



Syngas Generation

Synthesis gas generation technology

Air Liquide Global E&C Solutions offers a variety of processes for the generation, treatment and application of synthesis gas from several types of feedstock, including coal.



Synthesis gas (syngas) is a gaseous mix containing mainly hydrogen (H₂) and carbon monoxide (CO). With Air Liquide Global E&C Solutions, you have at your disposal the most competitive technology for the purification and conditioning of syngas in the world from a range of feedstock.

CO-Shift™

One of the first steps to produce clean syngas is the CO-Shift process. This steam-driven process converts the CO in syngas originating from gasification, natural gas or other gases containing carbon monoxide into hydrogen.

Our CO-Shift process operates at both high and low temperatures, and is suitable for sweet or sour syngas feedstock.

Lurgi Fixed Bed Dry Bottom (Lurgi FBDB™) Coal Gasification

Our Lurgi FBDB™ coal gasification is a proven technology for the conversion of solid carbonaceous feedstocks to synthesis gas.

The technology is able to gasify coal under pressure in the presence of high pressure steam and pure oxygen to produce synthesis gas.

The benefits of the Lurgi FBDB™ gasification process have been well proven with its use in several large-scale applications over many years. Among other features, the technology has a modular design, high reliability and gasification efficiency, and low oxygen consumption.

All types of coal ranks have been commercially gasified, however the competitive advantage of the Lurgi FBDB™ gasifier is greatest when used with low rank, high ash content coal.

Lurgi FBDB™ gasification reactors are commercially available in two sizes, which are the Mk 4 and Mk Plus™ gasifier.

Multi-Purpose Gasification MPG® for Large-Scale Hydrogen Plants [POX]

Our proprietary Multi-Purpose Gasification MPG® technology is suited for the non-catalytic partial oxidation of solids, gaseous or liquid feedstock for the production of large quantities of synthesis gas.

With over 45 years of active experience in gasification technologies and over 75 units on-stream, Air Liquide Global E&C Solutions is the right partner to maximize advantages of the MPG® technology.

In particular, the benefits of this technology include its maximum feedstock flexibility; extended guaranteed burner lifetimes; inherent plant safety by pressurized a cooling water system; and the long reactor lifetimes due to moderate, uniform wall temperature profiles.

The technology also features sophisticated designs for boiler and quench configuration.

In combination with raw gas shift and raw gas purification technologies, MPG® is the superior choice for large-scale hydrogen plants based on heavy residue feedstock such as oil sands, vacuum residues, visbreaker residues or asphalt.

Lurgi Reformer®

The Lurgi Reformer technology is able to reform feedstock ranges from natural gas to light hydrocarbon (LPG or naphtha) under pressure and temperature catalytically in the presence of high pressure steam to produce synthesis gas.

The proprietary design of the Lurgi Reformer® technology evolved from our outstanding experience of designing more than 120 steam methane reforming (SMR) units world-wide, the integration of start-up experience, the results of significant efforts and the long term operational experience from conventional SMR led to superior operability and low investment and operating costs.

To achieve an optimum customization of the Lurgi Reformer® plant design, Air Liquide Global E&C Solutions offers a full range of process options including:

- Pre-Reforming > conversion of higher molecular hydrocarbons and optimization of overall energy efficiency ;
- Autothermal Reforming > conversion of light natural gas with the presence of oxygen under pressure and temperature catalytically in the presence of high pressure steam to generate synthesis gas. The process offers great flexibility over a wide operating range ;
- Combined Reforming > the most economical way to produce synthesis gas from heavy natural gases and oil associated gases. This concept has become known as the Lurgi Combined Reforming process.

Auto Thermal Reforming

Our Lurgi auto-thermal reforming (ATR) technology, also called secondary reforming, is accomplished by reacting a mixture of hydrocarbon feedstock and steam with oxygen in a ratio substantially less than stoichiometric in a refractory lined

pressure vessel with a top-mounted burner (no start-up burner required). The reactor contains a reforming catalyst in the lower part where the process of reforming is completed. The produced syngas finally leaves the ATR reactor at a temperature of approximately 1000°C.

Our Lurgi ATR Technology can process a wide range of gaseous feedstock to produce syngas suitable for many downstream processes with the required H₂/CO ratio and a very low methane slip. The very compact design can provide huge single train syngas capacities at reactor outlet pressures of up to 60bar.

In the past six decades we have provided more than 30 auto-thermal reformers for multiple applications which today represents the most references and experience for this reforming technology. Based on this experience, a significant progress to optimize the design has been achieved over the past decades. This has been supported by using latest Computational Fluid Dynamics (CFD) models as well as extensive test campaigns and studies in order to define and prove the most efficient process parameters in terms of temperature, pressure and lowest steam to carbon ratios.

Today our ATR technology defines the state-of-the-art in terms of burner lifetime, highest plant availability as well as safe and efficient operations.

The syngas value chain

