Carbon Capture and Carbon removal

OUR COMPREHENSIVE SOLUTIONS

CCUS



Ingersoll Rand

Our Value in Carbon Capture, Utilization and Storage

The accelerating concerns about climate change have catalyzed the development of sustainable technologies.

Carbon Capture, Utilization, and Storage (CCUS) emerges as a crucial part of the solution, mitigating the impact of carbon dioxide on our atmosphere. Ingersoll Rand, with its expertise in engineering and manufacturing, plays a pivotal role in this arena, providing specialized pumps, blowers, compressors and loading arms that are integral to the CCUS process.

Value



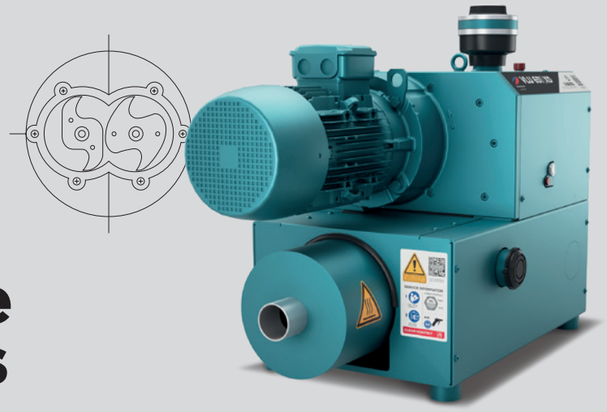
Understanding CCUS and Its Importance

Carbon Capture, Utilization, and Storage (CCUS) refers to a set of technologies that capture carbon dioxide (CO_2) emissions produced from the use of fossil fuels in electricity generation and industrial processes, preventing CO_2 from entering the atmosphere. The captured CO_2 is then either used to create valuable products or stored underground in geological formations.

In 2023, the EU adopted a set of Commission proposals to make the EU's climate, energy, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels. This will enable the EU to become the first climate-neutral continent by 2050.*

Ingersoll Rand provides value in every step of the CCUS process, from input gas feed to CO_2 end use application.

*The European Commission (2020, March). The European Green Deal. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en



