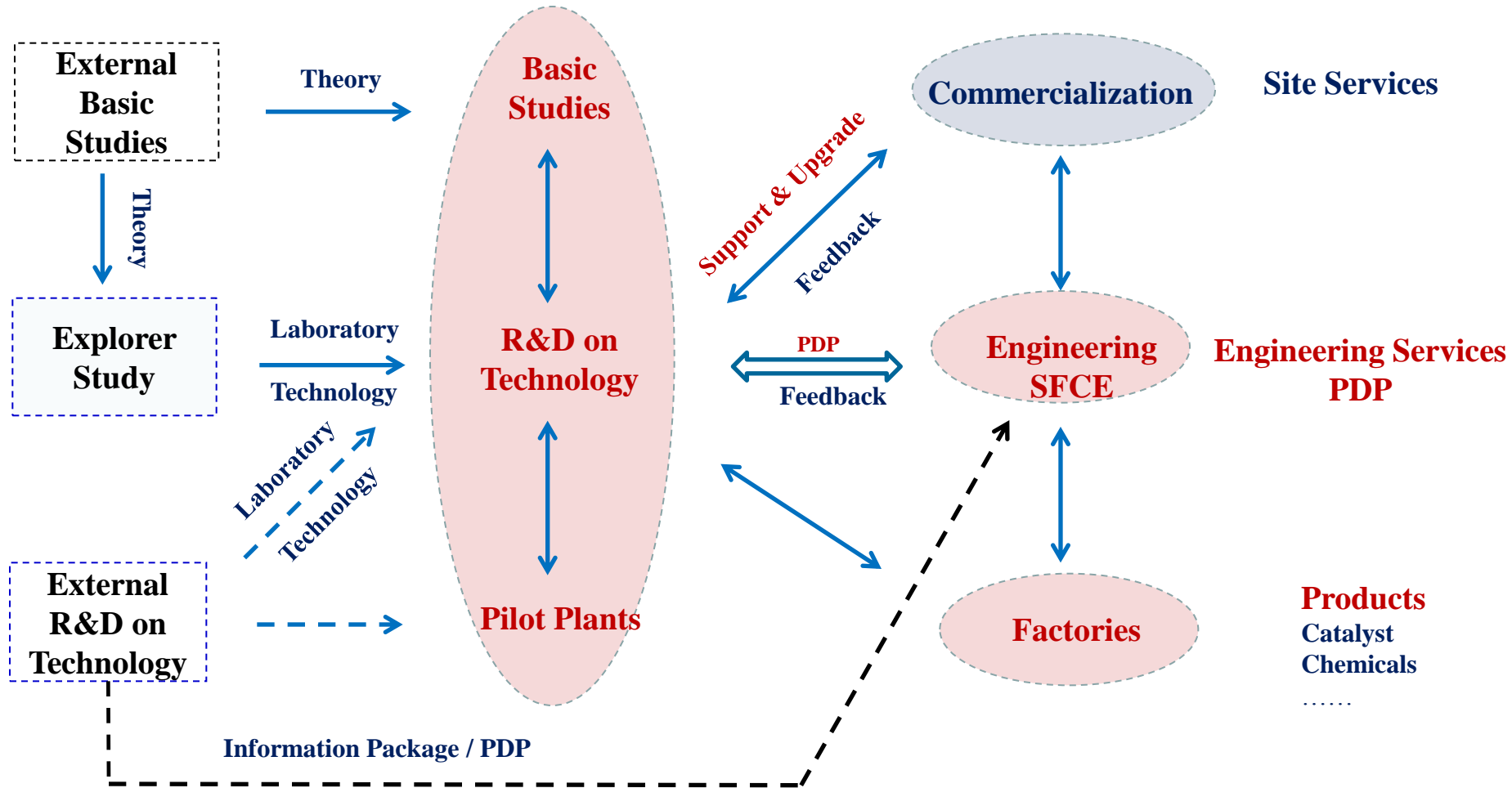
Synfuels Americas (USA)
ChemEssen (Seoul, Korea)



