Personal details and contact info

Title	Full Name
Mr	Jianhao Yu

UCL e-mail address	Role in the department
jianhao.yu.15@ucl.ac.uk	PhD student

Room	Phone number
204	+442076793809 Ext 33809

Education and awards

Education:

- BEng in Chemical Engineering and Technology, Beijing University of Chemical Technology,2008 - 2012
- MSc in Engineering Business Management, University of Warwick, 2014 - 2015
- PhD in Chemical Engineering, UCL, 2016-

Awards:

Personal affiliations

Junior Engineer, Issued by China National Chemical Corporation

Bio

Jianhao Yu received his Bachelor's degree in Chemical Engineering and Technology from Beijing University of Chemical Technology in 2012. Then he worked for China National Tyre Quality Supervision and Inspection Center as a junior engineer for 2 years. After that he decided to go UK to study. He got his Master's degree in Engineering Business Management from University of Warwick in 2015. And now he is studying in UCL as a PhD student in Chemical Engineering.

Research interests

Project title

A Study of Predicting the Impact of Isolation Valves on Limiting the Inventory Loss as a Result of the Accidental Rupture of CO_2 Pipelines

Summary

This Project describes a mathematical model for predicting the impact of isolation valves on limiting the inventory loss as a result of the accidental rupture of CO_2 pipelines employed as part of the Carbon Capture and Sequestration (CCS) chain.
The model is based on the homogeneous equilibrium model (HEM) assumption, where the constituent fluid phases are assumed to be in both thermodynamic and mechanical equilibrium. This is followed by presentation of the hydrodynamic correlations for predicting speed of sound, heat transfer and friction effects. A suitable real fluid Equation of State (EoS) is employed to calculate the fluid thermal properties and phase equilibrium. The relevant boundary conditions (e.g. the upstream and downstream of the pipe, failure plane, the ball valves and the check valves) are also presented in this study. The resultant system of conservation equations is solved numerically by using the Method of Characteristics (MOC).
In order to investigate the impact of isolation valves installed along long distance pipelines on limiting loss of inventory during accidental failure, a series of numerical tests are performed using the above model and the results are presented and discussed. The base case involves a hypothetical 5000 m long, 180 mm i.d. CO2 pipeline at 150 bar and 293 K experiencing a 100 mm dia. puncture half way along its length. The effects of inline valve spacing, valve type including ball valves and non-return check valves as well as their combinations on the amount of inventory lost prior to complete isolation are investigated.
Significantly the results show that increasing the number of equidistance inline check valves progressively results in a reduction of the amount of initial inventory released by a maximum of 50% corresponding to 2 valves. Further increase in the number of check valve beyond 2 shows little effect in further reduction in the amount of inventory escaping. In contrast in the case of ball valves, the amount of inventory released prior to complete isolation progressively decreases with increase in the number of valves employed. However, this is set against the escalating capital cost expenditure which can become prohibitive. Finally, with the combinations of both check valves and ball valves installed at previously tested valve locations along the pipeline length, the simulated results indicate that the total inventory loss is minimised as compared to the cases where only one type of the valves is installed. The above showcases the potential of applying appropriate valve combinations for optimisation towards much improved cost-effectiveness in safeguarding pipelines in the event of failure.

Supervisors

1. Haroun Mahgerefteh	2. George Manos	3.

Publications

Teaching

Research group

Additional information