

Running Report on ZYPC MTO Plant



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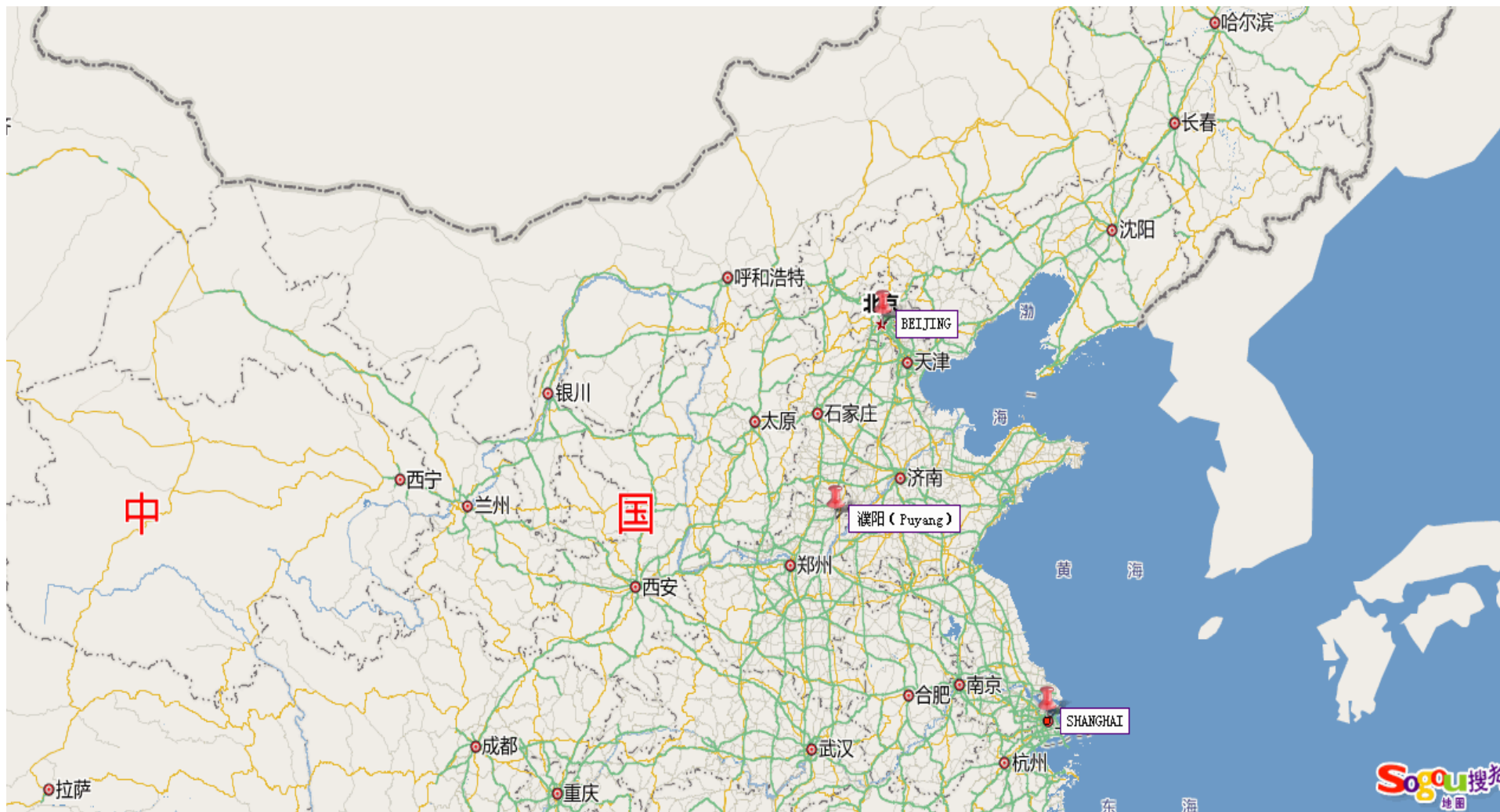
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Introduction of ZYPC