SFC Catalyst Factories
Anhui & Inner Mongolia

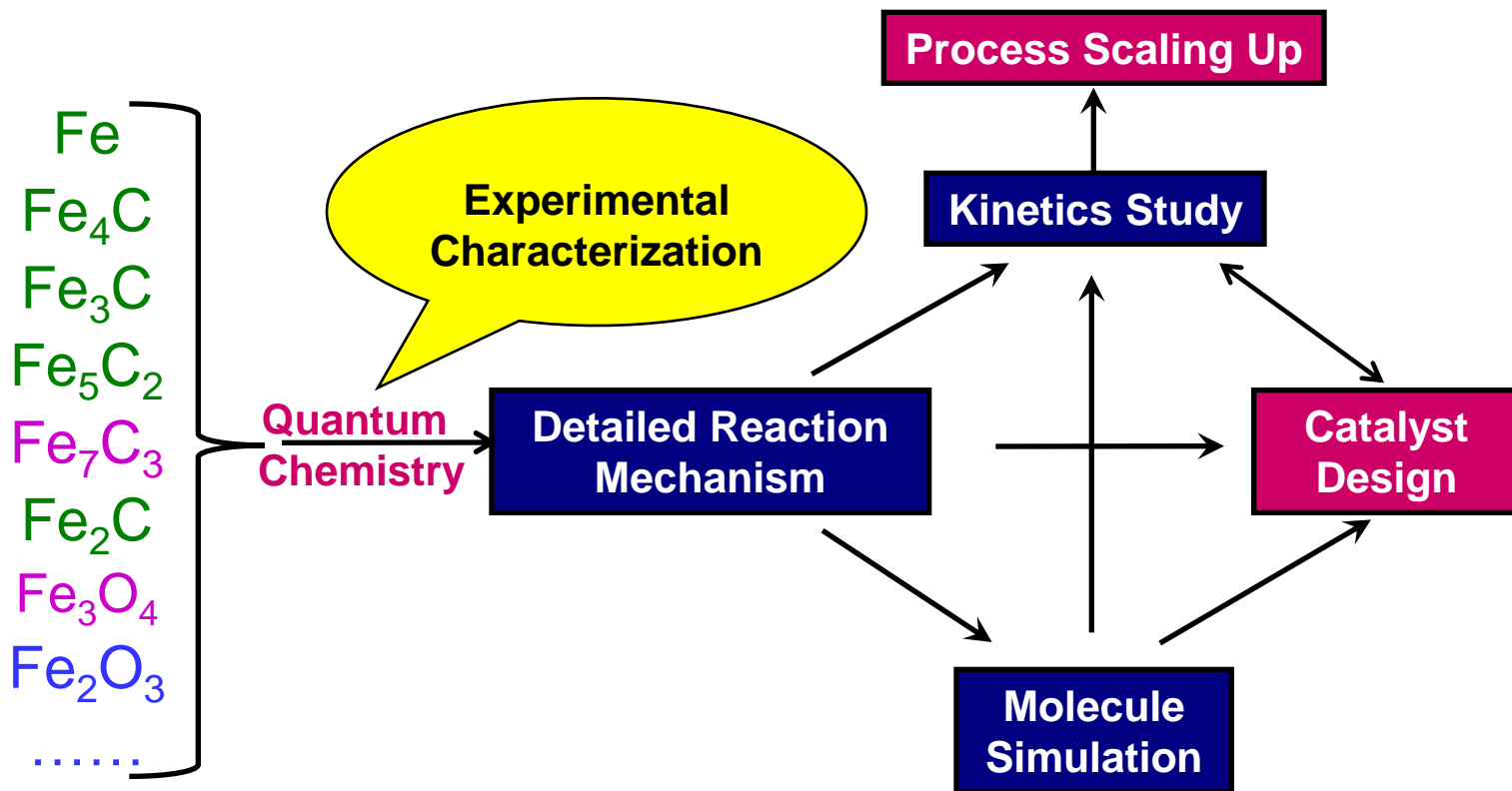
SFC Inner Mongolia Co., Ltd.

