



## 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 participation in the large EU project Naturalhy 2005, 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 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 re-

duced 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 now ongoing and contains 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 will be presented: "Field test of hydrogen in the natural gas grid" - Henrik Iskov and Jan K. Jensen.



### 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.