

Further Developments and Commercial Progress of the BGL Gasification Technology

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BGL Gasifier

Company

Envirotherm GmbH

is an experienced and qualified engineering partner with an extensive list of references and strong growth based on proprietary technologies acquired from Lurgi

- Envirotherm GmbH is a subsidiary of Allied Resource Corporation, Wayne, PA and sister company of Allied Syngas (ASC), Wayne, PA
- Headquarters in Essen, Germany
- Envirotherm's Competence:
 - Flue Gas Treatment (DeNOx-SCR, Dedusting, Desulphurization)
 - Stationary and Circulating Fluidized Bed Combustion
 - Circulating Fluidized Bed Gasification
 - BGL Gasification

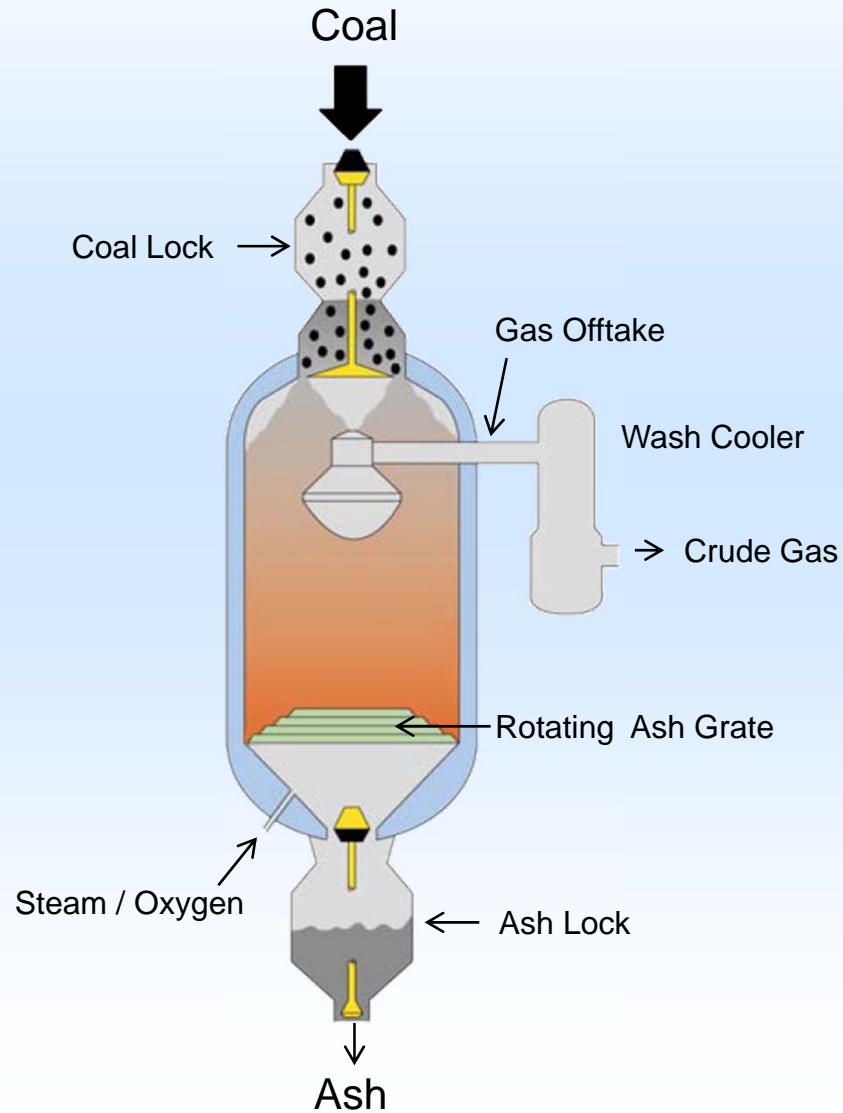
Development and Application

- The improved “slagging” version of the existing Lurgi Gasifier was jointly developed with British Gas from 1974 onwards in Westfield/Scotland to:
 - have a reactor to produce non-leachable vitreous slag rather than dry ash
 - improve specific reactor throughput
 - increase fines content acceptable in feed
 - reduce steam consumption and consequently gas condensate production
 - recycle tars/oils to extinction
 - increase CO/H₂-yields
- Technology successfully demonstrated with a wide range of coals and proven on commercial size gasifier units until 1991
- First commercial plant at Schwarze Pumpe, Germany, from 2000 until 2007, using broad range of feedstock including waste

