



PRESENTATION

FROM **COAL** TO **STEEL** CONFERENCE
Responsible Mining and Sustainable Steel

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- Deeply Rooted In R & D of Comprehensive Utilization of **Coal** and NG Chemical Industry in 1958
- Provide Solution for
 - Low Carbon
 - Environment Friendly
 - Clean Energy
- Increase Comprehensive Utilization and Economic Benefits for Resources of Traditional Industry



Topic: Clean Energy from Coking By-product

- H₂ Separation and Purification from COG by PSA (Pressure Swing Adsorption) Technology
- Provide Cheap H₂ for Hydrogen Energy



- Coke is essential raw material in the steelmaking industry.
- Coking process brings a large amount of by-product COG.
- COG is not used effectively, it will cause environmental pollution and waste of resources.



■ In 1987: PSA - H₂ from COG by CTYC

- COG composition:

Composition	CO ₂ %	C _n H _M %	O ₂ %	CO %	H ₂ %	CH ₄ %	N ₂ %	Total	Q _w kj/Nm ³	Q _c kj/Nm ³
Average value	5.75	2.65	0.26	5.75	58.07	22.42	8.5	103.40	16670	18811
Min value	5.12	2.29	0.07	5.12	55.19	20.8	5.52	94.11	15944	17955
Max value	6.09	3.08	0.5	6.09	60.78	24.01	11.71	112.26	17390	19615

- Impurity content (mg/Nm³):

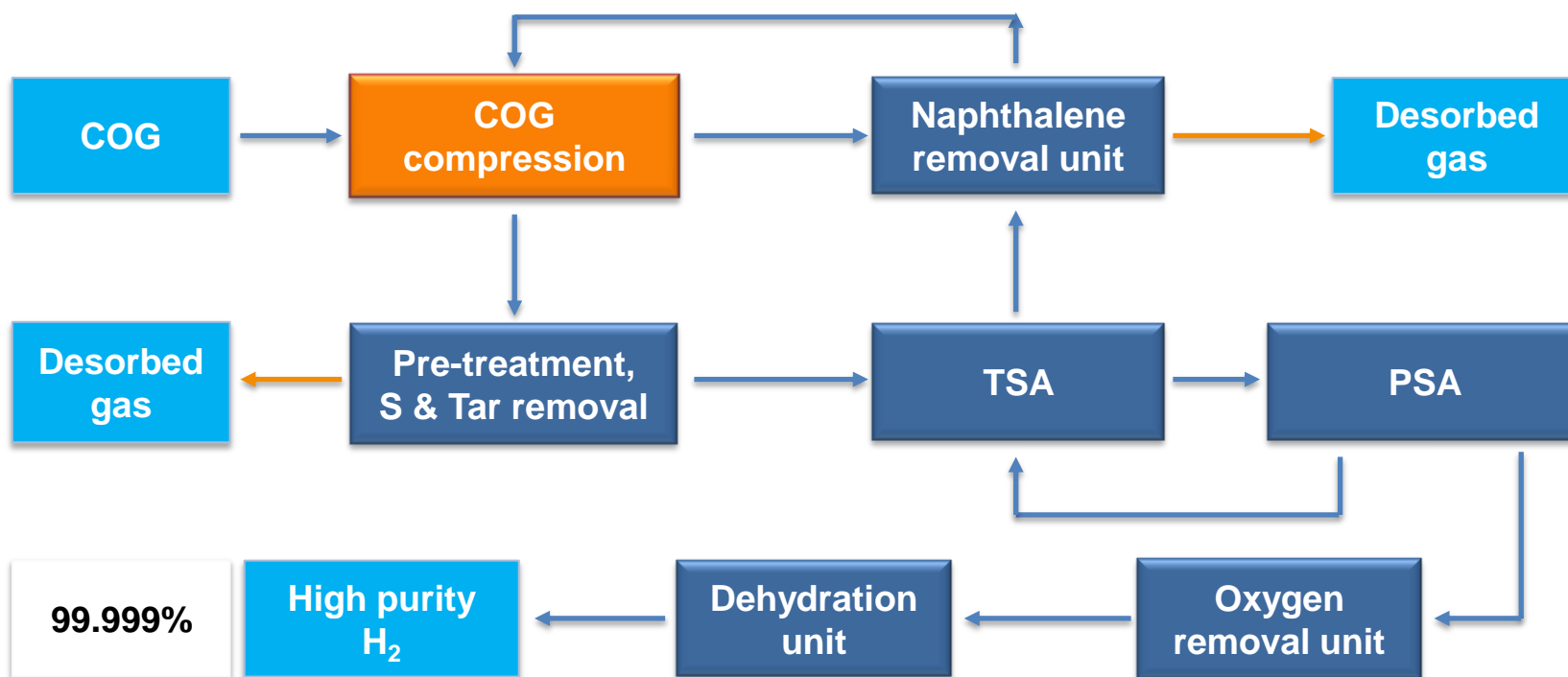
Pollutant	H ₂ Sg/100 NM ³	Naphthalene g/100 NM ³	BTX g/NM ³	NH ₃ g/100NM ³
Average value	12.26	3.26	0.124	0.571
Min value	4.33	0.95	0.04	0.326
Max value	26.75	3.26	0.671	1.099



