



China Methanol to Olefin (MTO) Technology & Industrialization Progress

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MTO technology background

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Overseas Market Prospect



Olefins are the base for modern chemical industry

Olefin

Synthetic Resin

Polyacetal

2 Phenyl Methane
Diisocyanate

Acetate
Monomer

Acetate

Acetic Acid
Ethyl Ester

PTA

Gasoline
Additive

PP/PE

Fuel Oil

Construction

Automobile

Electronic

Application

Coating

Insulating
Material

Pharmaceutical

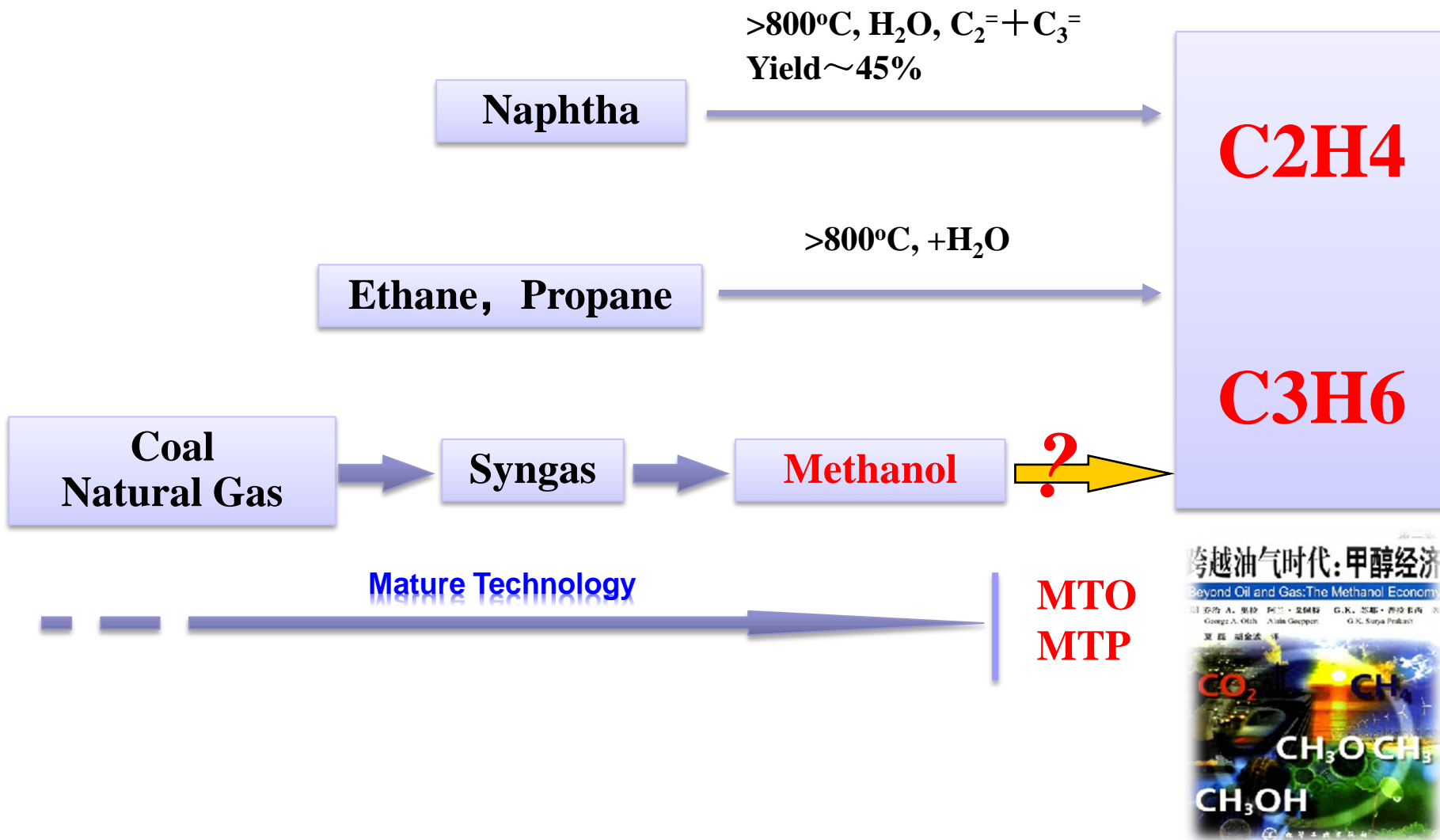
Packing

Solvent
Adhesive





Methanol is a bridge connecting coal chemical and petrochemical industries





SYN Overview



- Demo plant was successful
- SYN Energy Technology Co., Ltd
- License DMT0 globally