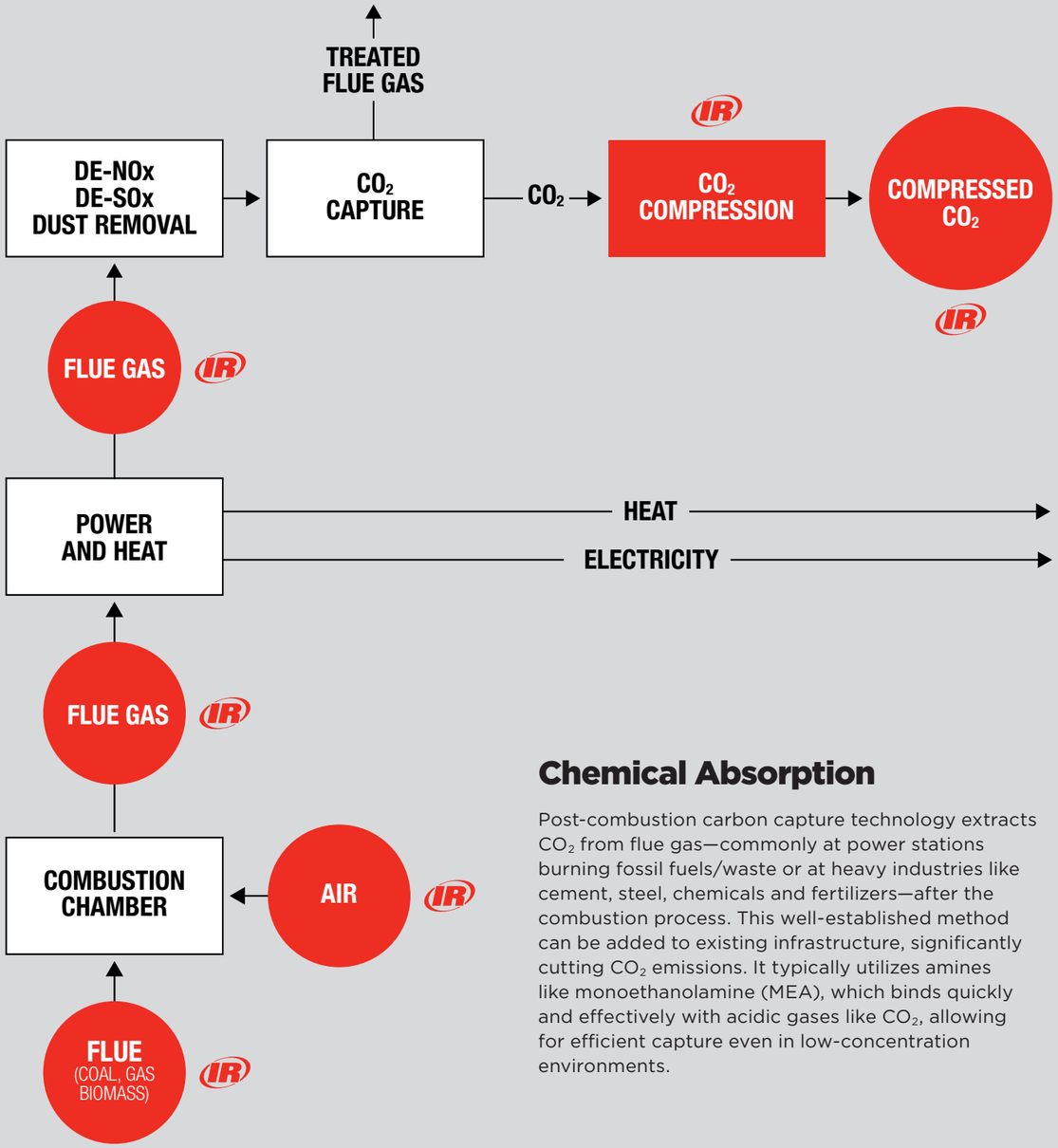
Comprehensive CCUS Solutions

Ingersoll Rand's range of vacuum pumps, blowers, compressors and loading arms are carefully designed to serve the multifaceted needs of the CCUS applications, ensuring optimal performance, durability, and adaptability.

	BLOWERS	VACUUM	COMPRESSORS	LOADING ARMS
	ELMO RIETSCHLE ROBUSCHI HIBON / ROOTS	ELMO RIETSCHLE HIBON / ROOTS NASH	NASH / GARO WITTIG	EMCO WHEATON
CHEMICAL ABSORPTION (AMINE, HPC...)				
Fuel and air feed to combustion chamber	●	-	-	-
Flue Gas feed to CCS unit (absorber-stripper)	●	-	●	-
Wet CO_2 extraction from stripper	-	●	-	-
MEMBRANE SEPARATION				
Flue gas feed to stage 1 separation	●	-	●	-
Vacuum behind stage 1 separation	-	●	-	-
Vacuum behind stage 2 separation	-	●	-	-
PHYSISCAL ADSOPRION (PSA)				
Flue gas feed to Adsorber	●	-	-	-
Vacuum extraction from Desorber	-	●	-	-
DIRECT AIR CAPTURE				
Air feed to sorbent beds	●	-	-	-
Chamber evacuation and Vacuum cooling	-	●	-	-
DOWNSTREAM PROCESSES				
Compression for liquefaction up to 17barg	-	-	●	-
Loading/unloading process for road/rail/ sea transport	-	-	-	●

Ingersoll Rand Group features an additional extended portfolio of products for High Pressure Compression, Gas Treatment and Fluid Handling. This is an opportunity to have a one-stop supplier for nearly any kind of CCUS installation.