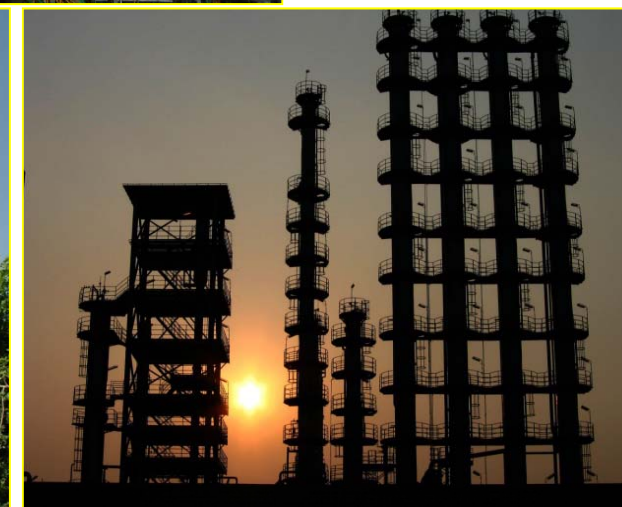
The Location of ZYPC



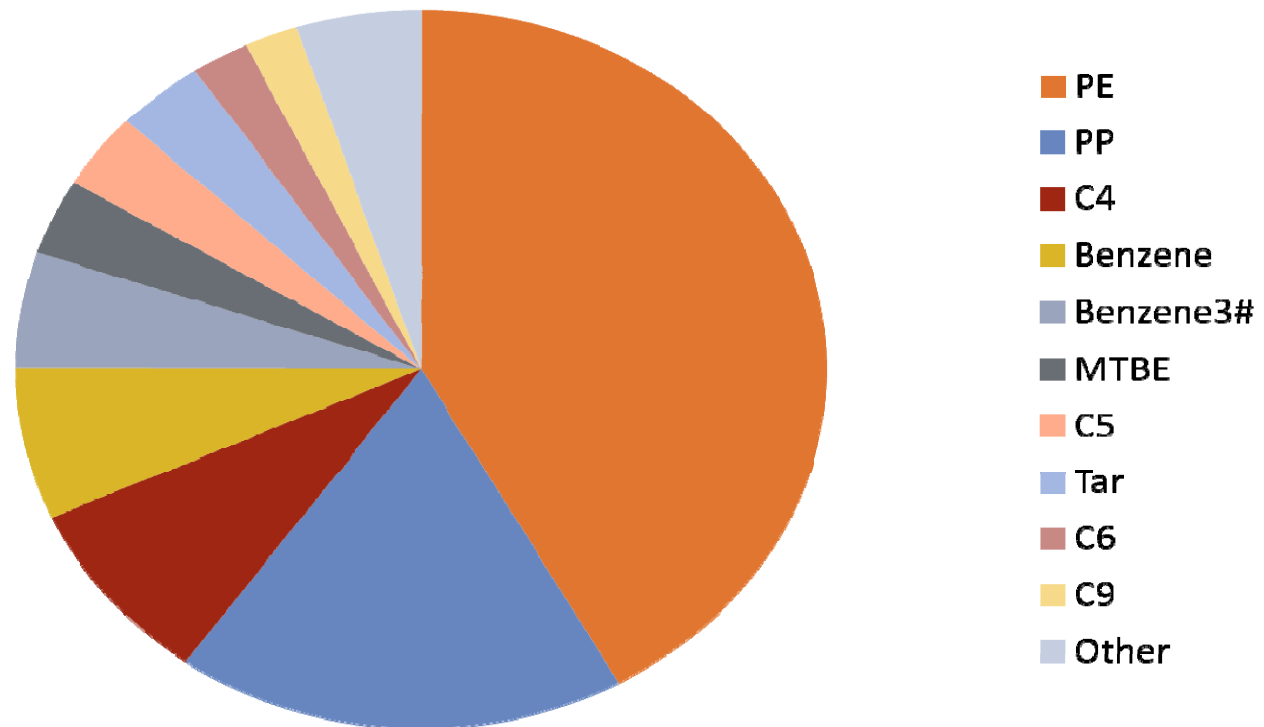
Plants and Facilities



ETHY	MTO	
PE	PP	BUTENE



Main Products (535,134 tons in 2015)



