

**India Compressed Hydrogen (Bottled Cylinder) Market Assessment, By Grade Type [Grade 1, Grade2, Ultra-High Purity], By End-user Industry [Chemical and Petrochemical, Semiconductor, Metalworking, Others] By Region, Opportunities and Forecast, FY2018-FY2032F**

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**Report description:**

India compressed hydrogen (bottled cylinder) market is projected to witness a CAGR of 9.40% during the forecast period FY2025-FY2032F, growing from INR 3578.75 million (USD 42.94 million) in FY2024 to INR 7243.14 million (USD 86.90 million) in FY2032. The market has experienced significant growth in recent years and is expected to maintain a strong pace of expansion in the coming years.

Emerging as a critical segment of India's clean energy transition, compressed hydrogen is becoming increasingly vital in the nation, motivated by growing environmental concerns and initiatives from the government to address decarbonization. Recognized as a versatile energy carrier, hydrogen is gaining momentum across industries, including transportation, industrial processes, and power generation, due to its potential to cut carbon emissions significantly. The Indian government has focused on achieving net-zero targets by 2070, and through policies such as the National Hydrogen Mission, Green hydrogen infrastructure development has gotten a much-needed impetus. Further, the Government's focus on promoting domestic semiconductor manufacturing is playing a vital role in the compressed hydrogen market.

Major players in the Indian market, including private players and international investors, have made significant investments in the semiconductor industry. For Instance, in February 2024, Tata Electronics Pvt. Ltd. announced a total investment of INR 910,000 million (USD 10,918.90 million) to build a mega semiconductor fabrication facility in Dholera, Gujarat. The facility will have a monthly manufacturing capacity of up to 50,000 wafers and will manufacture chips for sectors like automotive, AI, and wireless communication.

Adoption of Compressed Hydrogen Fuel Cell Vehicles in India Creates Opportunities

Compressed hydrogen (bottled cylinder) is ready to expand in fuel cell technology and is implemented in transportation sectors

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for running automobiles, buses, trucks, and trains. For example, some automobile companies in India have already taken the initiative to develop automobiles run on hydrogen. Companies like Tata Motors, Mahindra & Mahindra, and Ashok Leyland have announced plans to develop hydrogen fuel cell vehicles (HFCEV), which will likely drive demand for compressed hydrogen gas in the country in the short term.

Furthermore, HFCEVs produce water vapors as a product during their consumption; therefore, this would be an environmentally friendly technology instead of using conventional fossil fuel-based vehicles. Another good point is the increase of investments in the compression gas distributing network and fuel stations to boost HFCEV utilization. The producers of the compressed hydrogen would achieve a large number of chances in India because this country moves to sustainable and clean energy-based transportation solutions. Hydrogen FCVs can complement conventional fossil fuel-powered cars, primarily for commercial fleets and public transport, as acceptance of these vehicles is high in India. Demand for compression hydrogen supply is increasing due to the fact that government programs, as well as incentives for green mobility, accelerate the deployment of refueling infrastructure for hydrogen.

In November 2024, NTPC unveiled its Green Compressed Hydrogen Mobility Project in Leh, which offers hydrogen-fueled buses explicitly developed for tough terrains and harsh climatic conditions. It has a range of up to 300 km with a single fill-up and runs very well at sub-zero temperatures and in low-density air. It has a specific hydrogen station that will consume 80 kg/day of energy from a 1.7 MW solar plant. The project aims to reduce carbon emissions by 350 metric tons annually and generate oxygen equivalent to planting 13,000 trees.

#### Expansion of the Semiconductor Market Application Fuels Market Growth

In India, the demand for semiconductor chips is gaining momentum, and it is said to drive high growth in the semiconductor industry. High-quality semiconductor chips are being demanded in automobiles, electronics, and the health sector. The upcoming development in technologies, such as AI, IoT, and 5G communications, fosters the demand for high-quality semiconductor devices and components in the market.

In India, compressed hydrogen (bottled cylinder) is emerging as an essential component in the semiconductor manufacturing, with applications including epitaxy, annealing, cleaning, etching, doping, and ion implantation. Therefore, the production of efficient semiconductor components and devices necessitates high-purity compressed hydrogen, making the demand for this gas a priority in the industry.

The Indian government has introduced India Semiconductor Mission (ISM) in a bid to attract semiconductor manufacturing in the country. In September 2024, the Government announced that under the mission, it will provide central and state government subsidies for five semiconductor units for the development of semiconductors and display manufacturing ecosystems in India with an outlay of INR 760,000 million (USD 9,119.09 million). The companies that are going to receive subsidies include Tata Electronics and Powerchip Semiconductor Manufacturing Corp (PSMC), Tata Semiconductor Assembly and Test Pvt Ltd (TSAT), CG Power and Renesas Electronics Corporation, Micron Technology, Kaynes Semicon and Suchi Semicon.

#### Supportive Government Policies Creates Market Opportunity

India is at the forefront of a green revolution with Hydrogen and Sustainable Aviation Fuel to shift towards a low-carbon economy. As the population grows and energy requirements increase, the nation strategically aligns its resources to achieve energy security, self-reliance, and sustainability. This is a massive opportunity for industries and investors.