Post-Combustion Carbon Capture

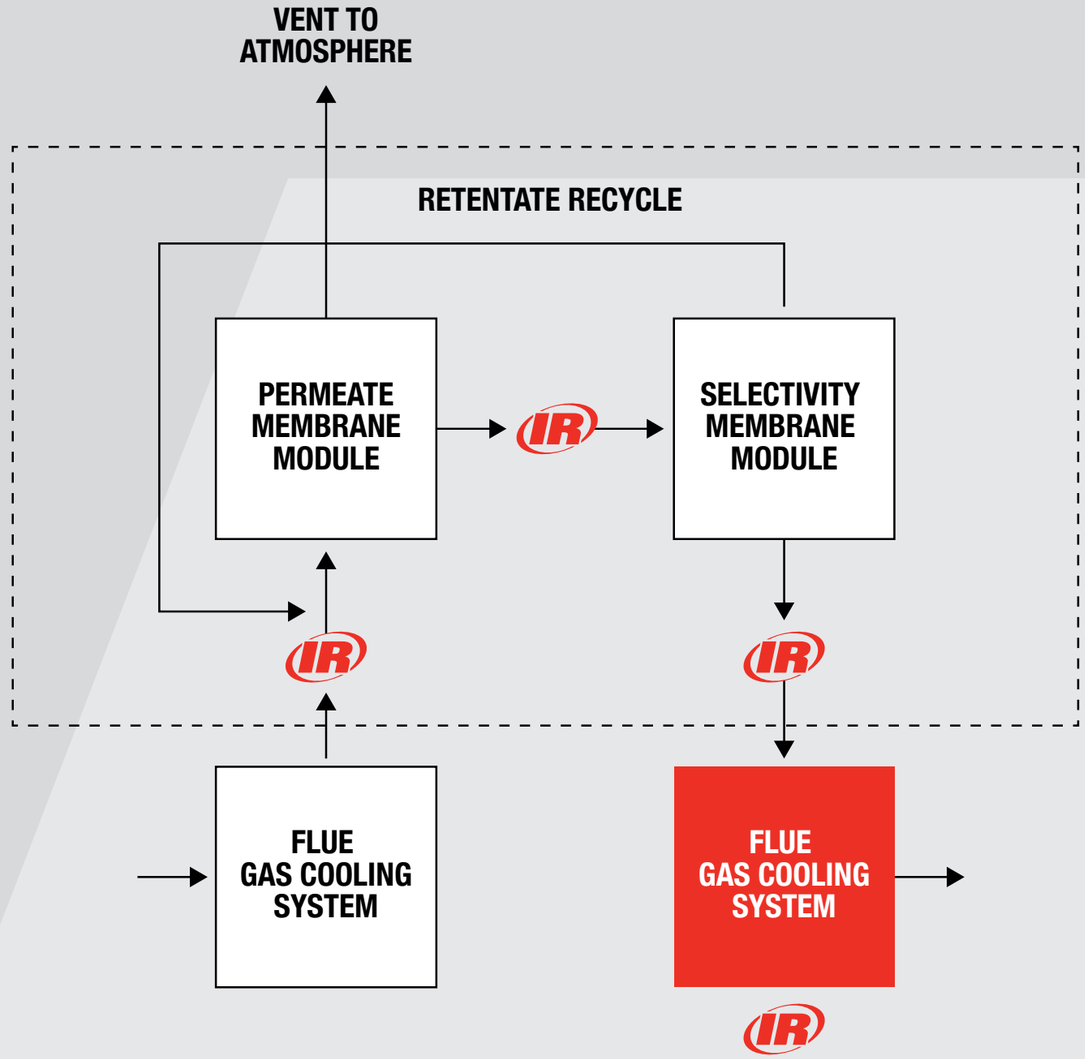


Chemical Absorption

Post-combustion carbon capture technology extracts CO_2 from flue gas—commonly at power stations burning fossil fuels/waste or at heavy industries like cement, steel, chemicals and fertilizers—after the combustion process. This well-established method can be added to existing infrastructure, significantly cutting CO_2 emissions. It typically utilizes amines like monoethanolamine (MEA), which binds quickly and effectively with acidic gases like CO_2, allowing for efficient capture even in low-concentration environments.

