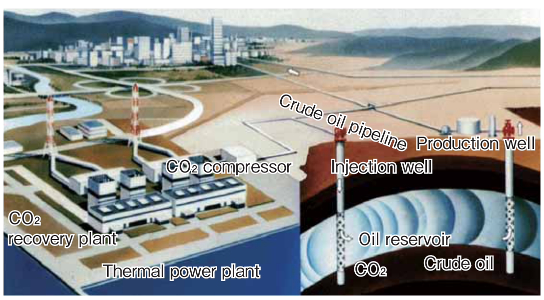
Efficient CO_2 separation and recovery from atmospheric pressure flue gas by chemical absorption

CO_2 separation and recovery system from combustion flue gas

KM-CDR Process® Feature

- Recovered high purity CO_2 can be used for boosting production of fertilizers and methanol, as well as EOR applications.
- Significant reduction in energy consumption and absorbent loss, compared to existing technologies.
- A simple structure comprised of easily available materials is suitable for construction since 1999 in developing countries.

Boosting urea production recovered from flue gas (Malaysia)



EOR using CO_2 recovered from flue gas

Overview (Technical principles, actions, etc.)

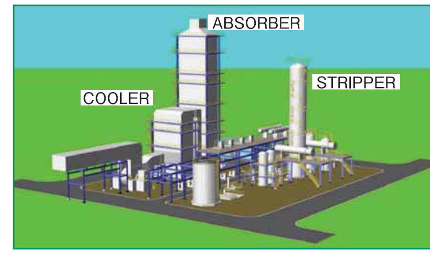
1) Chemical absorption principle

The flue gas introduced into the cooling tower is subsequently introduced into the absorber tower, and comes in contact with the CO_2 absorbent solution flowing down on the filler inside the absorber tower. During the process, CO_2 is absorbed by the solution, while nitrogen and other substances are left in the gas. The CO_2-rich solution is then guided to the stripper and steamed to separate CO_2. The lean solution after the CO_2 is removed is reintroduced into the absorber tower to be reused as a CO_2 absorbent solution. The separated CO_2 is dehydrated in the CO_2 separator and then recovered as high-purity CO_2 (99.9%).

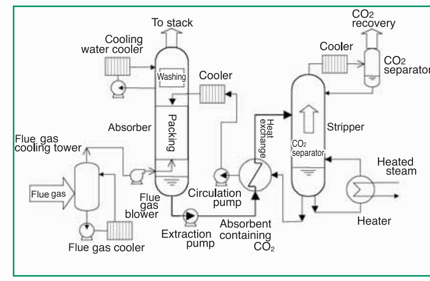
2) Technology progression

We began researching carbon capture technology in 1991, including the development of a proprietary solvent (KS-1™), by 1994 the required energy for CO_2 capture had already been reduced by 20% from conventional technology. Further advancements are being made year on year, the latest process only requires approximately 68% of the energy required by conventional technology. Absorbent degradation/loss and corrosion issues have also been significantly reduced.

3) The system does not require special materials, thanks to due to the low corrosive properties of KS-1™. An operation pressure close to atmospheric and simple configuration facilitate the construction of large-scale systems.



Large-scale CO_2 recovery system sketch



Recovery system mechanism

Commercial Track Record

■ The technology is applied at urea production plants and other facilities around the world.

Country	Purpose	Capacity	Launch year
Malaysia	Increase in urea production	160t/d	1999
Japan	Multi-purpose	283t/d	2005
India	Increase in urea production	450t/d×2	2006
UAE	Increase in urea production	400t/d	2009
India	Increase in urea production	450t/d	2009
Bahrain	Increase in urea production	450t/d	2009
Vietnam	Increase in urea production	240t/d	2010
Pakistan	Increase in urea production	340t/d	2011
India	Increase in urea production	450t/d	2012
Qatar	Increase in methanol production	500t/d	2014

Effects

◎By introducing a CO_2 recovery system into a urea production plant and making minor modifications to the system, fertilizer production is increased and the CO_2 emissions of the plant are reduced.

◎By introducing a CO_2 recovery system into a methanol production plant and making minor modifications to the system, the carbon-hydrogen ratio in the materials is optimized and methanol production is increased. The CO_2 emissions of the plant are reduced at the same time.

◎Enhanced oil recovery (EOR) applications improve crude oil productivity by pressurizing the oil fields and reducing the viscosity Launching a CO_2 recovery system for the EOR applications can significantly increase crude oil productivity, while storing large amounts of CO_2 in oil fields.

◎Recovering CO_2 from a large amount of flue gas from thermal power plants and storing the CO_2 in an aquifer will directly help prevent global warming.

The Kansai Electric Power Co., Inc.
R&D Center
3-11-20 Nakoji, Amagasaki, Hyogo 661-0974 Japan
● TEL / +81-50-7104-2426 ● FAX / +81-50-7104-2587 ● http://www.kepco.co.jp/

Mitsubishi Heavy Industries, Ltd.
Infrastructure Business Group, Plant Business Department, Energy & Environment
3-3-1 Minatomirai, Nishi-ku, Yokohama, Kanagawa 220-8401 Japan
● TEL / +81-45-200-6743 ● FAX / +81-45-200-9301 ● http://www.mhi.co.jp/