Products and Applications



Brief Introduction of all 10 Plants

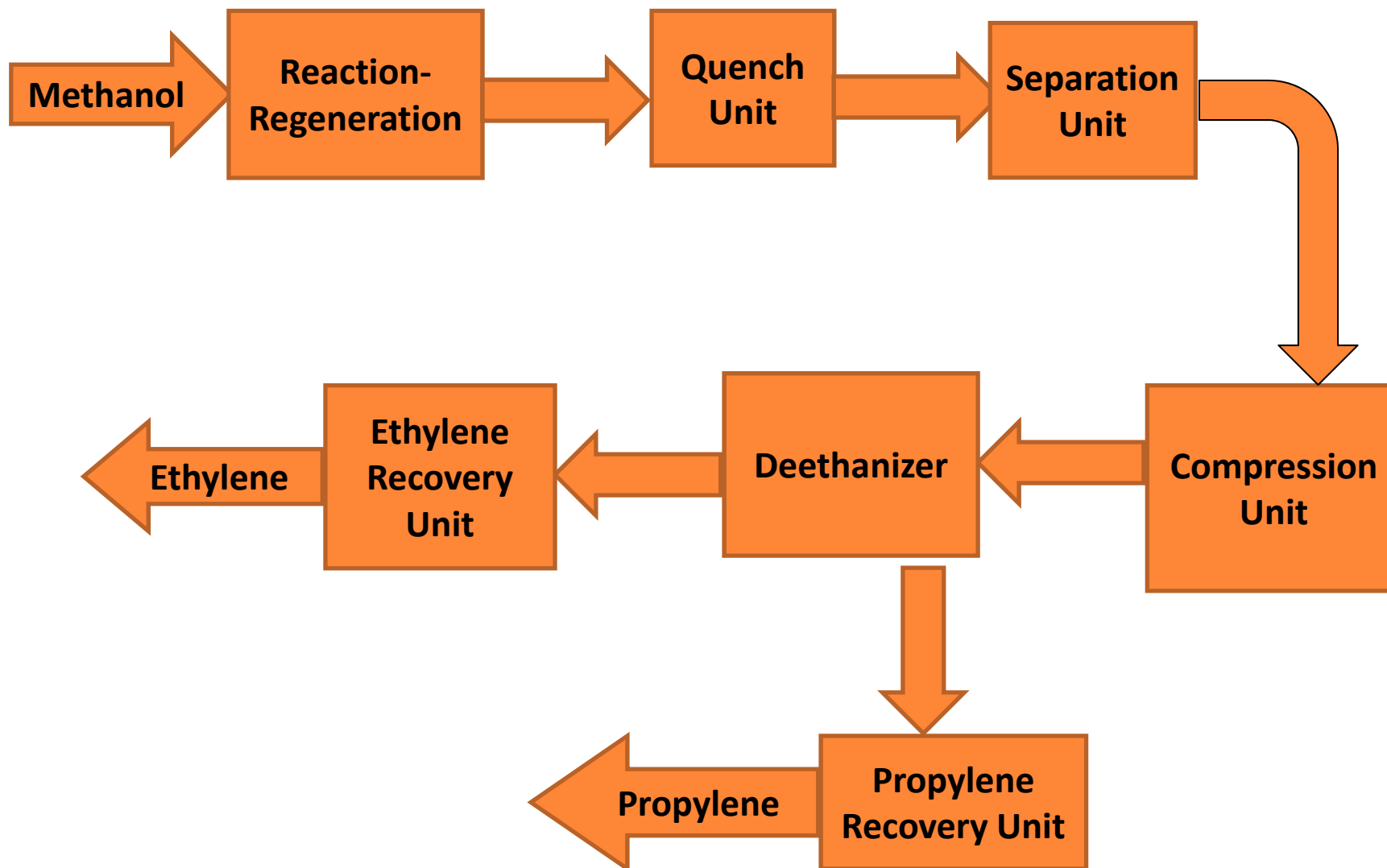
unit: KTA

Plant	Ethylene	MTO	PE	No. 1 PP	No. 2 PP	DPG	Benzene	Butene	OCC	PSA to H2
Design	180	200	200	40	100	60	50	50	60	4670Nm ³ /h
Year of Start Up	1996	2011	1996	1996	2011	1996	2005	2005	2009	2005
Max Output	215	232	260	85	100	100	100	50	60	2.7

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Overview of the MTO Plant





Methanol Transferring



Olefin Recovery



➤ **The License, engineering and construction of the MTO project**

- ✓ **The license: S-MTO**
- ✓ **The engineering company: SEI (Sinopec Engineering Incorporation)**
- ✓ **The construction company: No .10 Construction Company ,SINOPEC**
- ✓ **The supervision company: Beijing Huaxia Supervision Corp. ltd .**

- **The MTO project laid foundation on April 4,2010**
- **Pile foundation started on August 15,2010**
- **Mechanical completion on August 10,2011.**
Construction period within 1 year
- **Commissioning started on Oct 10,2011**
- **Started up successfully two months after the mechanical completion**
- **Only 14 months from the pile foundation to feedstock startup**
- **The MTO Plant run smoothly and safely, with high quality and high efficiency**
- **Realized the industrialization of SINOPEC Methanol To Olefin Technology**



Outline of the MTO Plant

	Item		Unit	Remark
1	License	S-MTO		Sinopec
2	CAPEX	825	million yuan RMB	land -use cost not included
3	Floor Area	2.37	hectare	245.5 meters long, 96.6meters wide
4	Employees	74		
5	Annual operation time	8000	hours	