- DMT0-II Commercial Plant
- Overseas Business Department

In 2004

In 2006

In 2010

In 2014

- Demonstration



- Baotou DMT0 plant





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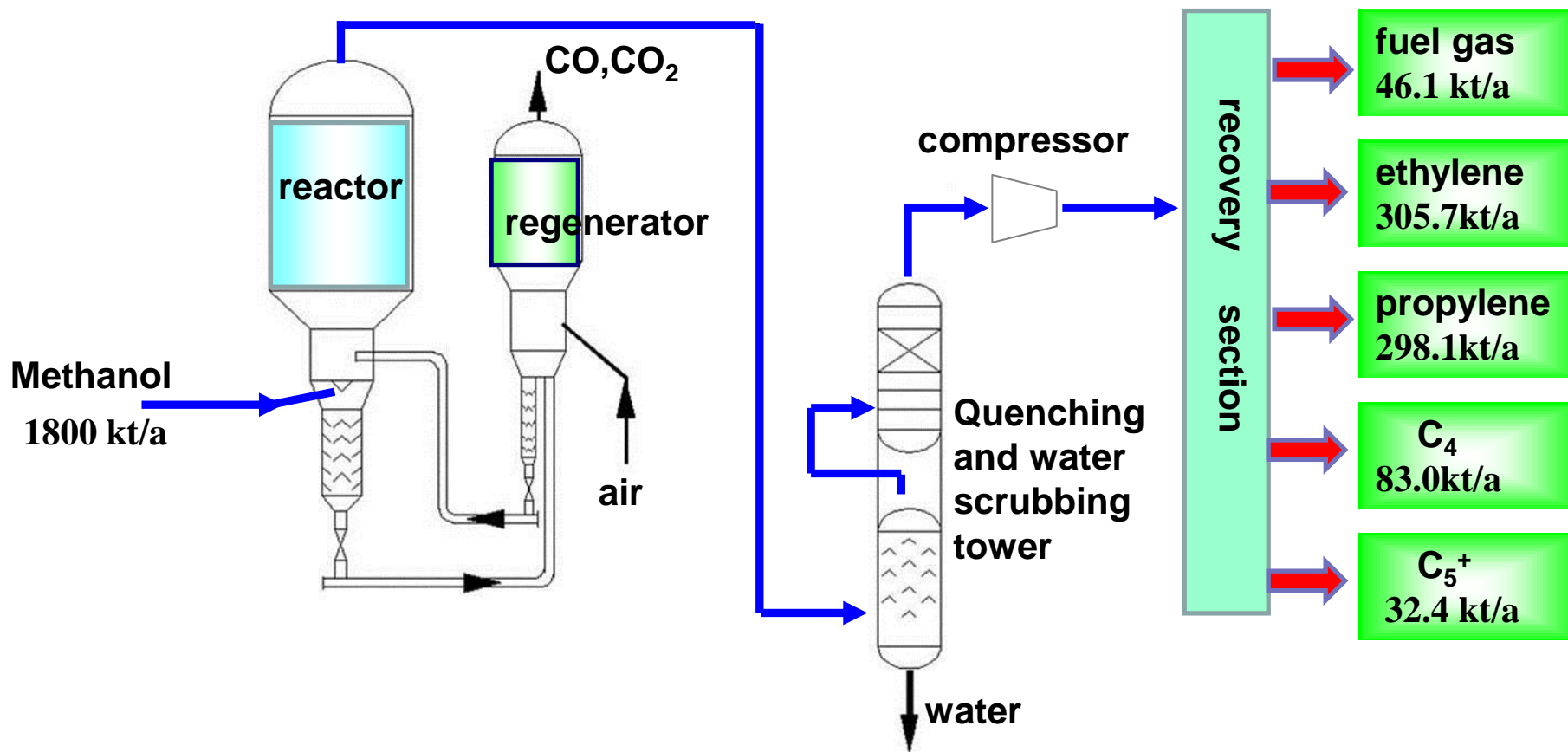
MTO Commercial Plants

