



新型煤气化技术工业示范合作项目 (阳煤集团-GTI)

**Industry Demonstration Project of New Gasification Technology
(Yangquan Coal Industry Group-GTI)**

**阳泉煤业（集团）有限责任公司
Yangquan Coal Industry (Group) Co., Ltd**

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本项目针对高灰熔点（AFT>1500°C）粉煤气化的难题，合作开发新型煤气化工业技术。

GTI, Yangquan Coal Industry Group and ECEC cooperate to develop a novel gasification technology in order to solve the gasification problem of pulverized coal with high ash fusion temperature (AFT>1500°C).

本项目由GTI提供技术基础，阳煤集团投资建设工业示范装置并负责生产运行，ECEC公司提供工程设计服务。

In this project, GTI provides technology support, Yangquan Coal Industry Group is responsible for the investment, construction and operation of the industrial demonstration plant, and ECEC provides engineering design services .



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1. 阳煤集团概况 Overview of Yangquan Coal Industry

集团简介 Introduction

阳煤集团是一家以煤为基，多元化发展的现代企业集团，产业涉及煤炭、化工、装备制造、物流贸易、地产、铝电、现代服务业等方向，是中国最大的无烟煤生产基地。其煤化工产业规模在中国名列前茅，拥有中国最大的煤化工设备制造公司。

Yangquan Coal Industry (Group) Company Limited (the “Group”) is a coal-based diversified modern enterprise group with businesses of coal, chemical industry, assembling manufacturing, trading logistics, real estate, aluminum electrolysis and modern service. The Group is the largest anthracite production base in China. The Group is also one of the best in coal chemical industry in China, running the largest coal chemical engineering equipment manufacturing company of China.



1. 阳煤集团概况 Overview of Yangquan Coal Industry

集团简介 Introduction

2014年煤炭产量6956万吨，营业收入2046亿元，总资产合计1700亿元。2015年世界500强第409位。

In 2014, the Group produced 69.56 million tons of coal. Total operating income amounted to RMB 204.6 billion with total assets of RMB 170 billion. The Group ranks 409th among the Fortune Global 500 companies in 2015.





1. 阳煤集团概况 Overview of Yangquan Coal Industry

化工产业

Chemical Industry

- 拥有阳煤化工、山西三维、太化股份三家上市公司，形成了农用化工、基础化工、精细化工、新型煤化工、化工新材料、化工装备制造六大板块，是阳煤集团规模最大、增长最快的产业。
- **The chemical industry is the largest and fastest-growing industry of the Group, which has six sectors: agricultural chemicals, basic chemicals, fine chemicals, new coal chemical industry, new chemical materials and chemical equipment manufacturing, and three listed companies: Yangquan Coal Chemical Industry Company Limited, Shanxi Sanwei Group Company Limited and Taiyuan Chemical Industry Company Limited.**
- 现有化工产品80余种，2014年化工产品总产量942万吨，其中尿素产量520万吨，位列中国前三。
- **The Group produces more than 80 kinds of chemical products. In 2014, the total output was 9.42 million tons, and urea output was 5.2 million tons, ranking top three of China.**



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2. 项目实施背景 Background

山西煤种特点

Characteristics of Shanxi Coal

- 山西省气化用煤大多灰熔点在1500°C以上，灰分含量在20%以上，煤炭产量85%为粉煤。
- **Ash fusion temperature (AFT) > 1500°C, ash > 20%.
85% of Shanxi coal is pulverized coal.**
- 阳煤集团煤炭总储量100亿吨，70%以上属于高灰熔点煤，是山西气化煤的典型代表。
- **As a typical representative of Shanxi Coal, the Group reserves 10 billion tons of coal, of which 70% is high AFT coal.**



