

R&D Project Metrology for PCC using Amine-Based Technologies.

Amine based carbon capture deployed at industrial installations is an emerging technique aiming to reduce global warming, a side effect though is the release of amines and degradation products to atmosphere. Measurements for the majority of these pollutants can be undertaken using existing standard reference methods, however these have not been validated on post combustion capture (PCC) facilities where different process conditions may have an effect. Nitrosamines are of particular concern as these may form through amine degradation and no reference methods to measure them exist.

This project aims to identify knowledge gaps associated with measuring flue gas components from PCC processes, develop and evaluate new monitoring methodologies and deliver a guidance document that shall establish a recommended monitoring plan for PCC processes. The project comprises four separate work packages.

Phase 1 – WP1 Literature Review

A desk based literature review shall identify knowledge gaps specific to emissions monitoring and process conditions on amine based PCC processes. This includes an assessment of available experimental data on emissions, amine degradation products, effects of stack gas conditions on potential methods, existing monitoring methods and gaps limiting the enforcement of future ELVs. Knowledge derived from this review shall form the basis of proposed sampling methodology for Nitrosamines for which there is currently no reference method.

Phase 1 – WP2 Method Development and Pilot Study Preparation

Proposed Nitrosamine sampling methods shall be developed and tested on the stack simulator facilities at NPL. The tests shall recreate process conditions encountered on PCC installations, allowing the assessment of proposed sampling and measuring techniques. The results from these experiments aim to refine the methodology allowing its deployment on a pilot study on a UK PCC installation.

Phase 2 - WP3 Pilot Study

A pilot study shall be conducted on a UK PCC facility, with the principal aim of assessing the performance of the proposed monitoring methods derived from WP2. Measurements for a range of additional flue gas components shall also be undertaken. This will aim to provide an understanding of the flue gas matrix composition, the impact of process conditions on monitoring methods, as well as contributing to a better understanding of solvent degradation and amine losses.

Phase 2 - WP4 Guidance Document and Measurement Protocol

A guidance document based on the results and outputs derived from WPs 1, 2 and 3 shall be developed. This shall address measurement gaps identified for PCC installations and recommend a measurement plan for future monitoring campaigns. The plan shall identify specific pollutants that will require monitoring, what methods to use and specific techniques associated with PCC plant.

A new measurement protocol for sampling Nitrosamines shall be established based on information gathered during the literature survey and associated validation data obtained from WP 2 and 3. The aim will be to create a draft measurement standard that will be used to check for compliance against future ELVs set out in PCC plant permits.