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Overseas Market Prospect



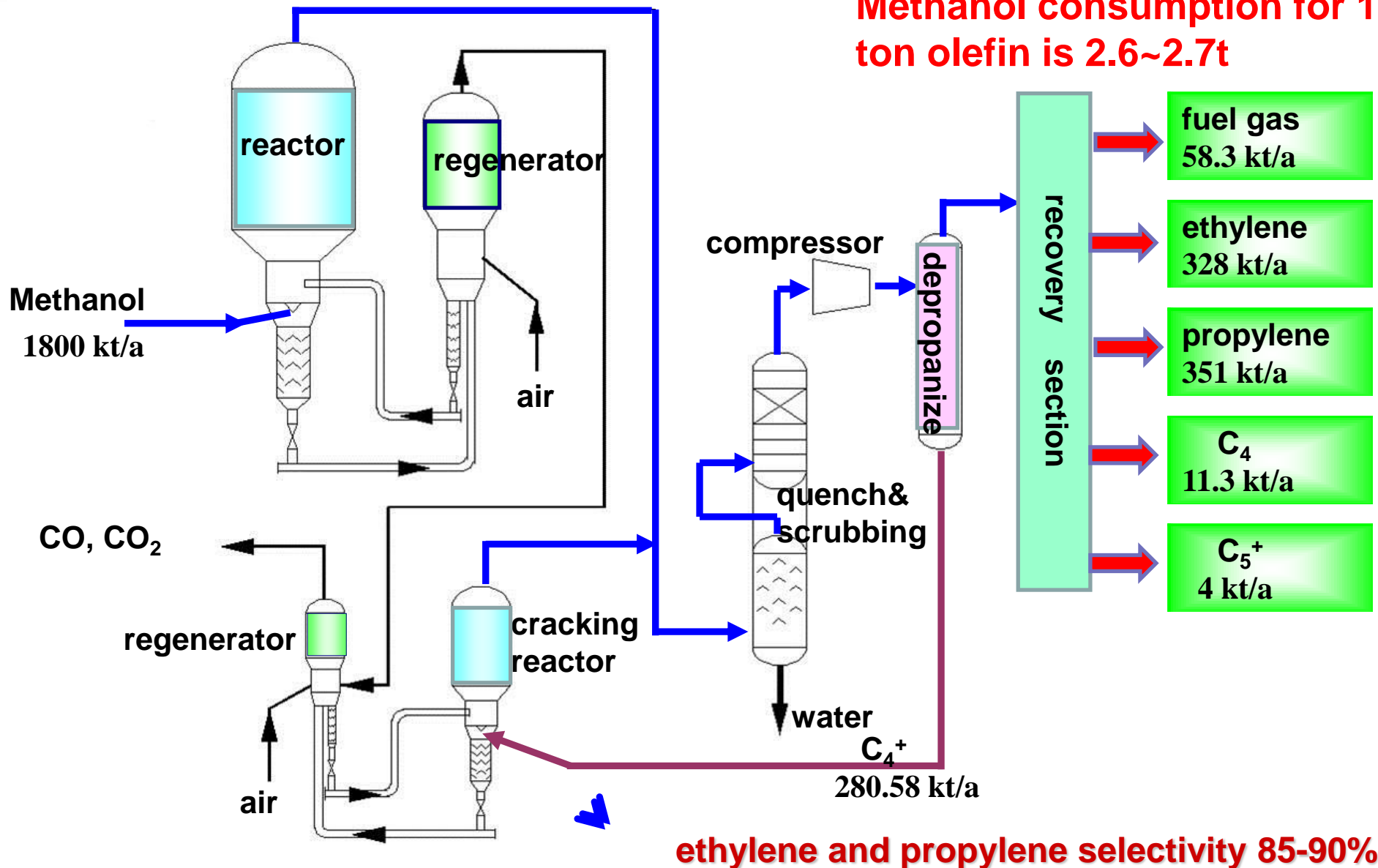
DMTO Technical process



Methanol consumption for 1 ton olefin is 2.96 ton
ethylene and propylene selectivity ~80%

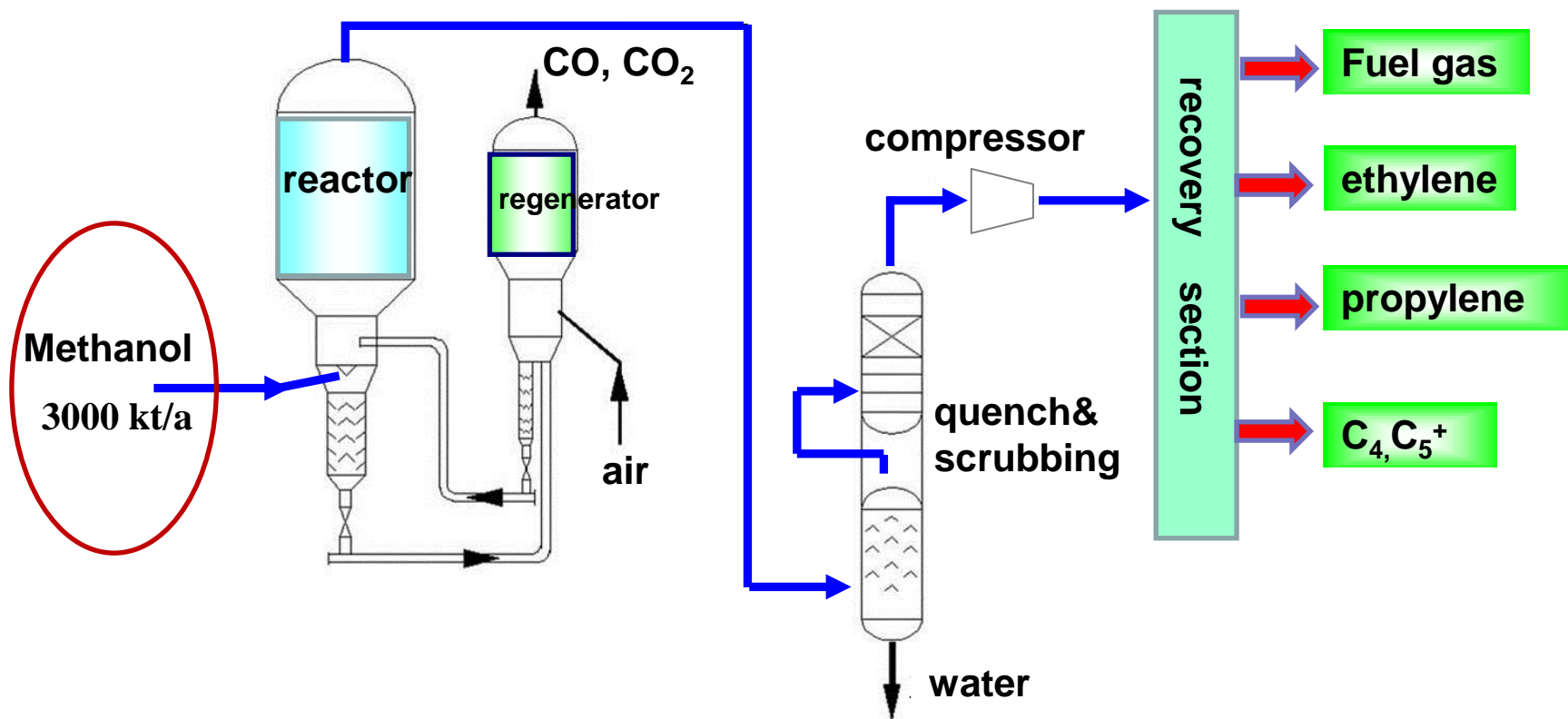


DMTO-II Technical process





DMTO-III Technical process



- ◆ New generation DMTO catalyst
- ◆ Methanol treatment capacity: 3000 kta
- ◆ Olefins output: ~1100 kta

~2.6 tons MeOH → 1 ton Olefin

Selectivity of Ethylene and Propylene ~90%



Advanced technology-DMTO IP Right

- DMTO filed patent applications and was granted in China and overseas markets.
 - Applied 167 patents in China and 77 granted
 - 24 patents in PCT, 75 patents applied overseas and 11 granted
- SYN licensed the DMTO process worldwide.