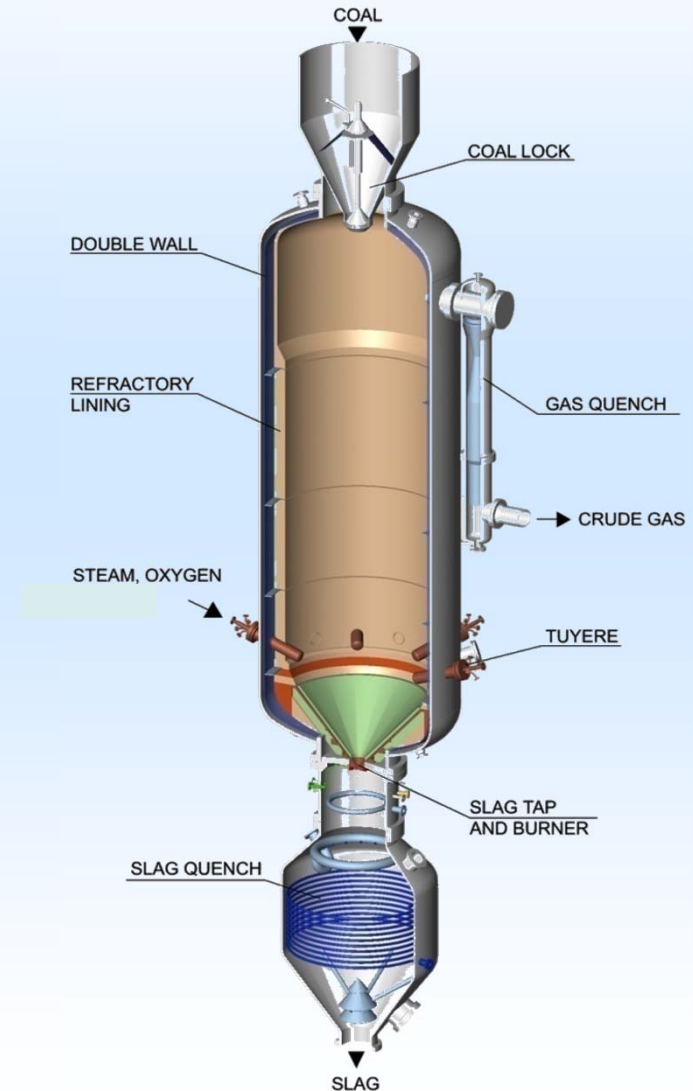
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Design Features / Comparison with Fixed Bed Dry Bottom