Equipments and materials in the MTO Plant

	Equipments/materials	Unit	Quantity
1	Process	set	417
2	Electricity	set	570
3	Instrument	set	4244
4	Pipeline	km	87.442
5	Power cable	km	127.455
6	Signal cable	km	324.630

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Operation and Performance



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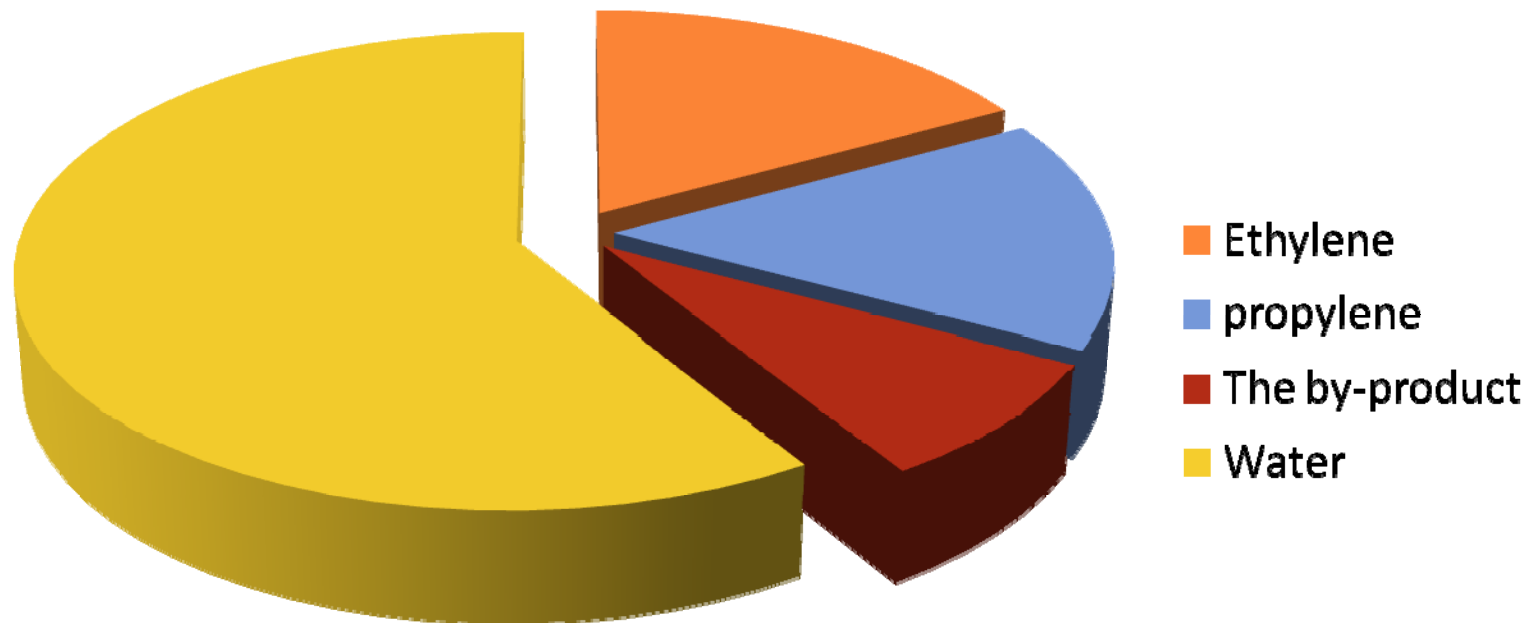
- The industrial demonstration MTO Plant was set up in October 9, 2011 and started up successfully. Polymer grade ethylene and propylene were produced about 7 hours after methanol feeding.
- From June 9, 2012 to July 12, the MTO Plant was calibrated for 72 hours. The calibration data shows that the technical index of the process and the SMTO catalyst reached or exceeded the design value.
- Since 2013, the plant has run smoothly with high loads, and obtained good economic benefits.