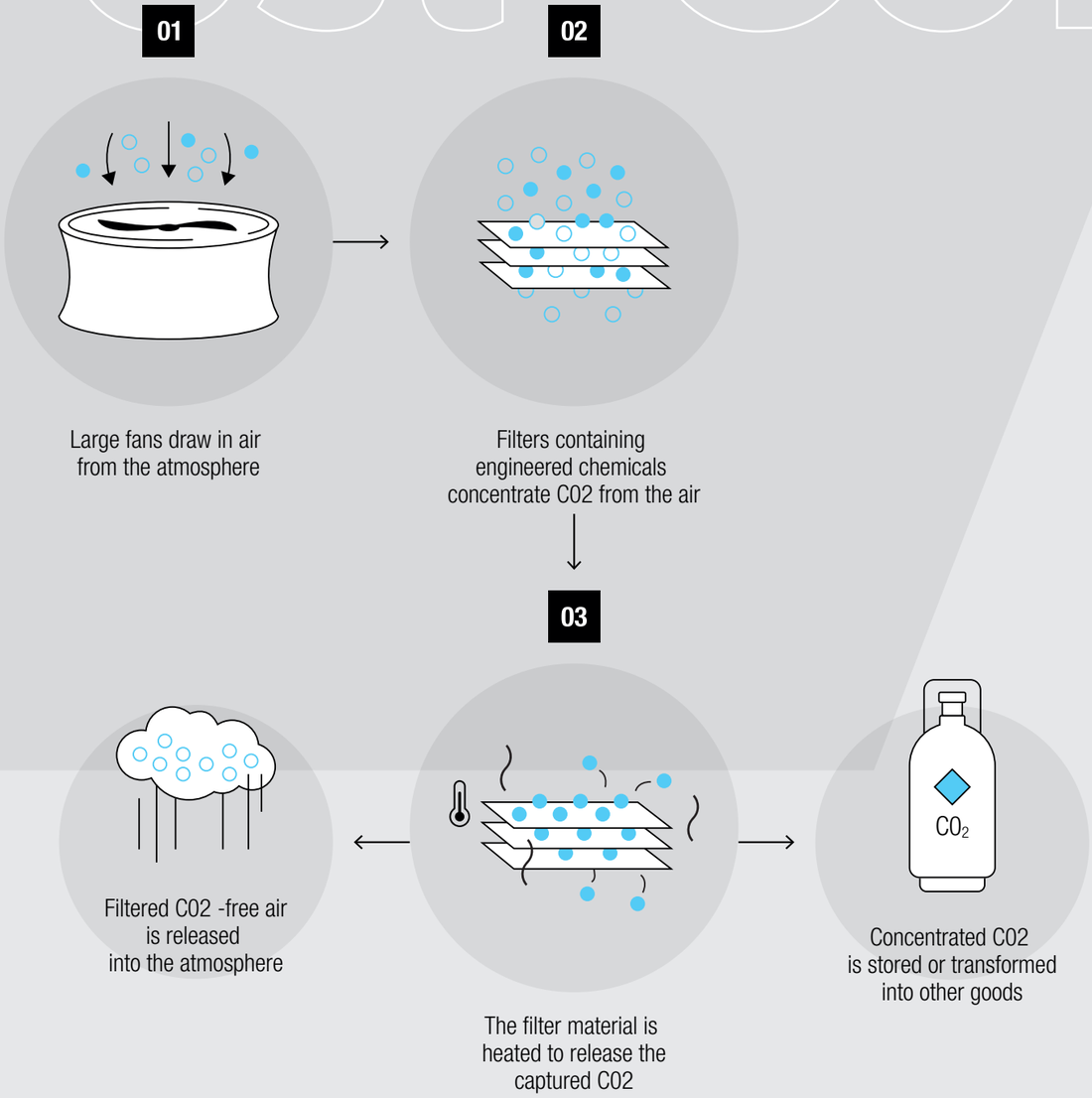
Membrane Separation

Membrane separation is another effective and innovative process to capture CO_2 from combustion flue gases. During membrane separation, CO_2-selective membranes are utilized to separate CO_2 from a flue gas stream. Membrane separation technologies have expanded their market share due to a series of benefits, such as low capital cost, low energy consumption, low space requirements and high sustainability in distant areas. In addition, they are environmentally friendly, have simple operation and do not produce harmful wastes.