2. 项目实施背景 Background

中国高灰熔点煤分布 Distribution of High AFT Coal



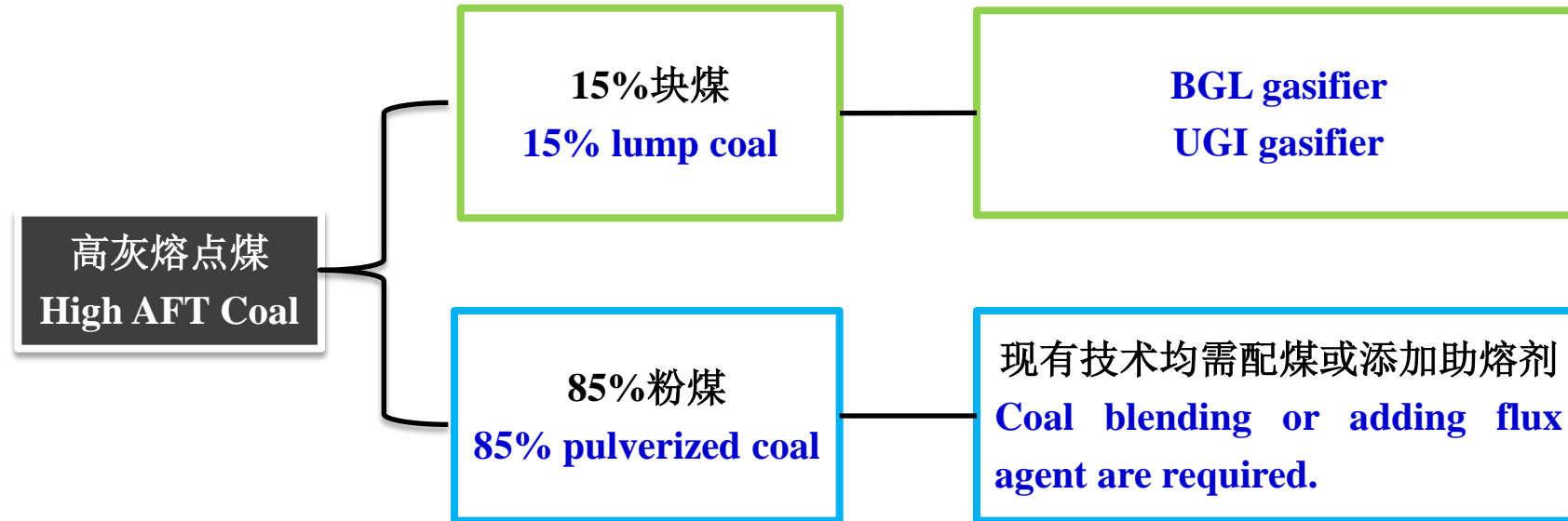
中国高灰熔点煤分布情况
The distribution of high AFT coal in China



2. 项目实施背景 Background

高灰熔点煤气化难题

Problem of High AFT Coal



高灰熔点煤区域煤化工发展受到限制

The development of coal chemical industry is hampered at the high AFT coal area.



2. 项目实施背景 Background

阳煤气化炉现状

Gasifiers of the Group

- 共有307台气化炉， UGI炉297台，清华炉4台，在建航天炉6台。
- **Has 307 gasifiers: 297 UGI gasifiers, 4 non-slag-slag grading oxygen gasifiers and 6 HT-L gasifiers.**
- 化工产业用煤总共784万吨，无烟块煤452万吨，燃料煤257万吨，外购低灰熔点配煤75万吨。
- **Uses 784 million tons of coal: 452 million tons of anthracite, 257 million tons of fuel coal and 75 million tons of pulverized coal which is purchased outside with ATF below 1500 °C.**
- 阳煤集团化工产业发展对高灰熔点粉煤气化炉具有大量需求（ ≥ 1.5 GWt）。
- **Has a large demand of gasifiers to gasify high AFT coal (≥ 1.5 GWt) .**



2. 项目实施背景 Background

项目实施意义 Significance

- ◆ 该新型气化技术气化温度高达2500°C以上，可在不添加助熔剂或配煤的情况下气化高灰熔点煤。该气化技术工业示范成功后，可解决山西煤种灰熔点高，气化难度大，粉煤气化不能本地化的难题，为全国高灰熔点煤种高效清洁利用提供一种可行的技术方案。
- ◆ **The temperature of new gasification technology is more than 2,500 °C. High AFT coal can be gasified without blending or adding flux agent. The gasification technology can solve the gasification problem of high AFT coal in Shanxi, and provide a feasible method for the high-efficient and clean utilization of high AFT coal in China.**



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3. 项目进展 Project Progress

- ◆ GTI建有18吨/天的中试装置，阳煤集团共运送70吨高灰熔点煤在中试装置试烧。
- ◆ An 18 TPD pilot plant has been built at GTI. The Group has transported a total of 70 tons of Yangquan coal with high AFT to GTI for testing.
- ◆ 2014年8月25日到27日，试烧阳泉新景煤20余吨，碳转化率达99.4%，试烧过程中在排渣口出现堵渣。
- ◆ More than 20 tons of Xinjing coal was tested from 25th to 27th August 2014, and the carbon conversion was up to 99.4%. In this test, fused slag deposit underneath quench lances.