SFC Methodology

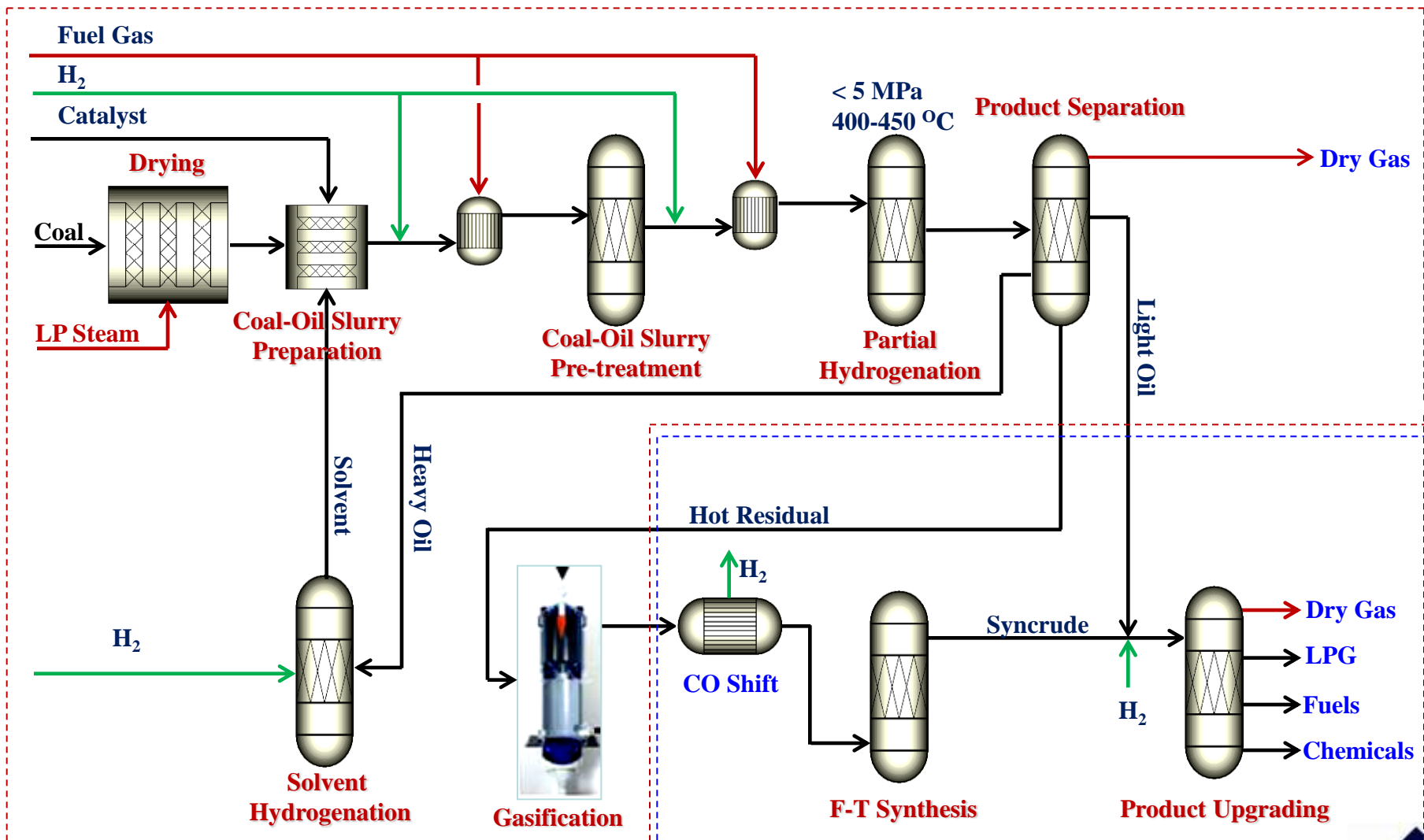


A unique integrated system has been established in SFC to facilitate the R&D and commercialization of SFC technologies.