Ingersoll Rand

Post-Combustion

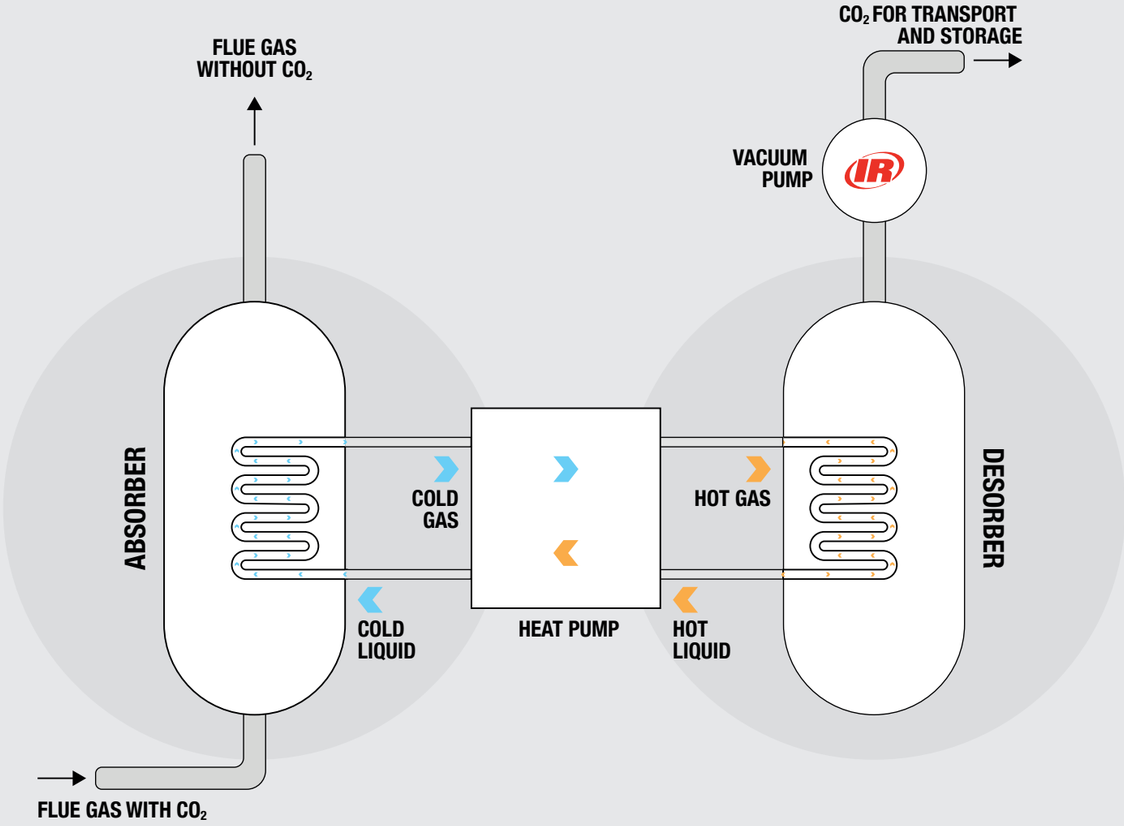


Carbon Removal or Direct Air Capture (DAC)

Direct Air Capture technology uses rotating equipment such as fans or vacuum pumps to draw in air from the atmosphere to allow the Carbon within the air to bond to chemicals known as sorbents. The sorbent are then heated under vacuum to release the captured carbon dioxide.

