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Purging hydrogen distribution pipelines: literature review, description of recent experiments and proposed future work

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The aim of the H21 project is to undertake measurements, analysis and field trials to support the safe repurposing of Great Britain's natural gas distribution network for hydrogen. As part of this project, work has been ongoing to develop new procedures for purging hydrogen pipelines. This has included a review of the scientific basis of current displacement purging practices, analysis of the potential implications of switching from natural gas to hydrogen, and experimental support work. The reduced density and viscosity of hydrogen means that minimum purging velocities should (in principle) be higher for hydrogen to avoid stratification and ensure adequate removal of the purged gas during pipeline purging operations. A complicating factor is the high molecular diffusivity of hydrogen (roughly three times that of natural gas), which causes hydrogen to mix over short distances more rapidly than natural gas. Current models for pipeline purging do not take into account the mixing effect related to molecular diffusion. The wider flammable limits, lower ignition energy and greater potential for combustion to transition from deflagration to detonation with hydrogen means that indirect purging with nitrogen is currently being considered as the best way forward for distribution pipelines.

This presentation at the ICHS conference will describe the ongoing analysis of hydrogen pipeline purging and also discuss a potential future scientific programme of work aimed at developing a new pipeline purging model that accounts for the molecular diffusion effects.

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