Lurgi Fixed Bed Dry Bottom



BGL Fixed Bed Slagging Gasifier

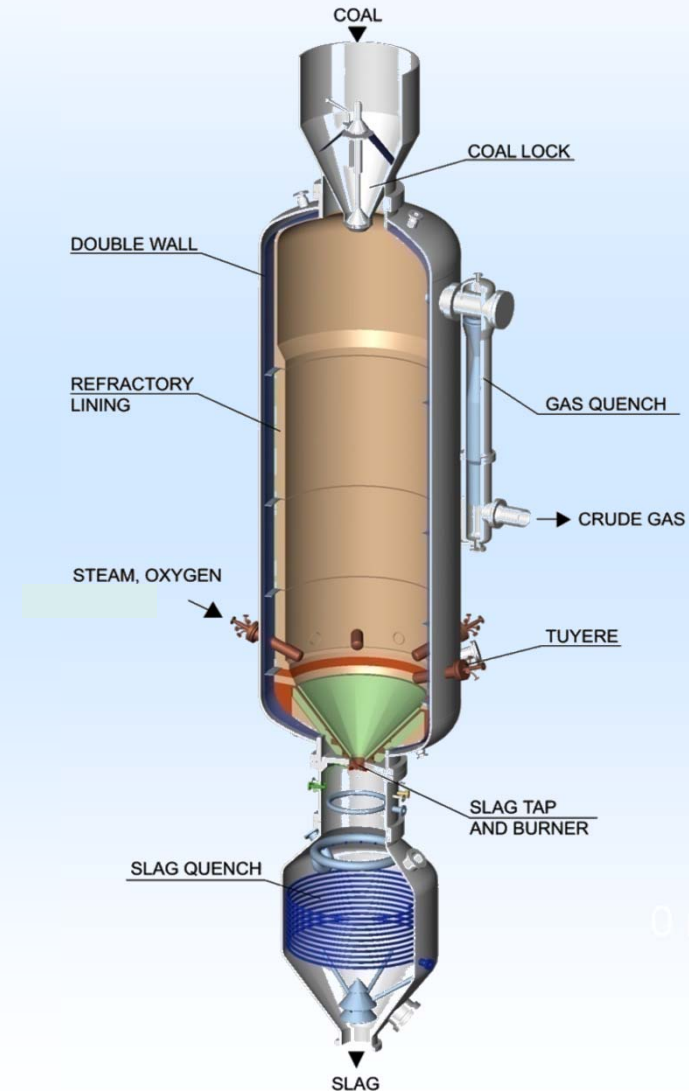


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Key Benefits

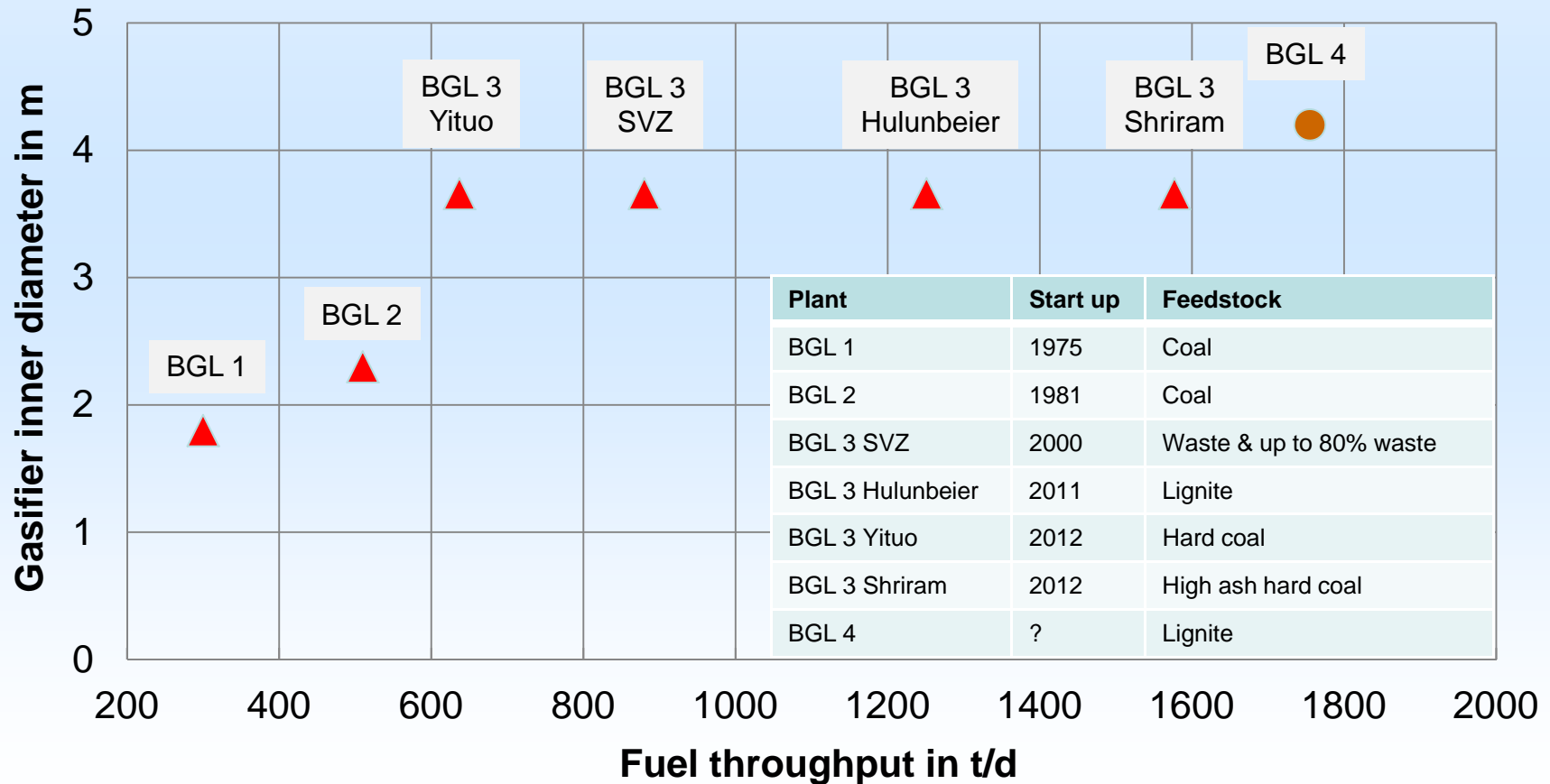
- High cold gas efficiency
- High carbon conversion
- Low oxygen consumption
- Low steam consumption
- Low aqueous liquor production
- Ash converted to non-leachable vitrified slag
- Fuel flexibility (nearly all types of coal and other fuels, e.g. waste)
- Well suited for SNG applications

