CLOSING KNOWLEDGE GAPS AND TECHNOLOGICAL BOTTLENECKS IN HYDROGEN SAFETY: A SNAPSHOT OF RECENT ACTIVITIES AT ULSTER UNIVERSITY

V. Molkov[1]

Abstract: The paper presents the progress in hydrogen safety research at HySAFER Centre of Ulster University. It includes results of two research studies performed in 2019. The first study is on the leak-no-burst (LNB) safety technology for explosion free in a fire composite tanks for high-pressure gaseous hydrogen storage. The second study is on the validation of Ulster's models and safety engineering tools against large-scale experiment on hydrogen jet flame from high-pressure hydrogen pipeline.

Keywords: hydrogen safety; prevention of blast; pipeline; flame length

DOI: 10.30826/CE20130201

Acknowledgments

The author is grateful to colleagues at HySAFER Centre of Ulster University, and EPSRC for funding through Hydrogen and Fuel Cells Hub Extension (H2FC SUPERGEN) under grant EP/P024807/1. This research has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No. 826193 (HyTunnel-CS). This Joint Undertaking receives support from the European Union's Horizon 2020 research and innovation programme, Hydrogen Europe and Hydrogen Europe Research.

References

1. Dadashzadeh, M., S. Kashkarov, D. Makarov, and V. Molkov. 2018. Risk assessment methodology for onboard hydrogen storage. *Int. J. Hydrogen Energ.* 43:6462–6475.
2. University of Ulster. 14.02.2017. Composite vessel for hydrogen storage. European (EPO) Patent Application No. 18706224.5. International (PCT) Application No. PCT/EP2018/053384.
3. Butler, M. S., C. W. Moran, P. B. Sunderland, and R. L. Axelbaum. 2009. Limits for hydrogen leaks that can support stable flames. *Int. J. Hydrogen Energ.* 34:5174–5182.
4. Lecoustre, V. R., P. B. Sunderland, B. H. Chao, and R. L. Axelbaum. 2010. Extremely weak hydrogen flames. *Combust. Flame* 157:2209–2210.
5. Molkov, V. 2012. Fundamentals of hydrogen safety engineering. bookboon.com. 216 p.
6. Molkov, V., and J.-B. Saffers. 2013. Hydrogen jet flames. *Int. J. Hydrogen Energ.* 38:8141–8158.
7. Acton, M. R., D. Allason, L. W. Creitz, and B. J. Lowesmith. 2010. Large scale experiments to study hydrogen pipeline fires. *8th Pipeline Conference (International) Proceedings*. Calgary, Alberta, Canada. 593–602.

Received January 21, 2020

Contributor

Molkov Vladimir (b. 1953) — Master Science in quantum radiophysics, Candidate of Science in physics and mathematics, Doctor of Science in fire and explosion safety, Fellow of the Energy Institute, Chartered Energy Engineer, Chartered Engineer (CEng) with Engineering Council U.K., director, Hydrogen Safety Engineering and Research Centre (HySAFER), Ulster University, Newtownabbey, Shore Road, BT37 0QB, Northern Ireland, U.K.; v.molkov@ulster.ac.uk

[1]Hydrogen Safety Engineering and Research Centre (HySAFER), Ulster University, Newtownabbey, Shore Road, BT37 0QB, Northern Ireland, U.K., v.molkov@ulster.ac.uk