- **In 1988:** Experimental PSA - H₂ unit from COG built by CTYC
at Coking Plant of WISCO
(Wuhan Iron and Steel (Group) Corp.)
- **In 1990:** 1000Nm³/h PSA - H₂ unit from COG, EPC by CTYC
based on the above experiment
at Coking Plant of WISCO
which was **the first PSA - H₂ unit from COG in the world**



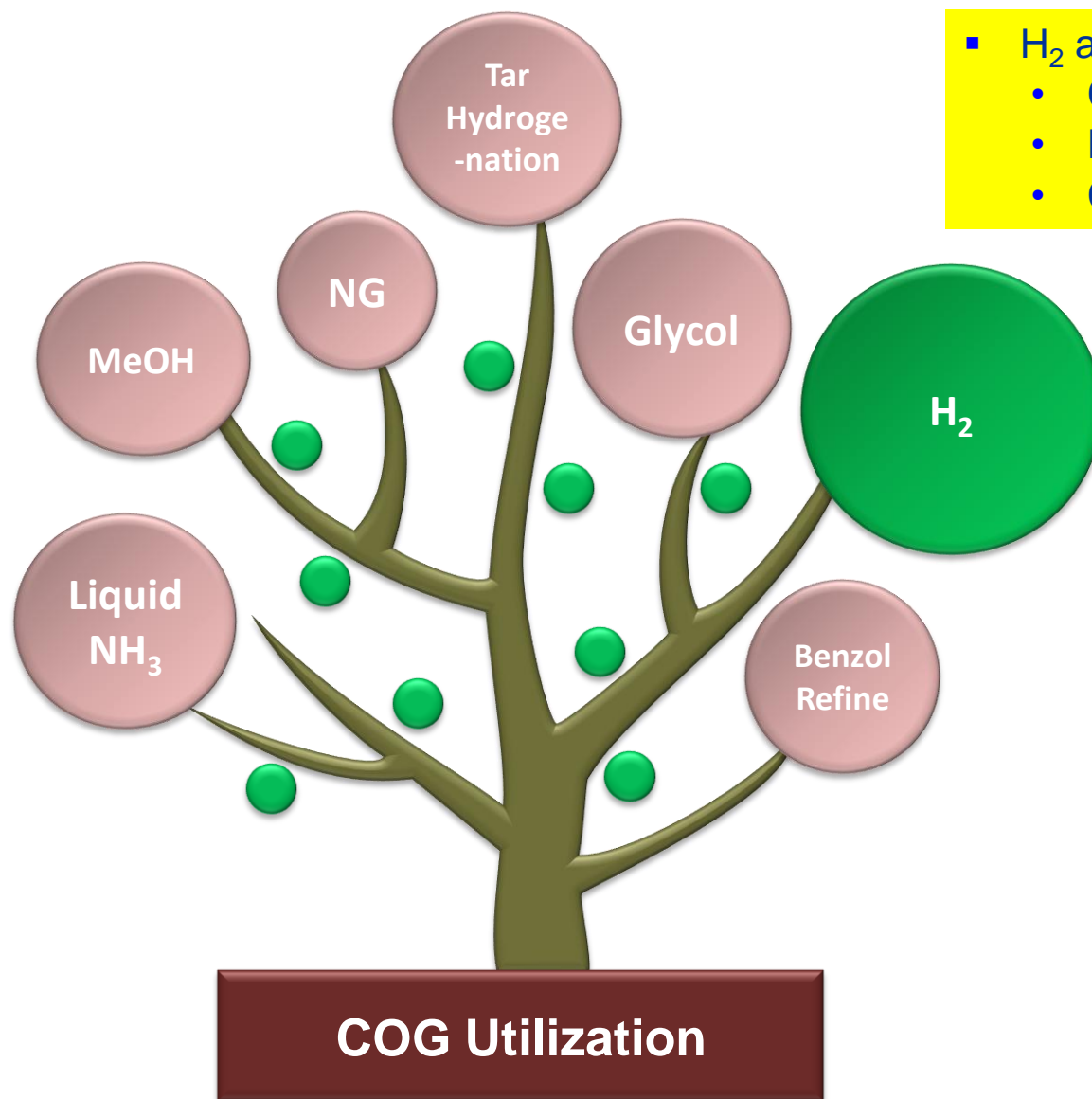
Flow Chart for PSA- H₂ from COG by CTYC



- Op. pressure : 0.7 - 1.6 Mpa
- Unit capacity : 500 – 140,000 Nm³/h
- H₂ recovery rate : 70 - 85 %
- Product H₂ purity : 98 - 99.999 %

- H₂ applications:
 - Cold rolling protection gas
 - Hydrogenation
 - H₂ driving vehicle





- H_2 applications:
 - Cold rolling protection gas
 - H_2 driving vehicle
 - Chemical products



**140,000 Nm³/h PSA-H₂ Unit from COG
at Qinghai Salt Lake Company**

The Largest PSA-H₂ Unit from COG in the world, EPC by CTYC





35,000 Nm³/h PSA-H₂ Unit from COG in Shanxi

**280,000 Nm³/h PSA-H₂ Unit
at Shenhua Erdos Direct Coal to Oil Complex, Inner Mongolia**





170,000 Nm³/h PSA-H₂ Unit at Shenhua Ningmei Indirect Coal to Oil Complex

PSA-H₂ Unit for 700 kt/a CTO, Pucheng, Shanxi



120,000 Nm³/h COG-LNG & H₂-rich Tail Gas to Liquid Ammonia Unit in Cangzhou, Hebei



200 kt/a COG & NG - Methanol Plant at Tangshan Jiahua



200 kt/a COG & Coal to Methanol Plant in Shanxi Tongshida



Also,

CO separation and purification from

