FOSTER WHEELER

GASIFICATION

& Syngas Generation

WHY CHOOSE GASIFICATION?

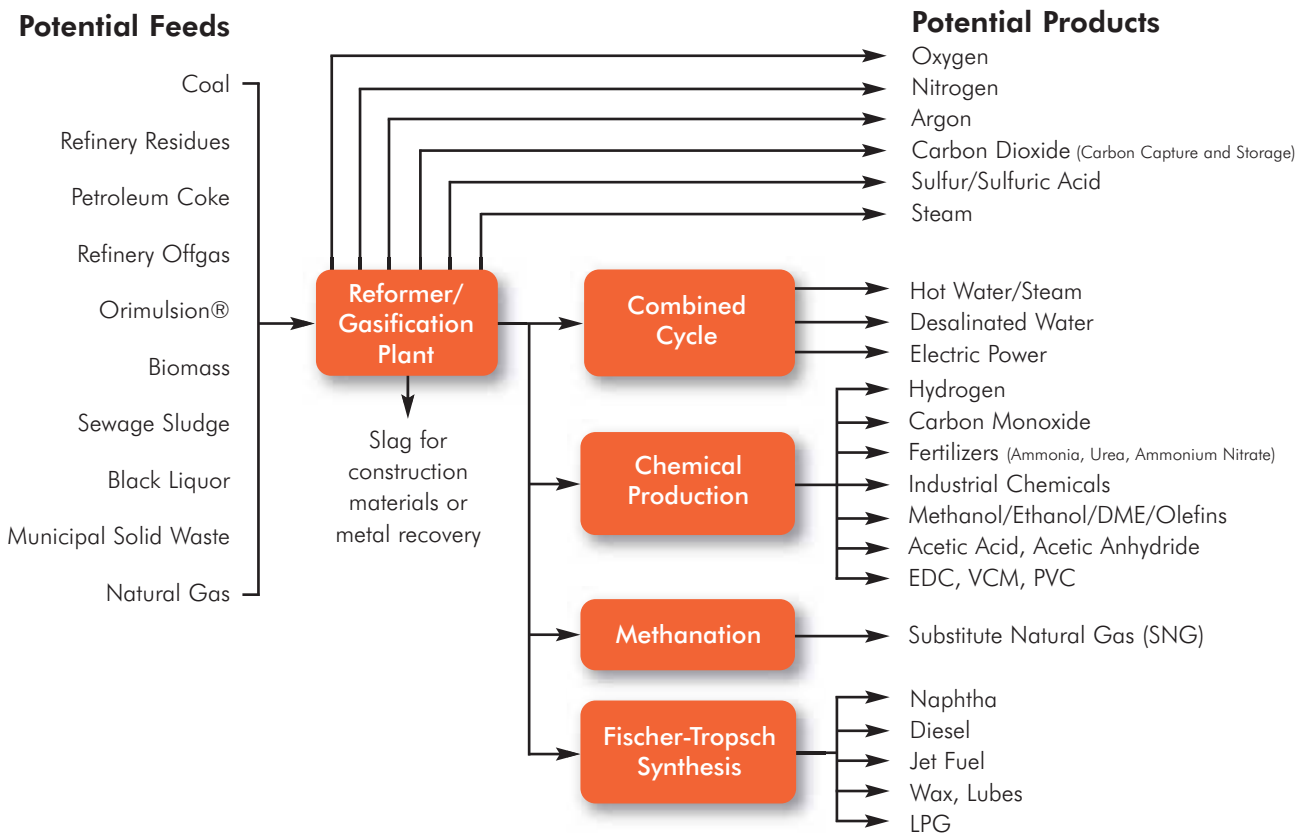
Gasification is a flexible, commercially proven and efficient technology, a building block for production of a range of high-value products including clean power, synthetic fuels, and chemicals, from lower value feedstocks.

Installing gasification and syngas cleaning units can reduce overall emissions of SOx, NOx, CO_2, particulates, metals and chlorine and can produce useful products to maximize profitability.

With continuing developments in the technology, gasification is becoming an important part of the portfolio of available processes to convert carbonaceous materials.