Typical BGL Gas Composition for bituminous coal by volume %			
H ₂	CO	CO ₂	CH ₄
33	56	4	7



BGL Gasifier Further Development

- Increase in reactor diameter to 4m → higher throughput
- Increase in operation pressure (up to 40bar) → higher CH₄ content, less tars and oils
- Stirrer implementation for caking coals, if required

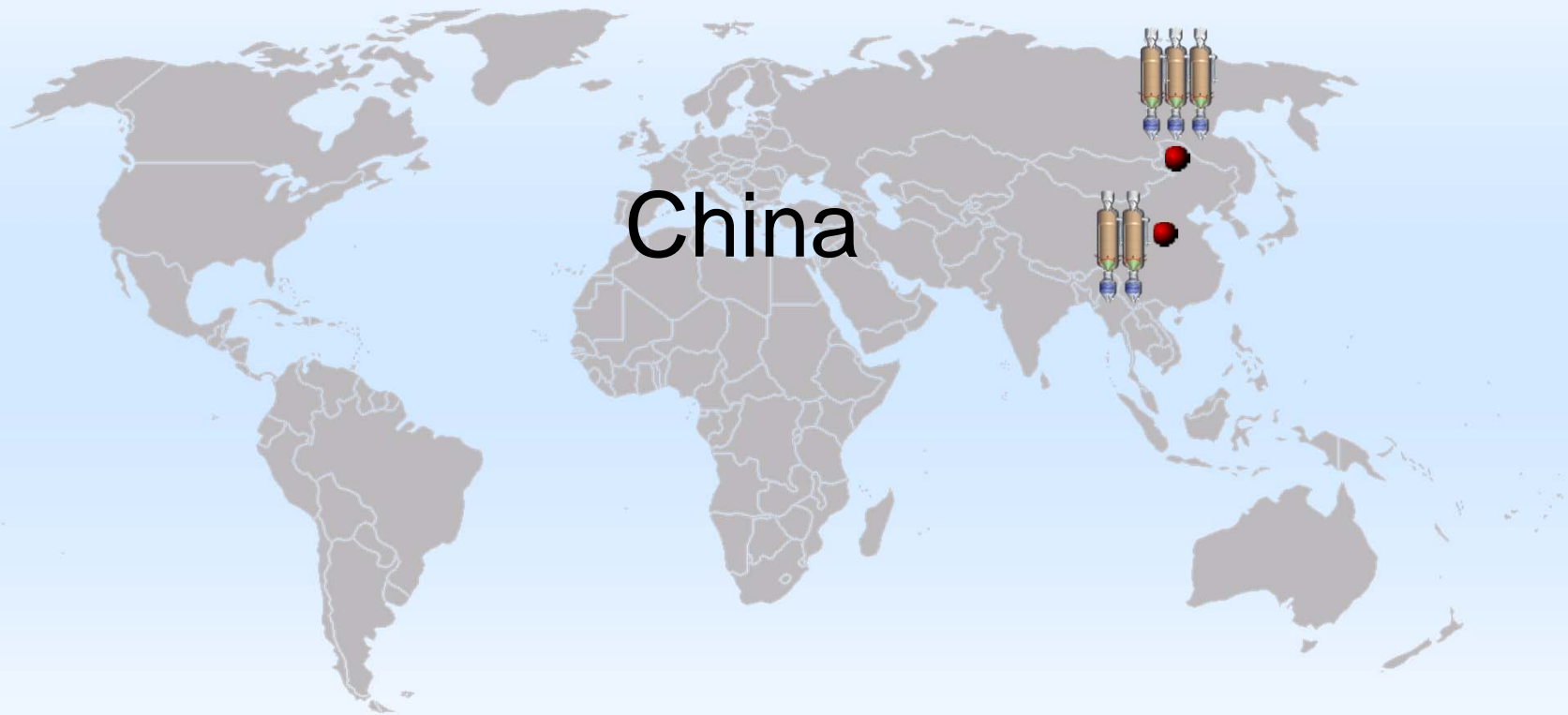


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BGL Gasifier
Current Activities

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Current Activities – Hulunbeier

Client	Yuntianhua United Commerce Co., Ltd. Kunming, Yunnan, PRC Hulunbeier New Gold Chemical Co., Ltd., Hailaer, Hulunbeier, Inner Mongolia, PRC
Location of facility	Hulunbeier, Inner Mongolia, PRC
Application	Syngas for the production of 500,000 t/year Ammonia (800,000 t/year Urea)
Feedstock	Domestic dried and briquetted lignite
