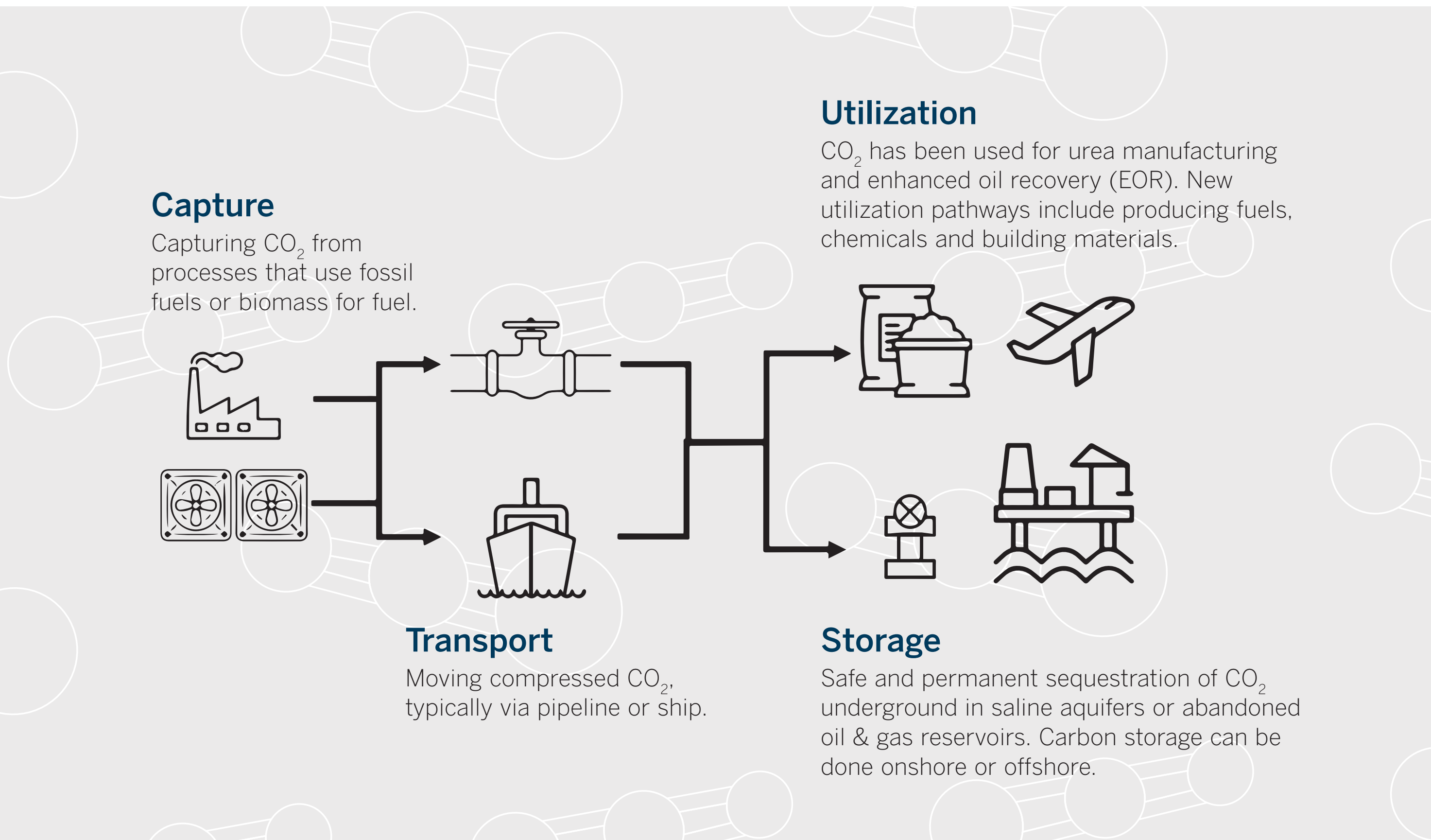
Sundyne

Pumps and Compressors for Carbon Capture, Utilization and Storage

Sundyne Pumps | Sundyne Compressors | ANSIMAG Sealless Pumps | HMD Kontro Sealless Pumps | Marelli Bombas | PPI Diaphragm Compressors | SUNFLO

What is Carbon Capture, Utilization, and Storage (CCUS)?

Carbon Capture, Utilization, and Storage is a set of processes used to "capture" carbon dioxide from large-scale industrial and power generation emissions sources. Once CO_2 is captured, it can be transported for use in industrial processes or for safe and permanent sequestration underground.



Why is CCUS Important?

According to the International Energy Agency (IEA), CCUS could account for 15% of all CO_2 emissions reductions by 2050 with 4.0 GT of CO_2 captured per year.[1] There are several key advantages to CCUS as a decarbonization technology:

- CCUS technology is ready today and can be scaled to capture CO_2 emissions from any size emissions source, including power generation and industrial hard-to-abate emissions.
- CCUS serves processes that use fossil fuels, so it can be deployed in today's energy mix without requiring new energy sources or production methods to be deployed.
- CCUS is an enabler to blue hydrogen, synthetic fuels production, direct air capture (DAC), and can be installed with biofuels production to produce negative-emissions fuels.

Multiple Technology Options

There are four main categories of carbon capture technology:

1. **Pre-combustion:** removing CO_2 from fossil fuels before combustion to produce syngas
2. **Post-combustion:** separating CO_2 from flue gas after fossil fuel or biomass combustion
3. **Oxy-fuel combustion:** burning fuel with pure oxygen (rather than air), resulting in a nearly pure CO_2 stream
4. **Direct Air Capture:** removing CO_2 directly from the atmosphere

Within each capture technology, there are various CO_2 separation techniques. These include absorption, adsorption, membranes, and cryogenics.

This brochure covers several processes within the carbon capture value-chain where Sundyne's product portfolio offers a superior solution.

[1] IEA (2020), CCUS in Clean Energy Transitions, IEA, Paris https://www.iea.org/reports/ccus-in-clean-energy-transitions, License: CC BY 4.0

Pre-Combustion Capture

Pre-combustion capture processes remove CO_2 from fossil fuels before they are burned. Once the CO_2 is removed, the resulting syngas is H_2-rich and can be used as a clean fuel in industrial or power generation processes. The process involves gasification, syngas processing, CO_2 capture and hydrogen production.

1 Gasification:

The first step in pre-combustion carbon capture is to convert a fossil fuel (such as coal or natural gas) or a biomass fuel into a synthetic gas (syngas). This process occurs in a gasifier, which reacts the fuel with oxygen and steam in order to break it down into primarily carbon monoxide (CO) and hydrogen (H_2). Gasification varies based on the feedstock.

2 Syngas Processing:

The syngas mixture containing CO and H_2 is then sent through a catalytic shift reactor, where a water-gas shift reaction occurs. The CO reacts with steam (H_2O) to form additional H_2 and CO_2. The resulting syngas mixture has higher concentrations of CO_2 (making it easier to separate) and higher concentrations of H_2 (for subsequent use as a clean fuel).

