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World Hydrogen

Industry Study with Forecasts for **2013 & 2018**

Study #2605 | February 2010 | \$5300 | 336 pages

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Demand will benefit as petroleum refiners consume more hydrogen in their production of low sulfur fuels, and as manufacturers produce more chemicals, microchips, glass, metal parts and food.

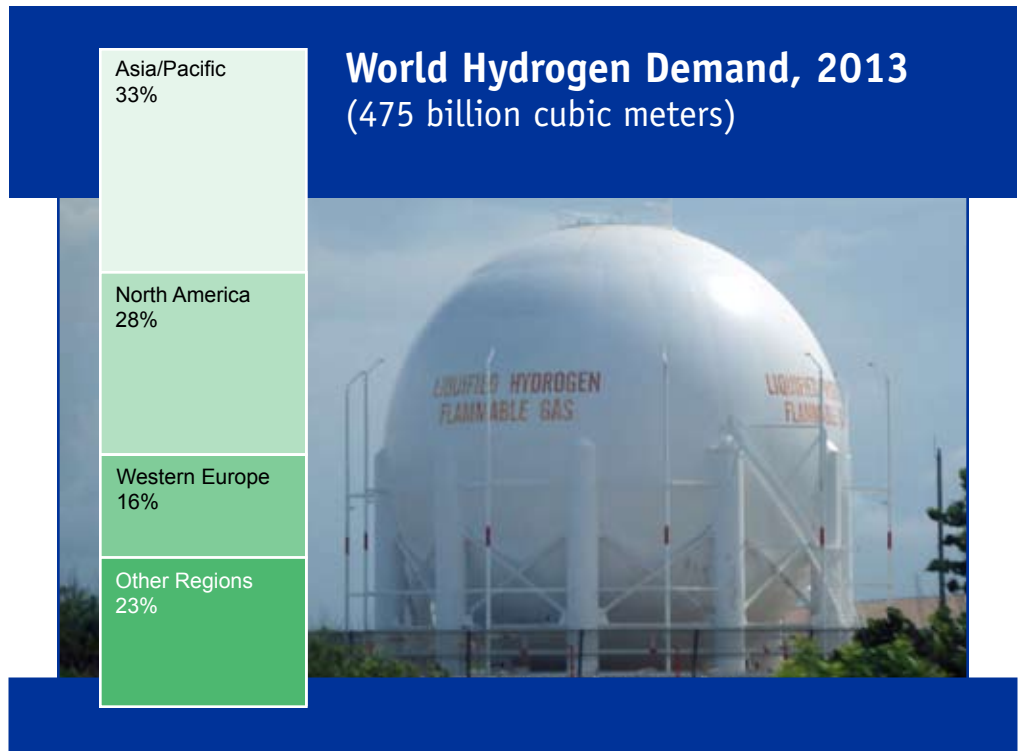
Global demand to expand 3.4% yearly through 2013

Global demand for hydrogen is forecast to expand 3.4 percent per annum through 2013 to 475 billion cubic meters. Demand will benefit as global petroleum refiners consume more hydrogen in their production of low sulfur fuels. Favorable demand fundamentals for hydrogen also exist in chemical manufacturing, as well as in the production of semiconductors, float glass, metal components and food.

Petroleum refining to lose market share to other uses

Petroleum refineries are by far the largest consumers of hydrogen, accounting for nearly 90 percent of global consumption in 2008. Historically, most refinery consumption was captively produced during refining. However, the production of newer low sulfur, clean-burning fuels requires massive amounts of hydrogen for the hydrotreating of petroleum distillates, which is driving demand for merchant supplies. Of the anticipated 73 billion cubic meters of increased global hydrogen demand projected through 2013, just under 84 percent will be consumed by refineries. Merchant suppliers will supply 55 percent of the increased hydrogen demand by refineries.

Manufacturing and other (non-refining) hydrogen applications accounted for eleven percent of consumption in 2008, or 45 billion cubic meters. Chemical



manufacturing (exclusive of ammonia and methanol production) accounted for six percent of global consumption; the remaining five percent was accounted for by other manufacturing and non-manufacturing applications. Hydrogen is used in the production of semiconductors and glass, in the thermal treatment of metal components, and in the hydrogenation of processed foods.

Asia/Pacific region to surpass North America as largest geographic market

In 2008, North America led the world in hydrogen consumption -- the result of its

huge economy and its stringent fuel emission standards. The Asia/Pacific region was a close second. More rapid growth in the economies of China, India, and other Asia/Pacific countries (excluding Japan, whose economy is already quite mature) as they nurture their emerging industrial bases will make this region the global leader in hydrogen consumption well before 2013. Western Europe is third among the world's hydrogen consumers. The other developing regions, Latin America, Eastern Europe and the Africa/Mideast region, will also experience faster growth in hydrogen demand than the more mature economies of North America and Western Europe.

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Sample Text, Table & Chart

ASIA/PACIFIC

Petroleum refineries accounted for 88 percent of demand for hydrogen in India in 2008. Indian refineries more than doubled of cleaner-burning products between 1998 and 2008, during which refinery consumption of hydrogen grew fivefold to 16.8 billion cubic meters. Given the projected increases in the nation's output of refined petroleum products, increases in hydrogen consumption will follow. In recent years, India has experienced a wave of refinery expansion, exemplified by Reliance Industries' construction of a second refinery at its site that will, when both refineries are completed, make it the largest refinery complex in the world. Similarly, in late 2009 Praxair announced it will supply hydrogen to Indian Oil for its greenfield oil refinery to be built at Paradip, Orissa. Such developments will drive gains in hydrogen consumption in India, with demand projected to rise 7.0 percent annually through 2013 to 22.6 billion cubic meters.