SFC R&D on F-T Catalyst



Multistage Liquefaction



80BPD Multistage Liquefaction Pilot Plant



Coal Drying



Pipeline Frame



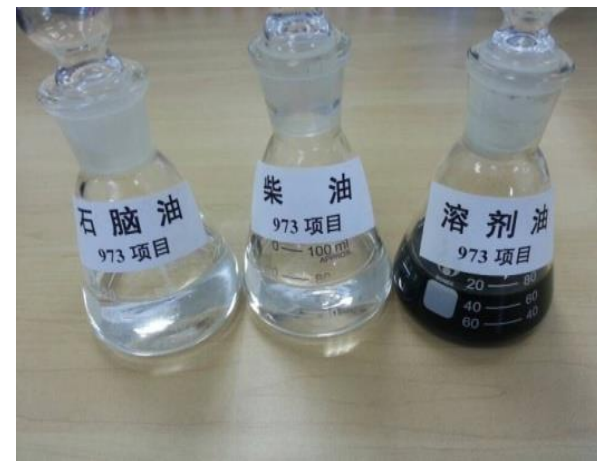
Storage



Furnace



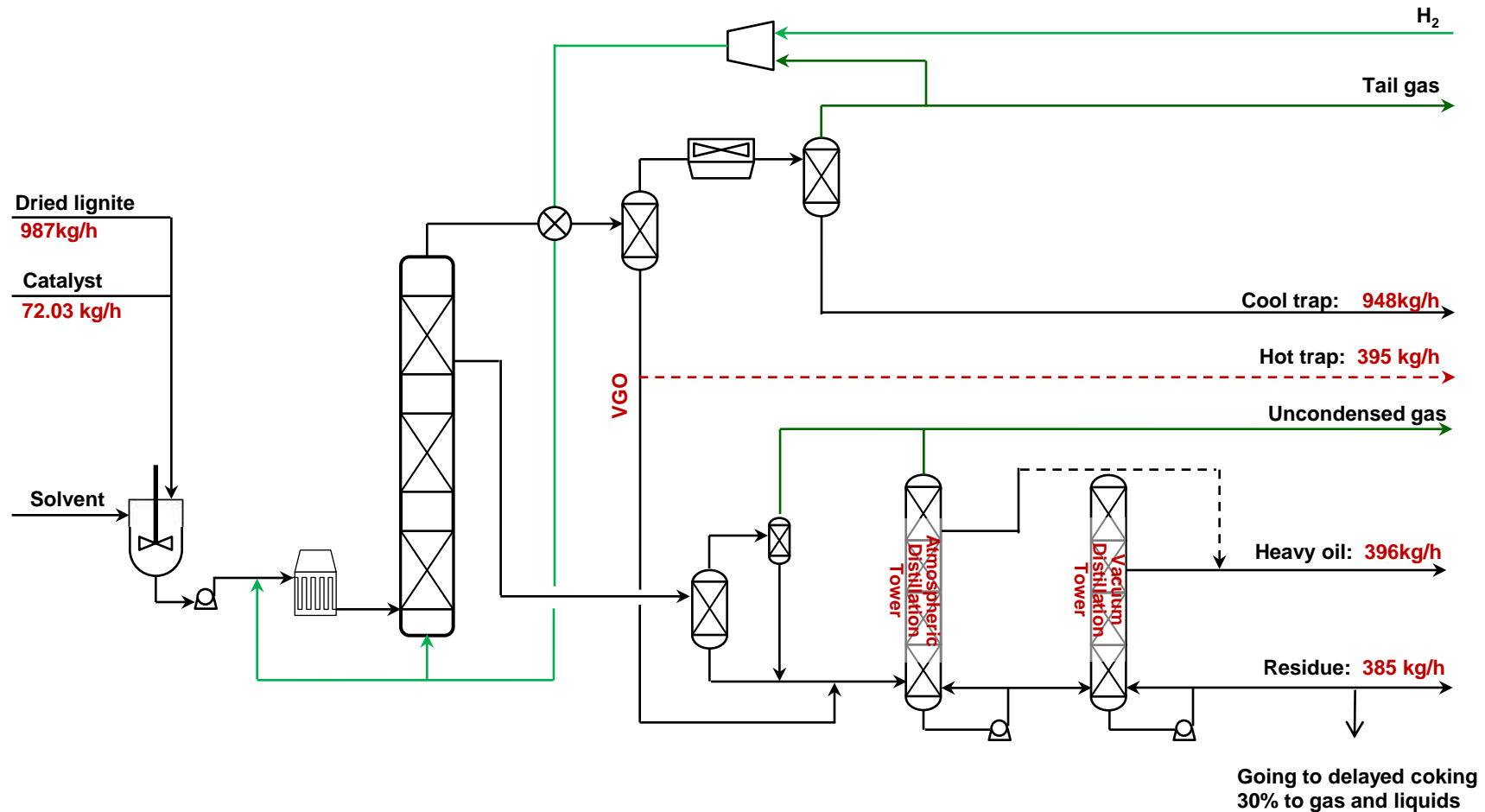
Reactor



Products

80BPD pilot Plant for Multistage Liquefaction

Overall material balance for a typical lignite under ~50 bar and 400-450°C



Coal slurry: 44-45%, Conversion: 88%, oil yield: 44.5%

Heavy Oil Upgrading



Feedstock Analysis

Density	20 °C, g/cm ³	1.0005
	API	9.9
Simulated Distillation	IBP	211.4 °C
	<370°C	11.40%
	<520°C	35.80%
	<720°C	63.60%
Elementary Analysis	C, wt%	86.08
	H/C, mol	11.01
	H, wt%	1.53
	N, wt%	0.94
	S, wt%	0.44
Other Properties	Ash, wt%	0.12
	H ₂ O, wt%	0.40
	Carbon Residue, wt%	13.66
	Asphalt, wt%	12.40

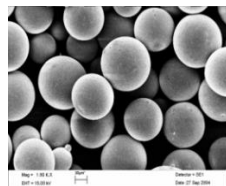
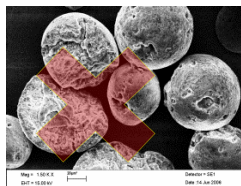
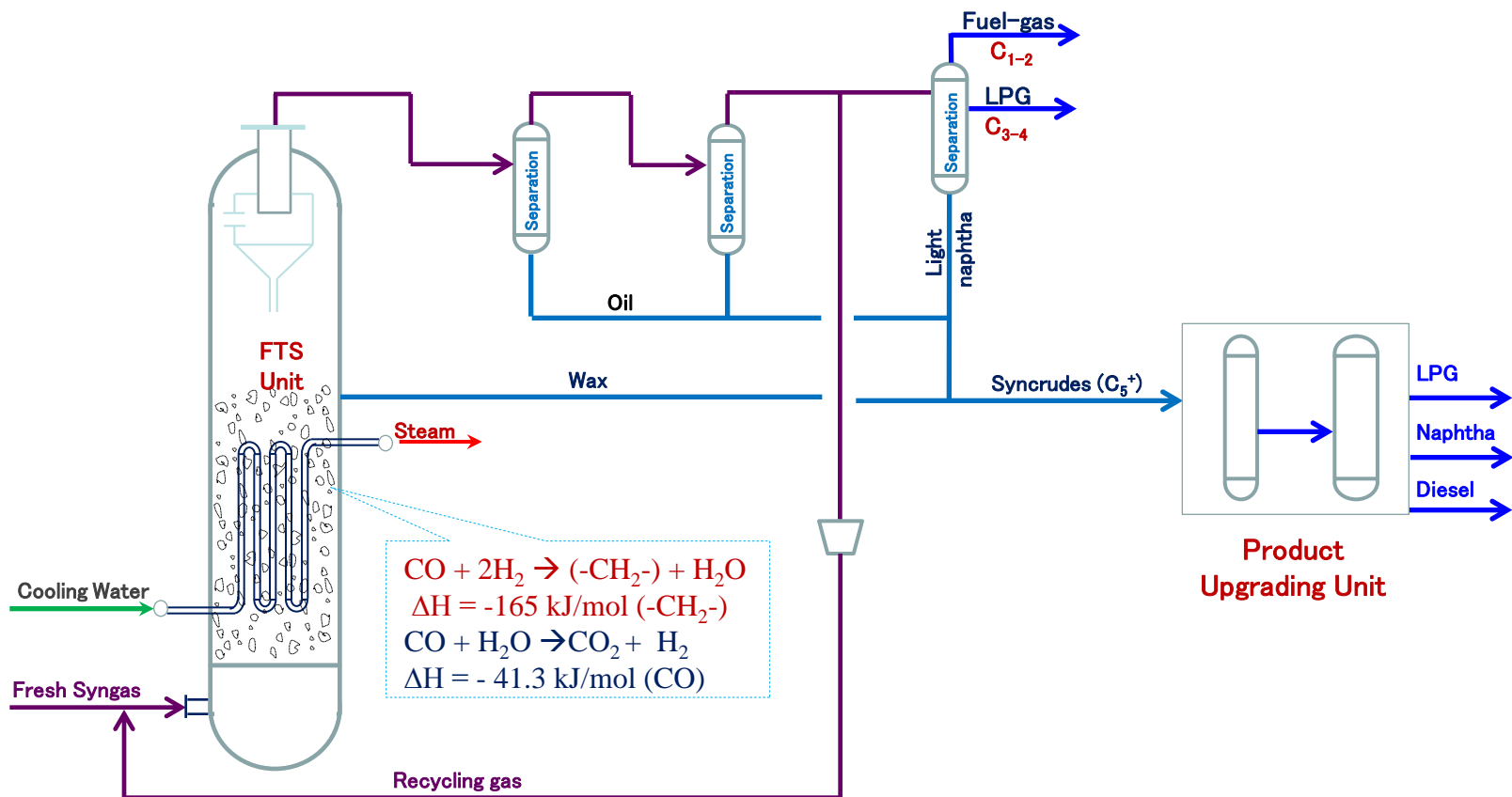
Product Yield

