A Mobile Carbon Capture Test Facility to De-risk Technologies at industrial sites

Chih-Wei Lin*, Roger Watson, Jon Gibbins, Mathieu Lucquiaud
The University of Edinburgh, School of Engineering, The Kings Buildings, Edinburgh EH9 3JL, United Kingdom
* Corresponding author: Chih-Wei.Lin@ed.ac.uk +44 (0) 1316507444

1. INTRODUCTION AND MOTIVATION

The cost of on-site industrial capture facility research and development would be expensive due to several engineering/scientific uncertainties. To tackle this issue, ACTTROM (Advanced Capture Testing in a Transportable Remotely-Operated Minilab), a low operation cost, moveable and remote-operated facility designed to allow long-term characterisation of CO₂ capture technologies under exposure with different industrial facility flue gases, has been proposed to significantly minimize financial, technical risks and R&D costs. The mobile facility is also fully compliant with the Machinery Directive and PUWER (Provision and Use of Work Equipment Regulations), which will be accepted by most UK and EU industrial sites and a start-of-the-art remote system via 3G/wifi was developed to allow operators controlling the process in a safety environment.

2. EXPERIMENTAL DESIGN

ACTTROM design overview:

- **Communications**: 3G/wifi internet access
- **Flow rates**: 1 L/min mains water and 8 L/min of flue gas
- **Inlet gas conditioning**: direct contact cooler and knockout drum
- **Outlet gas conditioning**: condenser and activated carbon adsorption filter
- **Analysis**: O₂ and CO₂ monitoring on inlet and outlet gas lines
- **Measurement**: temperature, flow, Level and pressure at key points within the system to log experimental conditions and enable remote fault identification
- **Safety**: fire alarms system, automatic fire extinguishers, low pressure relief

3. SAMPLING ANALYSIS

- Aged solvent samples are collected to investigate solvent degradation mechanisms
- Thermophysical property measurements to investigate solvent performance and develop future real-time solvent monitoring sensor systems
- Solvent degradation mechanisms are investigated by chemical analysis
- Commissioning with air and 30 wt% MEA has been completed (15 days), four samples were collected

4. CONCLUSIONS AND FUTURE WORKS

Conclusions
A remotely-operated facility for evaluating emissions mitigation technologies at bench scale on industrial sites has been developed and tested. The resulting design incorporated numerous features which would minimize the risk to the reputation of the host site. It is envisaged that the development of ACTTROM will inform the development of similar facilities in future.

Future works
- Installation of ACCTTROM in PACT has been agreed and ACTTROM will connect to Biomass boiler to commissioning Bio-Cap project in PACT.
- ACTTROM will be shipped (in 2016) to Wilton 10 Power Station, Sembcorp, Teesside to which biomass flue gas from 50% virgin wood and 50% recycle wood will be connected and to investigate impact on impurities of metallic ions from bio-mass flue gas