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Power Supply Equipment Market for Water Electrolysis - A Global and Regional Analysis: Focus on Application, Equipment Type, and Region - Analysis and Forecast, 2023-2032

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Abstracts

Power Supply Equipment Market for Water Electrolysis Overview

The power supply equipment market for water electrolysis was valued at $331.5 million in 2022, and it is expected to grow at a CAGR of 33.27% and reach $5,714.8 million by 2032. The growth in the power supply equipment market for water electrolysis is expected to be driven by supportive government initiatives, strict net zero targets, and rising demand for hydrogen fuel cell vehicles, green ammonia, green methanol, and other applications.

Introduction of Power Supply Equipment for Water Electrolysis

Power supply equipment for water electrolysis refers to the devices or systems that provide electrical energy for the process of water electrolysis. The power supply equipment is responsible for delivering the necessary electrical energy to drive the electrolysis reaction. Water electrolysis is the process of converting electrical energy into chemical energy in the form of hydrogen and oxygen, and an electrolyzer is a system that breaks water into hydrogen and oxygen with the help of electricity. As per the International Energy Agency (IEA), water electrolysis-based hydrogen production has the potential to prevent the release of around 830 million tons of CO2 annually. The rising demand for green hydrogen is a significant driver for the growth of the water electrolysis market. This, in turn, creates a demand for power supply equipment that can efficiently support the electrolysis process.

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Market Introduction

The power supply equipment market for water electrolysis has experienced significant growth in recent years due to increasing government support through policies and incentives, technological advancements, and increasing investments in renewable energy infrastructure. Furthermore, the advancement of water electrolysis technologies, particularly PEM electrolysis, has led to the need for specialized power supply equipment that can meet the unique requirements of these systems. The power supply equipment market for water electrolysis is currently small, but it is projected to experience substantial growth in the near future. This growth is anticipated due to ongoing technological advancements in power electronics, renewable energy integration, and energy storage technologies. Additionally, the increasing recognition of the imperative to transition toward green hydrogen further contributes to this anticipated growth. The market has attracted significant interest and investment as companies strive to develop and establish their position in the power supply equipment segment specifically tailored for water electrolysis.

Industrial Impact

The power supply equipment market for water electrolysis is driven by several factors, such as growing interest in hydrogen as a clean energy source and the need for energy storage solutions. Various companies and startups are actively developing and commercializing water electrolysis systems, aiming to improve efficiency, reduce costs, and increase scalability. The growth and development of the water electrolysis market have a direct impact on the demand and innovation within the power supply equipment market.

The key players operating in the power supply equipment market for water electrolysis include ABB, General Electric, Nidec Industrial Solutions, Danfoss Drives, SMA Solar Technology AG, and American Superconductor. These companies are focusing on strategic partnerships, collaborations, and acquisitions to enhance their product offerings and expand their market presence. In conclusion, the market for power supply equipment for water electrolysis is growing and evolving significantly because of factors such as the rising focus on reducing greenhouse gas emissions and transitioning to cleaner energy sources, supportive regulations, subsidies, and targets for renewable energy and hydrogen production.

Market Segmentation:

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Segmentation 1: by Application

- Alkaline Electrolyzer
- Proton Exchange Membrane (PEM) Electrolyzer
- Solid Oxide Electrolytic Cell (SOEC) Electrolyzer
- Anion Exchange Membrane (AEM) Electrolyzer

Alkaline Electrolyzer to Dominate the Power Supply Equipment Market for Water Electrolysis (by Application)

Alkaline electrolyzer held the largest share in the power supply equipment market for water electrolysis in 2022. Alkaline electrolyzers have a long-standing history in industrial applications and were the primary electrolyzer technology until the emergence of proton exchange membrane (PEM) electrolyzers in the 1970s. One of the advantages of alkaline electrolyzers is that they do not require the use of precious metals as catalysts, making them a cost-effective solution with a longer operational lifespan compared to PEM electrolyzers.

Segmentation 2: by Equipment Type

- Rectifier
  - Thyristor Rectifier
  - IGBT Rectifier
  - Others
- Transformer
- Others

Rectifier Segment to Grow at a Significant Growth Rate in the Power Supply Equipment Market for Water Electrolysis (by Equipment Type)

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In the power supply equipment market for water electrolysis, rectifier is expected to grow at a significant rate during the forecast period (2023-2032). In a water electrolysis plant, both rectifiers and transformers play important roles; however, their dominance varies depending on the specific requirements and configuration of the electrolysis plant. Also, if the energy is sourced from the grid, additional transformers may not be necessary. However, when renewable energy is utilized, transformers are commonly employed to adapt the voltage for optimal operation of the electrolyzer cells. IGBT rectifier is growing at a significant rate during the forecast period owing to benefits such as fast response times, high efficiency, and reduced energy losses.