C ₁ -C ₂	1.29%
C ₃ -C ₄	0.70%
<150 °C	1.71%
150-370 °C	54.96%
370-520 °C	27.19%
H ₂ O	1.69%

Note: once-through data

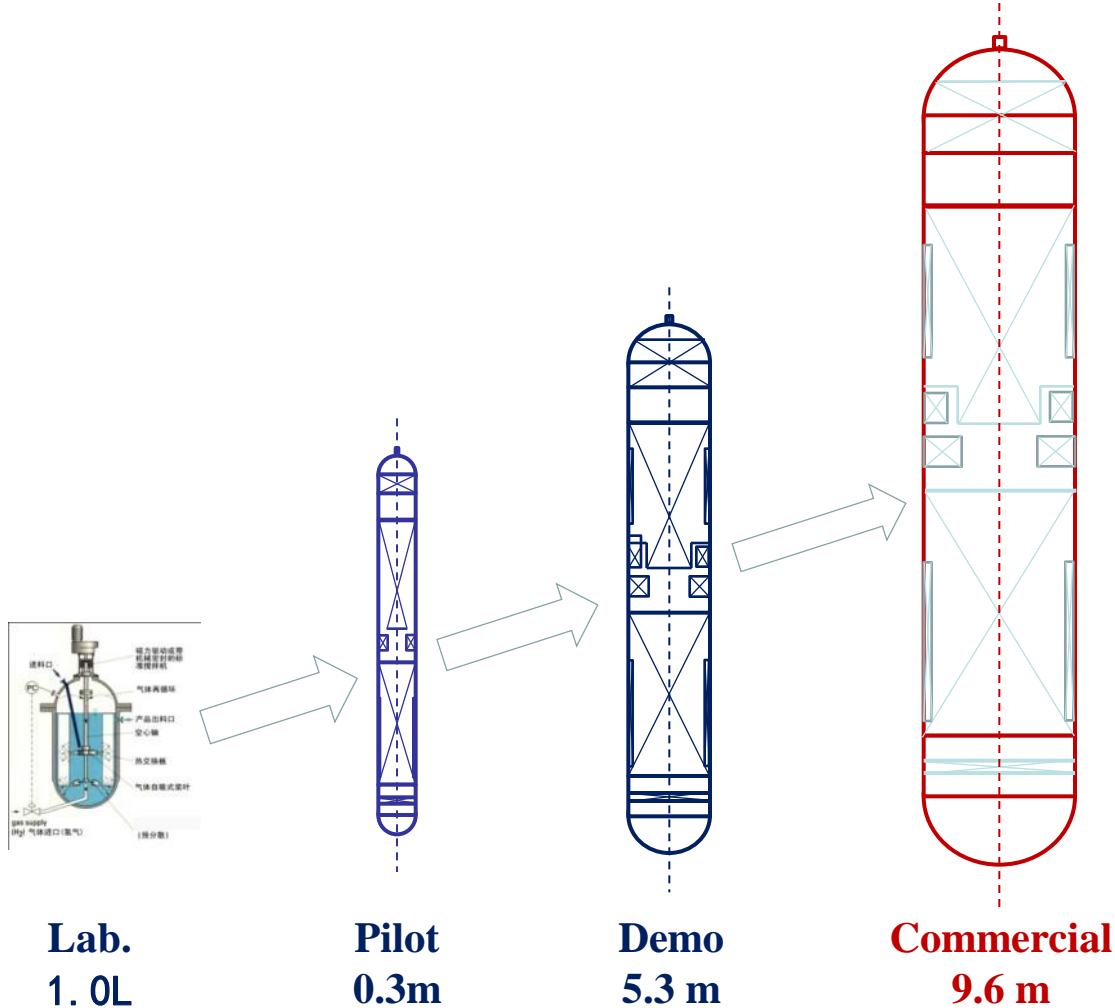
Operating conditions: 400-500 °C, 4-5 MPa, Oil Yield 85-90%