Features	Two (2) + one (1) BGL gasifiers (40 barg operating pressure) Synthesis gas production 119.000 Nm ³ /h (H ₂ +CO)
Scope of Supply	Process Design Package for gasification and gas liquor separation Process performance guarantees Plant erection and commissioning assistance
Start-up (expected)	Summer 2011
Project challenges	Fasttrack Project Construction only during summer months possible (winter temperatures approaching -45 °C)

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Current Activities – Hulunbeier

Progress

May 2008 site clearance and civil work commenced
Process Design Package delivered 4th Quarter 2008
Detailed Design completed 3rd Quarter 2009
Gasifier installations on site 2009-2010
Plant operation staff training, August 2010



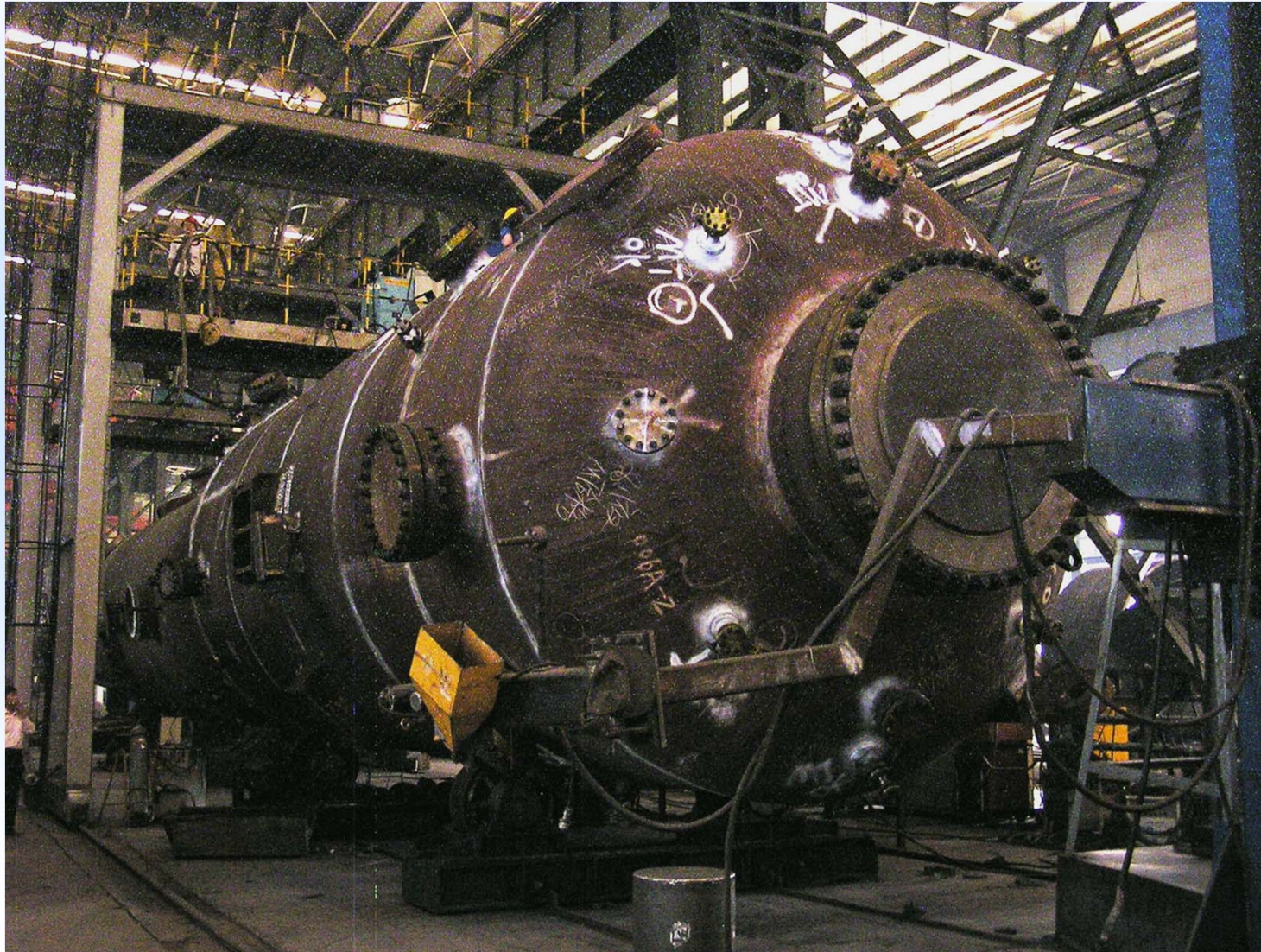
BGL Gasifier Current Activities - Hulunbeier

