



SINOTECH ENERGY



Taking the lead on clean energy



Sinotech is an Associate of the Ecochlor Technology Group

About Sinotech

Sinotech has three business segments:

- Carbon Capture & Storage
- LNG Membrane Containment System
- LH₂ Membrane Containment System

Low Energy

Sinotech's Carbon Capture and Storage (CCS) solution offers the ideal combination of flexibility and affordability. With various design options available, including scrubber only, scrubber and CCS, or CCS with an already installed scrubber, you can easily customize the solution to meet your specific requirements.

Sinotech's low energy CO₂ capture technology features cutting-edge low temperature amine stripping, an efficient energy recovery strategy resulting in a low energy 'penalty'. Invest in a cost-effective and smart solution with Sinotech's CCS.

Proven Technology

The Sinotech CCS boasts an impressive track record with over 50 successful land-based operations, some of them for over 20 years. In addition, they have gained the approval in principle (AiP) from several reputable maritime class societies including LR, BV, and NK. With years of invaluable experience and impressive credentials, going with a company with proven technology is the smart choice for all your carbon capture and storage needs.

Competitive Edge

The Sinotech system's CO₂ recovery rate can be adjusted to capture between 5% and 95% of the vessel's rated CO₂ output, however, typical vessel capture rates range between 15% and 35%. These are selected on a case-by-case basis per vessel, guided by the required degree of CII improvement to be achieved by the year that each vessel is planned to remain in operation.

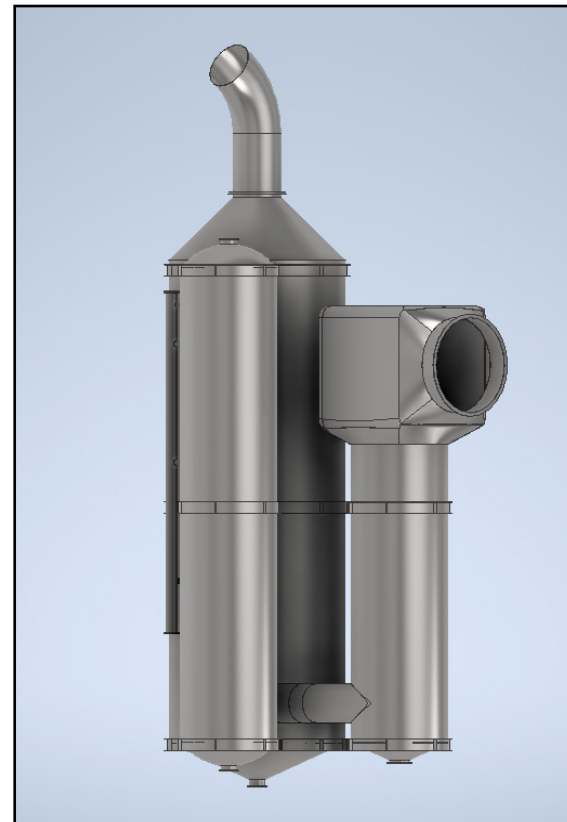
Sinotech incorporates a system to recover, clean and reuse amine helping to further reduce the systems operational footprint.

Following the recovery, liquefaction and cooling process, CO₂ is then stored in a discharge-ready form. The regeneration (recycling) of amine reduces the quantities of amine that remain onboard. In addition, the production of LCO₂ abides by the generic trend that reception facilities for LCO₂ are being gradually created at different locations worldwide.

Sustainability - Now and Future

Invest in sustainability and reap the rewards for your business and the environment.

In the future, captured high purity CO₂ can be sold or repurposed, making sustainability a profitable commodity. Sinotech offers potential better CII rating with reduced carbon tax, giving your business up to two levels of advantage.