SFC HTSFTP Technology



- Catalyst Features:**
- ✓ high activity
 - ✓ excellent selectivity
 - ✓ high attrition resistance

Scaling Up of F-T Slurry Reactor



Process Parameter
capacity, gas velocity

Case Dimension,
internals requirement

Internals Design
cold experiment
allocation
heat exchangers

Material
manufacture
field assembly
installation

9.6 m reactor technology



Three Demon Plants Using HTSFTP

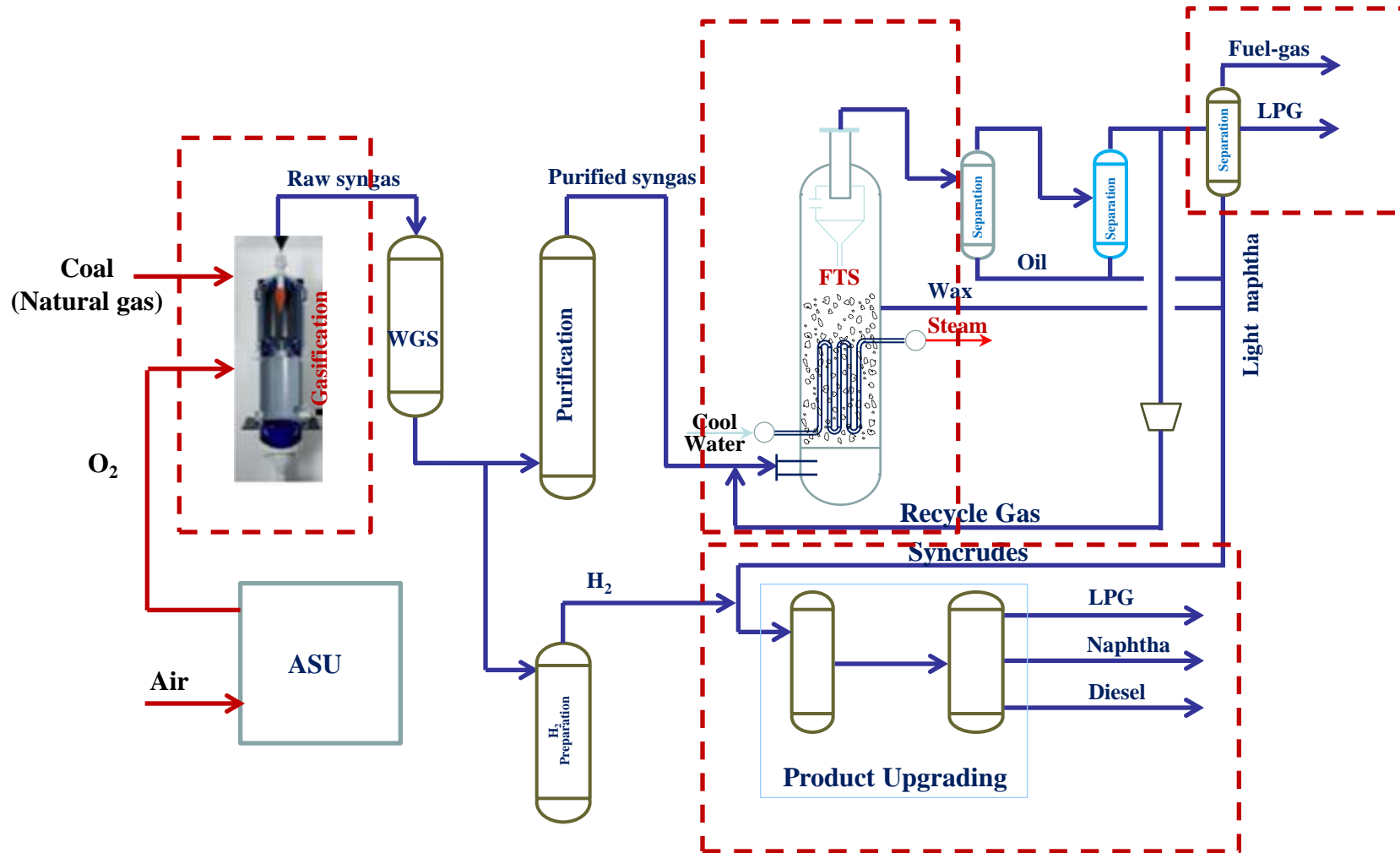


- ❖ **Yitai CTL plant:** coal-water slurry gasifier, 4000bpd, Inner Mongolia
- ❖ **Lu'an CTL plant:** fixed bed gasifier (Lurgi), 4000bpd, Shanxi
 - Constructed between 2005 and 2008, commissioned in 2009
 - F-T Reactor Diameter: 5.3m (Yitai), 5.8m (Lu'an)

