



神华鄂尔多斯煤制油分公司 *Shenhua Erdos DCL Co.*

神华煤制油项目及Shell煤气化装置 开车及运行

Shenhua Coal to Liquid and Shell Coal Gasification Application and Operation

2008 Oct 1st



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中国神华集团公司 **Shenhua Group**

- 以2006年度的煤炭产量、销售量和煤炭储量计，我们是中国最大的煤炭上市公司，而且是世界上最大的煤炭上市公司之一。
- the largest listed coal company in China and one of the largest in the world as measured by our coal reserves, coal production and sales volume in 2006.
- 中国神华的煤炭和电力业务迅速增长。2002年至2006年，煤炭产量和发电量年均复合增长率分别达到23%与24%
- Annual growth rates of 23% in coal production and 24% in power generation from 2002 to 2006.
- 拥有54个煤矿,累计生产能力为2亿吨,拥有全长1367公里的运转能力为1.28亿吨公里的铁路专用线和港口, 11,960兆瓦装机容量的电厂,煤制油和煤化工项目正在加快建设。
- Total 54 coal mine, annual production 200m ton coal, 1367km self-owned train line and one harbor, 11,960 MW power capacity, coal to liquid and coal chemical project is under construction
- 中国神华能源股份有限公司是由神华集团有限责任公司独家发起,于2004年11月8日在北京注册,在香港和上海证交所上市
- China Shenhua Energy Company Limited ("CSEC") was established as a stock company on 8 November 2004, listed on the stock exchanges of Shanghai, Hong Kong





神华集团主要业务 *Shenhua Group Main Business*

煤炭板块 Coal Mining

煤制油板块 Coal to Liquid

铁路港口业务 Train and Harbor part

电力板块 Power part

金融板块 Financial part

此地图仅为示意
The map is for illustrative purpose

图例
Legend

- 国有铁路 State Owned Rail
- 神华铁路 Shenhua Rail
- 地名 Place
- 港口 Port
- 电力 Power
- 矿区 Mines



主要业务数据 Main Business Data

- **1.711 亿吨** 中国神华2006年的商品煤销量。我们是中国最大的煤炭生产商，并且是最大的煤炭销售商之一，2006年煤炭销量位居世界煤炭上市公司第二位；
- **171.1 million tones** our commercial coal sale volume in 2006. We are the largest coal producer and one of the largest coal marketers in China, and the second largest coal seller among the listed energy companies in the world as measured by this figure in 2006.
- **59.6 亿吨** 中国神华2006年的可售储量(按JORC标准)。按照2006年的年产量计算，我们的开采年限近43年；
- **5.96 billion ton** our marketable coal reserves by the end of 2006(JORC code). Based on the commercial coal production in 2006, we have coal reserves which may be exploited for another 43 years.
- **1,367 公里** 中国神华拥有的铁路线长度。我们是中国唯一拥有和经营一体化的大规模煤炭运输网络(包括自有铁路和港口)的综合性能源公司。
- **1,367 kilometers** the total length of our dedicated rail lines. We are the only coal-based energy company in China that owns and operates a large-scale integrated coal transportation network, which consists of dedicated rail lines and port facilities.
- **11,960 兆瓦** 中国神华控制并运营的电力总装机容量。我们拥有规模可观、经营高效和发展迅速的电力业务。
- **11,960 MW** is the total installed capacity of power plants under our controls and operations. Our power generation business are sizeable & in rapid growth



神华鄂尔多斯煤制油分公司 *Shenhua Erdos DCL Co.*



内蒙鄂尔多斯神华直接液化项目

Inner Mongolia Erdos Coal Direct Liquefaction Project



鄂尔多斯神华直接液化项目 Erdos Direct Coal Liquefaction Project



- 神华煤直接液化项目是世界首套商业化示范装置，采用神华自主知识产权的煤直接液化工艺。

Shenhua Erdos project is the 1st industrial demonstration Coal direct liquefaction with Shenhua own IP process