Sinotech CCS Modular Design

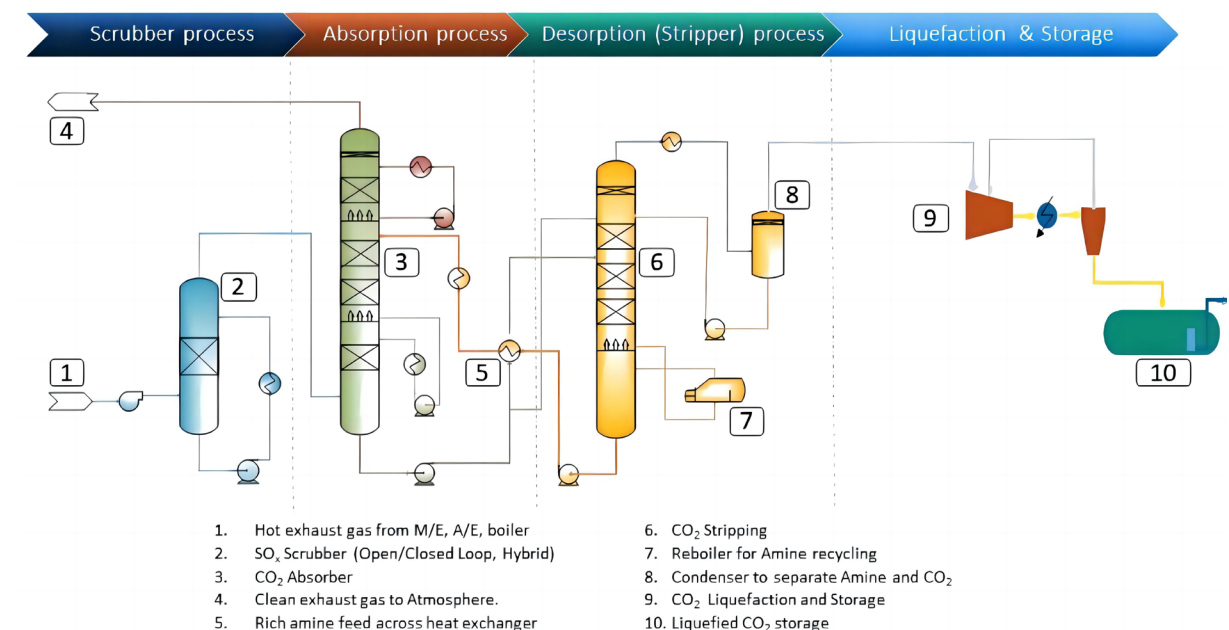
Sinotech provides a flexible solution for vessel operators with its CCS modular design. Suitable for both existing and newbuild vessels, the Sinotech units can be installed in combination with an existing exhaust gas cleaning system or scrubber. Additionally, if your vessel runs on low sulfur fuel oil, it can operate as a stand-alone CCS system.

Moreover, Sinotech offers the latest version of its scrubber as a CCS-ready option for easy integration with CCS functionality at a later date. The Sinotech scrubber is available in both open-loop and hybrid versions to suit your operational needs.

With an in-house engineering team, Sinotech can provide the complete installation engineering. Choose Sinotech to upgrade your vessel's performance and keep your operations running smoothly.

Maximize Your Vessel's Performance and Lower Emissions with Sinotech's CCS

Sinotech's Amine CCS Process



The Sinotech CCS process consists of four stages: Scrubbing, Absorption, De-Sorption and Storage

1st Stage, Scrubber: The hot exhaust gas from main and aux engines as well as boiler is cooled down from a capacity 300°C to 30°C and sulphur dioxide is removed, in line with IMO 2020 sulfur discharge limits. In case of a stand-alone CCS, this would be simple quenching stage to cool down the exhaust gas with sea water.

2nd Stage, Absorption Tower: The cool exhaust is moving upwards while amine solution droplets rain down. During this interaction between gas and liquid, the amine solution absorbs CO₂. The clean exhaust is discharged into the atmosphere while the rich amine solution is collected at the bottom of the tower. A droplet separator at the top of the tower makes sure that amine droplets are kept in the process.

3rd Stage, Desorption Stage: the rich amine solution heated up by means of a heat exchanger and a reboiler. The high temperature releases the CO₂ so that the lean amine solution can be collected at the bottom of the desorption tower. Its residual thermal energy is recovered in the heat exchanger before the amine solution is recirculated into the second stage. The CO₂ is collected at the top of the de-sorption tower and any evaporated amine solution is recovered in the condenser.

4th Stage, Storage: The CO₂ is compressed and cooled down to 2.4 MPa and -20°C respectively which reduces its volume by 99.9% before it is stored in cryogenic tanks.

The Sinotech CCS Advantage

Patented Amine solution can be stripped of the absorbed CO₂ at 90°C, 25% below the industry standard. Along with the efficient heat recovery design, it results in a very low energy demand per ton of captured CO₂. The Sinotech liquefaction process is the most efficient way to store CO₂ simplifying onshore disposal logistics.

Easy CO₂ Removal



The liquified carbon dioxide can be stored in IMO Type C tanks as well as 20' or 40' tank containers. Due to Sinotech's simple CO₂ offloading, the second option is especially suitable for CCS installations on container vessels.

The liquid CO₂ can be offloaded in port to quayside tank trucks, CO₂ tank barges or a permanent onshore CO₂ reception facility. The optimum system setup and CO₂ recovery rate is selected based upon several factors including the vessels trade route, onboard storage capacity and preferred discharge locations.

CO₂ Transport and Storage



CO₂ terminals play a critical role for shipping in order to load and unload the CO₂ and to ensure its suitability for further transportation and injection. Numerous CO₂ terminals are currently under development worldwide, including those in Port of Antwerp in Belgium, Port of Gdnask in Poland, Port of Gothenburg in Sweden, Dunkirk Harbour in France, the BlueHyNow project in Germany, and more. Additionally:

- The United States has announced \$2.5 billion funding to provide for the continuous development of commercial-scale carbon storage infrastructures, expanding commercial CO₂ transport and storage across the country
- The United Kingdom is building a CO₂ Terminal at Immingham to provide for a CCS transport and offshore storage network
- In June 2023, China's first offshore CO₂ facility became operational in the South China Sea, per the China National Offshore Oil Corporation

Moreover, the possibility of utilizing ship-to-platform and ship-to-well delivery methods is being explored, which could potentially eliminate the need for CO₂ unloading terminals in the future.



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