Shenhua Ningmei 100,000 BPD CTL plant and Luan 25,000 BPD CTL plant are under construction in China to produce diesel as main oil product, using Synfuels China HTSFTP technology. Both plants are to be commissioned late 2016.

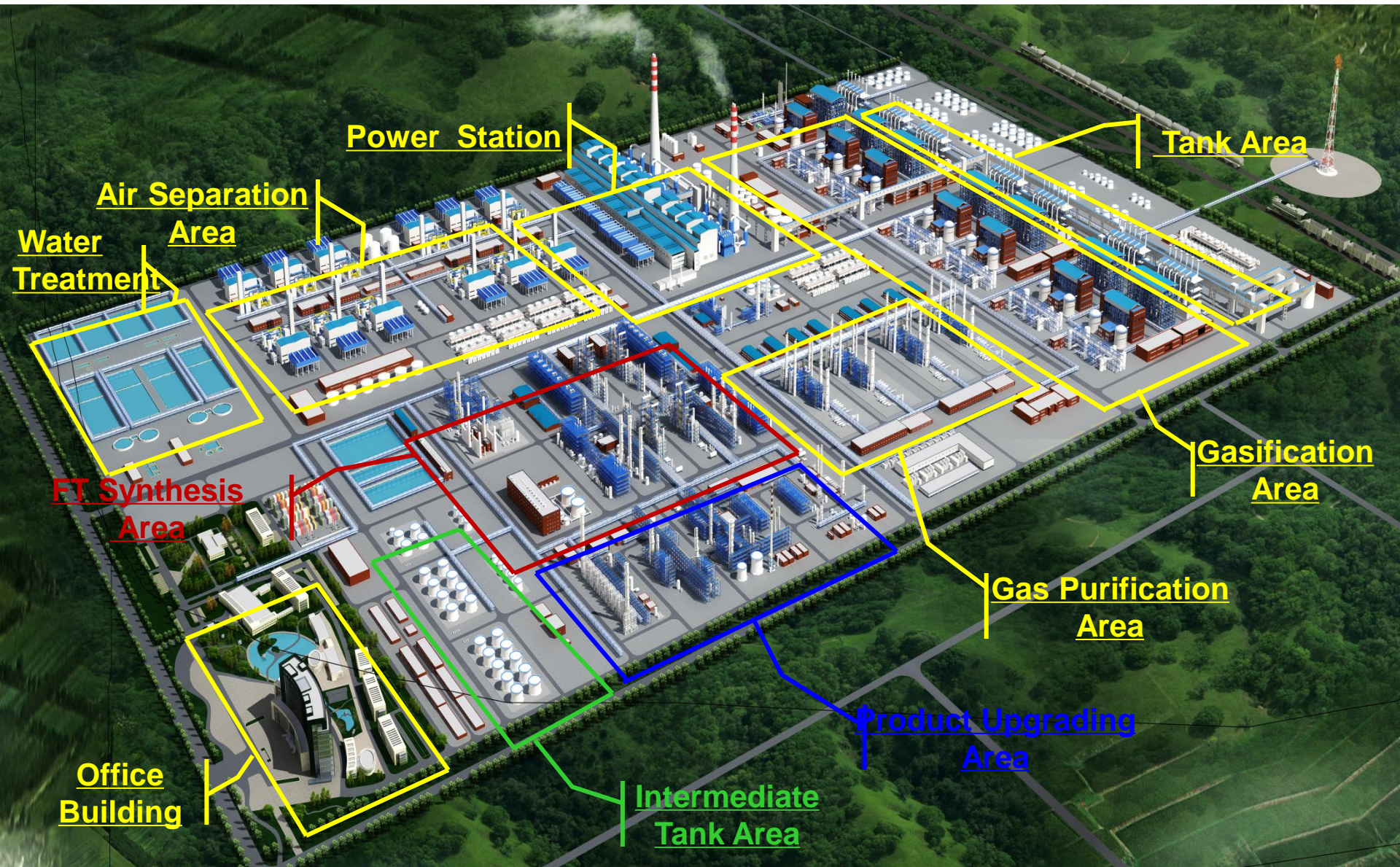


Optimized Integration of Processes



SFC HTSFTP can be integrated with various commercial gasification technologies using different feedstocks such as residual from heavy oil processing, coal, natural gas, biomass, etc.

