



Hydrogen in natural gas systems

- Hydro transportation
- Hydrogen and use
- Safety
- Gas quality
- Field tests
- Laboratory tests

DGC and hydrogen

Hydrogen is expected to form an important part of the future energy supply and the natural gas grid may be able to function as buffer storage for surplus green energy and a distribution method for hydrogen.

Before introducing hydrogen in the natural gas grid a lot of questions must be addressed relating to transmission and distribution grid and to end user equipment:

- Safety
- Durability, maintenance
- Billing (Metering)
- Variations in hydrogen content
- Extracting hydrogen from natural gas/hydrogen mixtures

During the last 10 years DGC has been active in various national and international projects covering different aspects of hydrogen in combination with natural gas, ranging from literature studies to full scale tests.

DGC on-going activities are covering, IEA Hydrogen Implementation Agreement (IEAHIA) participation, Phase II field-testing of the suitability of the Danish gas distribution

grid for hydrogen transportation. In our laboratory we are testing residential fuel-cell systems of the PEM, DMFC and SOFC type.

100% hydrogen in natural gas distribution system

Phase 1

The purpose of the tests in this major national project was to reveal the possibilities of transport of hydrogen via the existing Danish natural gas grid.

Steel and plastic pipes from the existing gas distribution grid were adapted for a standalone "miniature gas grid" constructed according to existing standards and authority regulations by the Greater Copenhagen Natural Gas Company (HNG). Tests were made for a total of 340 operation days.

The results of phase 1 indicate possibilities for hydrogen transportation via the 19 bar steel distribution grid as well as via the 4 bar plastic distribution grid. The plastic grid requires additional (ongoing) investigations of the tendency towards changes in melting index and reduced resistance against oxidation after hydrogen exposure. Also, the

tendency towards increased rigidity of PEM plastic and reduced rigidity for PE100 plastic needs to be investigated further. The tests showed that all joints, components and fixtures of the gas grid should be checked for leakages at regular intervals. Certain components should be modified in order to be hydrogen tight.

Phase 2

Phase 2 is finished and contained a three-year continuation including further tests of polymer and steel pipes in the miniature gas grid similar to phase 1. At WGC 2006 a paper on the project was presented: "Field test of hydrogen in the natural gas grid" - Henrik Iskov and Jan K. Jensen.

Phase 3

So far results after phase one and two have so far been quite positive. Due to some minor uncertainties in the development of polymer material characteristics a third test phase was decided. The third phase began in 2011 and is scheduled for a total of 5 years. Based on the project results two smaller hydrogen grids with polymer pipes have been put into operation in Denmark and a third grid is expected in 2012 (as a part of the Danish fuel-cell based micro-cogeneration program).



Contact us

If you have any questions to the subjects described on the product sheet or other DGC services, you are welcome to contact us:

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Profile

DGC is a specialized consultancy and development company within energy and environment. DGC's main focus area is gas utilization.

DGC offers consultancy, measurements, laboratory testing, training and certification.

DGC has its head office and laboratory in Hørsholm, north of Copenhagen and a local office in Aalborg.