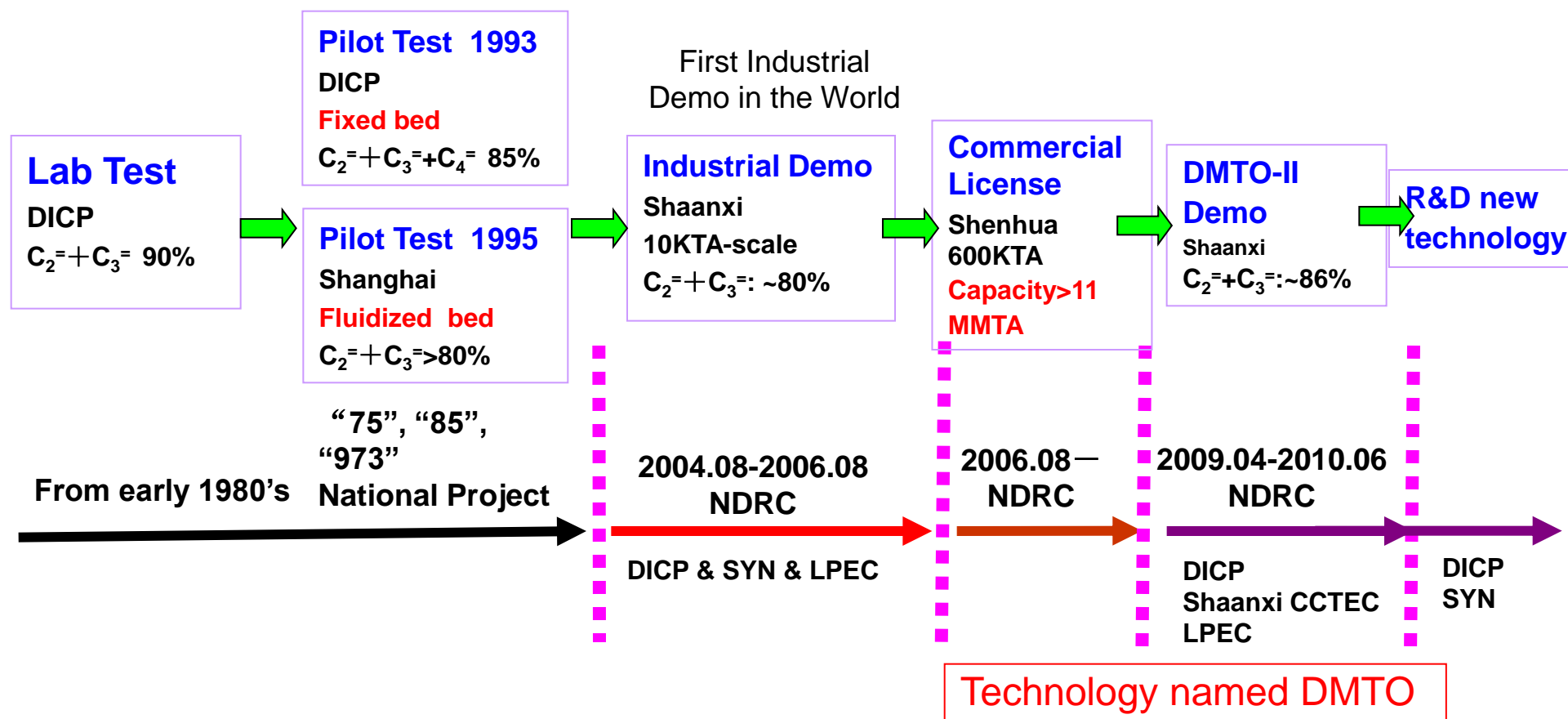




Advanced Technology

- DICP first demonstrated good performance of SAPO-34 molecular sieve catalysts in MTO reaction.

(Applied Catalysis, Vol.40, No1-2, p316, 1988 ; Applied Catalysis, vol.64, p31-40, 1990)





A precise development process to ensure the liability and safety of DMT0 technology



Pilot Test



**Industrial
Demo**



**DMTO
Commercial
Plant**



**DMTO II
Commercial
Plant**

Methanol Feeding ~ 120 kg/d

~ 50,000 kg/d

~ 5,500,000 kg/d

~ 5,500,000 kg/d

Gas velocity ~20cm/s

~1m/s

~1-1.5m/s

~1-1.5m/s

Bed type bubbling

bubbling

turbulent

turbulent

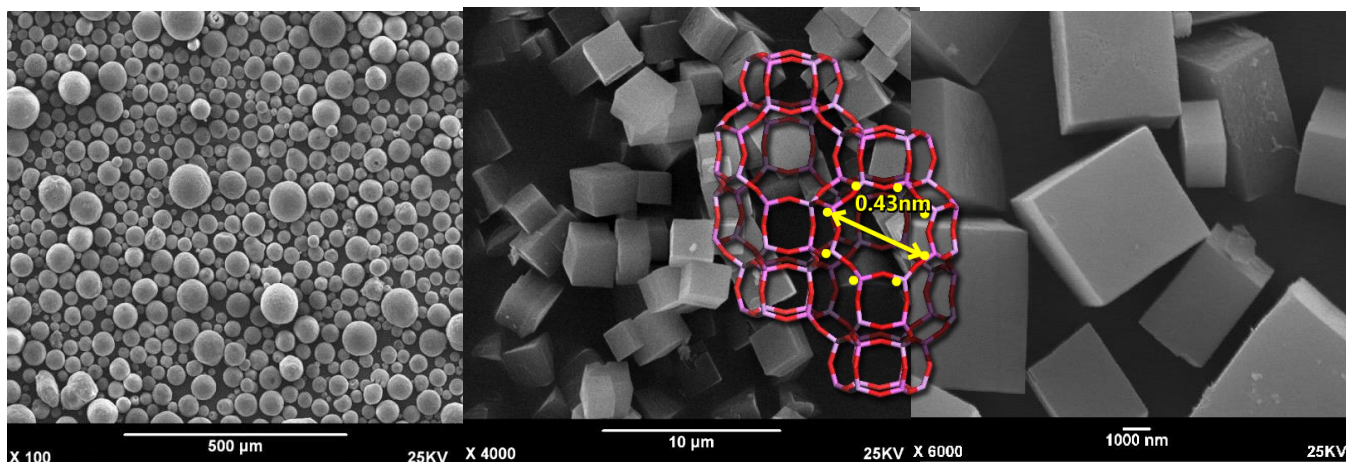


Stability of catalyst supply

Chia Tai energy material Dalian Co., Ltd
Commissioned in 2008, production capability is 7500 tons per year.

