SINOTECH ENERGY

Frequently Asked Questions

GENERAL INFORMATION

What is driving interest in Marine, On board Carbon Capture and Storage? The carbon capture and storage (CCS) market is experiencing growth thanks to the new EU ETS policy, which targets large ships entering EU ports to reduce carbon emissions. This policy came into effect on January 1st, 2024, and applies to vessels regardless of their flag state. Additionally, the energy efficiency of a ship is evaluated using the EEXI and CII ratings. The shipping industry has made decarbonization a top priority, with global institutions introducing the Poseidon Principles for Marine Insurance. The AER measure is utilized to determine a ship's carbon emissions per tonne of cargo per mile traveled. These developments provide a significant market opportunity for eco-friendly technologies, such as CCS.

What is a Carbon Capture and Storage System? A Carbon Capture and Storage (CCS) system, sometimes also referred to as CCUS (Carbon Capture, Utilization and Storage) or OCCS (On board CCS) removes and / or stores some or all carbon dioxide from the vessels exhaust to reduce carbon dioxide emissions to the environment. The carbon dioxide can later be dis-charged and stored permanently (e.g., underground in depleted oil reservoirs) or potentially be used in a sustainable way (e.g., e-fuel production, agriculture, food & drinks industry).

SINOTECH CARBON CAPTURE & STORAGE

What is Sinotech's CCS solution? The Sinotech CCS consists of an amine-based primary CO_2 absorption process and a secondary CO_2 stripping stage where the captured CO_2 is recovered, processed and then stored on board This allows a recirculation of the amine solution which reduces both OPEX and the required tank volume for the amine solution and the CO_2. Sinotech also offers an alternative approach where after absorption, the CO_2 is held on board in solution with the amine. This is discharged in port and the CO_2 extraction takes place at a land-based facility where the amine is recycled.

What is an amine solution? Amines are a large group of organic chemical compounds. The Sinotech CCS process uses a mixture of primary and secondary amines dissolved in water. This amine solution is non-toxic, non-flammable and handling does not require any protective equipment besides protective clothing, gloves, eye protection and / or face mask. The Sinotech amine is a very effective and efficient way to capture CO_2 using lower energy inputs.

How does Sinotech's CCS work? In the absorption tower, the cooled and low-sulfur exhaust gas from the scrubber moves upward while the amine solution rains down. During this intense contact between gas and liquid, the amine solution absorbs CO_2 gas. The cleaned exhaust gas then passes a droplet separator before being discharged into the atmosphere.

The CO_2-enriched amine solution (rich amine) is collected at the bottom of the absorption tower, warmed up in a heat exchanger and fed into the stripping tower. Inside the stripping tower the amine solution is heated by a reboiler which releases the pure CO_2 gas from the amine solution (desorption). The now CO_2-free amine solution (lean amine) is collected at the bottom of the stripping tower and passes the heat exchanger to use its residual thermal energy to heat up in-coming rich amine, before being re-injected into the absorption tower.

At the top of the stripping tower, CO_2 gas is removed and passes a condenser to separate and recirculate any evaporated amine solution. The pure CO_2 gas is then compressed and cooled down for liquefaction and stored at -20°C and a pressure of 2.4 MPa. (In the case of CO_2 being held on board in a solution with the amine, the stripping and separating processes details above do not take place.)

What is the purpose of Sinotech's CO_2 stripping, compression and liquefaction? The Sinotech CO_2 stripping and liquefaction process reduces the storage volume by approximately 90% compared to storing rich amine solution. Additionally, the volume of amine solution to operate the CCS process is significantly reduced.

How much CO_2 can Sinotech's CCS capture? Sinotech CCS can be adjusted to capture between 5% and 95% of the vessel's rated CO_2 out-put. Typical settings are 25% to 35% as this balances bunker consumption with captured carbon dioxide: Each ton of fuel consumed is the equivalent of a tonne of CO_2 captured, which maximizes cargo capacity.

How is the captured CO_2 stored on board the vessel? The captured CO_2 is dried, com-pressed to 2.4 MPa and cooled down to -20°C for liquefaction and storage. This reduces the storage volume by 90% compared to rich amine solutions and by 99.9% compared to CO2 at room temperature. Alternately the CO_2 / amine solution is stored on board until the vessel can discharge in port and reload with amine for the next voyage.

What type of tanks are used to store the CO_2 on board the vessel? Suitable storage units are IMO type C tanks or standard cryogenic shipping containers. The volume of the tanks depends on total vessel CO_2 output, capture rate and travel time between reception facilities.