	AFT (°C)				Ash (%)	Ash Composition Analysis (%)					
	DT	ST	HT	FT		SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	SO ₃
Xinjing coal	>1500	>1500	>1500	>1500	24.48	52.70	34.15	6.09	1.48	0.45	1.17
Xinyuan coal	1480	>1500	>1500	>1500	24.50	57.39	31.03	4.06	2.37	0.60	2.06



3. 项目进展 Project Progress

- ◆ 第二次煤炭试烧选取多组分析数据进行质量及能量守恒计算，并预计了投煤量为800吨及3000吨的工业模型计算。
- ◆ Several data points were selected for the calculation of mass and enthalpy balance. The performance of 800 TPD and 3000 TPD scale gasifiers was predicted.

	Xinyuan Coal		Xinjing Coal	
	DAP230	DAP233	DAP 234	DAP 237
Coal, lb/hr	1035	1039	1070	1018
Oxygen, lb/hr	1040	1120	1040	1120
Strem, lb/hr	200	200	200	200
Nitrogen, lb/hr	113.3	169.9	169.4	129.2
Carbon Conversion, %	95.76	97.00	89.66	95.44
Carbon Balance, %	95.30	99.00	106.20	102.40
Mass Balance, %	108.10	101.30	104.40	102.60
Enthalpy Balance, %	92.70	96.70	103.90	99.80



新景煤 Xinjing Coal Sacks



新元煤 Xinyuan Coal Sacks



3. 项目进展 Project Progress

800吨/天和3000吨/天投煤量工业模型计算
Predicted commercial gasifiers performance

	800 TPD	3000TPD
Exit Gas Temp/°C	1601	1601
Pressure/bar	40	40
CO+H ₂ (% ,dry)	95.00%	95.60%
Cold Gas Efficiency (%)	79.4%	80.4%
Nm ³ O ₂ /kNm ³ (CO+H ₂)	358	348
kg Coal/kNm ³ (CO+H ₂)	465	459



Pilot in GTI

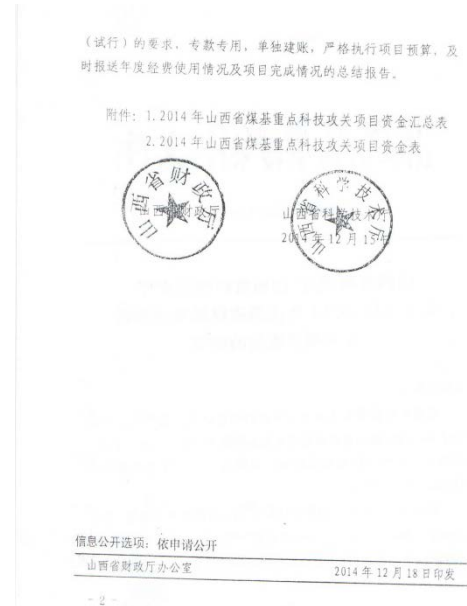
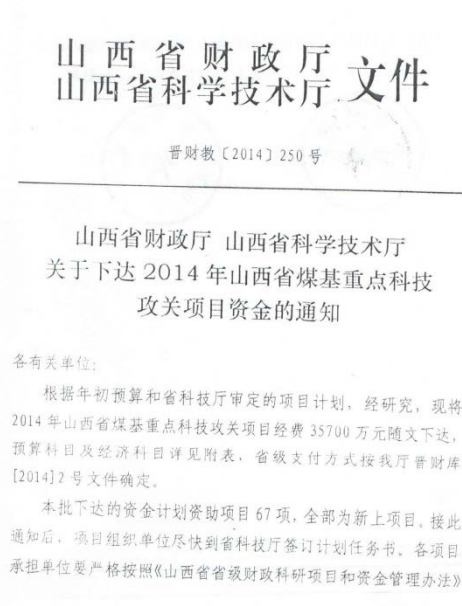


Slag sample of Xinyuan coal



3. 项目进展 Project Progress

- ◆ 该项目列入山西省2014年煤基重点科技攻关项目。
- ◆ The project was included in the Key Coal-based Scientific and Technological Projects by Shanxi province.
- ◆ 阳煤集团、东华工程公司、GTI已签署保密协议，三方正式合作协议正在谈判中。
- ◆ Confidentiality agreement has been signed by the Group, ECEC and GTI, and the formal cooperation agreement is under negotiation.