- Gasifiers can be designed to run on a single material or a blend of feedstocks including:
  - Solids – petroleum coke, coal, biomass, waste paper, plastics, industrial and municipal waste
  - Liquids – liquid refinery residues
  - Gas (by reforming) – natural gas or refinery/ chemical off-gas
- Products include methanol, ammonia/urea, hydrogen, carbon monoxide, chemicals and fertilizers, substitute natural gas, transportation fuels and power
- Clean and environmentally-compatible use of high sulfur and heavy metal content fuels
- Large-size plants for competitive electric power and hydrogen production
- Marginal cost to capture CO_2 is low
- Flexible design to meet different capacity requirements

GASIFICATION FEEDS AND PRODUCTS



WHY CHOOSE FOSTER WHEELER?

WE DELIVER SOLUTIONS

We bring together highly qualified, experienced and committed teams of specialists to deliver quality solutions and add value throughout the project lifecycle, including:

- Technology evaluation and selection
- Optimization and integration studies
- Concept and feasibility studies
- FEED
- Engineering, procurement, construction and commissioning

Gasification projects demand strong technical expertise, and the ability to integrate and optimize all of the elements of the planned facility. Our independent technology position means we can deliver the best solution.

WE DELIVER QUALITY

Unlike pure consultancy companies, we not only develop the right concept, but can also implement your project. This brings you continuity and, because we are also a well-known global EPC contractor, the solutions that our technical experts develop are practical, constructable, based on detailed local knowledge, real costs and real experience.

With our global network of engineering centers, and a long and successful EPC track record, we work with our clients to 'build their vision', providing project management, detailed engineering, procurement, construction and commissioning expertise to deliver high quality facilities that meet our clients' expectations.

... AND WE DO IT SAFELY

We have a fundamental and continued commitment to safety. Our list of safety awards continues to grow, including RoSPA's prestigious Order of Distinction Award for Occupational Health and Safety, and a Platinum Certificate of Achievement by WorkSafe, just two in a long list of proudly-won accolades.

We recently celebrated 35 million manhours without a single lost-time incident on one project, a massive achievement demonstrating that safety is genuinely at the forefront of all our activities.

CHEMICALS

Gasification is emerging as a key technology allowing the use of unconventional materials for an ever-widening range of chemicals.

The development of processes, such as methanol-to-olefins, and potential new markets for downstream products, such as dimethyl ether, significantly broadens the attractiveness of syngas-based technology.

As traditional hydrocarbon feedstocks have become more price volatile, coal and petcoke gain economic advantage. Chemicals and fertilizer production is an attractive market for gasification in regions with large coal reserves and/or access to major petcoke markets.

Confidential client, China

Extended feasibility study for the world's largest coal-to-chemicals plant utilizing methanol-to-olefins technology. The project encompasses a wide range of downstream processes and our role includes configuration, technology selection and economic evaluation.

Confidential client, USA

Feasibility study for a large ammonia-based fertilizer complex based on locally produced petcoke.

HYDROGEN

Hydrogen availability is key in refineries installing residue upgrading units to meet clean fuels requirements and to produce more valuable products. Gasification can provide the answer.

Syngas produced from gasification consists mainly of a mixture of hydrogen, CO, CO_2 and water with pollutants that need to be removed. Hydrogen in the syngas and that produced by means of CO shift, can be separated from sour compounds and CO_2 and purified in a PSA unit.

We have current expertise in designing gasification units to provide a reliable source of hydrogen. Some important measures that need to be considered include provision of dual trains for key areas to maximize reliability and availability.

IEA GHG

Assessment of the potential advantage of flexible production of hydrogen and electricity by applying gasification with CO_2 capture. Investigation into market demand for hydrogen and study of several production scenarios including hydrogen storage.

POWER PRODUCTION

The syngas produced from gasifying coal or biomass can also be used to produce electric power, steam and desalinated water when routed through a combined cycle plant.

Lahden Lämpövoima, Finland
We designed and supplied our own biomass gasifier for this facility. Feedstocks including biomass and waste plastics are gasified to provide fuel to an existing coal-fired utility-scale boiler. The first large-scale gasification project for repowering of an existing coal plant, this has delivered reductions in CO_2, NOx and SOx.

RESIDUE UPGRADING

Residue upgrading technologies provide an opportunity for the refiner to move towards zero fuel oil production, while meeting future light product demand growth from low-value residuals rather than additional crude processing.

Foster Wheeler leads the way in advising on residue upgrading and implementing cost-effective bottom-of-the-barrel solutions.

We license world-leading delayed coking technology, plus state-of-the-art hydrogen, solvent deasphalting and visbreaking technology.

In a refinery application, the residue upgrading system can be designed to produce optimized quantities of hydrogen, power and steam for use within the refinery.

