Efficient and reliable high-pressure CO_2 compressor solutions from Atlas Copco Gas and Process

Great ideas transform industries.

Efficient, reliable, high-pressure CO_2 delivery

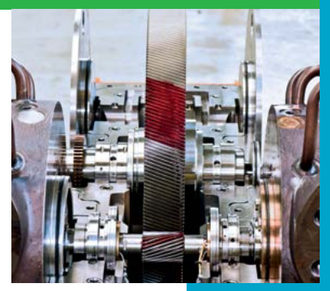
The Atlas Copco Gas and Process High-Pressure CO_2 Compressor is specifically developed for modern applications requiring efficient design that translates into major energy savings. This integrated solution delivers over 200 bar while promising a long lifetime of reliable operation.

Performance through **innovation**

Compressing CO_2 to high pressures creates unique technical challenges. Pushing the gas into its supercritical state results in a sudden higher density of the compound and increased force levels on rotating equipment. The Atlas Copco Gas and Process High-Pressure CO_2 Compressor is specifically designed with these considerations in mind.

Based on decades of experience in the field of CO_2 compression, Atlas Copco Gas and Process developed an integrated solution with exceptional robustness and the reliability required for the job. And thanks to technical features such as interstage cooling, **the compressor uses around 30% less energy than a standard single-shaft compressor.**

Atlas Copco Gas and Process are specialists in the integral gear technology employed in the high-pressure CO_2 compressor.



Integral **gear technology**

When multiple stages are required to compress a gas such as CO_2 from inlet to outlet, the benefits of integral gear design quickly become apparent. By mounting impellers at the ends of multiple pinions that are connected to a bull gear, the speed of the individual pinions and the respective stage can be optimized. This results in excellent efficiency and reduces the overall footprint of the compressor.

Interstage cooling, which is difficult and costly with a singleshaft compressor, can be easily incorporated with an integrally geared compressor after each stage. This **increases efficiency and helps reduce power consumption and operational cost.**

Dynamic dry gas seals

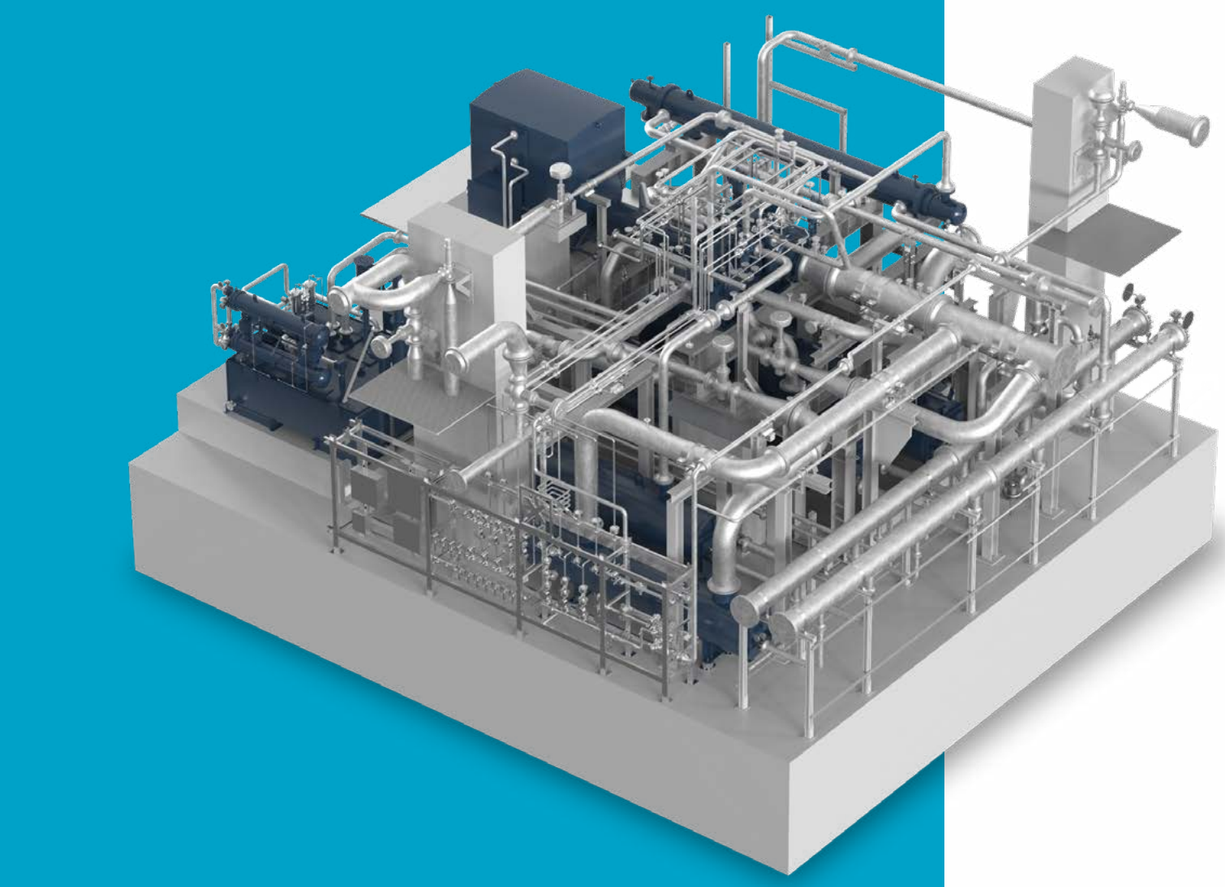
Another of the compressor's technical features are its dynamic, contactless dry-gas seals. These dry gas seals ensure that CO_2 remains inside the compression loop and is delivered to the plant.

