



Cryogenics Solutions (O₂, N₂, CO, CO₂, Ar, He)

From small standard and automated gas separation units to the world's largest air separation units, Air Liquide Global E&C Solutions can offer world-class solutions for air, syngas and CO₂ separation, to markets such as Oil & Gas, Refinery, Chemicals, Steel, Non Ferrous, Energy, Electronics, Glass, Pulp & Paper and Environment.

Air separation units



Our cryogenics solutions are helping customers worldwide with the supply of oxygen, nitrogen, argon and rare gases (Kr, Xe, He, Ne). Our Air Liquide Global E&C Solutions teams can respond effectively to the challenges of the most complex industrial projects, optimizing overall design to meet our customers' expectations. We offer a unique combination of technology, engineering and project management expertise which is key to our customers' success.

We accompany them from upstream planning, solution optimization and execution to downstream operational support.

Customized cryogenic units

Our tailor-made plants are designed for each customer's specifications and requirements (flexibility, reliability, as well as energy consumption optimization). Oxygen production capacities can be up to 7000 MTPD by air separation unit (ASU) train.

Mega air separation units

Cryogenic distillation is the only available technology that produces large volumes of oxygen and/or nitrogen. We are a technology partner of choice in large capacity air separation units, having supplied more than 75 units above 2 000 MTPD. This technology is constantly improved in order to address the growing markets of coal and gas transformation into chemical products or into energy (e.g. GTL, CTC, CTL, CTX, IGCC, SNG), and oxycombustion. It relies on optimized process schemes, advanced technologies for extra large ASU size, advanced process control (fast load change, etc ...), and possible integration with customer processes.

Modular air separation units

Our modular air separation units meet the needs of customers in metals, chemicals and refining markets for high quality, flexible and cost-optimized utility supplies. Our units are designed to support a wide range of applications in terms of capacity, pressure and purity. In comparison to conventional air separation units, our modular ASUs can generate up to 20% cost savings. These cost benefits have been achieved by maximizing standardized plant concepts; using pre-engineered, pre-fabricated standard components; and modules that facilitate fast-track construction and maintenance operations.

Standard plants

Standard plants are cost efficient units that come in fully packaged modules and yield an array of benefits. These include a compact design and layout, minimal delivery and installation times, as well as simpler operation and maintenance. Our standard plants have been used by many industries such as iron and steel, non-ferrous, glass, refining and chemicals, pulp and paper, electronics, photovoltaic and environmental applications. The main competitive advantages of this technology include low-cost supply, high reliability, adaptable production pressure and capacity and purity, as well as simple operation and maintenance.

CO₂ separation

Air Liquide Global E&C Solutions has recently developed a range of Cryogenic Purification Units (CPU), called Cryocap™. Dedicated to CO₂ capture (CCS), this technology addresses the environmental challenges posed by global warming, helping to reduce greenhouse gas emissions while also serving the market for enhanced oil recovery (EOR).

Cryocap™ Steel: CO₂ capture solutions from Iron & Steel gases (especially for Blast Furnace, Corex™, Finex™)

Cryocap™ Oxy: CO₂ capture solutions from power plant

Cryocap™ SMR: CO₂ capture solutions from hydrogen production units

Cryocap™ Liquefier: CO₂ liquefaction unit for CO₂ logistic chain

Each Cryocap™ unit consists in an original combination of Air Liquide Global E&C Solutions technologies, such as adsorption, permeation and cryogenics. They have been adapted to specific application challenges in terms of performances and capacity to treat a large range of impurities. Our solutions have been successfully demonstrated in real conditions in several pilot plant tests, including CIUDEN and CALLIDE.

