Product description

Line pipe in steel grades up to and including API 5L X52 (L360) is approved or considered non-critical for the transportation of pure hydrogen or natural gas with hydrogen admixtures of up to 50 % (EIGA Guideline, DVGW tests, EU project NaturalHy). This assessment had also resulted from previous (partly in-house) tests [1-6]. Higher grades are not mentioned in the relevant standards, nor are they being used at present.

The behavior of pipe in grade X70 (L485) steel used for conveying pure compressed hydrogen (100 bar) was investigated in slow strain rate tensile tests (Fig. 1). Neither the base material, nor the HFI weld or the standard girth weld showed signs of increased susceptibility to the effects of hydrogen (Fig. 2). Tests were published in various journals, including bbr 3/2014 [7].

Fig. 1: Round test bar for slow strain rate tests

Given an energy mix with a strong regenerative focus, the technical compensation of fluctuating electricity production and demand-based long-distance conveyance to the centers of consumption assume critical importance. Innovations in energy storage and transportation are thus decisive for a successful energy turn-around.

Application

Besides worldwide increasing energy demand, it is particularly political efforts to reduce greenhouse gas emissions that are generating a growing demand for alternative energy sources. This is accompanied by a decrease in power generation capacities below base-load requirements, a development that is especially conspicuous in Germany due to this country’s accelerated exit from nuclear energy.

In the power-to-gas sector, hydrogen, in particular, has proved itself as a useful medium for storage and transportation. New hydrogen applications include re-conversion, admixture into the natural gas grid, or the automotive industry (fuel cell technology).

Especially in Germany, increasing the use of hydrogen makes good sense for several reasons.

• The country has over 100 years’ experience in the commercial handling of hydrogen
• It ranks among the group of global leaders in the development of H₂ and fuel cell technologies; it has the world’s leading premium automobile industry
• Its chemical industry is searching for hydrogen from increasingly carbon (C)-extensive sources
• There are salt caverns for large-volume H₂ storage available in northern Germany (unlike California or Japan)
However, increased use of hydrogen calls for a corresponding infrastructure for the medium's transportation and storage.

This, in turn, creates an enormous demand for new gas pipelines suitable for hydrogen conveyance. Based on the simulation of a hydrogen network infrastructure with mass-storage facilities [8], a possible future scenario was determined: For the complete conversion of mobility to hydrogen as an energy source by the year 2052, with 33.9 million fuel-cell vehicles, 9,450 \( \text{H}_2 \) filling stations would be required. Since hydrogen technology is also being seriously promoted in countries with an extremely high traffic density, such as the USA, Japan, China and India, there is no question that new pipelines are needed.

High-frequency induction-welded line pipe from Mannesmann Line Pipe is extremely well-suited for the upcoming expansion of pipeline capacities. The proven welding technology and the use of modern steel grades, which are resistant to hydrogen-induced corrosion, make our line pipe an economical and eco-friendly solution.

**Product properties**

Steel is a material characterized by extremely high toughness, durability and high resistance to external influences. The manufacturing program of Mannesmann Line Pipe GmbH stretches from DN 100 to DN 600, covering a wide and varied range of standard and special applications.

**Literature**


**Image sources**

Overleaf upper right: Offshore-Jackets, Freezingtime, istockphoto.de
Overleaf lower right: Photovoltaik, Fotolia.de

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