



Important applications

CO₂ 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 CO₂. They require that the compound is delivered under high, sometimes supercritical, pressure and in larger quantities.



1

1. Supercritical Power Cycle

The emerging Supercritical Power Cycle through oxyfuel combustion is a game changer. Proven to be among the most efficient fossil fuel power cycles, it uses supercritical CO₂ (sCO₂) as a working fluid and operates above supercritical point/region of CO₂.



2

Instead of conventional phase changes to recover energy, sCO₂ undergoes drastic density changes over small temperature and pressure gradients, enabling significant energy recovery within comparatively small equipment. The entire cycle relies on efficiency, where the design of the CO₂ compressor is crucial.



3

2. Urea / Fertilizer Production

Pressures of 140-200 bar greatly increase conversion of ammonia and CO₂ to produce urea. Efficiency and reliability are important for an urea installation and integrally-gear centrifugal compressors are well established in the industry due to lower power requirements, robustness and ease of maintenance.



4

3. Enhanced Oil Recovery

An answer for underperforming oil fields is CO₂ Enhanced Oil Recovery (EOR). High-pressure CO₂ is injected into an oil reservoir to boost production. A principle called partial miscibility allows the CO₂ at a supercritical pressure and temperature to completely mix with oil, enabling it to flow freely for collection. Under lower pressure, the CO₂ and oil easily separate.

4. Carbon Capture and Storage (CCS)

Capturing and storing CO₂ released from burning fossil fuels has emerged as a promising technology. The most mature form of CCS is post-combustion capture, where CO₂ is removed after fossil-fuel combustion by using a chemical solvent. But even with more efficient oxyfuel and precombustion technologies, if there is no immediate use for the CO₂ (such as EOR or fertilizer production) it needs to be stored. Here, high-pressure compression of CO₂ is required to inject it into suitable underground reservoirs.



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Atlas Copco Gas and Process

Schlehenweg 15, 50999 Cologne, Germany
Phone: +49 2236 96 50 0
www.atlascopco-gap.com



The Atlas Copco logo is positioned in the top right corner of the image. It consists of the company name "Atlas Copco" in a white, italicized serif font, centered between two horizontal white bars. The logo is set against a blue rectangular background that is part of a larger blue graphic element in the bottom left corner of the page.

Atlas Copco

The background of the entire page is a detailed photograph of an industrial CO2 compressor. It features a complex network of large, dark-colored metal pipes and flanges. The flanges are heavily bolted, and the overall structure is dense and industrial. The lighting is bright, highlighting the metallic textures and the intricate connections of the machinery.

Eight-stage, 200-bar CO₂ compressor

Atlas Copco Gas and Process Solutions

HANDLE THE PRESSURE

Efficient, reliable, high-pressure CO₂ delivery

The Atlas Copco Gas and Process High-Pressure CO₂ Compressor is specifically developed for modern applications requiring high compression where efficient design translates into major energy savings. This integrated solution delivers over 200 bar while promising a long lifetime of reliable operation.



Atlas Copco Gas and Process are specialists in the integral gear technology employed in the high-pressure CO₂ compressor.

Performance through innovation

Compressing CO₂ 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 CO₂ Compressor is specifically designed with these considerations in mind.

Based on decades of experience in the field of CO₂ 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.

Integral gear technology

When multiple stages are required to compress a gas such as CO₂ 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 single-shaft 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 CO₂ 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 CO₂ 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 high-speed pinions.

Putting CO₂ under pressure

The eight-stage GT-Series CO₂ compressor incorporates Atlas Copco Gas and Process's 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.