Does CCS affect my vessel's stability or cargo capacity? Typically, the total wet weight of a CCS system is very low, so retrofitting CCS does generally not require a re-calculation of vessels stability. The combustion of a 1 ton of fuel oil typically generates ca. 2.99 to 3.45 tons of CO_2, so a capture rate of approximately 30% ensures that 1 ton of burnt fuel oil is balanced by 1 ton of capture CO_2, so the storage of captured CO_2 does not reduce the cargo capacity.

SINOTECH RELIABILITY & EFFICIENCY

What are the advantages of a Sinotech CCS? The Sinotech CCS uses an amine solution that requires 25% lower temperatures for CO_2 strip-ping. In combination with the highly efficient energy recovery process, it reduces the specific energy demand to just 2.4GJ/m³ CO2. In more practical terms: The operation of a Sinotech CCS will require approximately 8% to 10% of the vessels installed power, compared to 10% to 20% as industry standard for CCS operation.

How do I know that Sinotech's CCS technology is reliable? Sinotech CCS is the maritime version of their land-based CCS plants located in China, some of which have been in operation for over 20 years. Every year, these plants capture over 1 million tonnes of high purity CO_2. Lloyd's Register (LR), Bureau Veritas (BV) and Nippon Kaiji Kyokai (NK) have issued "Approvals in Principle" (AiP) for Sinotech CCS.

Is an Exhaust Gas Cleaning System required in order to use the Sinotech CCS? A Sinotech CCS system requires the exhaust gases it processes to be cooled down from their usual high emission temperature. If the vessel already has a scrubber installed, the scrubbing process has already pre-cooled the gases. Alternatively, a Sinotech Exhaust Gas Cleaning System (EGCS or scrubber) can be added to the design or the CCS can be installed with a simple quenching device to cool down the exhaust gas flow - in this case, the vessel continues to operate on LSFO or MDO.

What is the lead time for a Sinotech CCS? Once the order is confirmed and detailed engineering and system specification has been completed, manufacturing of the system generally takes around four months for CCS without stripping, liquefaction, and CO_2 storage and approximately six months for CCS with stripping liquefaction and CO_2 storage.

How do you offload stored CO_2? The liquid CO_2 can be offloaded in port to quayside tank trucks, CO_2 tank barges or permanent onshore CO_2 reception facilities. The capability to discharge and receive captured CO_2 from global shipping is growing rapidly worldwide alongside existing infrastructure supporting the industrial sector.

INSTALLATION

What is Sinotech's "plug and play" concept? The "plug and play" concept allows key components of the system to be engineered, manufactured and installed using a modular approach. Each of the elements are specified to suit the vessel layout and the chosen CO_2 recovery rates and storage methods. This approach ensures that the Sinotech CCS system is tailored to meet a ship-specific operational and whole vessel emission plan.

Who handles the CCS integration engineering? Sinotech has its own in-house engineering team which provides every stage from the initial proposal to detailed engineering. They are also supported by experienced 3rd-party service providers and engineering companies around the world.

Does Sinotech also offer turnkey delivery and installation services? Yes. Sinotech has corporate offices in Shanghai, China and through this office they offer full turnkey delivery and installation services based in select Chinese shipyards. Internationally, they are represented by Authorized Installation Partners and shipyards to ensure on time delivery as well as a cost-effective installation of the Sinotech CCS.

MAINTENANCE

What is the maintenance for a Sinotech CCS? Minimal maintenance requirements are required for the Sinotech CCS system as it is designed to ensure a reliable and efficient operation over an extended period. The primary CCS tower (crafted from SMO254 and Super Duplex Stainless 2205) is engineered to withstand the harsh marine environments. The tower is a critical component with no moving parts and only requires twice annual visual checks by crew members to ensure optimal performance. Routine, industry standard maintenance of pumps and valves is required. Sinotech is available to support system calibration as needed to ensure efficient, effective operation of the system.

Does Sinotech have global service capability? Yes. The Sinotech Technical Support team works hand in hand with the Ecochlor Global Sales and Service Network to provide customers with the necessary technical assistance needed to keep the system operating at peak performance. This includes remote troubleshooting, on-site technical support, and training with service support available in every time zone.

FINANCING TERMS

What warranty terms are provided? Sinotech offers an industry standard one year warranty for their system. Extended warranty terms can be provided at additional cost.

Are you able to offer finance packages? A number of flexible finance solutions are available upon request. Often the savings created by changing fuel type from LSFO to HFO help provide a significant part of the support funding and ROI.

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