Segmentation 3: by Region

North America: U.S., Canada, and Mexico

Europe: Germany, France, Spain, Netherlands, and Rest-of-Europe

U.K.

China

Asia-Pacific and Japan: Japan, South Korea, India, Australia, and Rest-of-Asia-Pacific and Japan

Rest-of-the-World: South America and the Middle East and Africa

The Europe region is expected to dominate the power supply equipment market for water electrolysis, owing to the presence of several leading companies, such as Nidec Industrial Solutions, Ingeteam, Prodrive Technologies, and KraftPowercon in the region, highly developed renewable energy market, and growing sales of fuel cell vehicles. Europe was an early adopter of water electrolysis technology for hydrogen production, with European countries leading the way. In 2020, Europe accounted for approximately 40% of the global installed capacity of water electrolyzers, according to the International Energy Agency (IEA). Recognizing the potential of electrolyzers, the European Union has incorporated electrolyzer capacity into its overall hydrogen capacity plans. This strategic approach is expected to drive significant growth, with a projected electrolyzer installed capacity of 75 gigawatts (GW) in the region by 2030.

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Recent Developments in the Power Supply Equipment Market for Water Electrolysis

In March 2023, Ingeteam introduced a new rectifier solution specifically designed for electrolyzers, known commercially as the INGECON H2 FSK E12000. This innovative product is tailored for large-scale green hydrogen production facilities. The initial units are scheduled to be delivered in September 2023, with projects in Germany and Spain being the first recipients of this technology.

In March 2023, Nidec Industrial Solutions unveiled two significant projects focused on green hydrogen production and storage in the southwestern region of the U.S. In the first project, the power supply unit, capable of generating 5.6 MW of energy, is expected to be housed within a 40-foot container. In the second project, Nidec Industrial Solutions assumes a crucial role in the storage of liquid hydrogen. The company is responsible for supplying the electrical component of the order, which includes 14 electric motors. These motors would be coupled with 14 compressors forming the mechanical part of the system.

In January 2023, TMEIC introduced an innovative power electronics solution designed specifically for contemporary electrolyzer technologies, enabling a high-current DC power supply. The Type-1 system incorporates a 24-pulse diode front-end rectifier to efficiently convert AC to DC. Similarly, the Type-2 system utilizes an insulated gate bipolar transistor (IGBT) front-end converter for AC to DC conversion.

In May 2022, Liyuan Rectifier Group announced to develop an electrolysis rectifier system for the proton exchange membrane electrolysis system.

Demand – Drivers, Challenges, and Opportunities

Market Demand Drivers: Shift toward Renewable Energy Integration

Renewable energy sources are gaining attention in the market to adhere to a more sustainable future. Green hydrogen produced from renewable energy is increasingly being utilized for various applications such as oil and gas, industrial feedstock, and as a fuel in energy generation industries. Several renewable energy sources will be integrated with technical and material technologies to save and store energy in the coming years. Green hydrogen is produced from renewable energy sources, such as

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solar, hydro, and wind.

According to International Renewable Energy Agency (IRENA), annual capacity addition for onshore wind power is expected to increase more than threefold by 2030 and more than tenfold by 2050 relative to 2018 levels. The shift toward renewable energy transition is expected to have a direct impact on driving the adoption of water electrolysis for hydrogen production.

Furthermore, sustainable production and the use of carbon-free products on a priority basis could attenuate the problem of rising carbon emissions. Consumers prefer green hydrogen over hydrogen produced from conventional methods, as it promotes the decarbonization of power and mobility industries. Several end-use industries are moving toward green hydrogen due to its zero-carbon emission ability. Numerous interesting studies have been conducted on green hydrogen manufacturing technology and its use. Thus, consumer awareness widens the scope for sustainable products, which is expected to drive the growth of the global power supply equipment market for water electrolysis during the forecast period.

Market Challenges: High Energy Losses during the Electrolysis Process

Green hydrogen offers a decarbonization solution to the industrial, chemical, and transportation sectors; however, there is a considerable amount of energy loss during green hydrogen production at every point in the supply chain. According to the World Economic Forum, more than 30% of the energy used in hydrogen production is lost during the electrolysis process. The water electrolysis technology is majorly used for hydrogen production, and alkaline water electrolyzers offer a range of 50-78% energy efficiency, while the proton exchange membrane water electrolyzers offer an energy efficiency between 50-80%.

The World Economic Forum (WEF) further states that liquefying or converting hydrogen to other carriers, such as ammonia, results in a further 13-25% energy loss, and transporting hydrogen requires additional energy inputs that are typically equal to 10-12% of the hydrogen's energy.

Also, the use of hydrogen in fuel cells results in an additional 40-50% energy loss. Therefore, the net energy loss in hydrogen production using water electrolysis technology and in its further application processes is a major challenge for hydrogen production using water electrolysis technology. This is expected to restrict the growth of power supply equipment during the forecast period.