① Impeller and rotor assembly

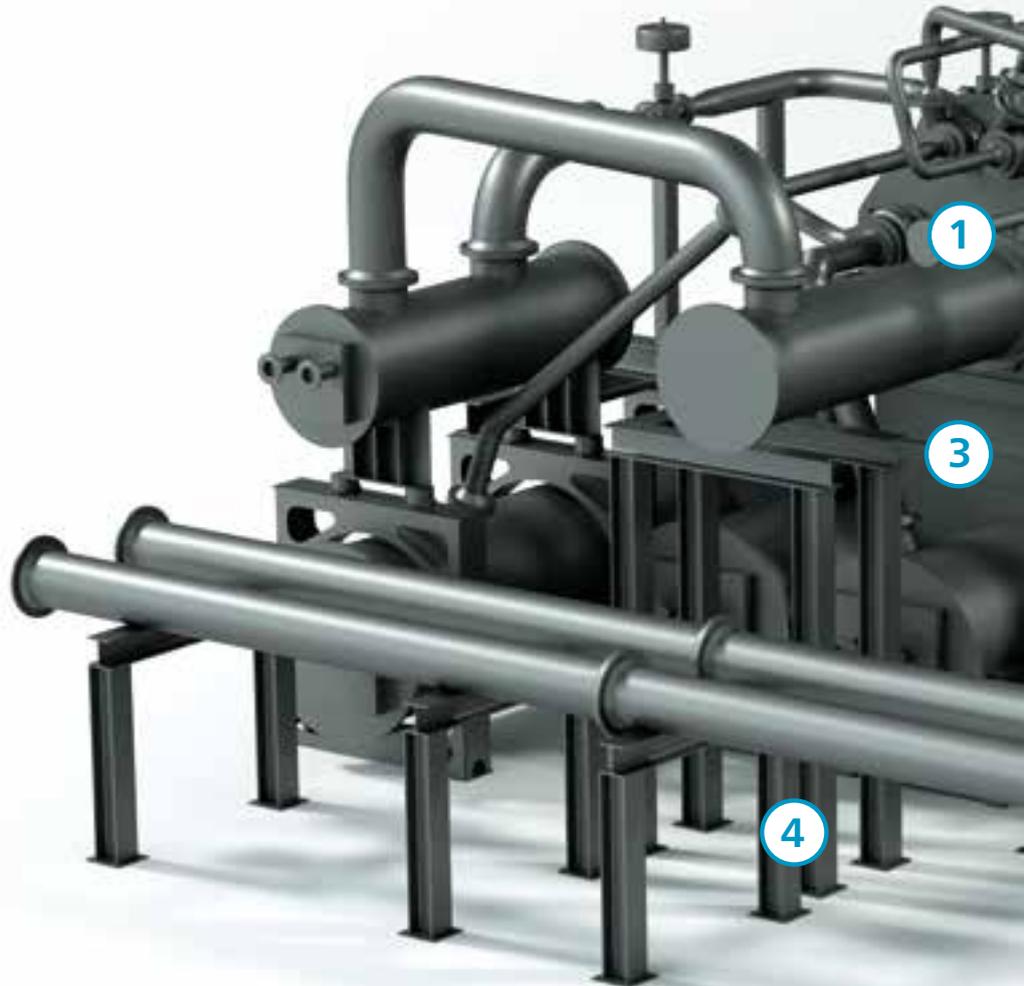
Atlas Copco Gas and Process's CO₂ Compressor features a proven impeller and rotor assembly design referenced in thousands of its GT-series compressors around the world. The compressor's impellers are milled from a solid forging for extra strength. All geometries have been thoroughly tested.

② 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.

③ Dry gas seals

Specially designed dynamic, contactless dry gas seals ensure that CO₂ 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.



CUSTOMER BENEFITS

- Top reliability with well-referenced compressor core
- Noticeable energy savings of up to 30% vs. single-shaft compressors
- Minimal gas leakage
- Compact footprint
- Backed by decades of experience in CO₂ compression



④ 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 Nm³ / h / 10 594 ncfm
- **Inlet Pressure:** Atmospheric
- **Outlet Pressure:** 205 bar(a) / 2 973 psia
- **Stages:** Eight, with interstage cooling
- **Seals:** Dynamic dry gas
- **Bearings:** Horizontally-split high-dampening bearings
- **Power:** 5.1 MW (6836 HP)
- **Applications:** High-pressure CO₂ delivery for applications such as urea production, carbon capture storage and enhanced oil recovery