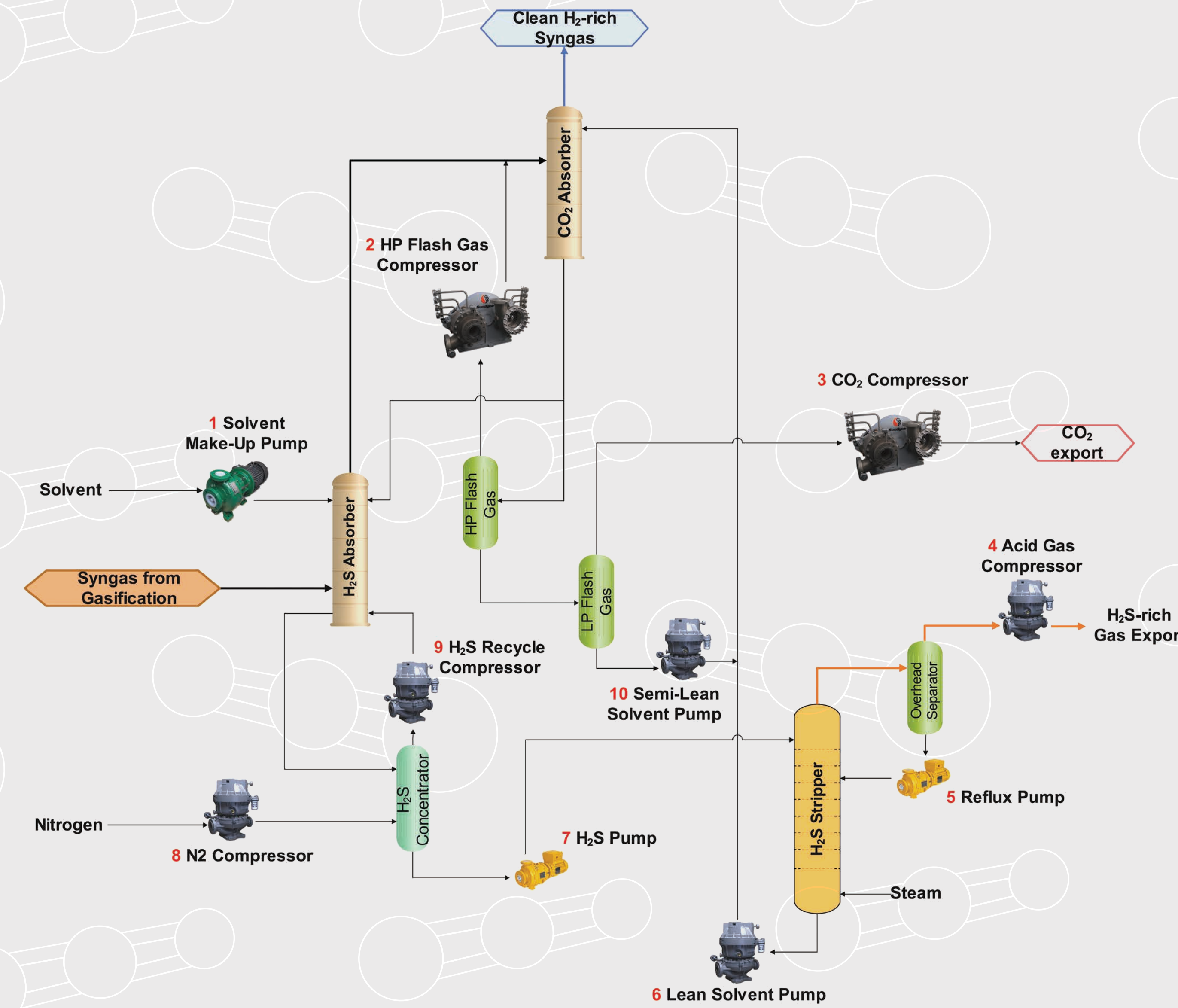
3 H_2S Removal and CO_2 Capture:

Any remaining H_2S must be removed from the syngas, since H_2S is a corrosive gas that can poison the catalysts used in carbon capture, damage equipment downstream, and can result in the emission of SO_2 which is a major air pollutant. The syngas is sent through an absorption tower, where an amine solution absorbs the H_2S and any other sulfur compounds. The H_2S-rich amine solution is then pumped to a regeneration tower, where the H_2S is released, and the lean-amine can be reused.

Next, the CO_2 is separated from the syngas. In pre-combustion capture, various technologies can be used to separate the CO_2, including physical solvents, chemical solvents, and membrane separation. In the diagram shown here, a chemical solvent is used to separate the CO_2 in the CO_2 absorber tower. Since the CO_2 is being removed from the pre-treated syngas mixture, the CO_2 concentration is higher than it would be for post-combustion capture solutions. For this reason, the overall energy-usage in the pre-combustion process is lower than in post-combustion carbon capture..

4 Hydrogen Production:

Once the CO_2 has been removed, a hydrogen-rich syngas remains. This "clean hydrogen" can be used as a fuel in various applications, including industrial heat, electricity generation, or for transportation.



Location	Service	Sundyne Equipment	Medium
1	Solvent Make-Up Pump	Ansimag, LMV, HMD, Marelli	Amine
2	HP Flash Gas Compressor	LF-2000	CO_2, H_2, N_2, H_2O
3	CO_2 Compressor	LF-2000	Wet / Dry CO_2
4	Acid Gas Compressor	LF-2000, LMC/BMC	H_2S, CO_2
5	Reflux Pump	HMD, LMV	Amine + CO_2
6	Lean Solvent Pump	LMV, HMD, Ansimag, Marelli	Amine
7	H_2S Pump	HMD, LMV	H_2S
8	N_2 Compressor	LMC/BMC	N_2
9	H_2S Recycle Compressor	LMC/BMC	H_2S
10	Semi-Lean Solvent Pump	LMV, HMD, Ansimag, Marelli	Amine, CO_2, H_2S

Post-Combustion Capture with Chemical Absorption

Amine-based absorbents are the most common and effective solvents for chemical absorption. Amines bond with CO_2 to absorb and remove CO_2 molecules from gas streams. There are many technology providers who offer chemical absorption process licenses and propriety amine solvent formulas. An amine-based scrubbing process unit can be installed as a retrofit onto any industrial process with a flue gas stream containing 3% to 20% CO_2 concentration. The CO_2 removal from flue gas by amine wash process works as follows:

1 Pre-Treatment:

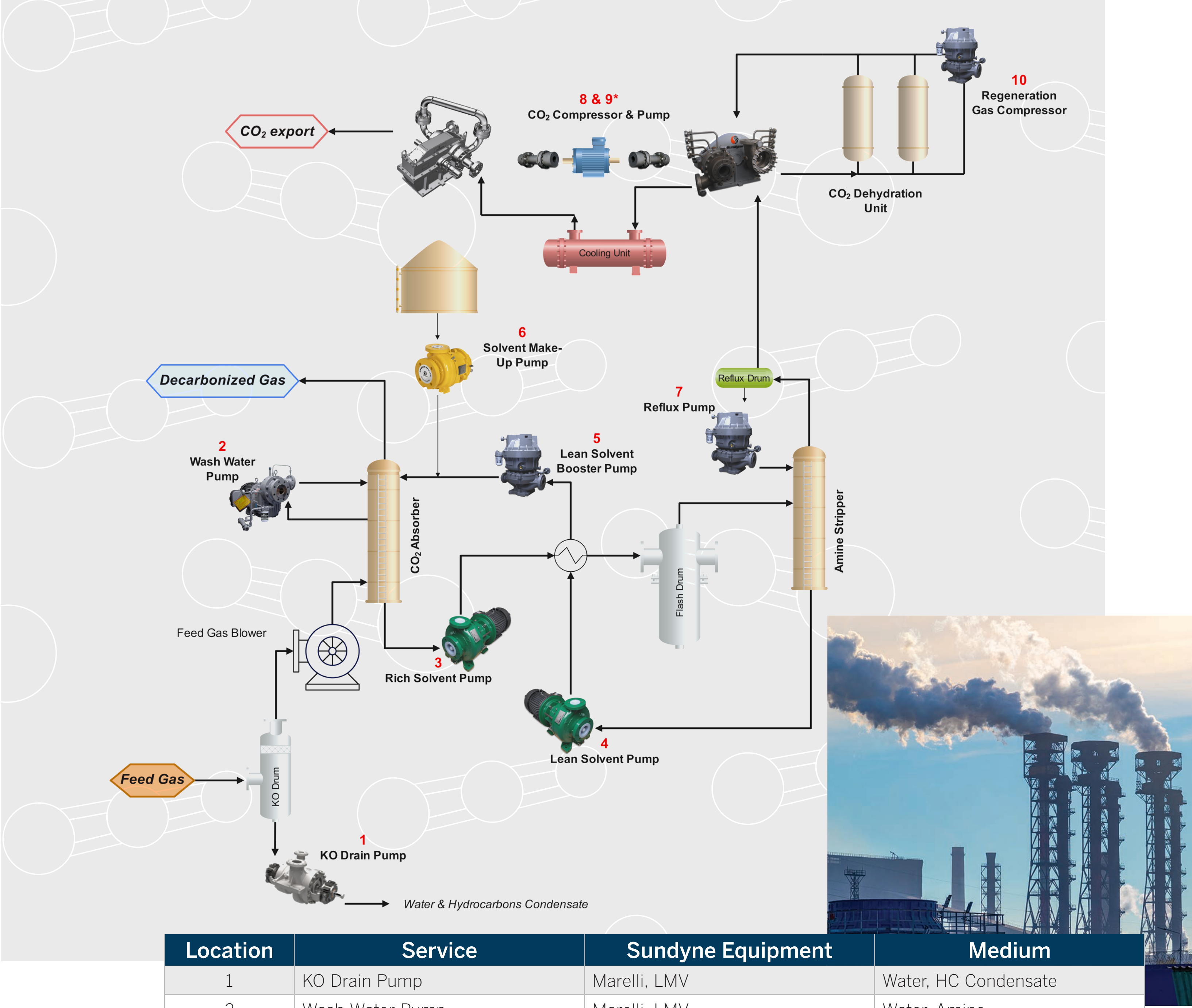
A Gas Blower or Gas Compressor moves the flue gas into a vapor-liquid separator (called a KO, or knockout drum), which removes water and liquid hydrocarbons from the gas stream. The flue gas stream is also cooled prior to being fed into the absorption tower.