- 总建设规模为年产油品500万吨，分二期建设，其中一期工程建设规模为年产油品320万吨，由三条主生产线组成，目前在建的为第一条生产线，包括煤液化、煤制氢、溶剂加氢、加氢改质、催化剂制备等14套主要生产装置。

The total capacity is 5m tons oil with 2 phases construction, Phase 1 is 3.2m tons with 3 trains, including DCL, Coal to H₂, Hydrogenation, catalyst preparation and etc, total 14 main production units

- 一期工程主厂区占地面积186公顷，投产后每年用煤量970万吨，可生产各种油品320万吨，其中汽油50万吨、柴油215万吨、液化气31万吨、苯、混合二甲苯24万吨

The phase 1 is 186 hectares, total coal consumption is 9.5m tons, oil production is 3.2 m tons(gasoline 0.5m ton, diesel 2.15m tons, LPG 0.31m ton, Benzene/xylene 0.24m tons)

- 2004年5月开始施工建设，预计2008底第一条生产线开车，该线生产能力将达到年产成品油100万吨。第一条生产线成功投产后，计划将再建多条生产线使产量达到每年1000万吨，2020年公司总的油品生产能力目标值为3000万吨/年

Construction started at May 2004, plan to startup 1st train in 2008 with 1 m tons capacity, after that increase capacity 10m tons, to 2020, reach target of 30 m tons capacity.



神华鄂尔多斯煤制油分公司 *Shenhua Erdos DCL Co.*



神华鄂尔多斯煤制氢装置-两套壳牌煤气化装置
Erdos DCL H2 unit – Two Trains Shell Coal gasification units



神华鄂尔多斯煤制氢装置-两套壳牌煤气化装置 Erdos DCL H2 unit – Two Trains Shell Coal Gasification Units

- 煤制氢是煤制油的重要上游环节，它提供煤制油所需的氢气，神华煤制氢装置采用壳牌粉煤气化技术。
H2 production from coal is the very important upstream unit of DCL, Shell Coal Gasification was selected to produce H2.
- 共有2套壳牌粉煤气化装置及下游配套变换和净化单元，每台炉子每天满负荷消耗2000吨煤，有效气(CO+H₂)产量为150000Nm³/h
Total 2 trains Shell coal gasification units and relevant downstream shift and conditioning units were built, each gasifier with 2000tons/day coal consumption, produces 150,000Nm³/hr valuable syngas (CO+H₂)
- 选择壳牌煤气化技术是因为壳牌技术是经过工业化验证的成熟的粉煤加压气化技术，是碳转化率高,热效率高,环保清洁的领先技术
Reason of selecting Shell coal gasification is due to SCGP is the mature coal powder gasification technology with industrial demonstration, it is a leading environment-friendly technology with high C conversion and high energy efficiency.



壳牌煤气化装置建设 Milestones SCGP Unit Construction



- 2005年4月18日，煤制氢装置开始破土动工
2005, April 18, start construction of coal to H₂ units
- 2006年8月20日，气化核心设备气化炉及合成气冷却器吊装就位
2006, Aug 20, the key equipment gasifier and SGC were erected
- 2007年10月6日，105装置气化系统气化炉烘炉工作圆满完成
2007, Oct 6, unit 105 gasifier refractory dry out was done
- 2007年11月7日,105装置气化系统气化炉水汽系统煮炉工作圆满完成
2007, Nov 7, unit 105 gasifier steam system boil out was done
- 2008年3月21日，105装置气化系统粉煤循环测试工作圆满完成
2008, Mar 21, unit 105 coal circulation test was done
- 2008年4月23日，105装置气化大系统的气密性工作全部完成
2008, Apr 23, unit 105 air tight test was done.
- 2008年4月29日23时45分，105装置气化系统第一个煤烧嘴点火成功
2008: Apr 29, 23:45, unit 105 started up 1st coal burner
- 2008年5月5日9时30分,105装置打通全流程，产出合格氢气，纯度为99.9%。
2008, May 5, 9:30 unit 105 produce the H₂ with purity 99.9%
- 2008年9月3日16时57分,106装置气化系统第一个煤烧嘴点火成功,两套气化装置开车胜利完成,转入调试和试生产。
2008, Sept 5, 16:57, unit 106 started up 1st coal burner, so the two trains SCGP unit finished startup, begin test production



