

Good plant design for measurement of CO₂ in carbon capture and storage applications

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Introduction

This project is looking to produce a good practice guide for measuring carbon dioxide (CO₂) streams containing different levels of impurities, as there is a gap in this area. The decarbonisation of hard-to-reach sectors (i.e. heating of homes and flexible power generation) requires knowledge on the presence and magnitude of impurities present in their resulting CO₂ streams, as it can ultimately save money and permit a safer operation.

Aim & Objectives

This project aims at producing a good practice guide for measuring carbon dioxide (CO₂) streams containing diverse levels of impurities, which will assist developers and allow for the most appropriate measurement techniques to be specified. To achieve this we will:

- Review existing guidelines, their scope and generate a database on existing guidelines and CO₂ streams (sources, composition and end-users)
- Identify and define the audience and scope of the guidelines to ensure industry needs are met
- Recommend measurement technologies (i.e. by creating a comparative matrix)

Existing Regulations

Measurement accuracy of CO₂:

Commission Regulation (EU) No 601/2012 – The monitoring and reporting of GHG emissions pursuant

OIML R117 Chapter 2 – Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices

NIST Handbook 44 – Dynamic measuring systems for liquids other than water (Part 2: Metrological controls and performance test)

Other references and standards:

DNV RP-J202 – DNV-RP-F104 Design and Operation of carbon dioxide pipelines, Recommended practice, Edition 2021-02 – Amended 2021-09

BS PD 8010: 2004 Part 2 – Subsea pipelines

BS EN 14161: 2011 – Petroleum and Natural Gas Industries. Pipeline Transportation Systems Institute of Petroleum Pipeline Code IP6

Existing CO₂ Measurement Methods

CORIOLIS

- Measures the mass of CO₂ directly
- Restriction in the pipeline size



Coriolis meter
Source: Emerson

ULTRASONIC

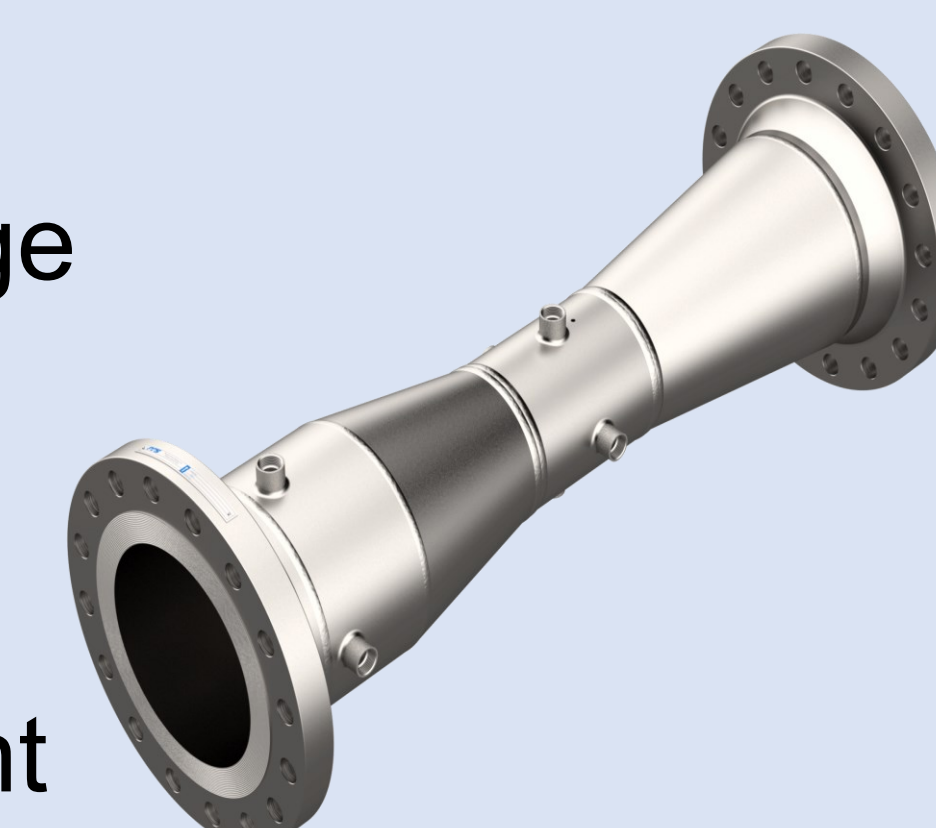
- Volume based measurement technology
- Cannot measure accurately when there is gas bubbles in liquid or liquid bubbles in gas

TURBINE

- Good for large pipeline size and good reproducibility
- Unable to use in two-phase flow

VENTURI

- Good for large pipeline size
- Higher measurement uncertainty



Venturi meter
Source: Primary Flow Signal

Literature Review

Workshop



Expected Outcomes

The CO₂ guidelines will:

- Become an addition to the Energy Institute's library, which will also complement the ISO2713 standard.
- Address the CO₂ transportation of CO₂ streams from CO₂ sources to storage sites or utilisation.
- Meet the needs of stakeholders (including policymakers and regulation developers) in the CO₂ sector and used in the decarbonisation sector.

Acknowledgements This project is funded by the Wave 2: IDRIC and UKRI

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