UCC first invented SAPOs in 1982 (USP4440871)

DICP first demonstrated good performance of SAPO-34 in MTO reaction



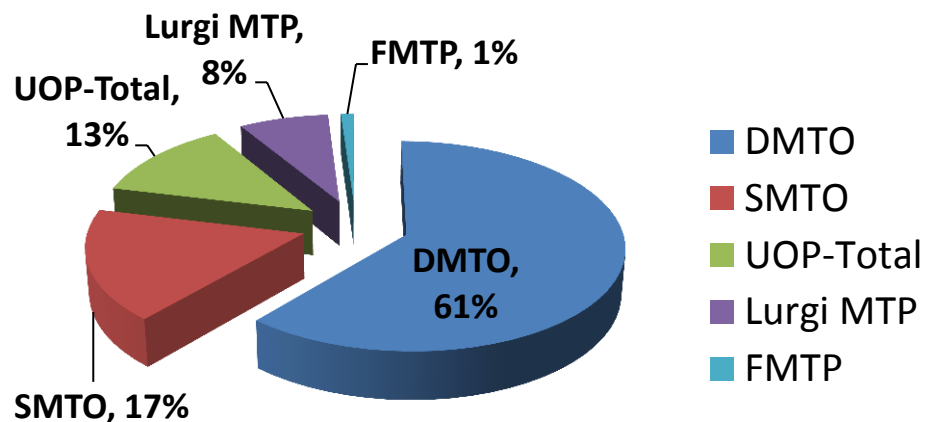
Methanol Molecule



Largest Market Share

Licensors of MTO or MTP in the China Market

licensor	No. of Contracted plants	Olefin capacity/MMT
SYN/LPEC DMTO	20	11.26
Sinopec SMTM	5	3.2
UOP-Total MTO	5	2.3
Lurgi MTP	3	1.4
FMTP	1	0.2
Total	34	18.36





Largest Market Share

Table .1 Number of contracted plants and total olefin capacity of different licensors

Licensor	SYN/LPEC-DMTO	UOP/Hydro-MTO	Sinopec-MTO
Contract Plant Number	20	5	5
Total Olefin capacity (million ton/a)	11.26	2.3	3.2
Market Share	67% ★	14%	19%

Table .2 Number of commercial MTO plants currently in operation and olefin capacity of different licensors (up to August 2016)

Licensor	SYN/LPEC-DMTO	UOP/Hydro-MTO	Sinopec-MTO
Commercial Plants Number	10	2	1
Total olefin capacity (million ton/a)	5.8	0.585	0.2
Market Share	88% ★	9%	3%



CTO&MTO plants on operation (up to Sep 2016)

No.	Project	Methanol (kta)	Olefin (kta)	Start-up time	Remarks
1	Shenhua (Baotou)	1800	600	2010.8	DMTO
2	Sinopec Zhongyuan Petroleum(Puyang)	600	200	2011.10	Sinopec-MTO
3	Fund Energy (Ningbo)	1800	667	2013.1	DMTO+OCU
4	Wison(Nanjing)	800	295	2013.9	UOP-MTO + Total-OCP
5	Yanchang Group(Jingbian)	1800	600	2014.6	DMTO
6	China Coal (Yulin)	1800	600	2014.7	DMTO+OCU
7	Baofeng Energy (Ningxia)	1800	600	2014.10	DMTO
8	Shenda Chemicals (Shandong)	1000	330	2014.11	DMTO
9	PCEC(Shaanxi)	1800	680	2014.12	DMTO-II
10	Zhejiang Xingxing(Jiaxing)	1800	690	2015.4	DMTO+OCU
11	Shandong Yangmeng Hengtong	800	290	2015.7	UOP-MTO + Total-OCP
12	Shenhua (Yulin)	1800	600	2015.12	DMTO
13	ChinaCoal Mengda (Inner Mongolia)	1800	600	2016.4	DMTO
	Total	18400	6752		

Light olefins produced from DMTO account for 88%.



