



Econo-Power International Corporation
The Clean Coal Gasification Company™

**EPIC, THE CLEAN COAL GASIFICATION COMPANY PRESENTS
ECONOMICAL COAL GASIFICATION FOR POWER, COGENERATION,
INDUSTRIAL AND PROCESS PLANTS**



Coal gasification is a process, first used in the 1800's, which over the years, has been modernized as equipment and technology have improved. Today it can economically provide clean fuel for power, cogeneration systems and other processes. The EPIC gasification process uses coal (or a mixture of coal and biomass), steam and oxygen in a controlled reaction to produce fuel or synthesis gas.

EPIC's innovative design uses air to provide the oxygen for gasification, eliminates the need for air separation plants and, thus keeps the costs low while offering an economic option for smaller power distributed generation or cogeneration systems. The basis of EPIC's gasifier design has been in use for over 40 years.

Coal gasification reactions, while seemingly complicated, are easily controlled and quite predictable. The gasification reactions in EPIC's system are within the gasification vessel and take place at relatively low pressure and temperature. The gas produced in the EPIC Clean Coal Gasification System is commonly called 'Syngas.'

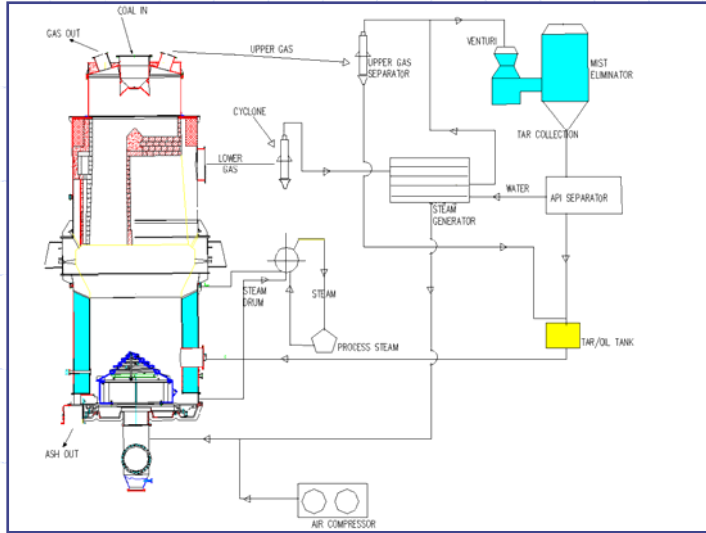
The EPIC gasification system consists of two major units. The first unit is a coal gasification process consisting of a coal delivery system, a series of gasifiers and an ash collection and removal system. The second unit is a gas clean-up plant that reduces the sulfur content of the syngas produced to a level well below any regulations while, at the same time, recovering the sulfur.

EPIC uses rugged industrial/utility grade components, which are well proven in operation and provide ease of maintenance. The overall plant control system is DCS-based and integrates the fuel gas production, gas cleanup and/or power plant systems into a single control point. The use of standard controls packages and commercially available software enables the system to operate in virtually automatic modes, minimizing operating labor costs.



Coal Gasification Process

The gasification section of the process has several parts including a pneumatic coal handling system from the coal receiving area to the ash removal point of the plant. Cyclones and recovery vessels are used to remove fine particles and collect the tar. The upper gas stream and lower gas stream are then mixed to provide the raw gas. A schematic drawing of the fuel gas production section is shown at the left below:



Gasification Section



5 Gasifier Installation (4 shown)

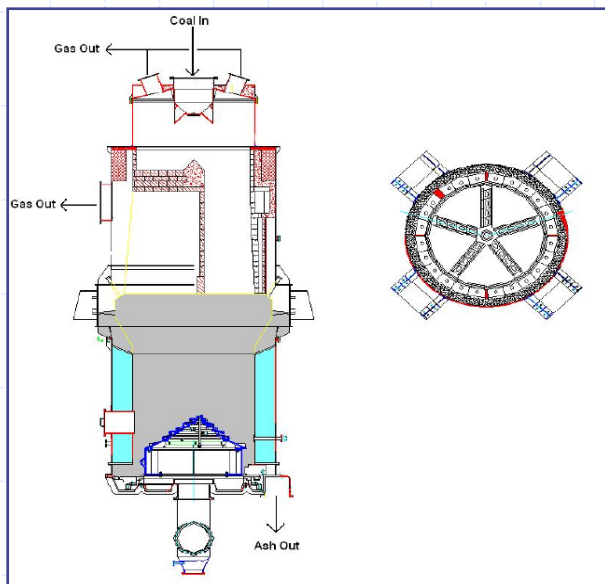
To allow for overhaul periods and emergency shut downs, provision is made for spare gasifier capacity to be installed at each plant.

The mixed gases from the gasification section of a plant will vary, depending upon the input coal. The following table provides some representative syngas from some common coals:

Coal	BTU/FT ³	CO%	CO ₂ %	H ₂ %	N ₂ %	H ₂ S%	CH ₄ %	CxHy%
PRB	193	32.1	3.5	18.1	42.3	<0.01	3.9	0.1
US Midwest	186	29.4	3.0	16.1	48.1	<0.01	3.3	0.1

Typical Coal Gas Analysis

Gasifier



EPIC's 2ST-3.6 Gasifier

The heart of the EPIC gasification system is the 2ST-3.6 two-stage gasifier. This well-proven gasifier produces a fuel (or synthesis) gas that is suitable for use in gas turbines or in conventional boilers or burners.