View of the Site (2009)



BGL Gasifier Current Activities - Hulunbeier

Gasifier Reactor during Manufacturing Process



BGL Gasifier Current Activities - Hulunbeier

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Gasifier Reactor Transport over more than 1,000 km Distance



BGL Gasifier Current Activities - Hulunbeier

Gasifier Installation



Courtesy of Hulunbeier New Gold Chemical Co. Ltd.

BGL Gasifier Current Activities - Hulunbeier

Gasifier Building (2010)



BGL Gasifier Current Activities - Hulunbeier

View from Gasifier Building (2010)



BGL Gasifier Current Activities - Yituo

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Client	China Yituo Group Co. Ltd., Luoyang, Henan Province, PRC
Location of Facility	Luoyang, Henan Province, PRC
Application	Fuel gas for industrial complex
Feedstock	Local hard coal
Features	One (1) + one (1) BGL gasifiers Gas production 43.000 Nm ³ /h
Start-up (expected)	Beginning of 2012
Scope of Supply	PDP for gasification, gas cooling and gas liquor separation Process performance guarantees Plant erection and commissioning assistance
Progress	Process Design Package delivered in April 2010 Detailed Design commenced in August 2010

BGL Gasifier Current Activities

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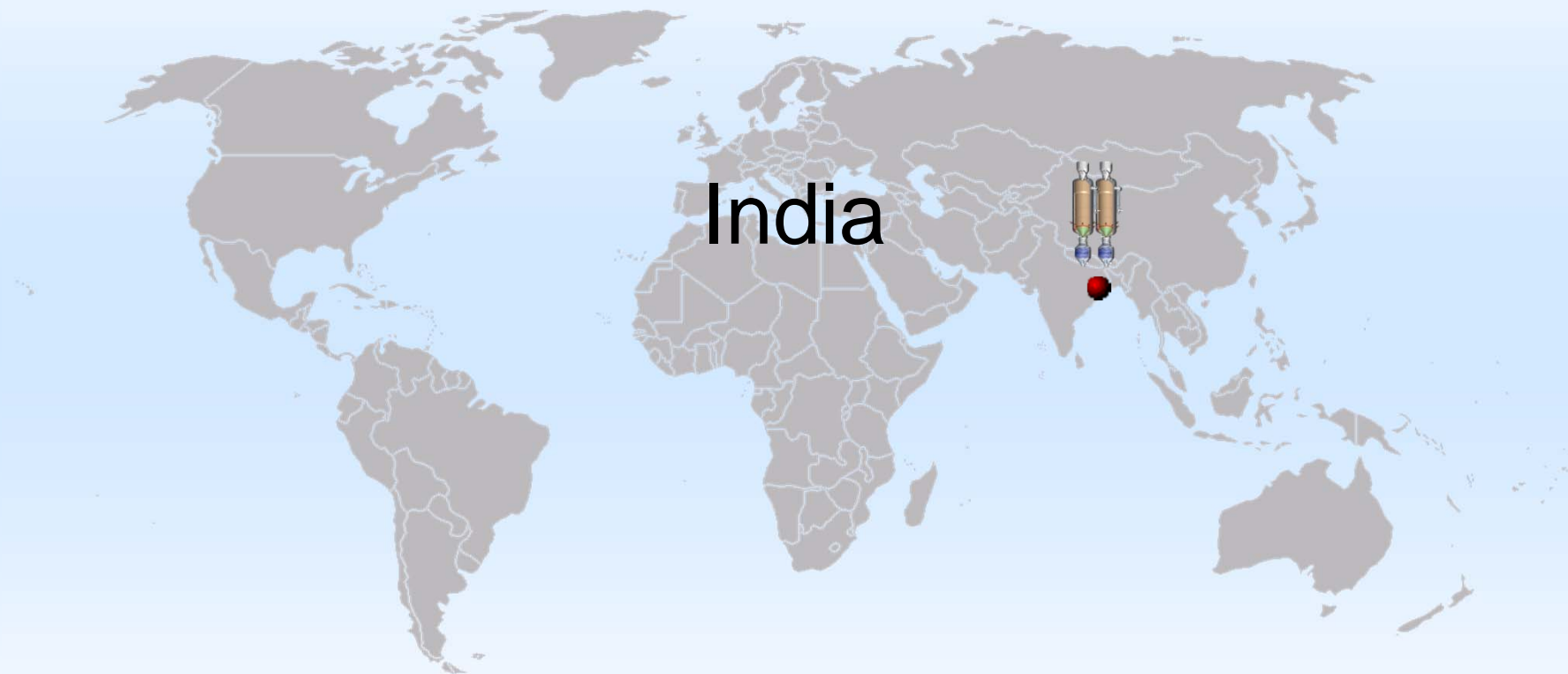
Current Activities - SHED

Client	South Heart Energy Development, LLC (SHED) (Joint venture between Great Northern Power Development, L.P. (GNPD) and Allied Syngas Corporation (ASC))
Engineer	Black & Veatch, Kansas City, US
Location of facility	South Heart, North Dakota, US
Application	H ₂ Production (approx. 4.7 million Nm ³ /d for power production) and utilization of CO ₂ (2.1 million mt/yr) for enhanced oil recovery (EOR)
Feedstock	Briquetted lignite (5747 t/d coal as received)
Features	Three (3) + zero (0) BGL gasifiers



BGL Gasifier Current Activities