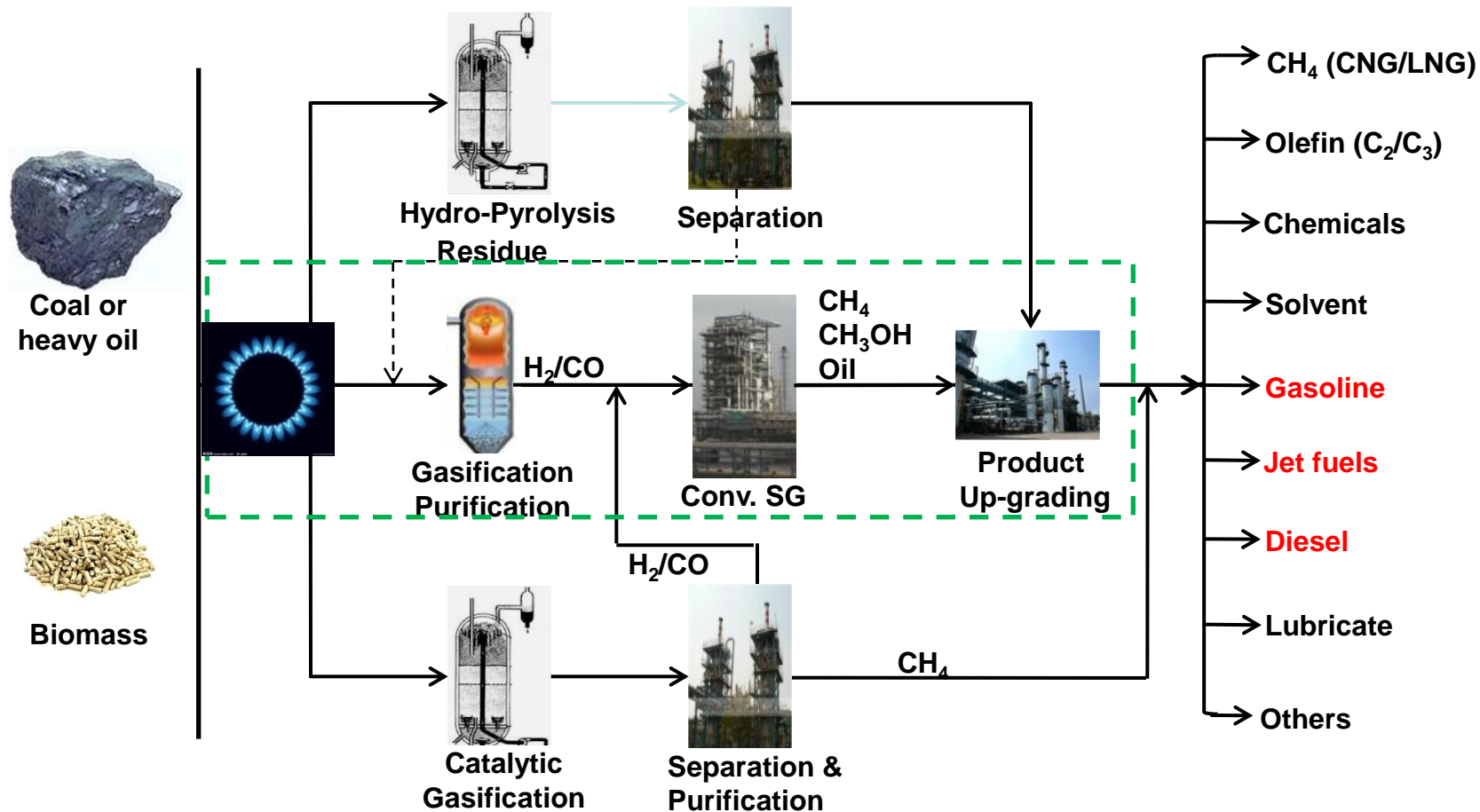
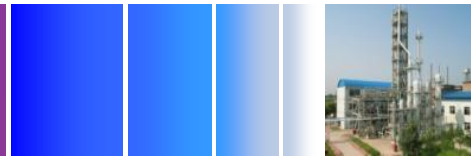
Ningmei 100,000 BPD CTL Plant



Ningmei 100,000 BPD CTL Plant



SFC Integrated Processes



Clean and efficient use of “hard” materials where/when lack of oil supply.

Conclusions



- ◆ **Synfuels China has developed proprietary Multistage Liquefaction technology for heavy oil upgrading and low-rank coal such as lignite. For a typical heavy oil with a API of 9.9, once-through oil yield reaches 85%. For a typical lignite, conversion is 88% with an oil yield of 44.5%.**
- ◆ **SFC's proprietary High Temperature Slurry F-T Process (HTSFTP) Technology has been successfully applied in two 160 kt/a CTL demon plants in China. Two large-scale CTL projects (100,000 BPD and 25,000 BPD) are under construction in China using SFC HTSFTP technology, to be commissioned in 2016.**



THANK YOU

OUR EXPERTISE ENERGY IN FUTURE 我们的事业，能源的未来