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Market Opportunities: Advancements in Electrolysis Technology

Green Hydrogen has been widely considered an ideal sustainable energy based on the advantage of high conversion efficiency, abundant reserves, zero pollution, and high energy density. It is crucial to develop a more cost-effective green hydrogen production/water electrolysis system to achieve the goal of reducing the energy consumption of water splitting. The proton exchange membrane electrolyzer technology holds core material technology and uses expensive noble metal-based catalysts and perfluorocarbon-based proton exchange membranes, which results in high costs of system manufacturing. In order to address the limitations associated with conventional technology, a research team in Korea has recently made advancements in the development of a next-generation water electrolysis system. This breakthrough technology offers significant improvements in durability and performance, along with a substantial reduction in the cost of producing green hydrogen energy. The Korea Institute of Science and Technology has announced this project, which is the result of joint research conducted by Dr. So Young Lee's team at the Center for Hydrogen and Fuel Cell Research and Prof. Young Moo Lee from the Department of Energy Engineering at Hanyang University. The team successfully developed a membrane electrode assembly for anion exchange membrane water electrolyzers, which holds promise for replacing the expensive existing PEM technology.

Moreover, an improved understanding of the nanoscale processes occurring in SOECs is expected to result in performance and lifetime gains on the cell, stack, and system levels, which in turn enable more sizable and highly efficient SOEC plants. In Germany, the proportion of intermittent renewable energy sources in the electricity supply has exceeded 30%, while in Denmark, intermittent sources account for nearly 50% of the electricity supply. As more countries experience this shift, there will be a growing demand for energy conversion technologies that are highly efficient, such as SOECs. These cells present an opportunity to reduce the costs associated with future renewable energy systems through enhanced conversion efficiency, enabling greater integration of renewables into the energy mix. Consequently, this creates opportunities for power supply equipment suppliers.

Moreover, a recent advancement in water-splitting technology known as hybrid water electrolysis has emerged. This innovative system leverages the thermodynamically more favorable electrochemical oxidation of organic molecules instead of traditional oxygen evolution reactions (OER). By coupling this approach with hydrogen evolution reactions (HER), the hybrid water electrolysis system enhances the efficiency of water

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electrolysis and promotes more efficient production of hydrogen. This strategy avoids the generation of unnecessary O2 and provides the production of value-added chemicals with large current density at low input voltages, thereby improving energy conversion efficiency. With such development in electrolysis, the demand for power supply equipment is also anticipated to gain traction during the forecast period.

How can this report add value to an organization?

Product/Innovation Strategy: The product segment helps the reader understand the power supply equipment used in the water electrolysis process, including rectifiers, transformers, and others. Moreover, the study provides the reader with a detailed understanding of the power supply equipment market for water electrolysis by different applications (alkaline electrolyzer, proton exchange membrane (PEM) electrolyzer, solid oxide electrolytic cell (SOEC) electrolyzer, and anion exchange membrane (AEM) electrolyzer).

Growth/Marketing Strategy: The power supply equipment market for water electrolysis has been growing at a rapid pace. The market offers enormous opportunities for existing and emerging market players. Some of the strategies covered in this segment are mergers and acquisitions, product launches, partnerships and collaborations, business expansions, and investments. The strategies preferred by companies to maintain and strengthen their market position primarily include partnerships, agreements, and collaborations.

Competitive Strategy: The key players in the power supply equipment market for water electrolysis analyzed and profiled in the study involve power supply equipment manufacturers and the overall ecosystem. Moreover, a detailed competitive benchmarking of the players operating in the global power supply equipment market for water electrolysis has been done to help the reader understand how players stack against each other, presenting a clear market landscape. Additionally, comprehensive competitive strategies such as partnerships, agreements, and collaborations will aid the reader in understanding the untapped revenue pockets in the market.

Key Market Players and Competition Synopsis

The companies that are profiled have been selected based on inputs gathered from primary experts and analyzing company coverage, product portfolio, and market penetration.

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Of the top players profiled in the report, the private companies operating in the global power supply equipment market accounted for around 60% of the market share in 2022, while the public companies operating in the market captured around 40% of the market share.

Key Companies Profiled:

Private Companies

- AEG Power Solutions B.V.
- Ingeteam
- Comeca Group
- TMEIC
- Prodrive Technologies
- FRIEM SPA
- Statcon Energiaa Pvt. Ltd.
- Green Power Co., Ltd.
- KraftPowercon
- Mak Plus Power Systems
- MUNK GmbH
- Liyuan Rectifier Group

Public Companies

- General Electric
- Sensata Technologies, Inc.

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Ador Powertron Ltd

Nidec Industrial Solutions

Danfoss Drives

ABB

American Superconductor

SMA Solar Technology AG

Companies that are not a part of the aforementioned pool have been well represented across different sections of the report (wherever applicable).

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