The 2ST-3.6 gasifier is a proprietary design with coal entering at the top and ash discharging from the bottom. In the upper section are refractory lanes in which a portion of the coal is converted to char which migrates downward into the lower, gasification area. Ash is removed by the revolving grate which also introduces an air/steam mixture into the vessel.

Simplicity of operation with rugged internal parts provide a system with virtually no periodic maintenance required.



Gasifier Grate



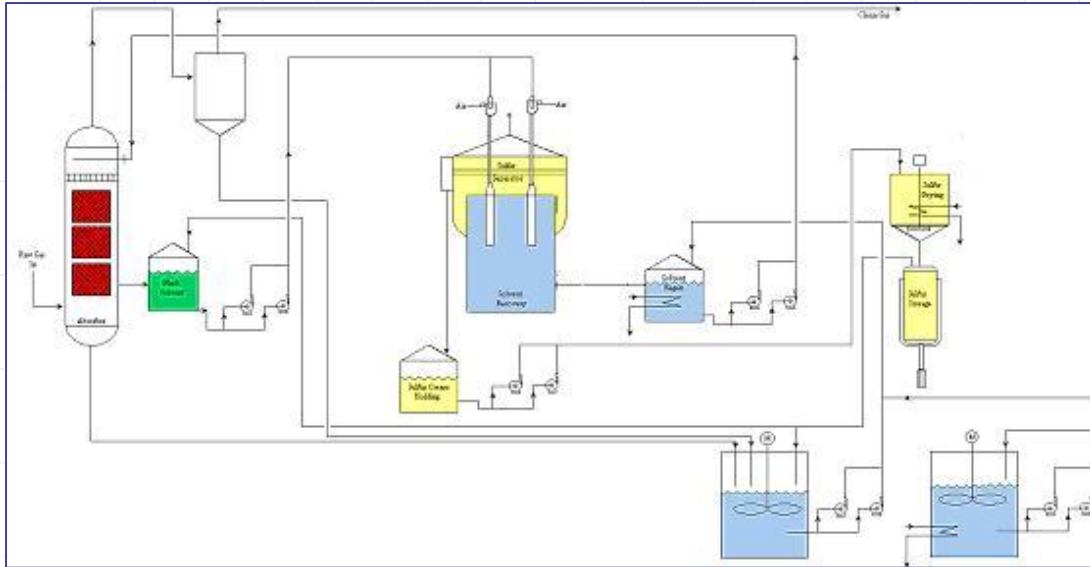
Refractory (after 10 years)

The 2ST-3.6 gasifier has been proven to operate continuously with the only required maintenance being to external mechanical components. Auxiliary vessels and mechanical equipment are also designed for ease in maintenance and reliability.



Gas Cleanup Process

The gas clean-up system for the EPIC gasification system is simple and cost effective. A schematic drawing of the EPIC gas clean up plant is shown below:



Hydrogen sulfide, the form in which the sulfur occurs in the product gas from the gasifier, is very soluble in a number of organic solvents and well-proven processes exist which not only remove most of the hydrogen sulfide but also convert the sulfur contained into elemental sulfur that can then be sold. EPIC uses a well proven system with over 40 years of operation. The output of this section can be directed to a gas turbine, or to a boiler or furnace burner. Representative pictures from an Asian sulfur removal installation are shown below:



Sulfur Cream Generator – Solvent Recovery



Sulfur Cream



Typical Arrangement

Typical Uses for EPIC's Syngas

The EPIC *Clean Coal Gasification System* Syngas can be used as a natural gas replacement in:

- Gas turbine fuel for new or retrofit IGCC plants
- Boilers
- Kilns
- Process burners
- Feedstock for ammonia production
- Feedstock for other processes such as H₂ production



Kilns



Gas Turbines



Boilers



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General Commercial Terms

The EPIC *Clean Coal Gasification System* is provided by EPIC on a Build, Own and Operate or Build, Own and Transfer basis, supplying clean Syngas to customers. EPIC works with customers to structure a contract that meets the customer's need to remove volatility and offers reasonable price stability based upon the use of coal. EPIC helps the customer optimize their energy requirements by either supplying Syngas only or working with strategic alliance partners to offer a complete energy supply facility. The ability of the EPIC *Clean Coal Gasification System* to offer Syngas at a discount to delivered natural gas and provide high levels of plant availability is an innovative development.

The following table provides approximate typical coal usage to convert coal to syngas:

<u>Coal</u>	<u>Coal Required (Tons/hour)</u>
US Midwest	20-25
US PRB	25-30
US Utah	15-20
US Southwest	20-25

Primary Assumptions:

1. EPIC contract term – 15 years
2. System provides 400 MMBTU/hour of syngas for 8600 hours per year
3. Cost of coal and transportation is not included in EPIC's scope

The EPIC coal gasification system offers attractive fuel gas alternatives to natural gas. For more information, contact:



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