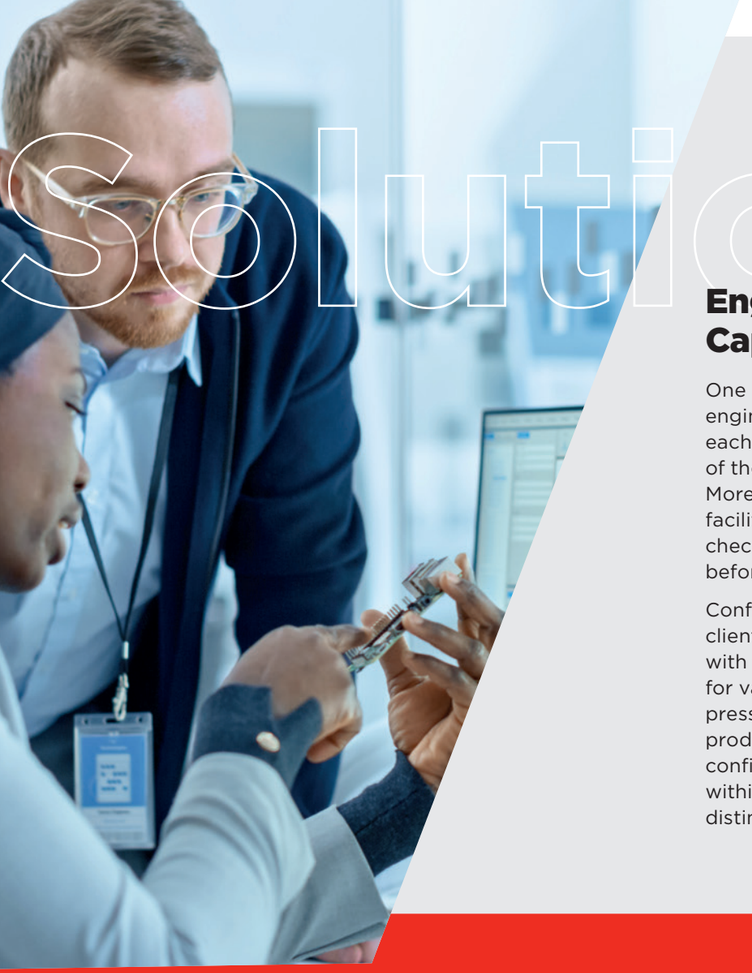
Physical Adsorption

In this technology, an adsorbent agent is used to selectively adsorb and separate CO_2 from the flue gas in a two-step process. CO_2 is initially adsorbed on the surface of the adsorbent agent, which is then regenerated usually via the application of heat (Temperature Swing Adsorption, TSA) or by reducing the pressure (Pressure Swing Adsorption, PSA).



Rotating Equipment and its Roles in CCUS

Rotating equipment is critical in CCUS operations, responsible for the movement and pressurization of gases throughout the capture and storage process. For instance, during post-combustion capture, compressors and blowers are used to feed flue gas into the CCS unit and then move the captured CO_2 to storage sites or utilization facilities. In direct air capture applications, vacuum pumps and compressors facilitate the air feed to sorbent beds and the subsequent vacuum cooling and chamber evacuation.



Solutions

Engineered to Order Capabilities

One key benefit of Ingersoll Rand is our engineered-to-order solutions. This means that each system can be tailored to the specific needs of the application, ensuring optimal performance. Moreover, the availability of dedicated testing facilities ensures that all products are thoroughly checked and approved
before they leave the factory.

Configuration options are extensive, allowing clients to select the technology that aligns best with their requirements. Whether the need is for vacuum, low-pressure applications or high-pressure scenarios, Ingersoll Rand offers a product to match. This flexibility in design and configuration is crucial for the varied processes within CCUS, where each step might have distinct operational demands.

