

CO₂PIPEHAZ: QUANTITATIVE HAZARD ASSESSMENT FOR NEXT GENERATION CO₂ PIPELINES

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Keywords: Transport, CO₂ pipeline hazards, accidental discharge

ABSTRACT

Without a clear understanding of the hazards associated with the failure of CO₂ pipelines, Carbon Capture and Storage (CCS) cannot be considered as a viable proposition for tackling the effects of global warming. The development of reliable validated pipeline outflow and dispersion models are central to addressing this challenge. This information is pivotal to quantifying all the hazard consequences associated with failure of CO₂ transportation pipelines forming the basis for emergency response planning and determining minimum safe distances to populated areas.

This paper presents an overview of the main findings of the recently completed CO₂PipeHaz project (www.co2pipehaz.eu) focused on the hazard assessment of CO₂ pipelines to be employed as an integral part of CCS. Funded by the European Commission FP7 Energy programme, the project's objective is to address this fundamentally important issue.

The development of the state-of-the-art multi-phase heterogeneous discharge and dispersion models for predicting the correct fluid phase during the discharge process are given special

consideration given the very different hazard profiles of CO₂ in the gas and solid states. Model validations are based on both small-scale controlled laboratory conditions as well as large scale field trials using a unique CCS facility in China, the world's largest emitter. The large scale tests involve the full bore rupture and puncture of an especially constructed fully instrumented 250m long, 0.23m i.d pipeline containing dense phase CO₂. The heterogeneous flow patterns in the ruptured pipe and the near-field dispersion region are fully investigated and modelled in order to obtain a complete understanding of the discharge phenomena and gas plume behaviour following a large-scale CO₂ release.

The understanding gained is used for evaluating the adequacy of control measures in CO₂ pipelines, with best practice guidelines being developed.



Photographs of the large-scale CO₂PipeHaz pipeline test facility during pipeline rupture tests in China. At 250m long and 0.23 m i.d, it is the longest fully instrumented CO₂ test pipeline in the globe fed from 7 MW post combustion power plant.

The research leading to this work has received funding from the European Union 7th Framework Programme FP7-ENERGY-2009-1 under grant agreement number 241346.