2 Absorption:

The untreated "sour" gas moves into the CO_2 absorber. Here, circulation pumps inject aqueous lean amine solutions that bind onto CO_2. The treated gas leaving the absorption column is CO_2 free and can be released into atmosphere.

3 Desorption and Regeneration:

The "rich amine" (now containing the CO_2) settles at the bottom of the absorber, where it is fed to the regenerator using sealless pumps. The pumps used in this process must be capable of supporting extremely high temperatures. Steam, generated in the reboiler, heats the amine and removes CO_2 in the amine stripper. The "lean amine" from the regenerator is cooled in an exchanger, where it is returned to the absorber to be re-used. At the top of the regenerator, the released CO_2 is saturated with water. The gas is routed through a reflux drum to condense the water vapor and remove any residual amine, which is then pumped back to the regenerator. The removed CO_2 is concentrated and can be sent to a pipeline for sequestration or other utilization end-markets.



Location	Service	Sundyne Equipment	Medium
1	KO Drain Pump	Marelli, LMV	Water, HC Condensate
2	Wash Water Pump	Marelli, LMV	Water, Amine
3	Rich Solvent Pump	LMV, HMD, Ansimag, Marelli	Amine + CO_2
4	Lean Solvent Pump	LMV, HMD, Ansimag, Marelli	Amine
5	Lean Solvent Booster Pump	LMV, HMD, Ansimag, Marelli	Amine
6	Solvent Make-Up Pump	LMV, HMD, Marelli	Amine
7	Reflux Pump	Marelli, LMV	Amine + CO_2
8	CO_2 Compressor*	LF-2000	Wet CO_2, Dry CO_2, sCO_2
9	CO_2 Pump*	LMV, Marelli	Liquid CO_2
10	Regeneration Gas Compressor	LMC/BMC, LF-2000	CO_2, Water

* Sundyne offers the unique ability to integrate multiple services within a single machine, including an integrated CO_2 pump and CO_2 compressor mounted on one skid with one motor. Whenever CO_2 is compressed to a supercritical state or whenever CO_2 is liquefied then pumped, a dual-service machine guarantees the best integration of process & control management within a compact and modularized arrangement.

Oxy-Fuel Combustion

Oxy-fuel combustion involves burning fossil fuels or biomass in an oxygen-rich environment instead of in air. Burning fossil fuels in air (which is roughly 78% nitrogen, 21% oxygen, and 1% argon) results in a flue gas stream with diluted CO_2 concentration, requiring more energy-intensive post-combustion carbon capture processes to be deployed. In oxy-fuel combustion, the flue gas has a high CO_2 concentration, which makes the subsequent carbon capture, transport and storage much more efficient. The process involves oxygen production, fuel combustion, and CO_2 capture.

1 Oxygen production:

Air separation units (ASUs) are used to separate oxygen from nitrogen. The resulting oxygen stream is fed into the combustion process.

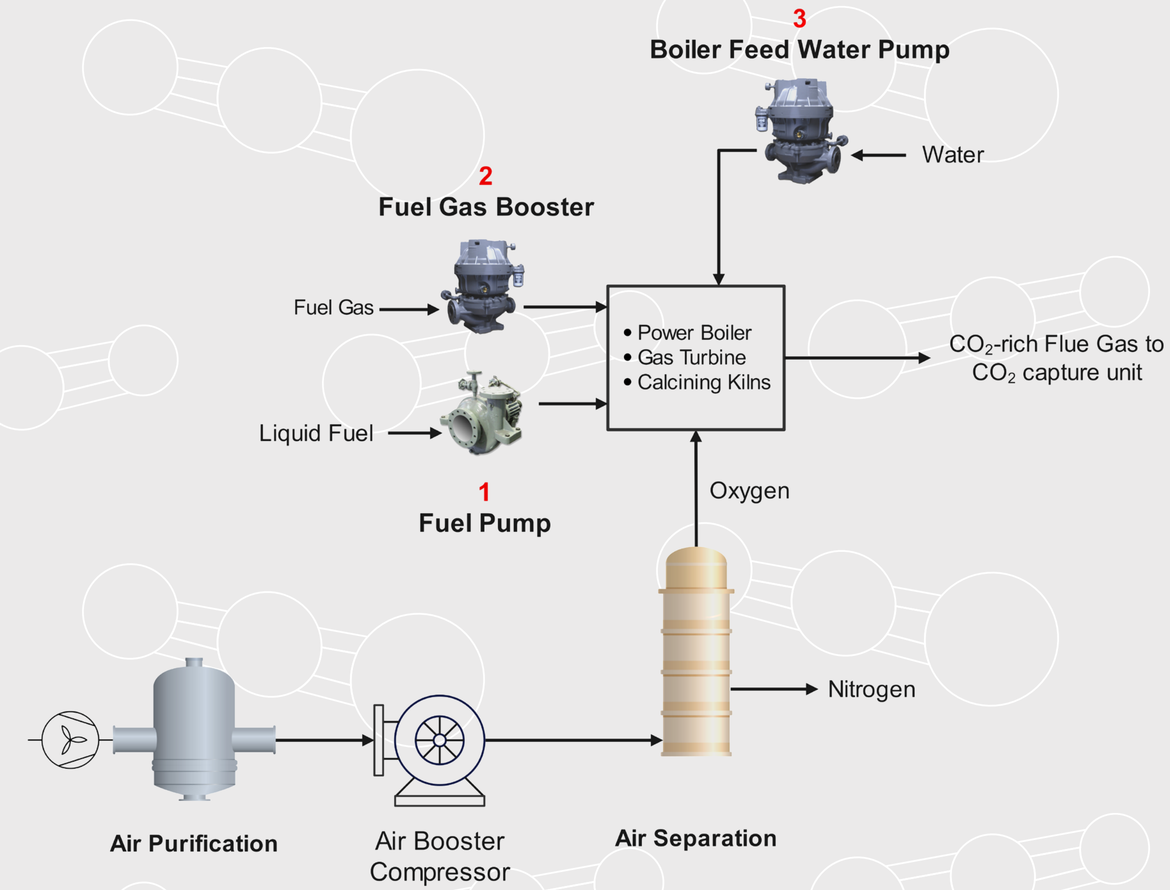
2 Fuel combustion:

The fossil fuel or biomass is then combusted in the pure-oxygen environment, which takes place at a higher temperature than in air. To manage the higher temperatures, a portion of the flue gas can be recycled and mixed with the oxygen and fuel.