Partner

Your Trusted CCUS Partner



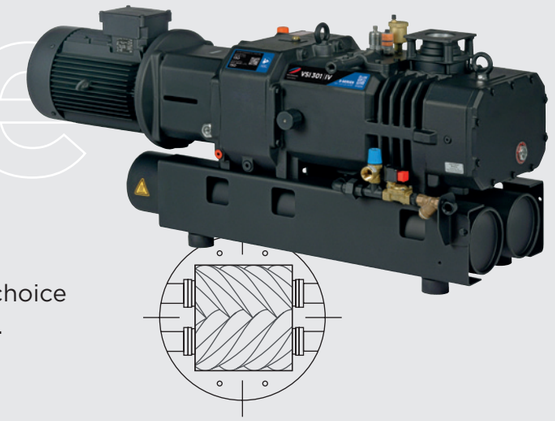
Ingersoll Rand emerges as a trusted partner in the CCUS sector, bringing over 600 years of combined R&D engineering experience to the table.

Our commitment to high-quality products, engineered-to-order solutions, and a customer-centric approach ensures that every step of the CCUS process is supported by durable and efficient technology. As the world moves forward in its fight against climate change, Ingersoll Rand's products will continue to be vital components in the CCUS infrastructure.

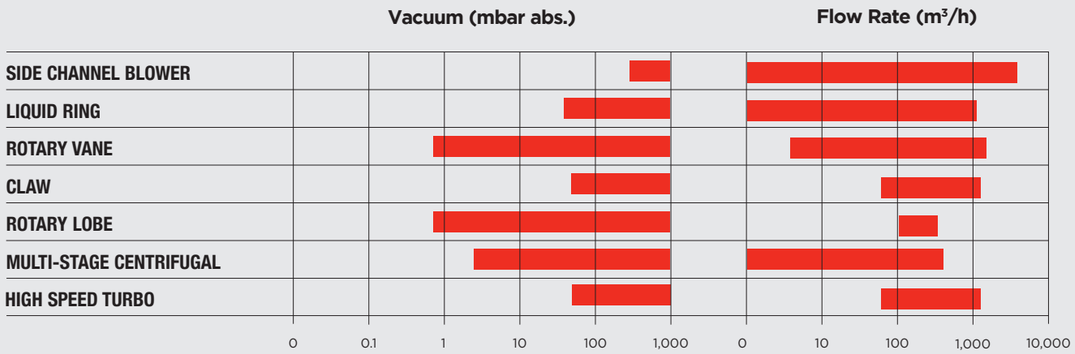
Range

Operating range

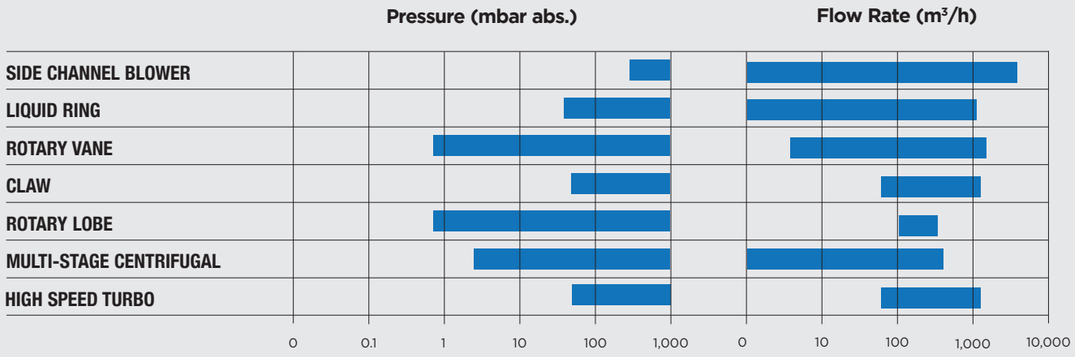
We offer the widest range of vacuum and low pressure technologies. Delivering outstanding choice of both oil lubricated and dry running solutions.



Vacuum



Pressure

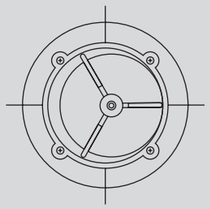


Our offering of Blowers and vacuums

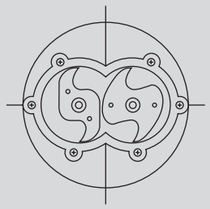
A comprehensive portfolio of brands for your CCUS application.