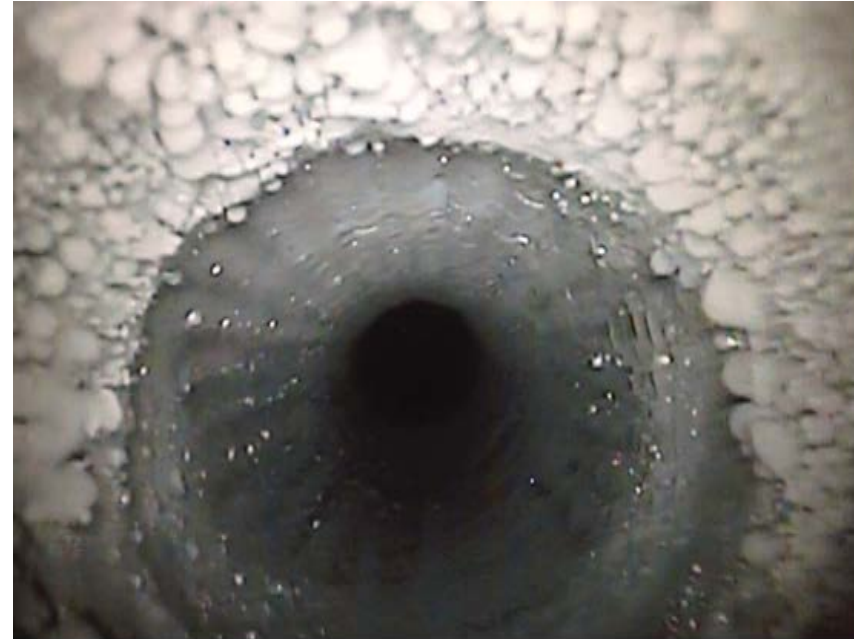
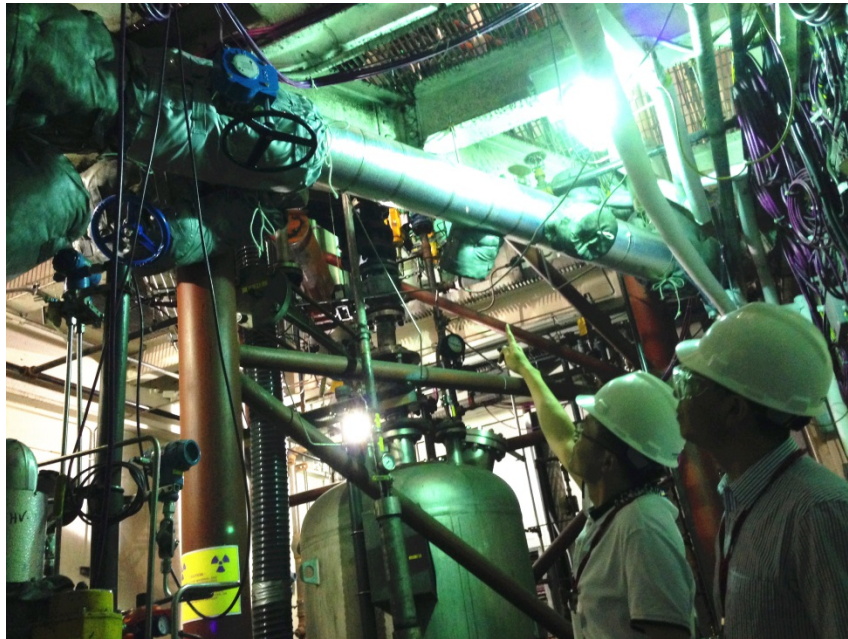


Files of Science and Technology Department of Shanxi Province



3. 项目进展 Project Progress

试烧现场 Testing Facility





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4. 项目规划 Project Plan

2015

- ◆ 阳煤将运输200~300吨煤在GTI中试装置进行试烧，探索工艺技术条件，为工业示范装置设计提供关键参数；东华公司将完善可研报告。
- ◆ **The Group will transport 200 to 300 tons of Yangquan coal to GTI for a long-period test to obtain key parameters for the design of industrial demonstration plant. ECEC will finish the feasibility study report.**
- ◆ 阳煤与GTI将完成正式协议谈判并签署。
- ◆ **The Group and GTI will negotiate and sign the formal cooperation framework agreement.**

2016

- ◆ 阳煤集团将开始在阳煤集团太原新材料有限公司建设800吨/天新型煤气化工业示范装置，预计2017年建成并投入运行。
- ◆ **The Group will start the construction of the 800 TPD scale industrial demonstration plant of the coal gasification in Taiyuan New Material Company Limited in 2016, which is expected to be finished and put into operation in 2017.**