壳牌煤气化装置开车调试经验

Lesson Learning during Construction and Commissioning



- 加强管道设备冬季保温伴热
Pay attention on the winterization and tracing
- 重视气化炉水汽系统的清洁
Keep the gasifier water/steam system clean during construction
- 粉煤循环管线焊接质量处理;
Pay attention on the welding quality of coal feed line
- 重视SUB及煤循环的调试
Pay attention on the SUB commission and coal circulation test
- 重视仪表调试,如柴油流量计,汽包液位计,在线分析仪表
Pay attention on the instrument calibration, such as diesel flow meter, drum level gauge, on-line analyzer
- 重视DCS/ESD系统的调试
Pay attention on DCS/ESD FAT/SAT



壳牌煤气化装置运行情况 **The SCGP Unit U105 Operation**



- 2008年4月29日,105单元第一次开车; 2008年5月5日 9:30 产出纯度为99.9%合格氢气.

April 29, 2008, Unit 105 startup 1st time, May 5, produced H₂ with 99.9% purity

- 主要运行技术参数: main operation parameters:

- 合成气组分 : CO: 58%, H₂: 24%

Syngas composition: CO: 58%, H₂: 24%

- 气化炉压力 : 3.45 Mpa

Gasifier pressure: 3.45 Mpa

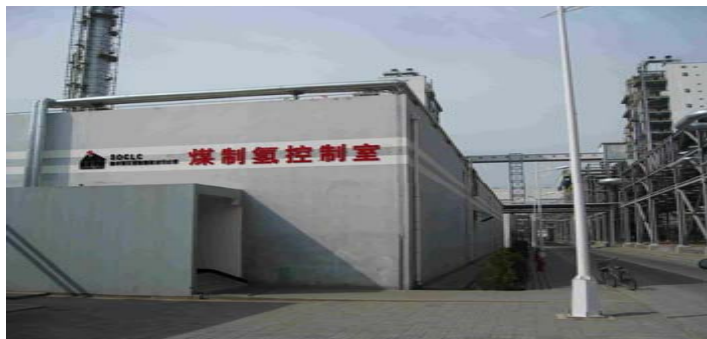
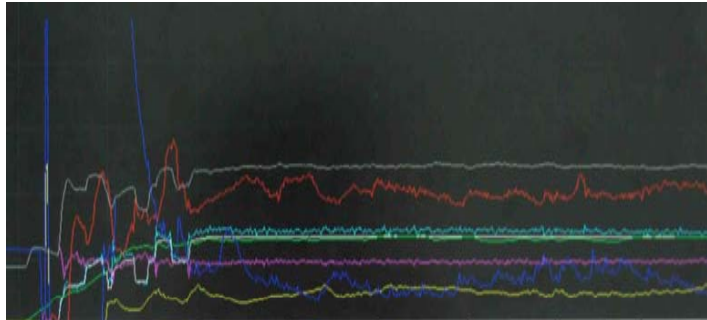
- 汽包压力 : 5.2 Mpa

Steam drum pressure: 5.2Mpa





壳牌煤气化装置运行情况总结 **Summary of SCGP Operation**



经过U105 几个月的运行,我们的操作体会:

Through several months test running of U105, we have following feedback and experience:

- 装置运行平稳,合成气参数达到设计要求
The gasifier in very stable operation, syngas composition reach the design requirement
- 几乎没有因为工艺系统失控造成的跳车
Trip seldom due to the process reason
- 自动化程度高,操作方便灵活
Advanced control system, flexible and easy for operator usage
- 气化炉经过检查没有设备损坏
No damage found in gasifier after inspection
- 在很短的时间内达到很高的在线率
Reach high availability within short time after startup



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Thank You and welcome to Shenhua
谢谢大家 欢迎大家访问神华