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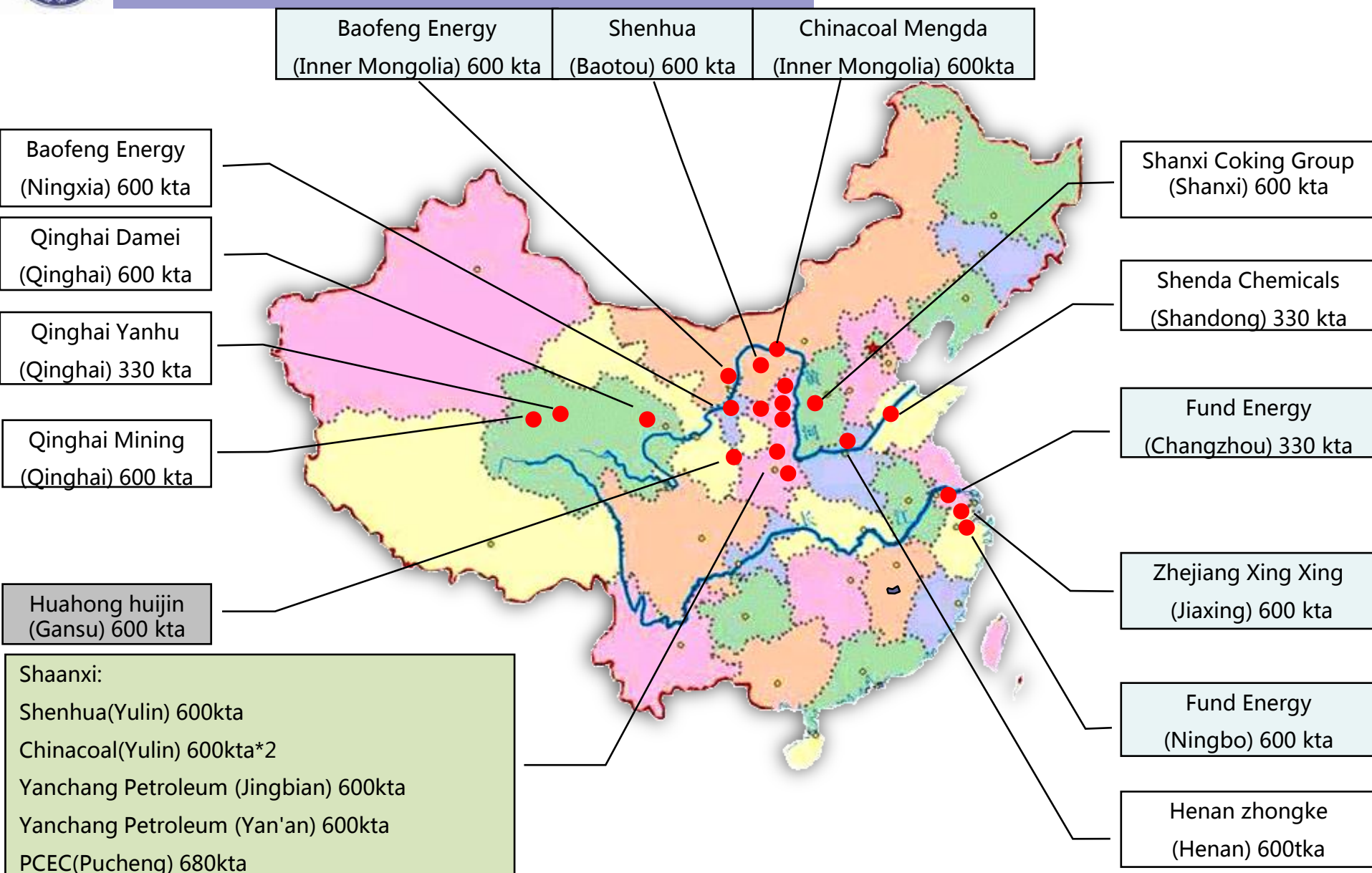
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Overseas Market Prospect

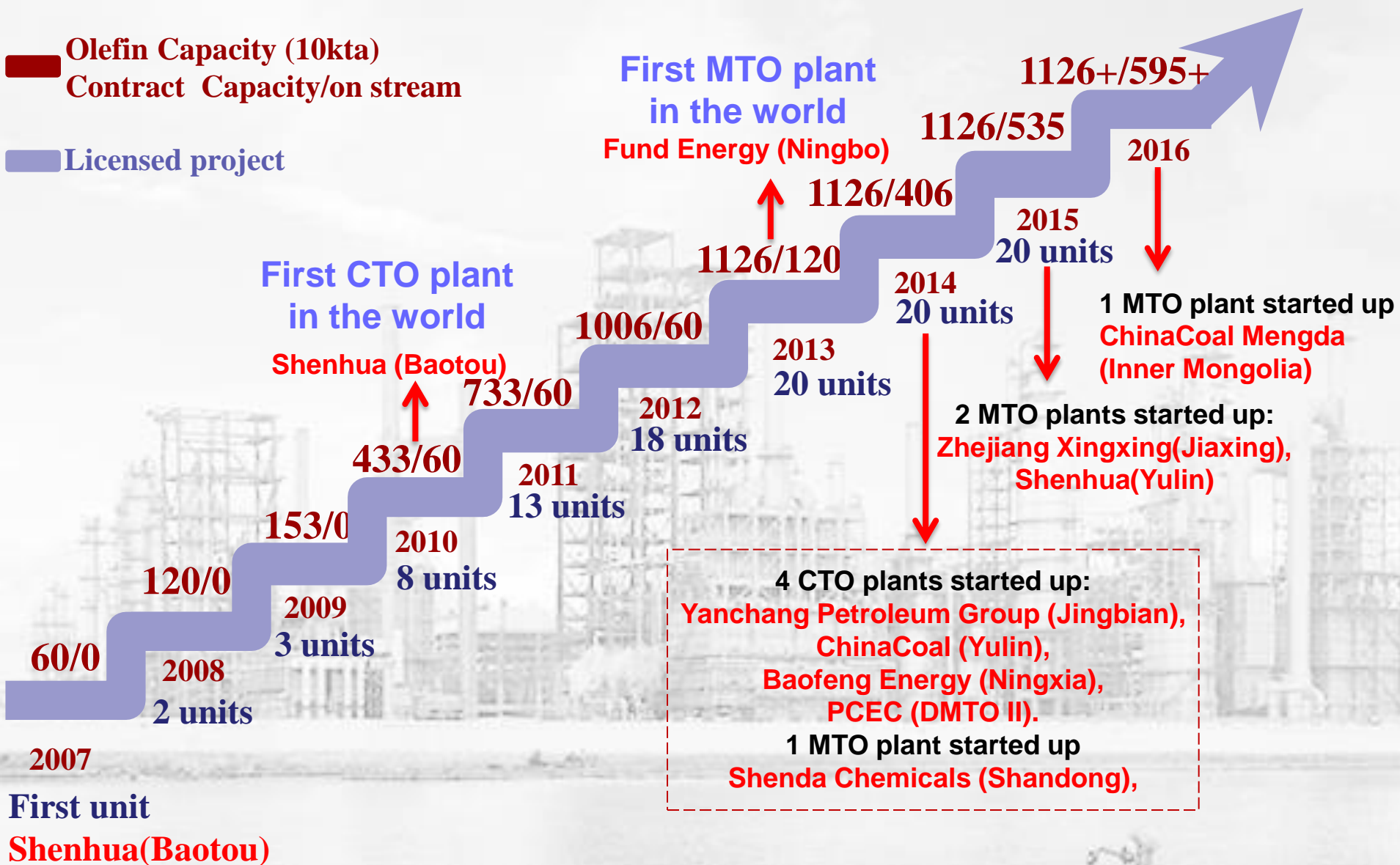


CTO&MTO Reference Plants with DMT0 in China (20 commercial plants with 11.26 million olefin capacity)