An additional benefit of oxy-fuel combustion is that there are minimal nitrogen oxides (NOx) emissions because the nitrogen is removed from the air prior to combustion.

3 CO_2 Capture:

The resulting flue gas from combustion is CO_2-rich and contains water vapor and trace amounts of other gases. The flue gas is cooled to condense and remove water vapor through a series of heat exchangers and condensers. Then, a CO_2-separation method, such as physical solvents, chemical solvents, or membrane separation, is used to capture the CO_2. Due to the high concentration of CO_2 in the flue gas, many methods are available and the energy requirements are less than that of post-combustion capture.



Location	Service	Sundyne Equipment	Medium
1	Fuel Pump	Marelli	Liquid Fuel
2	Fuel Gas Booster	LMC/BMC, LF-2000	Natural Gas
3	Boiler Feed Water Pump	LMV, HMP, Sunflo	Water

Other Services

In addition to the carbon capture process, Sundyne equipment supports utilities and balance-of-plant services for CCUS projects. Here are some common services that Sundyne equipment can serve:

Other Services	Equipment Type	Medium
Boiler Feed Water Feed Pumps	Marelli, LMV, HMP, Sunflo pump	Water
Condensate Pump	Marelli, LMV, HMP, Sunflo pump	Water
Closed Cooling Water Pumps	Marelli pump	Water
Corrosion Inhibitor Pumps	HMD, Ansimag pump	Alkaline compounds Amine, Hydrazine
Demi Water Feed Pumps	Marelli, LMV, HMP, Sunflo pump	Water
Demi Water Circulation Pumps	Marelli, LMV, HMP, Sunflo pump	Water
Refrigerant Gas Compressors	Sundyne LMC/BMC or LF-2000	HCFC, CFC, HC, CO_2, Ammonia
Quench / Condenser Pump	Ansimag, HMD pump	Process Water

Direct Air Capture

Direct Air Capture (DAC) involves removing carbon dioxide directly from the atmosphere.

For this reason, DAC is viewed as a carbon removal technology, rather than a carbon abatement technology like the point-source carbon capture methods. Atmospheric concentration of CO_2 is approximately 419 ppm, or 0.04%. Compared to post-combustion capture, which is effective at ~4%+ CO_2-concentration in flue gas, the low concentration of CO_2 makes DAC very energy-intensive. To maintain the climate benefits of DAC, renewable electricity sources are often used to power the process. If all power consumption is met by renewable sources, then DAC can be considered a carbon negative technology.

There are two main types of DAC based on the CO_2 removal method: (1) liquid sorbents and (2) solid sorbents.

Liquid Systems

In liquid systems, a chemical solution (such as KOH, potassium hydroxide) absorbs CO_2 from the air and then forms a carbonate (K_2CO_3) or bicarbonate.

$$2\ KO_{(aq)} + CO_{2\,(g)} \rightarrow K_2CO_{3\,(aq)} + H_2O_{(l)}$$

The potassium carbonate is reacted with calcium hydroxide pellets ($Ca(OH)_2$) in a pellet reactor to regenerate the KOH absorbent and create calcium carbonate ($CaCO_3$).

$$K_2CO_{3\,(aq)} + Ca(OH)_{2\,(s)} \rightarrow 2\ KOH_{(aq)} + CaCO_{3\,(s)}$$

Then, the calcium carbonate is heated in a calciner to release the CO_2 and create calcium oxide (CaO).

$$CaCO_{3\,(s)} \rightarrow CaO_{(s)} + CO_{2\,(g)}$$

The calcium oxide is reacted with steam in a slaker to produce calcium hydroxide pellets, which are sent back to the pellet reactor. This method is energy-intensive due to the need to regenerate the absorbent (similar to post-combustion carbon capture) however, it is highly effective in capturing CO_2 at low concentrations and can be operated continuously.

Solid Systems

In solid-sorbent systems, a solid-based adsorbent or metal-organic framework binds onto the CO_2 from the ambient air. The solid sorbent is then regenerated, typically using a temperature swing adsorption (TSA) process, to release the CO_2 and restart the process. For this reason, there are typically multiple sorbent beds installed so that one can be operating while another is being regenerated. This method has lower energy costs than liquid systems.

Process Steps

For both processes, the typical steps are as follows:

1. **Ambient air contacting:**

A set of fans or blowers brings the ambient air into contact with the sorbent system (either solid or liquid). These systems are often designed like industrial cooling towers to handle large volumes of airflow.

2. **Carbon capture:**

For liquid systems, CO_2 reacts with the liquid sorbent, forming a carbonate or bicarbonate which is processed in the regeneration step. For solid systems, CO_2 is adsorbed by the solid material through either chemical or physical bonds.

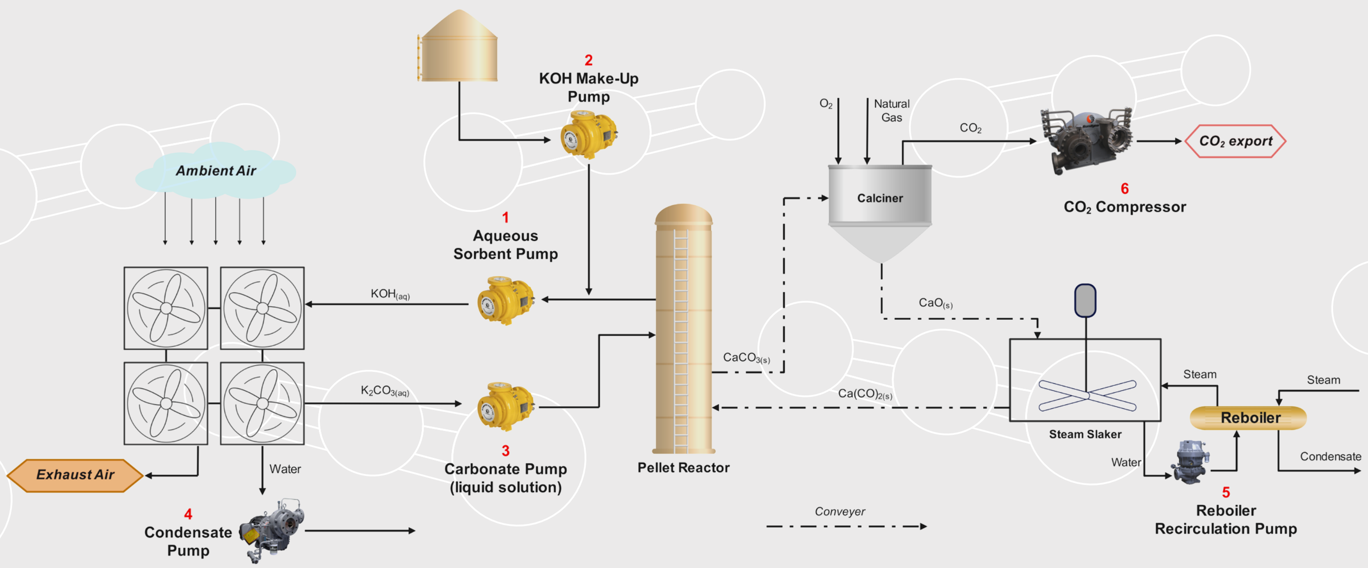
3. **Sorbent regeneration:**

Once the CO_2 is captured, it needs to be released and then the sorbent can be regenerated for reuse. In liquid systems, the carbonate is heated or reacted to release the pure CO_2 and recycle the liquid solution (such as KOH). In solid systems, the adsorbent is regenerated by applying either temperature or pressure swings.

