


A large orange circle on the left side of the slide, partially cut off by the edge.

MHI Value Proposition 2002

- PRODUCT: absorber
 - INDUSTRY Power-biomass
 - VALUE PROPOSITION: Highly efficient CO₂ absorber for CO₂ electricity
- 
- A series of four yellow dashed line segments in the bottom right corner, arranged in a curved, upward-sloping pattern.

MHI is the Leader in CO₂ Capture from Biomass Combustors

- The 4000 MW Drax coal plant has been converted to biomass. A carbon capture system is presently being constructed by MHI. With sequestration this will be the largest carbon negative project in the world
- The system uses a propriety solvent and will capture up to 99% of the CO₂.
- The economics of the system are significantly improved because of reduction in solvent loss
- MHI is also installing this system in a number of smaller biomass combustion systems

CO₂ Capture Accelerating according to IEA

Interest in carbon dioxide capture, utilization and storage (CCUS) projects is increasing around the globe. But more CO₂ capture capacity is urgently needed in order to reach net zero emissions — almost 30 times more by 2030, according to the International Energy Agency (IEA).

Progress was initially slow, but “[development is picking up](#)”, the IEA says, as a diverse range of industries are now taking up CO₂ capture projects.

Momentum has been building since 2018, and developers now have more than 200 new facilities due to be operational by 2030, capturing over 220 million tonnes of CO₂ a year.

And more projects are emerging, thanks in part to new climate targets, as well as a burgeoning value chain for captured CO₂ and a host of incentive-based initiatives from governments — not to mention an increasingly diverse range of CCUS technologies.

Global CO₂ [capture capacity is around 45 million tonnes a year](#) - across 35 commercial facilities - according to the IEA. Adding to that are 10 final investment decisions, made as of June 2022.

The application of CO₂ capture technology is expanding to a variety of emissions sources. These include waste-to-energy plants, LNG production, steel plants, cement plants, gas engines, chemical plants and ships. The latest projects include [biomass power](#) and [cement manufacturing](#) in Japan, as well as [steel production](#) in Belgium and North America.

Proprietary Solvent has Many Advantages

- A variety of CO₂ capture technologies exists. Currently, chemical absorption is the proven method for capturing CO₂ from combustion exhaust gases.

MHI has been developing KM CDR Process[™], with unique amine solvent KS-1[™] in collaboration with Kansai Electric Power Co., Inc. (KEPCO) since 1990, which has several outstanding features as follows:

- 1.Can be applied to various types of flue gas sources
- 2.Advanced energy saving process - significant operation cost saving
- 3.Highly efficient proprietary solvent KS-1[™], with the lowest energy consumption and the least degradation

KA-21 Advantages

1. KS-21[™] solvent offers lower volatility and higher stability against degradation. Its contribution of reducing absorption reaction heat and capture energy translate to potential economic benefits with respect to lower operating costs for the customer, etc.
2. A low level of amine emissions results in reduced solvent consumption and lighter impact on the environment. (Environmental impact assessment by a third-party institution has yielded highly reliable emissions measurements.)
3. The new system can accommodate carbon capture from a variety of flue gas sources. It supports customers in industrial and infrastructure areas including not only conventional power generation and chemical plants, but also biomass and LNG liquefaction plants, steel and cement factories, waste incineration facilities, etc., from project formulation stages including basic design, pilot demonstration, licensing, etc.

7 MW and Other Smaller Systems also Supplied

- **Mitsubishi Heavy Industries Engineering, Ltd.** (MHIENG), a group company of **Mitsubishi Heavy Industries, Ltd.** (MHI), has received an order for a compact CO₂ capture system from **Taihei Dengyo Kaisha, Ltd.**, a provider of plant construction, maintenance, and auxiliary services, for incorporation into a biomass power plant.
- The system offers a capture capacity of 0.3 metric tons per day (tpd). Spurred by this latest order, going forward MHIENG will promote decarbonization in all sectors globally, especially power, and industrial production, as a way of contributing to the realization of a carbon-neutral society.
- Taihei Dengyo is targeting establishment of carbon-negative solutions from a carbon-neutral system, to help realize a circular society. The company seeks to achieve this shift through separation, capture, and initial storage of the CO₂ emitted by biomass power plants, followed by use of the stored carbon to grow plants, etc.
- The introduction of the newly ordered compact CO₂ capture system is part of that initiative. Plans call for its integration into a 7-megawatt (MW) class biomass power plant operated by Taihei Dengyo in "Hiroshima Seifu Shinto," an urban complex within Hiroshima City.

System Being Installed in Biomass Plant in Hiroshima

- The newly ordered system is based on a test plant manufactured to verify the impact of applying the new CO₂ capture system to a biomass flue gas source, which made early commercialization possible. The base system is a pilot facility used in bioenergy with a carbon capture and storage (BECCS) project conducted at a biomass power plant owned by **Drax Group**, one of the United Kingdom's leading power providers. The basic configuration has been upgraded with the addition of automated operation and other functions for the commercialization.
- The system on order is easily installed, requires an installation space of modest size — only 5 meters in length and 2 meters wide — and can be transported from the factory by truck. It features a modular design enabling mass production, and its highly versatile standardized design reduces investment, operation and maintenance costs and results in faster delivery. For these reasons, the new system can respond to a broad range of needs to cut carbon emissions at relatively compact facilities in the industrial sector, etc.
- Going forward, the system lineup will be expanded to enable carbon capture from diverse emission sources worldwide, and eventually MHIENG expects to provide operational support services using its proprietary remote monitoring system. In this way, the company aims to put in place a fully integrated customer support structure from system design to after-sale servicing.

13 Systems Have Been Put into Operation

- The CO₂ capture technology adopted in the new system is the "KM CDR Process™", jointly developed by MHIENG and **Kansai Electric Power Co., Inc.** (KEPCO), which employs the high-performance "KS-1™" amine solvent. The technology significantly reduces energy consumption.
- As of November 2021, MHIENG had delivered a total of 13 commercial plants using the KM CDR Process™ at locations worldwide, and two more plants are currently under construction. This robust track record gives MHIENG the top share of the global market for commercial plants in terms of CO₂ capture volume.
- MHI Group is currently undertaking strategic strengthening of its business in the energy transition, and development of a CO₂ ecosystem is a core component of that initiative. Carbon capture, utilization, and storage (CCUS) is garnering attention as an effective means for realizing a carbon-neutral society.
- Going forward, MHIENG will continue to contribute toward reducing greenhouse gas emissions on a global scale by promoting broad adoption of high-performance CO₂ capture technology worldwide. It will also press ahead in developing new proprietary technologies to protect the global environment.

CO₂ Capture System with Solvent Regeneration