DMTO Commercialization Progress





CTO & MTO Plants with DMT0 Process

	Reference Plants	Methanol (kta)	Olefin (kta)	Start-up	Remarks
	CTO Project				
1	Shenhua (Baotou)	1800	600	2010.8	DMTO
2	Yanchang Group(Jingbian)	1800	600	2014.6	DMTO
3	China Coal (Yulin)	1800	600	2014.7	DMTO+OCU
4	Baofeng Energy (Ningxia)	1800	600	2014.10	DMTO
5	PCEC(Shaanxi)	1800	680	2014.12	DMTO-II
	MTO Project				
1	Fund Energy (Ningbo)	1800	667	2013.1	DMTO+OCU
2	Shenda Chemicals (Shandong)	1000	330	2014.11	DMTO
3	Zhejiang Xingxing (Jiaxing)	1800	690	2015.4	DMTO+OCU
4	Shenhua (Yulin)	1800	600	2015.12	DMTO
5	China Coal(Inner Mongolia)	1800	600	2016.4.15	DMTO
	Total Capacity	17200	5967		



World first coal-to-olefin plant in Baotou of China Shenhua Group



Polymerization
units

DMTO unit

Methanol
synthesis unit

Coal supply



Scale: 1,800 KTA Methanol → 600 KTA polyolefin

Approved by NDRC (Dec, 2006)

Construction was finished on May 31, 2010

Have been started operation from 8th, August, 2010



Shenhua Baotou CTO Plant



Time	Polyolefin Production (kta)	Operating Income (×100 million RMB)	Profit (×100 million RMB)	Taxes (×100 million RMB)	Profit & Taxes (×100 million RMB)
Aug-Dec, in 2010	8.2				
2011	502	56.42	9.92	8.00	17.92
2012	546.7	59.1	9.50	7.66	17.16
2013	545	59.9	11.0	8.2	19.2
2014	525	58.8	11.4		
2015	623.8	53.11	3.18	7.63	10.81



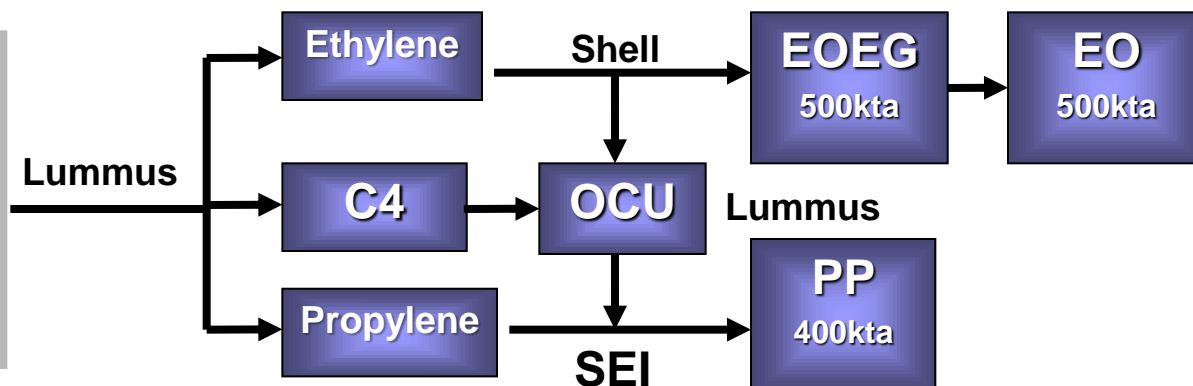
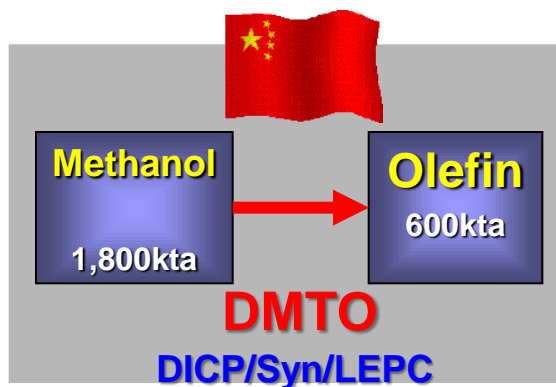
Fund Energy (Ningbo) - First MTO Plant in Coastal area



MTO through outsourcing methanol, total investment 6.7 billion RMB.

- In 2010.2, DMTO license contract was signed.
- In 2010.12, DMTO Process Package completed.
- In 2012.12, DMTO Plant construction completed.

- On 2013.1.28, DMTO plant start up successful.
- On 2013.2.3, polymer grade ethylene and polymer grade propylene were produced.
- From 2013.4.1, DMTO plant began running at full-load.





First MTO Plant in Coastal area-Fund Energy (Ningbo)

- In 2013, methanol price was relatively high. (3100-3300 RMB/Ton)
 - DMTO plant operation load was 97%.
 - Olefin output was 491,000 ton.
 - Net profit was 430 million RMB.
- In 2014, oil price and olefin price both declined.
 - DMTO plant ran 338 days with operation load of 103.2%.
 - Olefin output was 651,000 ton.
 - Net profit was 404 million RMB.
- In 2015
 - DMTO plant ran 320 days on 97.1% operation load
 - Sales revenue was 530 million RMB.