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Current Activities - Shriram

Client	Shriram EPC Ltd., Chennai, India
Location of Facility	Haldia, West Bengal, India
Application	Syngas for the production of synthetic ammonia
Feedstock	High ash domestic hard coal (132 t/h, 3,200 t/d)
Features	Two (2) BGL gasifiers, one relocated from Germany, second gasifier built identically to relocated one Raw gas production 150.000 Nm ³ /h
Scope of Supply	Relocation and reengineering as far as required for gasification, gas cooling, gas liquor separation and phenol recovery Basic engineering for new BGL Plant erection and commissioning assistance on request Project management for downstream ammonia plant (relocation and refurbishment)
Start-up (expected)	2th Quarter of 2012
Progress	Basic Engineering completed 4 th Quarter 2010 Existing BGL Gasifier transported to India in September 2010

BGL Gasifier Current Activities - Shriram

Dismantling of the Former SVZ BGL Gasifier for Relocation



BGL Gasifier Current Activities - Shriram

Dismantling of the Former SVZ BGL Gasifier for Relocation



- Considerably growing interest in BGL technology for SNG production in Asia
- Increased demand in gasification of low rank coal
- Growing interest in substitution of gasifiers in existing plants or in already planned projects with BGL technology
- Less small scale but more large scale projects

- Unique gasifier design offers major advantages including high fuel flexibility and low consumption of steam and oxygen
- BGL technology for all gasification routes applicable
- Currently seven gasifiers under construction or in detailed design phase
- Projects for production of fertilizers, SNG, power, fuel gas and CtL
- Start up of first multiple BGL gasifiers plant in mid 2011

BGL Gasifier

Thank you
for
your attention!

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