

COAL GASIFICATION

# HOW

## IN YOUR WORLD

**KBR**

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TECHNOLOGY

# Unlock the potential of low-rank and high-ash coal with the TRIG™ Gasifier from KBR

The KBR Transport Reactor Integrated Gasifier, also known as TRIG™, is an advanced coal gasification technology that provides clean, particulate-free syngas for a variety of industrial applications.



## A Reliable Gasification Technology for Low Rank and High Ash Coal

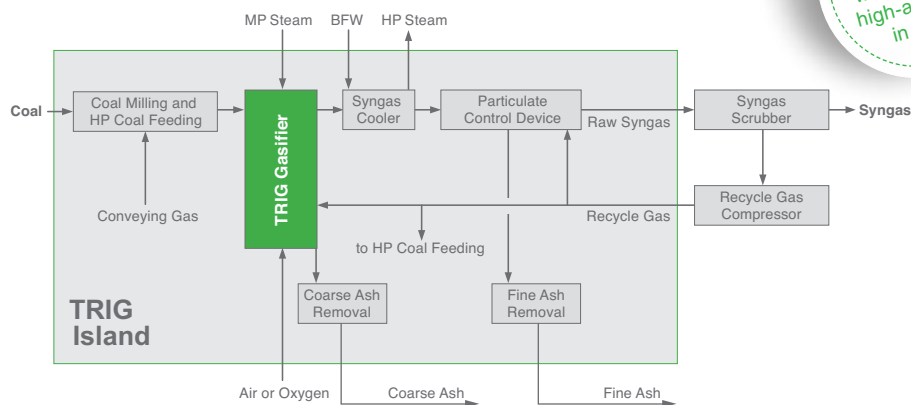
KBR's proprietary Transport Reactor Integrated Gasifier (TRIG™) technology offers a simple and reliable method to produce clean synthesis gas for hydrogen, chemicals, electricity, or various combinations while eliminating virtually all air pollutants and liquid effluents. Unlike most existing technologies that only perform best on high-rank coal, our TRIG™ processes low-rank, high-moisture and high-ash coal cost-effectively and efficiently. KBR and Southern Company are working together to implement TRIG™ in a multitude of product applications to meet the global energy demands.

## FCC Legacy is the Foundation for TRIG™

TRIG™ is a non-slugging gasifier with refractory carbon steel derived from over 60 years of FCC experience in petroleum refineries worldwide. KBR has over a 100-year legacy of developing and commercializing technology-firsts for the hydrocarbon industry.

The TRIG™ Island scheme including our proprietary coal feeding and ash handling systems have been tested on an engineering scale at the demonstration unit at the Power Systems Development Facility in Wilsonville, Alabama, USA.

KBR's TRIG™ Island Process : unlock the potential of low rank coal



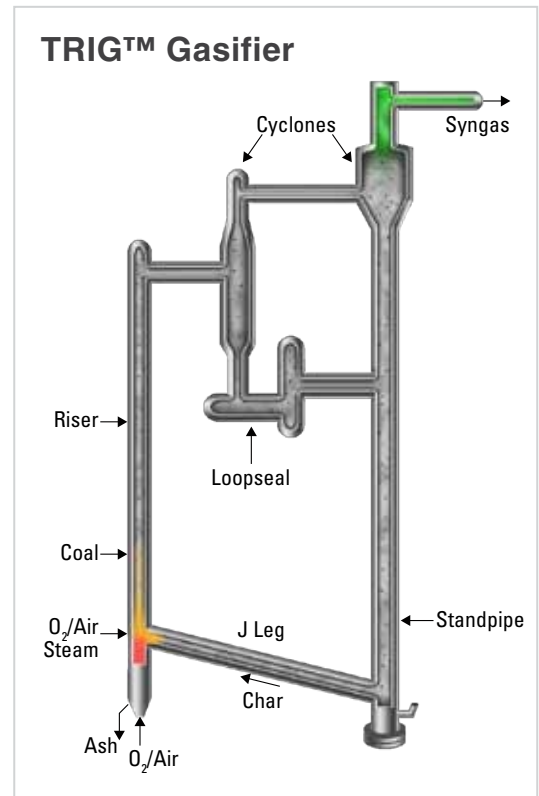
Developed specifically with low-rank, high-ash coals in mind.

## Affordable & environmentally friendly

- Circulating fluidized bed gasifier with high solids circulation rate and gas velocities
- Reliable operation similar to KBR's robust Fluid Catalytic Cracking (FCC) Process
- No internals, moving parts, expansion joints or vulnerable components, and no burners
- Lower energy consumption – less oxygen consumption than slagging gasifiers
- Low cost proprietary refractory with long life (10+ years)
- Lower capital and operating costs
- Lower feedstock cost – low-rank coal, including lignite
- Environmentally friendly – no black water
- Minimizes environmental impact of criteria pollutants - NOx, SOx, and particulate matter
- KBR's integrated TRIG™ processes captures and compresses carbon dioxide at a lower cost suitable for storage or enhanced oil recovery

## Reliable & flexible

- Lower operating costs – requires less oxygen or air
- Lowest water use – excellent technology fit for sites with limited water resources
- Reduces maintenance costs – lower temperature operation and no internal parts or burners
- Maximizes flexibility – can operate in air-blown or oxygen-blown mode
- High reliability syngas cooler design
- Higher throughput, up to 4000 T/D of coal from a single gasifier
- More reliable, no spare units needed
- Produces less methane and no tars and oils
- 100% Coal utilization – No briquetted coal needed and can handle fines
- Excess capacity and low turndown design available with minimal additional cost
- Scalable technology – Available in sizes of 50 - 4000 T/D coal feed



Gasifier Type	Energy Use	Availability	OPEX	Gasifier Throughput	Tars and Oils
Slagging-Entrained Flow	○ High	◐ Moderate	○ High	◐ Moderate	● Low/Nil
Non-Slagging Fixed/Moving Bed	◐ Moderate	● High	◐ Moderate	○ Low	○ High
KBR TRIG™ (Non-Slagging)	● Low	● High	● Low	● High	● Low/Nil

**LEGEND:** ● Large Advantage    ◐ Small Advantage    ○ No Advantage

## TRIG™ Projects

KBR and Southern Company are actively involved in the commercial deployment of TRIG™ units worldwide. The following are the major projects underway in various stages of implementation. The versatility of TRIG™ technology, its excellent fit for upgrading low cost coal, combined with low water use have been the key attributes for success.

Visit [coal.kbr.com](http://coal.kbr.com) to learn more about Coal Gasification at KBR.

Client	Project Location	Project Start-up Date	Feedstock / Gasifier Capacity	Number of TRIG™ Gasifiers	End-use / Final Product
Beijing Guoneng Yinghui Clean Energy Engineering Co., Ltd	Dongguan, China	2013	Lignite – 1 X 1600 T/D	1	IGCC / Power Retrofit
Xilinguole Sunite Alkali Industry Co., Ltd	Inner Mongolia, China	2014	High Ash Lignite – 1 X 1000 T/D	1	Coal to Chemicals
Mississippi Power	Kemper County, MS, USA	2014	MS Lignite – 2 X 4000 T/D	2	IGCC / Power Grassroots

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