Hydrogen consumption in the chemical sector has grown rapidly since 1998, accounting for 12 percent of the nation's total hydrogen consumption. The chemical sector has a broad base of applications, including the production of ethylene, propylene, and other chemical products. Consequently, hydrogen consumption in the chemical sector will rise 7.0 percent annually through 2013 to 16.1 billion cubic meters. Petrochemicals are the nation's fastest growing chemical segment, with significant production of basic chemicals such as ethylene, propylene, benzene, xylene and their derivatives.

Non-chemical manufacturing and other applications account for 16.1 percent of hydrogen consumption in 2008, when demand was 900 million cubic meters. This is 2.3 times the level of consumption in 1998, growth having been driven by manufacturing activity in components, float glass, processed food and semiconductors (India is more known for its integrated circuit design capabilities than its production). A healthy growth outlook for India's non-chemical manufacturing sector is expected through 2013, with demand projected to rise 7.0 percent annually through 2013 to 16.1 billion cubic meters.

TABLE VI-7

INDIA ECONOMIC & MARKET ENVIRONMENT

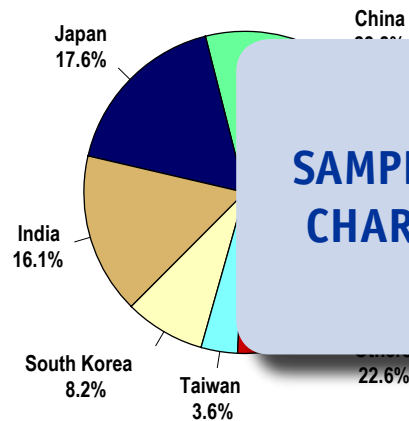
| Item | 1998 | 2003 | 2008 | 2013 | 2018 |
|--------------------------------------|------|------|------|------|------|
| Population (mil persons) | | | | | 5 |
| GDP/capita | | | | | 0 |
| Gross Domestic Product (bil 2007\$) | | | | | 5 |
| cubic meters/capita | | | | | 7 |
| cubic meters/000\$ GDP | | | | | 8 |
| Petroleum Refining (mil metric tons) | | | | | 3 |
| Chemical MVA (bil 2007\$) | | | | | 9 |
| Manufacturing MVA (bil 2007\$) | | | | | 1 |
| Commercial Fuel Cell Demand (mil \$) | | | | | 3 |
| Hydrogen Demand (bil cubic meters) | | | | | 0 |
| % India | | | | | 3 |
| Asia/Pacific Hydrogen (bil cu m) | | | | | 0 |

SAMPLE
TABLE

SAMPLE
TEXT

CHART VI-1

ASIA/PACIFIC HYDROGEN DEMAND BY COUNTRY (119.6 billion cubic meters, 2008)



SAMPLE
CHART

Sample Profile, Table & Forecast

TABLE VI-8
INDIA HYDROGEN DEMAND BY MARKET
 (billion cubic meters)

| Item | 1998 | 2003 | 2008 | 2013 | 2018 |
|-------------------------------------|------|------|------|------|------|
| Gross Domestic Product (bil 2007\$) | | | | | 55 |
| cubic meters gas/000\$ GDP | | | | | 8 |
| Hydrogen Demand | | | | | 0 |
| Petroleum Refining | | | | | 2 |
| Chemical Manufacturing | | | | | 0 |
| Other | | | | | 8 |
| \$/000 cubic meters | | | | | 2 |
| Hydrogen Demand (mil \$) | | | | | 60 |

SAMPLE
PROFILE

COMPANY PROFILES

Messer Group GmbH

Limespark
 Otto-Volger-Strasse 3c
 65843 Sulzbach
 Germany
 49-61-96
 http://ww

Sales: \$
 Geograph (supported by company)
 Western 50%, Asia/Pacific
 Region 1
 Employm (y)

Key Products: hydrogen for plasma arc cutting, thermal spraying, carburization, glass polishing, food and other applications

Messer Group, formerly Messer Griesheim GmbH, operates in one business: the production, supply and distribution of industrial gases. The privately held company is owned by the Messer family.

The Company participates in the world hydrogen industry through the manufacture of hydrogen and a wide range of other gases for plasma arc cutting, thermal spraying, carburization, glass polishing, food and other applications. Messer Group's plasma arc cutting hydrogen gas is used to increase cutting speed, reduce metal waste and distortion, and provide clean cut surfaces. Thermal spraying hydrogen is used primarily in the automotive, aviation, mechanical engineering, mining and trade industries. The thermal spraying process is used to protect base metals, including steel, from corrosion, wear and heat damage. Messer's HYDROCARB carburization process utilizes hydrogen or hydrogen/nitrogen mixtures to harden steel without causing edge

"Between 1998 and 2008, Indian hydrogen demand increased nearly fivefold to 19.2 billion cubic meters. This remarkable rate of growth is due primarily to rapid increases in Indian refining capacity and the trend toward refinery modernization. As this expansion continues, and as Indian manufacturing continues to grow rapidly, hydrogen demand will increase at a healthy 6.1 percent annual pace through 2013 to 25.8 billion cubic meters valued at \$2.7 billion."
 --Section VI, pg. 211