Performance Data

Item	Performance values S-MTO only	Performance values S-MTO+OCC
Feedstock(load) t/h	77.04	77.04
Methanol conversion %	99.98	99.98
Consumption of methanol (ton methanol / ton of olefin)	2.98	2.64
Catalyst loss (kg/ton methanol)	0.25	0.25
Light olefins recovery rate %	99.9	99.9
Consumption of energy (kgEO/ton olefin)	373.58	

Yield coefficient



Utility Consumption

- Utility consumption to process 1.0 ton methanol when the operation load at 100% (data of Jan.,2016)

Item	Unit	Consumption /ton methanol
Natural gas	Nm ³	0.24
Industrial water	t	0.02
Cooling water	t	93.23
Polished water	t	0.76
Condensate	t	-0.94
Electricity	°C	41.20
High pressure steam	t	0.66
Medium pressure steam	t	0.59
Low pressure steam	t	-0.06
Nitrogen	Nm ³	48.30
Industrial air	Nm ³	50.90
Instrument air	Nm ³	13.16

Product Quality

➤ The quality of main products

- ✓ Purity of ethylene is 99.95%
- ✓ Purity of propylene is 99.6 %
- ✓ C4 constituents in byproduct mixed-C4 >95wt%
- ✓ The components of high molecule hydrocarbons :

C5: 50 ~ 60wt%

C6-C8: 30 ~ 40wt%

C9: 7 ~ 16wt%

Environmental Index--waste water

- Use the different process to handle the different waste water produced in different parts of the unit. It reached the requirement of the government for the disposal waste water index.
- ✓ Water from the quench tower contains pollutants. We use the anaerobic biological process to pretreatment , then pump to the sewage treatment plant. Actual detection COD value of the waste water from the quench tower is around 800-1400 mg/l.

- ✓ **The detected COD data of the total pollutants to the sewage treatment plant is less than 1000mg/l generally.**
- ✓ **Water from the process water stripper and oxygenates stripper with less pollutants is pumped to sewage treatment plant after mixing.**

Environmental Index —waste gas

- Waste gas is from two parts:
- ✓ Continuous discharge of flue gas: 12,000 ~ 15,000Nm³/h.
- ✓ Gas discharge of the Startup Preheating Boiler temporarily 7,700 Nm³/h。
- The continuous discharge data from the Heat Recovery Boiler is in a normal level. The pollutants data satisfies the government requirement.

Analysis item	Unit	Analysis data
O ₂	%	6.43
CO	%	Undetected
NO _x	ppm	1.0
SO ₂	%	Undetected

Environmental Index– other wastes

➤ **Spent caustic**

The spent caustic from the Caustic Wash Tower is transported to a local authorized company which utilized the spent caustic comprehensively.

➤ **Solid wastes**

The solid wastes produced by the plant are mainly waste catalyst and called back by the waste treatment enterprise.

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Maintenance



There are three times planned turnaround during 5 years running ,including the overhaul in 2014.

➤ **April 26, ~ June 19, 2012**

- ✓ **The load of the plant was only able to be controlled at ~ 80% after the initial success startup , Because of some minor defects of the deethanizer manufacture .**
- ✓ **We shut down the plant to check the equipment and no serious problems were found during the turnaround. The defects and the operation bottle necks were eliminated.**
- ✓ **The load was able to reach 108% of the design load.**

- **April 15,~May 18,2014 The planned overhaul**
- ✓ **The routine equipment maintenance and technical improvement were performed after two years high load operation in order to optimize the technical condition, energy utilization etc.**
- ✓ **20 items of technical improvements**
- ✓ **156 items of maintenances**
- ✓ **The plant put in to operation immediately and reached the highest load 110% with the energy consumption from 393 to 343 *kgOE/t olefin***
-

- **Oct.10, ~ Nov 16, 2015 , the planned turnaround**
- ✓ **No utility to supply because of the overhaul of the other downstream plants of ZYPC.**

- **Conclusion**
- ✓ **The plant can run for 3 ~ 4 years steadily based on our experience of equipment maintenance these years. It is the same as common petrochemical plants in this respect.**

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Economic Returns



Profit of the MTO Plant (2013/2014/2015)

	Time period	Varied cost per ton methanol (RMB Yuan)	Gross profit (million RMB Yuan)
1	Year 2013	385	405
2	Year 2014	372	481
3	Year 2015	356	199

Investment outline

	Item	Investment (million RMB Yuan)
1	Total	825.74
2	Equipment	412.2
3	Material	186.87
4	Installation	81.48
5	Building	44.19

Conclusion

- The S-MTO technology has its characteristic of high running stability, high operating reliability.
- The S-MTO technology is capable to bring good economic returns.
The test-run result of ZYPC MTO Plant shows that the S-MTO technology is competitive and in a leading level in the world.
- The S-MTO Process with combination of OCC Process(C4 Olefin Catalytic Cracking) can promote the technical advantage and elevate the running efficiency.
- The proprietary SMT0 catalyst has the characters of high conversion ratio , high selectivity, and good at abrasion-resisting, fluidization and stability.





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