The government has been crucial to this process by initiating future-driven policies and monetary benefits. Compressed hydrogen, an important component of this environment, will drive the Indian energy scene to a different dimension. The fuel can efficiently and sustainably be used for transportation, industrial purposes, and electric power, in alignment with the country's decarbonization goals.

For instance, in March 2022, the Union Ministry for Road Transport and Highways introduced a "pilot project on hydrogen-based advanced fuel cell electric vehicles", otherwise known as FCEVs. The pilot project was conducted jointly with Toyota Kirloskar Motor and the ICAT or International Centre for Automotive Technology. The project aimed to study and evaluated the first hydrogen car in India, Toyota Mirai, one of the world's first hydrogen-fuel electric vehicles, on Indian roads and in climatic conditions. The project was aimed at spreading awareness about hydrogen and FCEV technology and support towards a hydrogen-based society in India.

With such supportive policies, India will be able to unlock the immense potential of the compressed hydrogen (bottled cylinder)

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market. This shift enhances energy security while positioning the country as a world leader in green energy fuel for a sustainable future and one that is self-reliant.

#### Chemical and Petrochemical Industry Dominates the India Market

The India compressed hydrogen (bottled cylinder) market is expected to experience dramatic growth due to the nation's pursuit of sustainable energy solutions and the growing chemical and petrochemical industries. The demand for these sectors is increasing continuously as the applications are critical in manufacturing, building, and the production of consumer goods. The accelerated urbanization and infrastructure projects have increased the demand for chemicals and petrochemicals, hence increasing production and consumption.

A major development in this regard is GAIL's new 10MW green hydrogen facility in Madhya Pradesh, which is a step towards India's renewable energy aspirations. The Secretary of the Ministry of Petroleum and Natural Gas inaugurated the facility on May 24, 2024. The facility highlights the strategic importance of green hydrogen in India's energy transition. This plant has a daily production capacity of 4.3 tonnes of high-purity hydrogen at 99.999%, thus showcasing the cutting-edge technology and the dedication GAIL has put into this venture. This development will help in increasing the demand of ultra-high purity hydrogen in coming years.

This development falls in line with the greater vision of India of cutting down its fossil fuel consumption and carbon emissions, along with setting itself as a forerunner globally in green hydrogen production. This will further spur the chemical and petrochemical industries in addition to creating a cleaner, more sustainable supply chain.

#### West and Central Regions Dominate the India Market

India compressed hydrogen (bottled cylinder) market in West and Central India has been leading since and it is expected to maintain its dominance during the forecast period mainly due to strong infrastructural development, significant investments, and the presence of key players in the region. Major companies such as Nirma Limited, Grasim Industries Limited (Aditya Birla Chemicals Limited), Gujarat Fluorochemicals Limited (GFL), and DCM Shriram Limited have their plants located in the west and central regions of India and contribute significantly to the Indian compressed hydrogen (bottled cylinder) market.

West India has been advanced in adopting sustainable energy sources, such as hydrogen fuel, due to its maturity in the industrial base and ecosystem of advanced technology. Central India has been using its strategic location and government initiatives to promote green energy projects and research. Policies supporting renewable energy and emission reduction have accelerated the deployment of hydrogen infrastructure, which has boosted market growth. Moreover, public-private collaboration along with the advancement in compression and storage technologies has strengthened the market in these regions. This sustained investment and commitment to energy transition will make West and Central India an integral part of the compressed hydrogen (bottled cylinder) market.

#### Future Market Scenario (FY2025 – FY2032F)

□ Policies and incentives on clean energy and hydrogen as a sustainable fuel will be encouraged by the government for growth while India pushes toward net-zero emission by 2070.

□ Continued investment in hydrogen production, storage, and distribution infrastructure will help underpin the market by providing infrastructure capabilities for higher-scale production and efficient deployment in transportation and industry.

□ Compression, storage, and fuel-cell technologies will advance to a point where hydrogen solutions become economical and efficient enough for commercial applications.

□ Increased partnerships among public and private players, with international partnerships as well, will be a catalyst for innovation and accelerate the development of a robust hydrogen ecosystem in India. This will further strengthen India's position as a leader in the global compressed hydrogen market.

#### Key Players Landscape and Outlook

The compressed hydrogen (bottled cylinder) market in India is an amalgamation of several key players. The market comprises energy firms, industrial companies, and specialized start-ups that are engaged specifically in the hydrogen solution space. All of these are investing in infrastructure, production, and technology developments to respond to the needs of this growing clean energy industry. There are collaborations between private sector organizations and research institutions to speed up the development of more efficient storage and distribution methods. Incentives and policy support also encourage further

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participation and innovation through the government's push for renewable energy. The market prospect is positive, with expansion to usage in transportation, industrial applications, and energy storage, which will drive long-term decarbonization and sustainability for India.

For instance, in February 2023, Primo Chemicals Limited received Environmental Clearance (EC) for two major projects, the Aluminium Chloride project and the Paracetamol API manufacturing project. These initiatives are expected to enhance the company's production capabilities and align with its forward integration strategy, particularly concerning hydrogen gas production.

In December 2022, SOL S.p.A, an Italian company, entered into a strategic partnership with Bhuruka Gases Limited in India to enhance their collaboration. Through this strategic alliance, SOL's footprint in south and west India was further increased, giving it access to a diverse clientele and established industrial facilities. Furthermore, the collaboration is expected to strengthen both company's positions in the market and contribute to the development of sustainable solutions across India.

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