In-field tests show that - compared to standard carbon ring seals - dynamic dry gas seals release a fraction of CO_2 into the atmosphere.

The short length of the dry gas seals - resulting in a **shorter overhung** - is also an advantage for rotors exposed to cross-coupling effects (i.e., the interplay between high density gas and the dynamics of the rotors). If required, the expected vibrations can be further **minimized by applying high-damping bearings to the highspeed pinions.**

Putting CO_2 under pressure

The eight-stage GT-Series CO_2 compressor incorporates Atlas Copco Gas and Process' proven impeller, aerodynamics and integral gear design, along with specially designed robust casing and dynamic gas seals, to create a complete all-in-one solution for high-pressure carbon dioxide delivery.



Impeller and rotor assembly

Atlas Copco Gas and Process's CO_2 Compressor features a proven impeller and rotor assembly design referenced in thousands of its GT-series compressors around the world. The compressor's impellers are milled from a solid forging for extra strength. All geometries have been thoroughly tested.

Dry gas seals

Specially designed dynamic, contactless dry gas seals ensure that CO_2 does not escape into the atmosphere, eliminate mechanical wear and tear, and play an important part in the overall rotor design to manage cross coupling effects.

Horizontally-split bearings

The high-speed rotor is supported by radial tilting pad bearings that are designed to eliminate virtually all vibration and provide superior operating stability.

Compact footprint

The compressor's core unit, lube oil system, driver and intercooler are all integrated into a compact baseframe. The result is a small compact footprint and reduced erection time.

Technical specifications

- **Flow:** 18 000 Nm^3 / h / 10 594 ncfm
- **Inlet Pressure:** Atmospheric
- **Outlet Pressure:** 205 bar(a) /2 973 psia
- **Stages:** Eight, with interstage cooling
- **Seals:** Combination of floating carbon rings and dry gas seals
- **Bearings:** Horizontally-split high-dampening bearings
- **Power:** 5.1 MW (6836 HP)
- **Applications:** High-pressure CO_2 delivery for applications such as urea production, carbon capture storage, and enhanced oil recovery. Also used as a working fluid in energy recovery and in heat pumps.

Customer benefits

- Top reliability with well-referenced compressor core
- Noticeable energy savings of up to 30% vs. singleshaft compressors
- Minimal gas leakage
- Compact footprint
- Backed by decades of experience in CO_2 compression

Key CO_2 applications we handle

CO_2 has long been used in modern industrial process ranging from oil and gas refinement to chemical and food industry processes. These days, a number of applications require more than gaseous CO_2. They require that the compound is delivered under high, sometimes supercritical, pressure and in larger quantities.