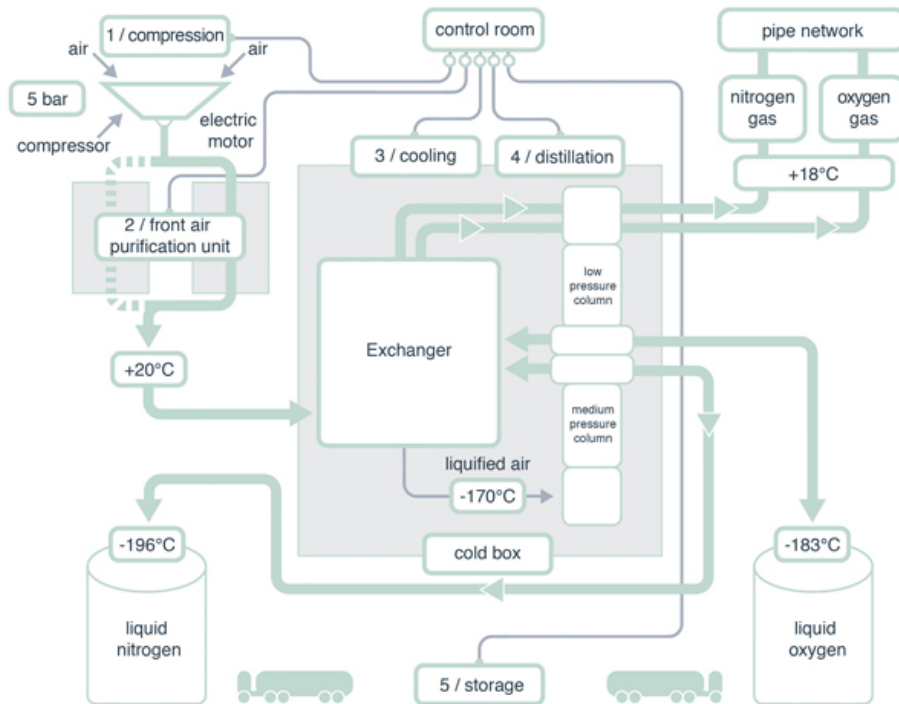
Syngas separation

Our customized syngas cryogenics solutions are helping customers worldwide with the supply of carbon monoxide, hydrogen, oxogas as well as gaseous and liquid methane. Different process schemes for syngas separation are available to address different market expectations. They are known as CH₄ Wash, Partial Condensation and Nitrogen Wash. For each of the process schemes, Air Liquide Global E&C Solutions has designed and manufactured some of the biggest partial condensations in the world: up to 55,000 Nm³/h CO, CH₄ Wash: up to 33,600 Nm³/h CO and Nitrogen Wash: up to 223,000 Nm³/h pure syngas to NH₃ synthesis.

Cryogenic distillation is the only available technology that produces high purity carbon monoxide including CH₄ and nitrogen separation especially when syngas is produced from natural gas with high nitrogen content.

This technology is constantly improved in order to address the growing markets of coal transformation into chemical products (e.g. Coal to MEG, Coal to Chemicals, Oxogas with low CH₄ content production, Gaseous or Liquid CH₄ co-production, H₂ purification to NH₃ synthesis). It relies on optimized process schemes, advanced technologies, advanced process control, and integration with our customers' process, providing the overall benefit of increasing a main product's recovery (CO and H₂), reducing inerts content in syngas that feeds applications such as NH₃ or MeOH and allowing the production of high purity co-products such as Gaseous CH₄ and Liquid CH₄.

Air distillation



Helium purification and liquefaction

Helium is the second most abundant element in the universe after Hydrogen. Due to its unique properties it is highly sought after, especially in light of the multitude of promising new applications that are currently emerging, in areas such as fiber optics, self cleaning gas, and innovative semi-conductors. Helium is often separated from natural gas in the course of removing nitrogen. Raw helium is first recovered from this rejected nitrogen by cryogenic separation through several partial condensation or distillation steps. It is further successively purified from hydrogen, methane and nitrogen in a dehydrogenation unit and in a Pressure Swing Adsorption (PSA) unit. Pure helium 99.995+ % purity is then liquefied for storage or filling into containers and trailers at temperatures in the range of -270°C;

Air Liquide is one of the main players in the worldwide helium market offering a full liquefaction system from gaseous helium to customer applications including supervision stations, gas analysis systems, liquefiers, liquid helium storage, gas bags for the recovery of helium losses, compression and much more. In addition, with Air Liquide's strategic investment in Helium projects in the Middle East, it has positioned itself as a major supplier of helium sources to service the industry on the long term.