4. **CO_2 compression and transport:**

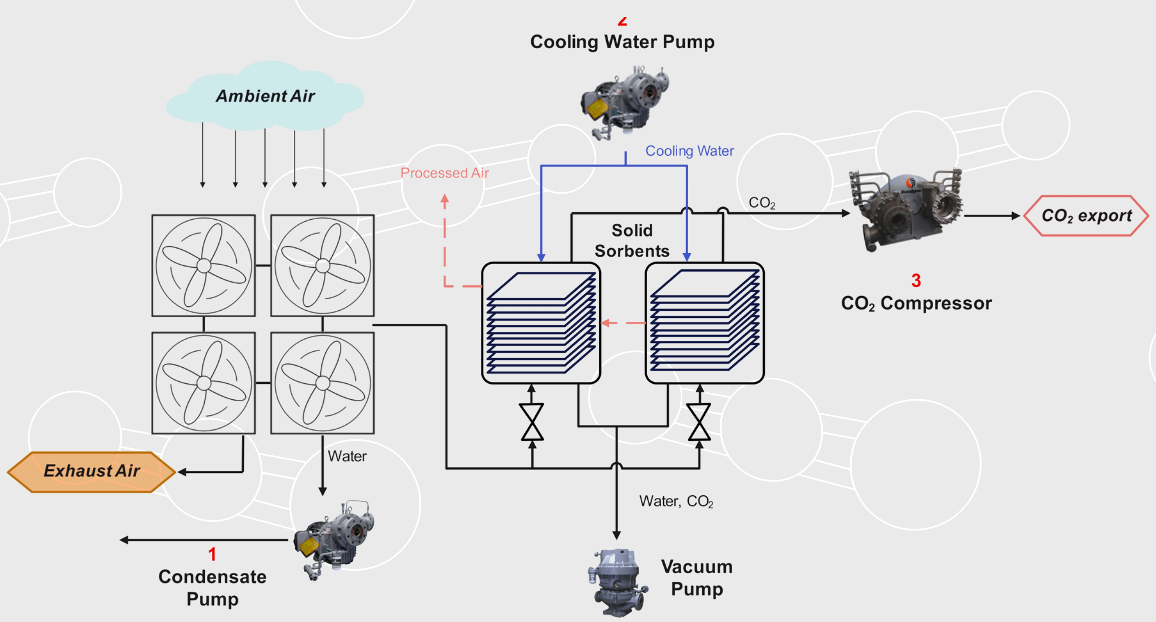
The pure CO_2 stream is then ready to be exported. A CO_2 compressor is used to increase the pressure to a supercritical state to improve the efficiency of transportation of the CO_2. Like other types of carbon capture, the CO_2 can now be permanently sequestered underground or sent to another industrial facility for utilization as a feedstock.

DAC with a Liquid-sorbent



Location	Service	Equipment Type	Medium
1	Sorbent Pump	HMD, LMV, Marelli	Liquid sorbent (KOH, other hydroxides)
2	Sorbent Make-up Pump	HMD, LMV, Marelli	Liquid sorbent (KOH, other hydroxides)
3	Carbonate Pump	LMV, Marelli	Carbonate slurry (K_2CO_3, other carbonates/bicarbonates)
4	Condensate Pump	Sunflo	Water
5	Reboiler Recirculation Pump	Sunflo, LMV	Water
6	CO_2 Compressor	LF-2000, LMC, BMC	CO_2

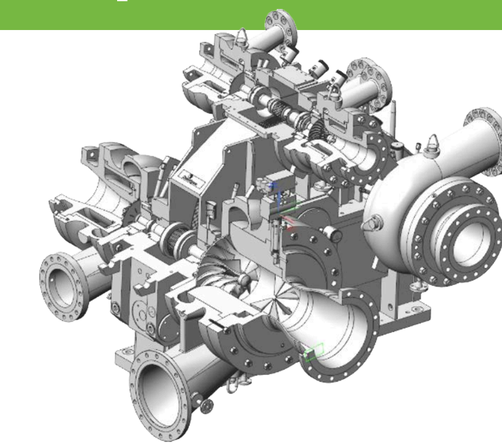
DAC with a Solid-sorbent



Location	Service	Equipment Type	Medium
1	Condensate Pump	Sunflo	Water
2	Cooling Water Pump	Sunflo, LMV	Water
3	CO_2 Compressor	LF-2000, LMC, BMC	CO_2

Integrally Geared CO_2 and sCO_2 Compressor

Sundyne offers a fit-for-purpose CO_2 compressor package designed to meet the technoeconomic needs of the carbon capture market. Our centrifugal compressor design includes all process and auxiliary systems. Sundyne offers this package in modules shipped ready for operation, or the package can be engineered-to-order to meet any site-specific needs.



Benefits

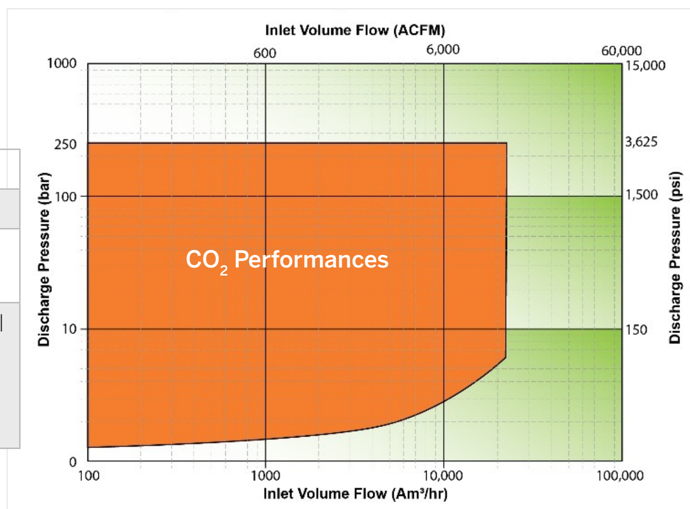
- **Centrifugal Design:** Range from 100 to 22,000 m³/h combining high reliability and minimum emissions down to zero leakage
- **High Efficiency:** Customized rotating speed for each impeller, intercooling between each stage, and variable inlet guide vane (IGV) control
- **Compact Footprint:** High-speed technology and modularized arrangement of compression package
- **Lead Time and Installation:** Standardized product offering specific to CO_2 to reduce lead time, site works, and enable repeated success
- **Demonstrated Performance:** Dedicated test bench for supercritical CO_2 at Sundyne's factory
- **Comprehensive OEM:** Sundyne's product portfolio offers the unique capability to meet all rotating equipment needs for CCUS projects by providing both pumps and compressors

Example Projects

- **CO_2 compressor running since 2009** in Asia, large MEG unit in Petrochemical complex
- **1300 KTPA CO_2 HP Flash Gas Compressor** in Middle East, Blue Ammonia Production
- Net-Zero Teesside Power, Feed of **CO_2 Compression for Power Plant carbon capture & storage**

