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Hydrogen the Future Fuel? A Review of the Technical Challenges in Replacing Natural Gas with Hydrogen for Heating

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Abstract

Hydrogen is being seen as a key future for reducing our carbon emissions and governments are seriously considering repurposing existing gas networks to pure hydrogen so that it can be used by industry, in homes and businesses, and in the energy sector. However, unlike other energy vectors such as electricity, hydrocarbon gases and district heating, high-purity hydrogen has not been deployed at large scales anywhere in the world. This puts hydrogen at a distinct disadvantage. Any attempt to replace natural gas with hydrogen will require a compelling case to compensate for this lack of experience.

This article explores the importance of natural gas to our energy systems and the benefits of hydrogen, which could significantly decarbonise our heating and reduce over-dependency on natural gas. These include: (i) Hydrogen can use much of the existing gas infrastructure, (ii) Hydrogen is a very versatile fuel which can be used by households, industry and businesses (iii) Hydrogen can be produced in large volumes (iv) Hydrogen compares well with other low-carbon heat technologies. This paper considers a number of key questions which need to be addressed before attempting any large-scale deployment of hydrogen to retrofit homes and businesses.

Biography:

Abhishek Asthana is the Director of Hallam Energy, the energy research group at Sheffield Hallam University (SHU). In 2009, he co-founded Hallam Energy and has since led and delivered more than 50 projects of industrial energy research, consultancy and knowledge transfer. He has won £3.5 million funding for SHU, co-authored 37 scientific papers and 1 book, invented 4 patents and developed 5 commercial software packages. He is the course director for BEng Energy Engineering and MEng and BEng Chemical Engineering programs at the university. In 2015, he established a Doctoral Training Alliance (DTA) in Energy to train PhD students conducting energy research. The DTA has now grown to 90 PhD students and 180 Supervisors across 19 British Universities in the University Alliance, UK, and Abhishek is currently its Deputy Director. He also recently led the alliance to success in winning €6.5 Million funding from the European Commission's Marie SkÅ‚odowska-Curie Actions COFUND to further expand the DTA program

Speaker Publications:

1. Mukherjee, S; Asthana, A; Howarth, M; Mcniell, R; "Waste Heat Recovery from Industrial Baking" Ovens. Vol 123, Pages 321-328, Energy Procedia, September 2017.
2. Asthana, A; Mukherjee, S; Mountney, S; Griffiths, R; "Experimental Validation of the Structural Integrity of Modular Horizontal Axis Wind Turbine Blades" [Proceedings] Sustainable Places 2017 conference (SP2017), Middlesbrough, UK, 28–30 June 2017, MDPI.
3. Mukherjee, S; Asthana, A; "Techno-Economic Feasibility of a Hybrid Power Generation System for Developing Economies" [Proceedings] Sustainable Places 2017 conference (SP2017), Middlesbrough, UK, 28–30 June 2017, MDPI.

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