Ingersoll Rand offers a diverse range of vacuum pumps, blowers and compressor technologies. These technologies cater to different stages of the CCUS process, demonstrating flexibility and adaptability to specific requirements.

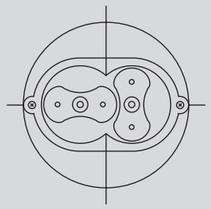
Our Technologies



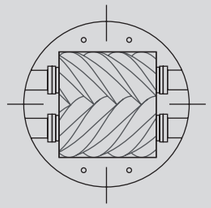
ROTARY VANE



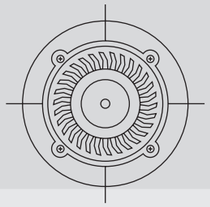
ROTARY CLAW



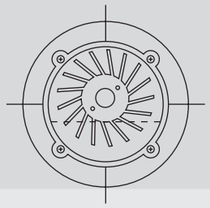
ROTARY LOBE



ROTARY SCREW



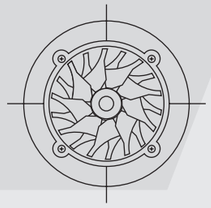
SIDE CHANNEL BLOWER



LIQUID RING



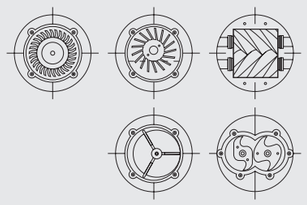
CENTRIFUGAL



HIGH SPEED TURBO

Our Brands

Elmo Rietschle · ROBUSCHI · hibon · ROOTS · NASH · Garo · WITTIG · EMCO WHEATON · Runtech Systems



Elmo Rietschle

Elmo Rietschle is one of the market leaders in vacuum creation. Two top class manufacturing locations in Germany supply a wide range of technologies with a high capability for standardization. Elmo Rietschle products fit perfectly into the demo and pilot applications of CCUS projects, where reduced sizes and short lead times are key drivers for the final technology selection.

Offering

Robuschi

Robuschi is a leader in the design and production of multi-stage centrifugal blowers. They operate manufacturing sites in Parma, Italy and Nurnberg, Germany, ensuring a global reach. Robuschi's focus is on high flow rates and exceptional efficiency, making their products ideal for large-scale CCUS applications where oil contamination is a critical concern.

Nash & Garo

Nash and Garo are leaders in the design and production of Liquid Ring technologies. They boast a global manufacturing footprint, ensuring efficient delivery. Their engineered-to-order solutions cover a wide range of flow rates and pressures, making them a versatile option for various applications. Their products are leak-free and proven to handle corrosive gas mixtures, including carbonic acid, which is generated by the chemical reaction between water and CO2. This makes them a perfect fit for CCUS projects.

Hibon & Roots

Hibon and Roots are leaders in the customization of rotary lobe technologies, catering to specific needs within the CCUS industry. They operate manufacturing facilities in both France and the North America, offering global accessibility. Their focus lies on air- or water-cooled, leak-free technology capable of handling high flow rates. This combination perfectly aligns with the requirements of large CCUS installations where reliability is paramount.

Wittig

Wittig's team designs and manufactures compression systems built to withstand the harshest conditions. Their systems comply with the most demanding standards, including ATEX and those for CCUS applications in marine environments. This expertise positions Wittig as a key player for maritime CCUS projects, where durability and regulatory compliance are essential.

Runtech

Runtech manufacturing plant in Finland delivers fully Engineered-to-Order solutions for vacuum and low pressure applications with large High Speed Turbo machines. Featuring high efficiency and good noise performances, High Speed Turbo systems can provide value for CCUS applications where Total Cost of Ownership is key for the end users.

Emco Wheaton

Emco Wheaton has been a pioneer in fluid transfer solutions for over 100 years, serving industries from gas to aviation with our engineered loading arms and coupling devices. Our expertise in creating high-quality systems is unmatched, ensuring safety, reliability, and operational efficiency for CCUS projects.

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