4. 项目规划 Project Plan

- ◆ 阳煤集团太原化工新材料有限公司位于山西清徐经济开发区，是目前山西省最大的煤化工基地，项目总投资143亿元，占地3000亩。目前设备已进入调试阶段，预计2015年底投入运行。
- ◆ **Taiyuan New Chemical Material Company Limited, located in Qingxu Economic Development Zone, is the biggest coal chemical base in Shanxi, and covers an area of 3000 hectares with a total investment of RMB 14.3 billion. Equipment there is being debugged, and is expected to be put into operation at the end of 2015.**





4. 项目规划 Project Plan

- ◆ 园区的煤气化部分已建成三套航天炉（750吨/天），其空分、水、电、气等公用工程符合本项目新型煤气化工业示范装置的技术要求；现场为800吨/天工业示范项目预留框架建设用地。
- ◆ **Three HT-L (750 TPD) gasifiers have been built, and the utilities meet the technical requirements of the demonstration plant. Place for the demonstration plant (800 TPD) has been reserved.**

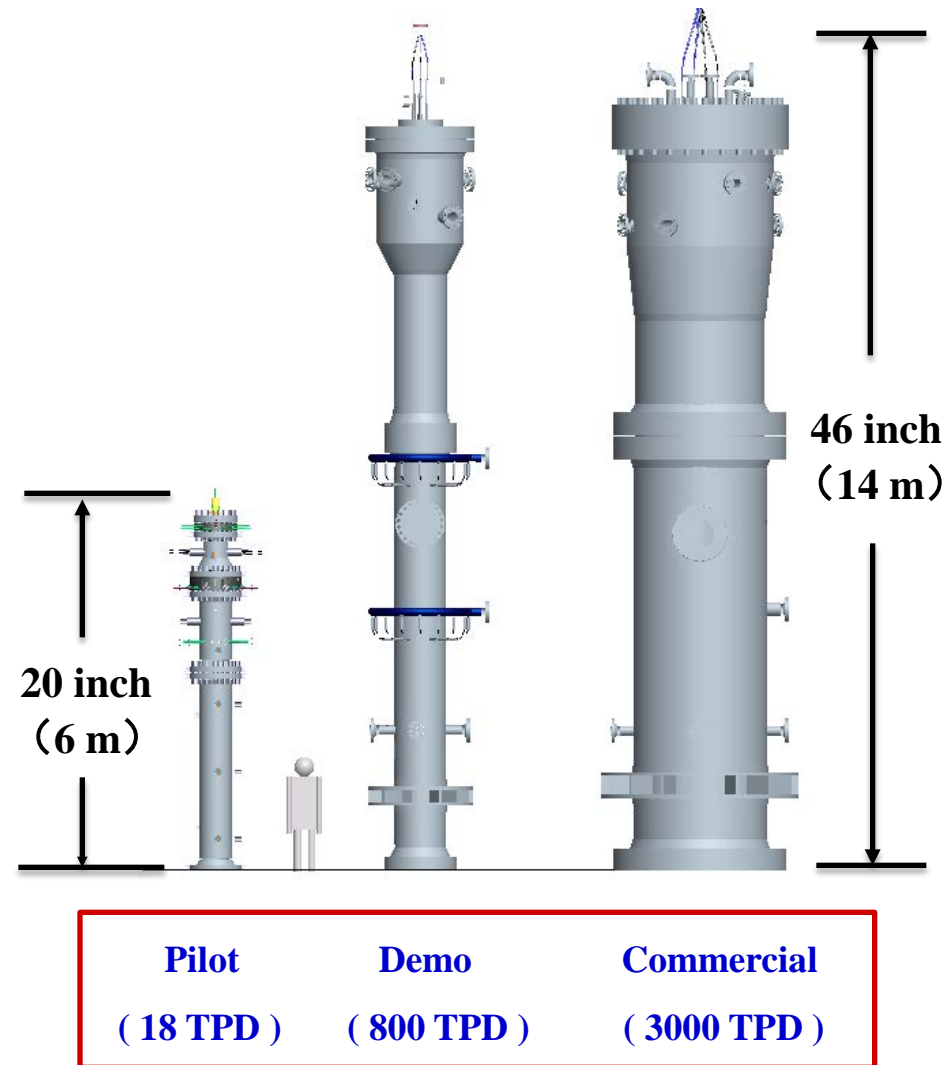


HT-L Gasifier Device (750 TPD)



4. 项目规划 Project Plan

- 800吨/天的工业示范装置完成后，阳煤、GTI和东华将开始研发投煤量3000吨/天的气化炉。
- The Group, GTI and ECEC will begin to develop a 3000 TPD gasifier after the 800 TPD gasifier is successfully operated.





谢谢！

THANK YOU!

August 24, 2015