Gasification fits very well with our bottom-of-the-barrel processing options, where the heaviest, and least valuable, products such as coke or asphalt can be gasified to produce hydrogen, power, or used as feedstock for downstream chemicals.

ISAB Energy, Italy
Feasibility study, optimization study, FEED and EPC of large gasification combined cycle plant based on solvent-extracted visbroken vacuum residue (asphalt) feed, to produce 525 MWe of power and up to 20,000 Nm^3/hr of high purity hydrogen for the adjacent refinery complex.

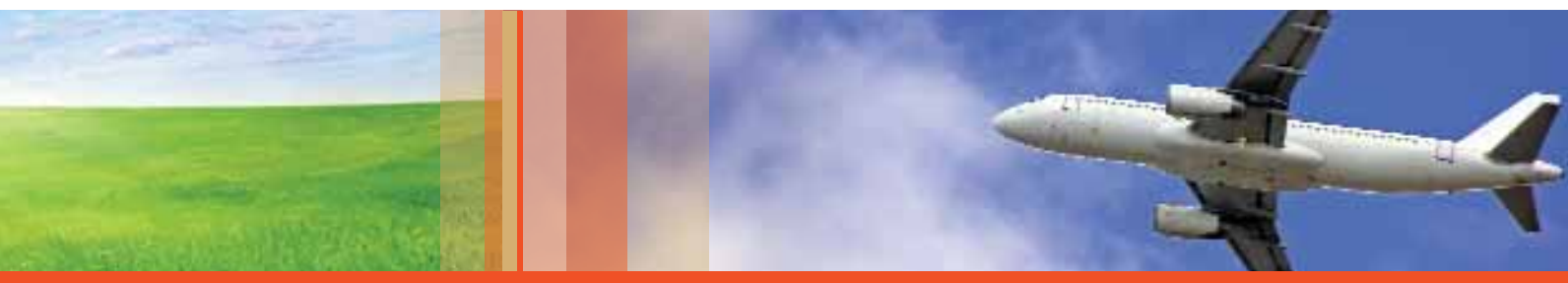
TRANSPORTATION FUELS

Gasification and Fischer-Tropsch (FT) technologies combine to enable the production of light products and transportation fuels, gasoline, diesel and kerosene from a range of feedstocks. The synthetic crude produced from FT can either be fully refined to saleable product specification or used as a blendstock with low-value off-spec products to meet stringent product specifications. We believe we are the world's most experienced contractor at integrating gasification units with leading FT technologies into gas-to-liquid and coal-to-liquid facilities.

Ningxia Sasol CTL, China
Feasibility study for an 80,000 bpd coal-to-liquids plant, to convert coal into selected fuel products such as diesel, naphtha and LPG by combining three principal processes: gasification of coal to syngas, conversion of syngas into liquid fuel, and refining the converted products into valuable fuel products.

SUBSTITUTE NATURAL GAS

Gasification can be used to create substitute natural gas (SNG) using a methanation reaction where the syngas produced in the gasification step can be converted into methane. The resulting SNG can be used in a variety of ways, including power generation or as a domestic heating fuel. SNG can play a key role in enhancing domestic fuel security and can provide an alternative to imported LNG or pipeline supply of gas.



CARBON CAPTURE & STORAGE

In a gasification system, CO_2 can be captured before it would otherwise be vented, using one of a range of technologies. Typically this first involves conversion of the CO and H_2 contained in the syngas via the 'water gas' shift reaction to CO_2 and water. Second, the CO_2 is removed in an acid gas removal stage resulting in a high concentration CO_2 stream which can be compressed and treated before being transported and stored.

We have an in-depth understanding of a wide range of solutions for separating, capturing, compressing, treating, transporting and storing CO_2.

BP, Scotland

Study and FEED for this groundbreaking planned facility converting natural gas into hydrogen and CO_2. The concept involved the use of hydrogen to generate power in a new combined cycle gas turbine power plant with integrated heat recovery. CO_2 is compressed and dehydrated using a pre-combustion decarbonization process before injection into a mature oilfield reservoir, extending the life of the field by about 20 years.

EPRI, US

Feasibility and optimization study covering forty IGCC designs processing different US coals with four alternative gasification technologies, with and without CO_2 capture. This is part of EPRI's CoalFleet for Tomorrow Program, a collaboration of more than 60 power industry companies, to encourage the early deployment of advanced clean coal power generation technologies.

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GLOBAL E&C OFFICE LOCATIONS