Key Data

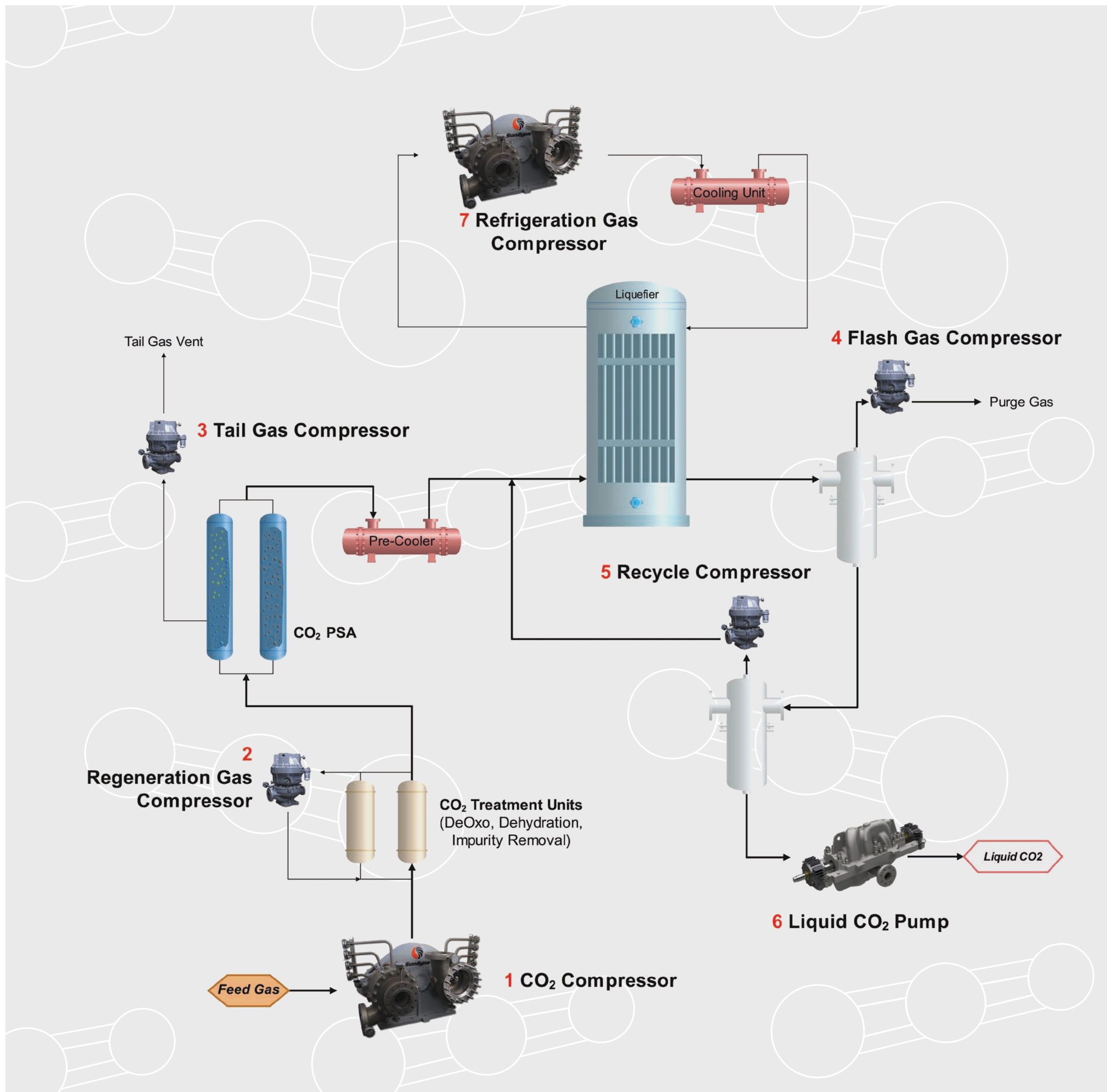
Capture Range	0 – 1,400 t/d CO_2
Max Pressure	250 bar
# of Running Compressors [as of 2024]	73
Target Industries	Refining & Chemicals, Natural Gas Processing, Hydrogen, Ethanol, Power Generation, Waste-to-Energy, Power-to-X



CO_2 Liquefaction

CO_2 can be liquefied before being transported in pressurized tanks on ships, rail or by truck. Liquefied CO_2 (LCO_2) carriers are used for the transport of CO_2 over long distances when pipelines are infeasible.

The CO_2 liquefaction process requires a series of compressors and cooling steps to liquefy the CO_2 and remove any water and impurities. Compressing CO_2 into a supercritical state makes it denser and more economical to transport CO_2. Pumps are used to load the liquid CO_2 into the ship's storage tanks and to unload it at the destination. On the receiving end (after shipping), the CO_2 is typically stored in a liquid state before a vaporization or regasification process. These pumps must handle CO_2 at low temperatures and high pressures.



Location	Service	Sundyne Equipment	Medium
1	Feed Gas Compressor	LF-2000	Flue Gas
2	Regeneration Gas Compressor	LMC/BMC or LF-2000	CO_2, Water
3	Tail Gas Compressor	LMC/BMC	Hydrocarbons, Water
4	Flash Gas Compressor	LMC/BMC	O_2, Ar, N_2, NO, CO
5	Recycle Gas Compressor	LMC/BMC	CO_2
6	CO_2 Pump	LMV	Liquid CO_2
7	Refrigerant Gas Compressor	LF-2000	NH_3 or other Refrigerant Gases

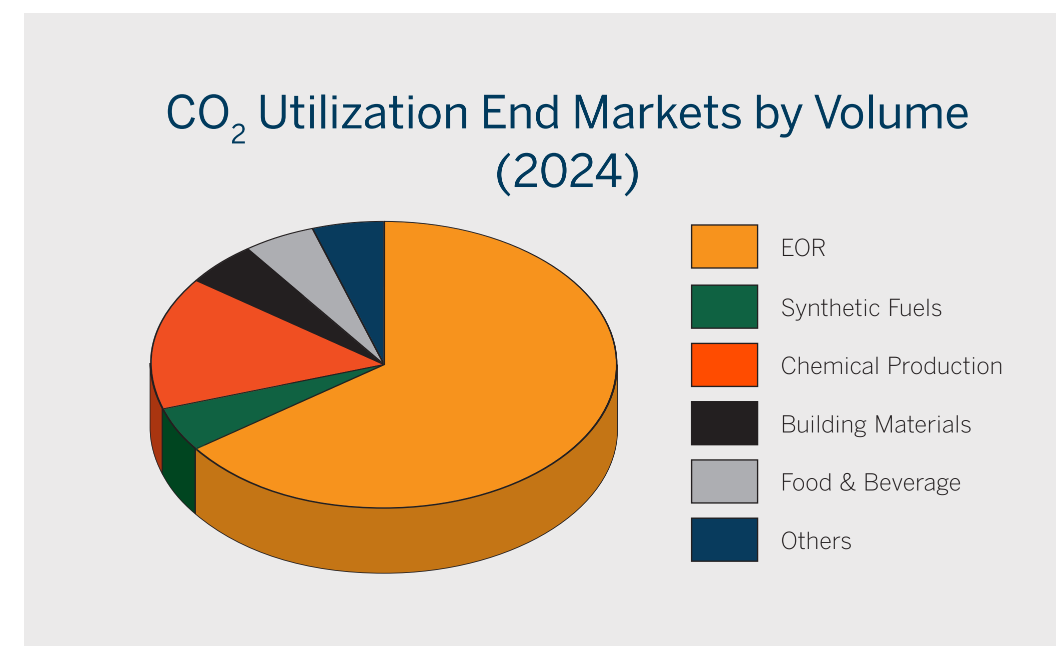
CO_2 Utilization

Today, the majority of announced carbon capture projects plan to permanently sequester the captured CO_2 in either saline aquifers or oil and gas reservoirs. In the future, CO_2 utilization markets will offer an additional value-stream by turning a waste product into a valuable commodity or feedstock.

The challenge is that few commercial processes exist at large-scales to transform CO_2 into useful products, and these processes are typically much more expensive than the incumbents. There are also infrastructure limitations in transporting CO_2 to new end-use outlets. Today, CO_2 pipeline infrastructure is largely built for permanent storage or enhanced oil recovery. Therefore, new transportation networks will need to be built to as CO_2 utilization markets develop.

The key markets for CO_2 utilization include:

- **Enhanced oil recovery:** injecting CO_2 into depleting oil fields to increase recovery rates
- **Synthetic fuels:** using CO_2 as a feedstock to produce renewable fuels, such as methanol
- **Chemical production**: using CO_2 as a feedstock to produce chemicals, such as urea, salicylic acid, and polymers
- **Building materials:** embedding CO_2 in concrete during curing or in synthetic aggregates
- **Food and beverage:** using CO_2 for carbonization or in packaging to extend shelf-life
- **Others:** Algae Cultivation, Agriculture, Wastewater Treatment



This brochure highlights synthetic methanol production as a fast-growing CO_2 utilization market. There is an increasing demand for sustainable fuels driven by global compliance and voluntary markets. Synthetic methanol can be used directly as a marine fuel, can be blended with gasoline, and can also be used in several industrial processes to reduce carbon intensity. Producing synthetic methanol involves carbon capture, hydrogen production, methanol synthesis, and methanol purification.

E-Methanol Production

1 Carbon Capture:

CO_2 is a feedstock for synthetic methanol production. As described in this document, CO_2 can be captured from industrial and power generation emissions through a variety of carbon capture technologies. Once captured, the CO_2 needs to be compressed typically between 30 and 100 bar for efficient reaction with hydrogen in methanol synthesis.