DMTO commercial plants

China Coal (Yulian)



Baofeng Energy (Ningxia)



Shenda Chemicals
(Shandong)



PCEC(Pucheng)



Yanchang Petroleum
(Jingbian)



Shenhua
(Yulian)



Zhejiang Xingxing
(Jiaxing)



China Coal Mengda
(Inner Mongolia)





MTO plants (to be started up in 2016 and later)

No.	Project	Methanol (kta)	Olefin (kta)	Start-up time
1	Qinghai Yanhua (Qinghai)	1000	330	2016
2	Fund Energy(Changzhou)	1000	330	2016–2017
3	Qinghai Damei(Qinghai)	1800	600	2017
4	Qinghai Mining (Qinghai)	1800	600	2017
5	Huahong huijin	1800	600	2018
6	Yanchang Petroleum (Yan'an)	1800	600	2018
7	Shanxi Coking Group(Shanxi)	1800	600	2018
8	Baofeng Energy (Inner Mongolia)	1800	600	After 2018
9	Henan Zhongke(Henan)	1800	600	After 2018
10	China Coal (Yulin) Phase II	1800	600	After 2018
	Total (kta)	16400	5460	



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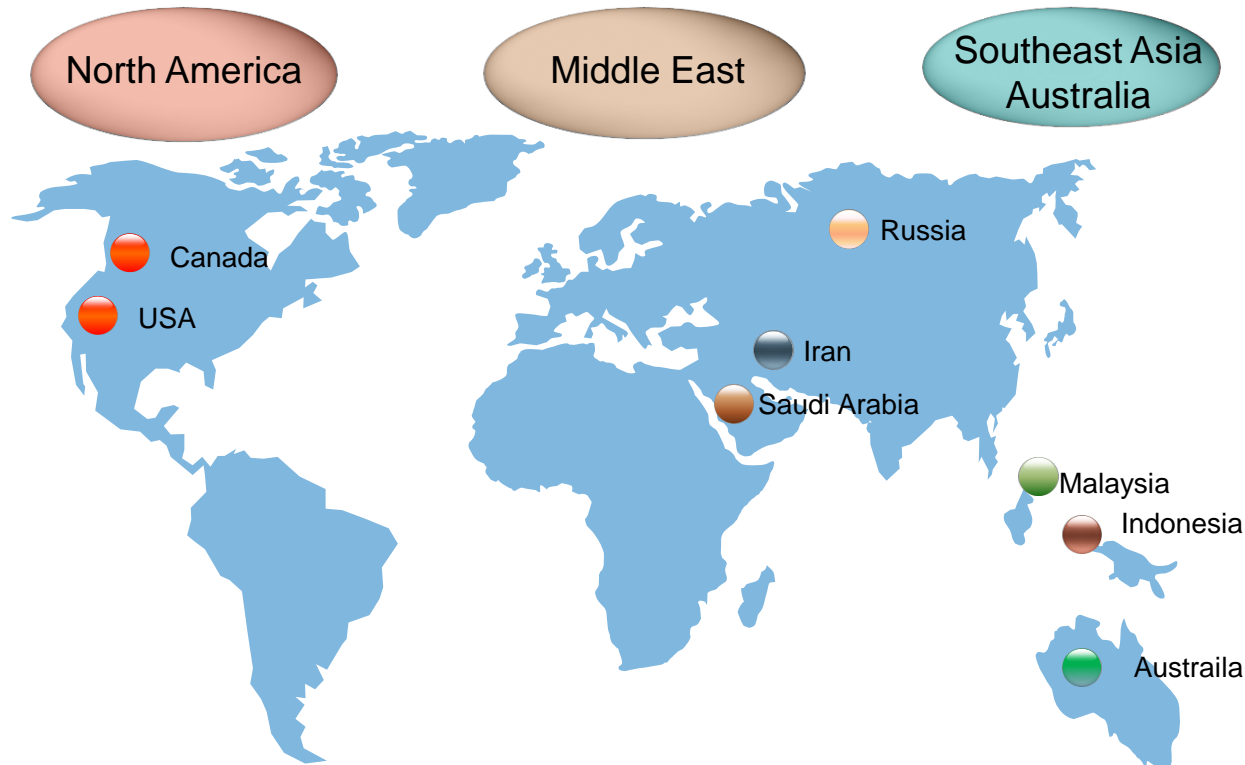
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Overseas Market Prospect



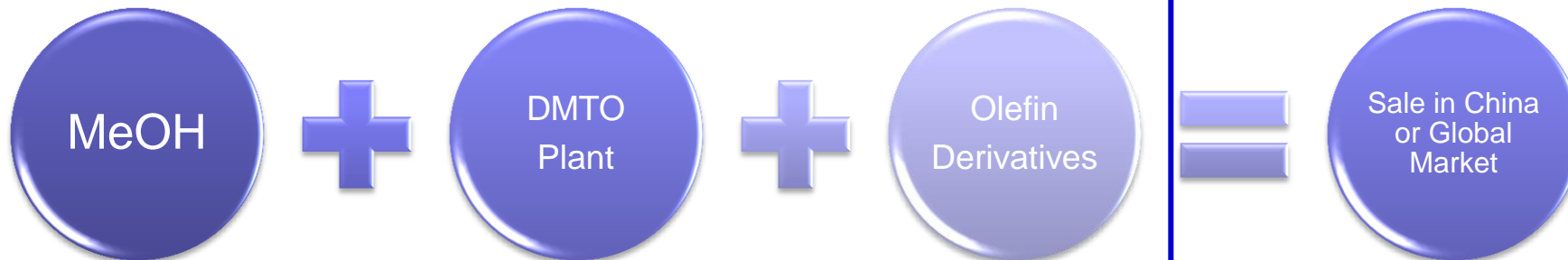
DMTO technology is advanced, well-proven, convincingly-reliable, and could bring a considerable economic profit for the project owner.

We are looking for potential customers, and are able to provide license, PDP, Engineering Design and Technical Service to all the global customers.



Natural Gas-Methanol-Olefin Value Chain

Build DMTO plant outside China based on overseas methanol.



- Exporting methanol will suffer greater price competition.
- 3 ton methanol to 1 ton olefin, lower freight rate.



Thank you for your attention

