Field Demonstration of Advanced CDRMax Solvent at the US-DOE’s National Carbon Capture Center and Technology Centre Mongstad, Norway

P. Bumb\textsuperscript{a}, Dr. Avinash N. Patkar, P.E.\textsuperscript{a}, Richard Mather\textsuperscript{a}, Ramesh Kumar Ausula\textsuperscript{a},
Frank Morton\textsuperscript{b}, and Justin Anthony\textsuperscript{b}

\textsuperscript{a}Carbon Clean Solutions Limited, 47, Castle Street, Reading, Berkshire, RG1 7SR, United Kingdom
\textsuperscript{b}Southern Company, National Carbon Capture Center (NCCC), Wilsonville, AL, USA

Abstract

Carbon Clean Solutions Limited (CCSL) has developed a family of energy efficient chemical solvents and economical processes which aim to reduce the overall operating and capital cost of CO\textsubscript{2} capture. CDR-Max is the process for CO\textsubscript{2} capture from gas fired power plants which have been intensively evaluated on the basis of vapour-liquid equilibrium (VLE) and reaction kinetics. Current work has been focused on overall solvent management particularly reduction of solvent degradation, corrosion and emissions.

CCSL with Southern Company which manages and operates the US Department of Energy’s National Carbon Capture Center (NCCC) and CO\textsubscript{2} Technology Center at Mongstad (TCM), Norway, the world’s largest industrial scale test facility. Both facilities are fully instrumented and designed to provide a vendor with an infrastructure to test, validate and scale its advanced CO\textsubscript{2} capture technology on all industrially relevant conditions.

CCSL advanced solvent CDRMax has been tested for more than 1,000 continuous operating hours at both pilot plants and compared with the conventional solvents in terms of CO\textsubscript{2} absorption: energy consumption, cyclic capacity and absorption kinetics. This CDRMax solvent was specifically developed to capture 3-6 vol\% CO\textsubscript{2} from gas fired power plant flue gas emissions.

The CO\textsubscript{2} capture plant provided useful performance data and operational experience for the continued development of the CCSL’s CO\textsubscript{2} capture technology. A well-designed test plan was successfully executed during this testing period to obtain detailed solvent performance and optimization data, which validated the CCSL thermodynamic and CO\textsubscript{2} capture process models.

This article will describe the results and operating experiences in the areas of solvent handling and solvent performance, which includes long term stability testing, energy demand, solvent degradation, corrosion and emissions. It will also document the lessons learned and operating experience with comparative results from the NCCC and TCM CO\textsubscript{2} capture plants.