Integrally-geared centrifugal compressor for oxy-combustion in sCO_2 power cycles.

Compact integrally-geared centrifugal Compander (compressor/expander combined on one gearbox). It is applied in a sCO_2 power cycle recovering waste heat from gas engine (typical power ranges between 2 and 10 MW).

sCO_2 as a **Working Fluid**

As the preferred working fluid for modern, efficient and compact power cycles and industrial heat pumps, sCO_2 is a game changer.

Instead of conventional phase changes to recover energy, sCO_2 undergoes drastic density changes over small temperature and pressure gradients, enabling significant energy recovery within comparatively small equipment.

Both for energy recovery and heat pumps, the entire cycle relies on efficiency, also meaning that the design of the CO_2 compressor and expander is crucial.

Urea / Fertilizer Production

Production pressures of 140-200 bar greatly increase the conversion of ammonia and CO_2 to produce urea.

Efficiency and reliability are important for an urea installation, and integrally-geared centrifugal compressors are well established in the industry and provide compression with to lower power requirements by design, supported by robustness and ease of maintenance.

Enhanced **Oil Recovery**

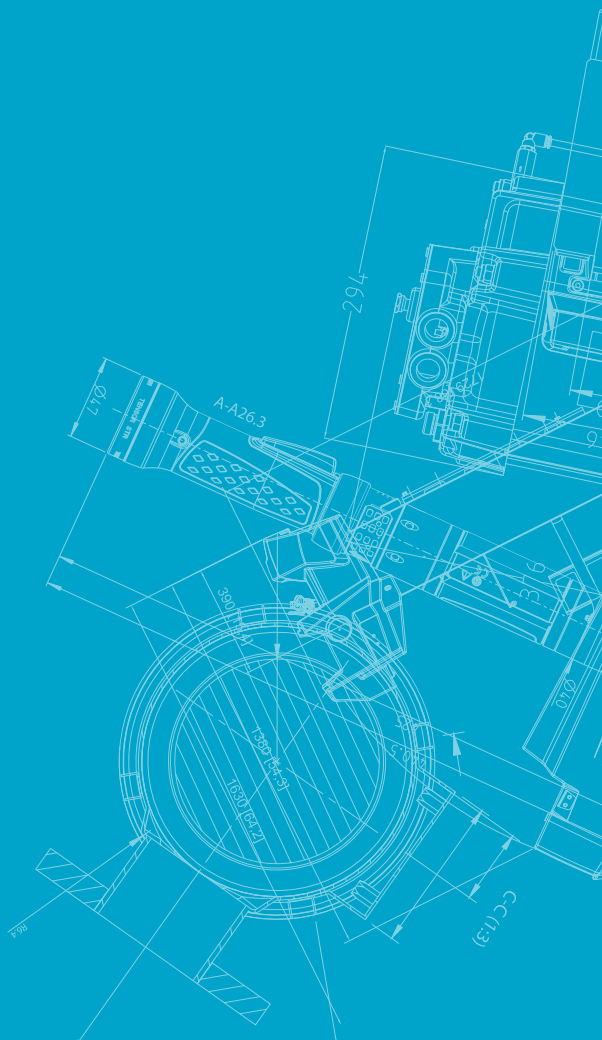
An answer for underperforming oil fields is CO_2 Enhanced Oil Recovery (EOR). High-pressure CO_2 is injected into an oil reservoir to boost production.

A principle called partial miscibility allows the CO_2 at a supercritical pressure and temperature to completely mix with oil, enabling it to flow freely for collection. Under lower pressure, the CO_2 and oil easily separate.

Carbon **Capture and Storage** (CCS)

Capturing and storing CO_2 released from burning fossil fuels has emerged as a promising technology.

There are developments around Oxyfuel, Direct Air Capture, as well Pre- and Post-Combustion processes using amine or membrane based processes. For any CCS technology - whether it uses solvents (i.e., amine-based) or membranes (i.e., PSA-based) - compressors are essential to boost low pressure wet CO_2 gas for transport or usage in nearby industries. Typically, pressures of 25-100 bar are needed for this. Meanwhile, in the case of sequestration, 150 bar or more are required.



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