

## Advanced KM CDR Process Using New Solvent

<sup>1</sup>Takashi NOJO, <sup>2</sup>Yasuhide NAKAGAMI

<sup>1</sup>Senior Research Engineer, <sup>2</sup>Manager

R&D Center, Kansai Electric Power Co., Inc., Osaka, Japan

Takashi KAMIJO

Project Manager

CO<sub>2</sub> EOR Business Department, Mitsubishi Heavy Industries Engineering Ltd.,  
Yokohama, Japan

**Keywords:** *CO<sub>2</sub> capture, chemical absorption process, new solvent for commercialization*

### Abstract

Kansai Electric Power Co., Inc. (KEPCO) and Mitsubishi Heavy Industries Engineering, Ltd. (MHIE) have developed KM CDR Process<sup>TM</sup> (Kansai Mitsubishi Carbon Dioxide Recovery Process) for CO<sub>2</sub> capture using proprietary equipment and KS-1<sup>TM</sup> solvent. The process has been successfully demonstrated in 13 commercial plants capturing CO<sub>2</sub> from various fossil fuel-burned flue gas sources. The recovered CO<sub>2</sub> is utilized for a variety of applications including chemical production enhancement, dry ice production, and EOR (Enhanced Oil Recovery) for increasing oil production. The process is constantly improved and scaled up with the experiences from constructing and operating commercial plants.

Advanced solvent development plays a key role in R&D since it affects the energy requirement, size of equipment, and environmental impact and consequently determines the overall economics. This paper will present the latest progress of the newly developed solvent, which is a possible alternative to KS-1<sup>TM</sup> with better performance in future commercial plants.

The current KS-1<sup>TM</sup> solvent has great absorption capacity, low steam consumption, high resistance to oxidation, and low corrosion tendency yet being cost competitive. In the recent commercial plant operations, it has been recognized that thermal degradation is one of the major contributions to amine losses, thus the further reduction of the amine emissions is preferable to meet regional regulation. Reducing amine losses can save not only the amine makeup cost but also the capital expenditure. As a result, a new solvent has been developed with higher stability and lower amine volatility while maintaining the same capture efficiency of KS-1<sup>TM</sup>.

The new solvent was successfully demonstrated last year in a CO<sub>2</sub> capture pilot plant located at Nanko Power Plant in Japan, which is capable of capturing 2 tonnes/day of CO<sub>2</sub> from a slip stream of flue gas from a natural gas-fired boiler. The major features of KM CDR Process<sup>TM</sup> are equipped in the pilot plant.

The pilot test results showed that the new solvent reduces amine emissions compared to KS-1<sup>TM</sup>. The steam consumption is as low as that of KS-1<sup>TM</sup>. Due to its stable structure, the new solvent potentially can reduce the amine losses caused by thermal and oxidative degradation.

To fully take advantages of the new solvent, the KM CDR Process<sup>TM</sup> is re-optimized by introducing new energy saving system and amine emission reduction system. KEPCO and MHIE will continue to develop and commercialize highly-efficient CO<sub>2</sub> capture process using the new solvent and contribute to solving environmental and energy issues.