2 Hydrogen Production:

Hydrogen is also a feedstock for synthetic methanol production. The production method and carbon-intensity of the hydrogen input determines the categorization of the resulting methanol product. **Blue methanol** is produced from **blue hydrogen** (i.e., hydrogen produced from natural gas using reforming with carbon capture). **Green methanol** is produced from **green hydrogen** (i.e., hydrogen produced from splitting water into hydrogen and oxygen through electrolysis using renewable electricity).

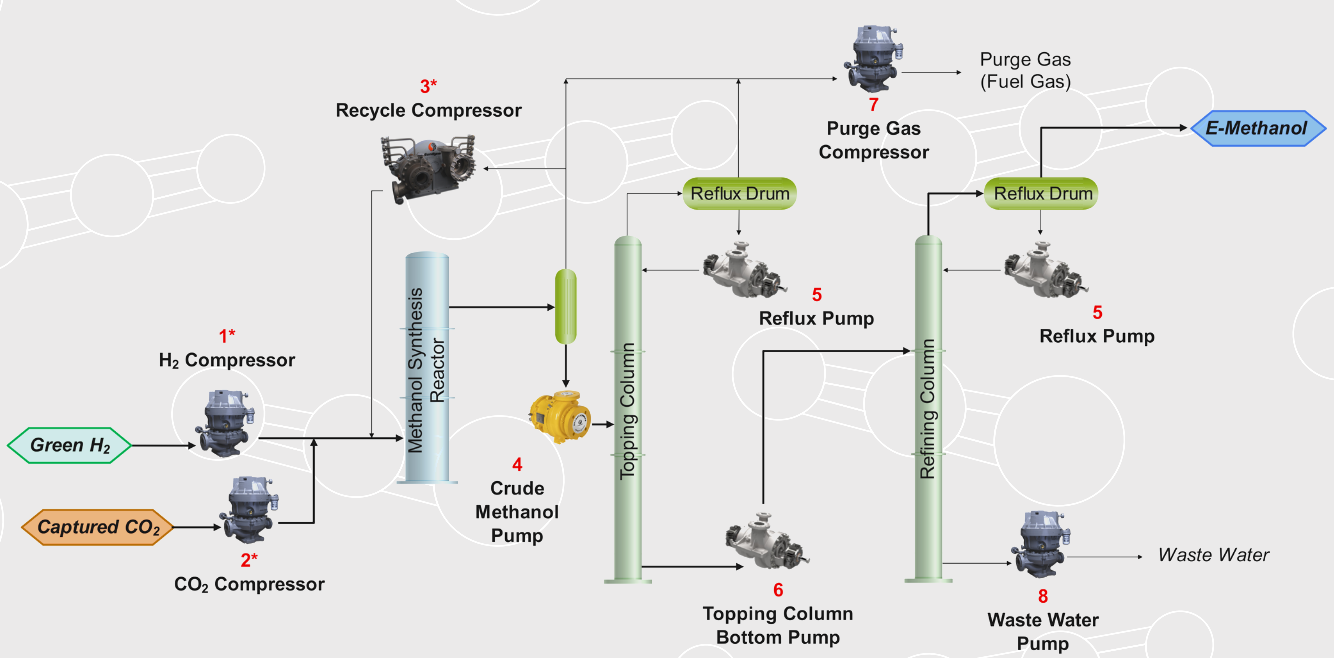
3 Methanol Synthesis:

Methanol is an intermediate product for producing other chemical products such as acetic acid, formaldehyde, dimethyl terephthalate, methyl tert-butyl ether, etc.

Compressed CO_2 and hydrogen are mixed and fed into a reactor where a catalyst is introduced. The following chemical reaction occurs within the reactor, producing methanol and water:

$$CO_2 + 3H_2 \rightarrow CH_3OH + H_2O$$

After the reaction occurs, the mixture is cooled to condense the water and methanol. Any residual CO_2 and H_2 is separated and recycled back into the reactor. Then, the liquid methanol is separated from the water in two distillation columns and the methanol product is sent to storage tanks for distribution and use.

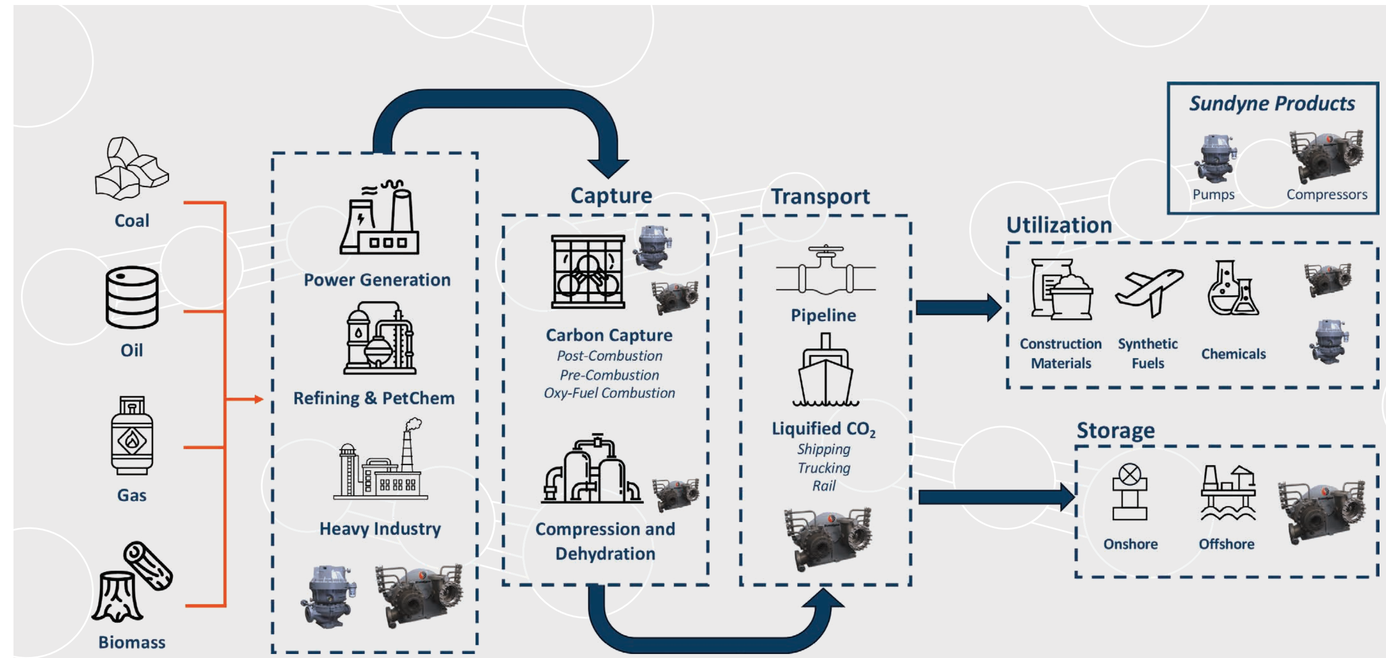


Location	Service	Equipment Type	Medium
1*	Hydrogen Compressor	LMC/BMC or LF-2000	Hydrogen
2*	CO_2 Compressor	LMC/BMC or LF-2000	CO_2
3*	Recycle Compressor	LMC/BMC or LF-2000	Proc CO and CO_2
4	Crude Methanol Pump	HMD	Methanol and Water
5	Reflux Pump	Marelli or LMV	Water and Methanol
6	Bottom Pump	Marelli or LMV	Methanol and Water
7	Purge Gas Compressor	LMC/BMC	CO, CH4
8	Waste Water Pump	Marelli	Water

* Sundyne integrally-geared compressors offer the flexibility to combine services 2, 3 and 4 on a single machine with a shared base plate and motor.

