1
INTRODUCTION

In the middle ages Paracelsus is reported to have noted that gas is held at when iron is dissolved in the “spirit of vitriolic”. Turquet De mayernc (1573-1655)noted that this gas was inflammable. However, **Hydrogen** was first separated and identified in the second half of the 18^{th} century. Boyle produced “factitious air “ from the diluted sulfuric acid and iron .

From many years the industrials demands for hydrogen were limited to the relatively small quantities used in operating oxy-hydrogen lamps used for projection purpose and for use in the oxyhydrogen blowpipe for melting refractory materials. But in 1900’s we started using it in production of ammonia, methanol and on a alcohol's and for the refinery purpose other than this now it is used in chemical refinery, metal treating, fats and oil hydrogenation. However, hydrogen-manufacturing process developed the last 75years where primarily for the use in hydrogen in ammonia and methanol production rather than the above uses. The process design is dependent on the final product as well as available raw materials and energy sources such as natural gas, naphtha, gas oils etc. among all industrial process for hydrogen production.

Hydrogen enjoys a long tradition as an energy carrier as well as a chemical resource. Its high energy content — 1 kg corresponding to 3.5 l of petroleum — quickly led to its recognition as an ideal fuel in applications where weight rather than volume was the important factor: applications such as providing the lift for Balloons or Zeppelins and more recently as a fuel for spacecraft.

In the first half of this century the entire gas supply consisted of town gas, a coal gas consisting of more than 50% hydrogen. Only with the discovery of Oil and Natural Gas reserves was hydrogen gradually forced out of the public supply system. As recently as in 1992, almost 3 billion m^3 of town gas (a third of that in the former East Germany) was still in use in the private household and small industry sector. This quantity represented about 10% of the natural gas consumption in this sector.

While decreasing coal usage continues to force hydrogen out of the energy sector, the long term chances for its return remain good as long as its advantages of renewable production and carbon-free nature continue to be demanded.

But why should these demands continue to increase in the near future? In the local emission balance, the quantum leap has already been achieved by a shift from petrol and diesel to natural gas. In this respect hydrogen offers emission levels way beyond existing and future emission standards.

An application therefore only makes sense where, along with the local low emission levels, other advantages are offered. As secondary energy carrier, hydrogen offers the possibility, through change in the share of energy sources, of a gradual change from CO_2-emitting to CO_2-free traffic while retaining existing technology.

The basis for a long term change is caused on the one hand by the concern about the depletion of fossil fuel resources and on the other hand by the need of drastically reducing all (and in particular climate affecting) emissions. In this respect, it is unimportant whether the depletion of fossil fuels or the pollution of the atmosphere dictates the course of action.

With these points in mind, it is only in connection with renewable energy based production that hydrogen has significant importance

- for the storage of energy,
- for the transport of energy and
- as a pollution free mobile energy carrier.

Having accepted these considerations, then due to the long lead-time before securing a significant market share, a well-timed program of continual development, testing and demonstration is required. A program that must begin immediately.

The move to a large scale hydrogen based energy sector will also be seen as an important option when the contribution by fluctuating generation electricity producers (Wind, Solar) reaches such a level that the electricity supply and demand can only be matched with the aid of a storage mechanism. Simulations with data from the German electricity industry show that this would be necessary for a 20 - 25% contribution from renewable energy sources, a level not subject to possible changes. Hydrogen presently has the most attractive properties as a "Storage Medium" of electricity: Compared with the storage of electricity in batteries, the material costs are many times lower. This application is used on a small scale in the energy-autonomous solar house of the Fraunhofer Institute for Solar Energy Systems. Excess electricity is stored in a 5-m3 hydrogen tank and then used as required for heating support, cooking or regeneration of electricity at times of low solar radiation. If the same amount of energy were to be stored in batteries, a lead-acid battery installation weighing 40 t and consuming an area of 100 m^3 would be needed.

Independent of this long-term option, hydrogen can be used as a pollution free fuel for traffic applications. In the short term, this could best be applied to urban vehicles in order to reduce emissions in city centers, in long term however every form of transport vehicle could be effected, be it ships, trains or aeroplanes. The advantages of no pollution and reduced fuel weight are however coupled with an increase in the volume and weight of the required fuel tank, which for small vehicles would lead to a reduction in range and payload.

Along with these three large scale areas, the technological developments of fuel cells achieved in the last few years are beginning to show electricity generation from hydrogen as an early niche market. The pre-requisite here however is that production costs can be brought down to levels comparable with those of conventional technologies. The worldwide efforts of the leading firms in this area result in the prediction that a large scale market entry can be expected around the turn of the century. Should these expectations be fulfilled, then early in the next century the fuel cell (similar to Photovoltaics) could cause a radical change in the entire energy sector, a change comparable in its dynamics and dimensions with that seen in the entire media and telecommunications sectors when the field of microelectronics forced transistors out of the scene.

If one is to follow the long term strategy of establishing hydrogen as an energy carrier, then the early "niche applications" in the transport area or fuel cell applications present the first available markets. A low cost introduction and testing phase can take place in the surroundings of conventional chemical hydrogen production. Within the next five to ten years, this should lead to an economical market penetration that could be sustainably extended in the medium-term with imported hydrogen and other hydrogen sources (e.g. biomass gasification)

HISTORY:

Cavandish provided that there were different type one of which was " inflammable air" and that a number of metals, when dissolved in acid, produced various amount of gas. In 1785 Lavoisier demonstrated the splitting water into hydrogen and gave the " inflammable air " the name hydrogen. In 1800 first production of hydrogen and oxygen by electrolysis and after that in 1898 liquefaction of hydrogen using linde process was done. In 1902 first commercial electrolysis installation was done. In 1929 pure Para hydrogen was produced, and another break through was discovery of hydrogen isotope deuterium. In 1954 led the ignition of the first hydrogen bomb on the bikini atoll (USA). In 1955 hydrogen was started using as energy carrier medium. Till 1986 total hydrogen production worldwide was 500 million m^3/annum (1).

Syngas can be produced from natural gas in several ways. The most suitable way for SMDS was using the Shell Gasification Process with oxygen taken from an adjacent air separation unit. Used in commercial plants since 1956, the process has several advantages. It is a direct process without the need for a catalyst, it has a very high process efficiency and is highly reliable as well as cost effective.