blast furnace gas and **converter gas** by PSA in Steelmaking Plants
for methanol synthesis and other chemical products.



**15,000 Nm³/h PSA-CH₄ Unit from Landfill Gas in Hong Kong in 2005,
Which is the First Plant from Landfill Gas to City Gas in the World**



What is the global focus on energy for the future?

**The cleanest and most environmentally friendly
energy resource H₂**



References for PSA - H₂

■ Feed Gas:

- various H₂ mixed gases

■ Product H₂ Purity:

- 98 - 99.999 %

■ Plants Capacity:

- 20 - 400,000 Nm³/h

■ Reference:

- More than 1000 units

References for PSA - H₂ from COG

■ Feed Gas:

- COG

■ Product H₂ Purity:

- 98 - 99.999 %

■ Plants Capacity:

- 500 - 140,000 Nm³/h

■ Reference:

- More than 60 units



■ CTYC Strong Advantages for PSA – H₂ from COG :

- the strongest technologies in the world
- the most references in the world as the patent company and general contractor
- the drafter and organizer for International Technical Specification for Safety of PSA systems for H₂ separation and purification



Thank you !

四川天一科技股份有限公司

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Over dozens of years of its existence, CTYC is a China's leading company in research & development and application of PSA technologies, C1 chemical technologies and catalysts and also up to international advanced level.