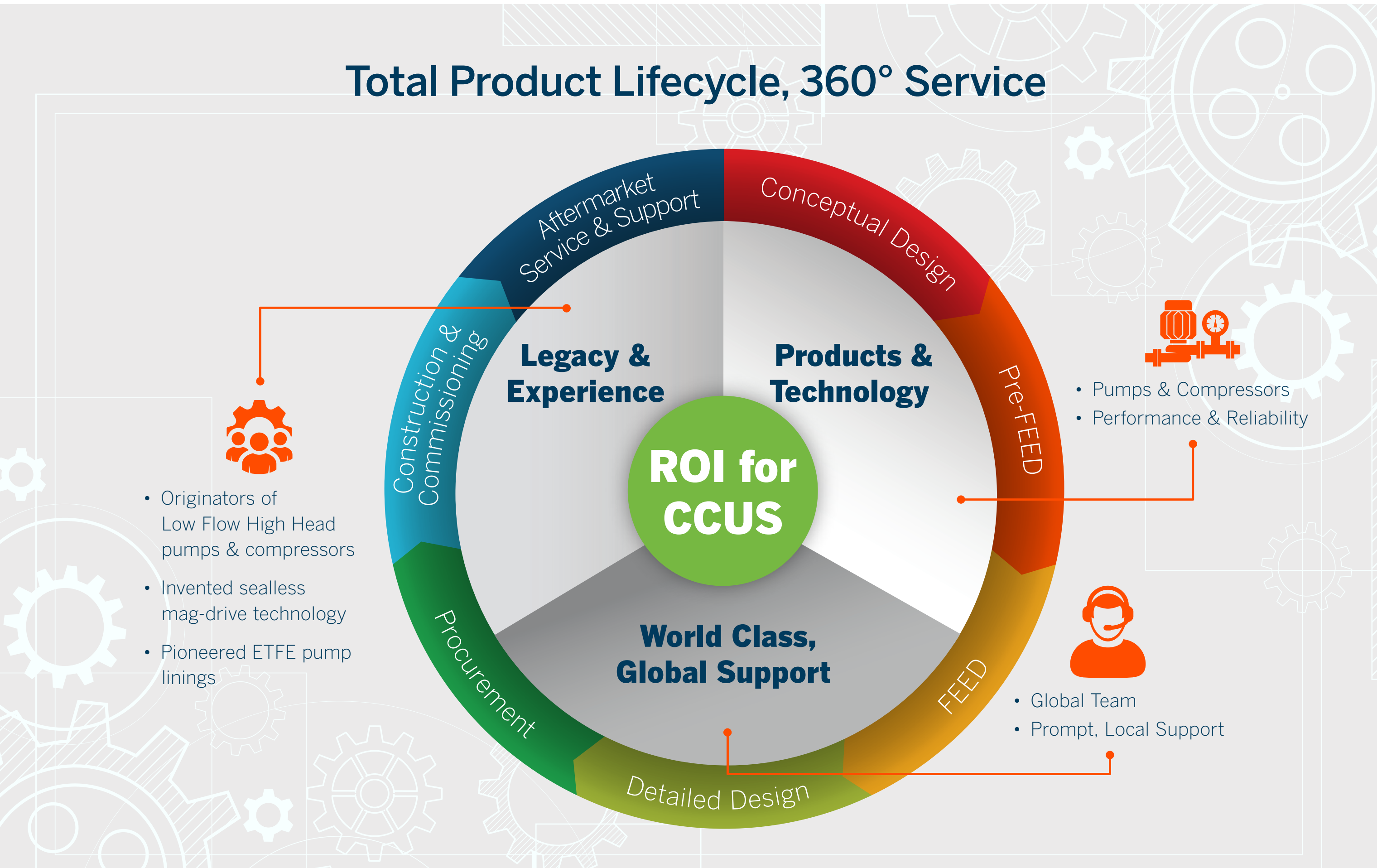
CCUS Value Chain

Sundyne has a range of products that serve the entire CCUS value-chain. To learn more about the Sundyne family of precision-engineered pumps and compressors, please visit www.sundyne.com.



Sundyne's Value Proposition for Carbon Capture

Sundyne's unique combination of technology, expertise and support provides a 360-degree, full lifecycle service that spans everything from project pre-FEED to comprehensive 24x7 support, utilizing a global network of Authorized Service Centers and aftermarket specialists.



Sundyne Compressors

Sundyne's Integrally-Geared Compressor line features a robust and compact design with an integrated gearbox that runs multiple stages, resulting in space-saving installations. In CCUS applications, efficient and reliable compression of CO_2 is critical for the success of projects. Sundyne compressors offer improved efficiency and precise control of operating conditions based on a full scope responsibility including process controls. With modularization of packaged solutions, Sundyne offers reduced lead-times and optimizes the total cost of a compression unit. Sundyne compressors, available from standard to full API compliant configurations, can operate continuously for up to 5 years without requiring maintenance or service.

Sealless Magnetic Drive Pumps – HMD and ANSIMAG

Sundyne sealless pumps provide optimum safety and environmental protection for a wide range of applications in carbon capture and CO_2 utilization. They are designed for hazardous and corrosive liquids, and applications that are difficult to seal. HMD Kontro metallic and Ansimag ETFE-lined sealless pumps ensure total product containment, increased reliability and uptime and simplified maintenance with no seals or seal support systems, whilst meeting industry standards such as ASME, ISO and API

Sundyne LMV and HMP Pumps

Sundyne integrally geared centrifugal pumps are optimized for low flow-high head applications. They offer the best efficiency in the low flow range with a proven track record of high reliability. A single impeller in a Sundyne LMV pump spins at high speed to produce the same head as a multistage pump running at synchronous speed. Sundyne LMV pumps are ideally suited for services such as boiler feed water pumps, condensate pumps, solvent circulation pumps and reflux pumps. To achieve event higher heads, two or more integrally geared stages run in series in Sundyne HMP pumps. Such pumps can be used in liquid CO_2 injection applications. The compact design reduces installation cost, and the simplicity limits the number of spare parts while making maintenance easier.

Marelli Pumps

Marelli pumps leverage a track record of more than 60 years in centrifugal pump design, development, manufacturing and service. Marelli caters to global markets from conventional oil & gas and petrochemicals to fast-evolving Clean Energy segments, including green/blue hydrogen, ammonia, carbon capture, and renewable fuels processing. Marelli covers a wide range of API 610 in OH, BB and VS types to meet stringent customer specifications.

Sunflo Pumps

Sundyne Sunflo pumps are Fit for purpose, Industrial grade pumps designed for Low flow – High head applications, such as boiler feed water, condensate, and demineralized water circulation. The design development of Sunflo range pumps is built on Sundyne knowledge and experience of its API integrally geared pumps. A single impeller runs at high speed to produce high heads in a very compact and reliable design. The close coupled configuration eliminates alignment, simplifies installation while further reducing footprint. The Sunflo cartridge shaft assembly comes complete with all the rotating parts and enables quick and easy servicing of the pump in-place.

When it comes to CCUS applications, Sundyne is the **Safer, Better, Best** choice.

Safer for Operations

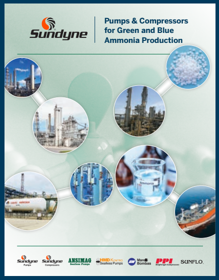
Better for the Environment

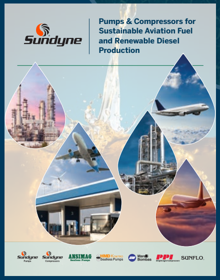
Best Total Lifecycle Value

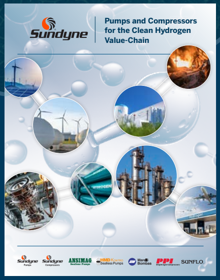
For more information please visit www.sundyne.com and fill out the Contact Me form. A Sundyne representative will contact you.

For more information on Sundyne's product fit in Clean Energy Markets, refer to our other clean energy brochures:

- Green and Blue Ammonia Production
- Sustainable Aviation Fuel and Renewable Diesel
- Clean Hydrogen Value Chain







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