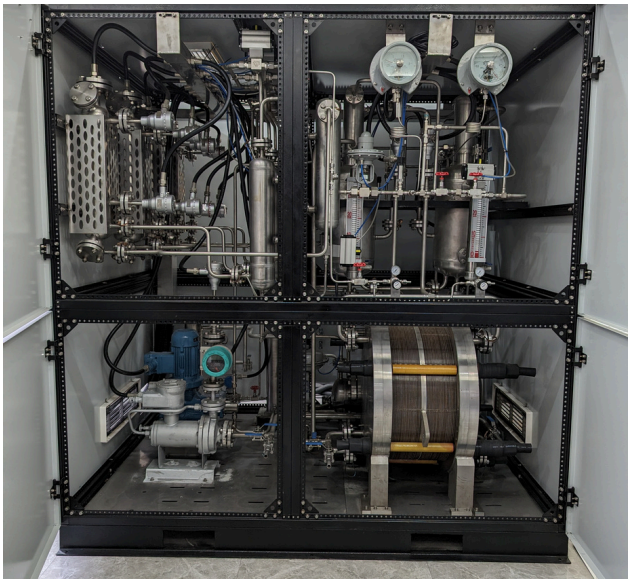
ASMAIN

HYDROGEN GENERATION SYSTEMS

CATALOGUE

Discover our latest projects around the renewable hydrogen value chain.
Explore innovative solutions for your needs.



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WELCOME

Headquartered in Madrid, Asmain is a Spanish engineering and equipment supply company with a significant international presence. We excel in three primary business areas:

1. **Marine Projects:** We specialize in ports, shipyards, and vessels, providing cutting-edge solutions to enhance maritime infrastructure.
2. **Energy Solutions:** Our focus is on the liquid natural gas and renewable hydrogen value chains, driving advancements in energy production and optimization.
3. **Industrial Equipment Supply:** We provide essential equipment for infrastructure projects, including pipelines, structural steel, and modified marine containers.

With over 20 years of experience, Asmain has established multiple offices and expanded into key international markets, including Europe, Asia, the Middle East, and the Americas. This extensive network allows us to serve a diverse client base and adapt to market needs and regulatory environments.

Our products are highly customizable, easy to install, and maintain. We undertake basic and detailed engineering tasks to ensure the optimal functionality of our solutions. Leveraging our international experience, we integrate global best practices and innovative solutions into our projects, delivering high-quality results worldwide.

At Asmain, our core values of integrity, innovation, and customer success are at the heart of everything we do. We strive for continuous improvement and believe in the power of win-win cooperation to achieve remarkable outcomes. Our results-driven approach ensures that every project we undertake not only meets but exceeds expectations. We are committed to embracing new technologies and innovative practices to deliver cutting-edge solutions that create significant value for our clients and the communities we serve.

Join us at Asmain, your reliable ally!

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INTRODUCTION

Welcome to the Renewable Hydrogen Generation Plant Section!

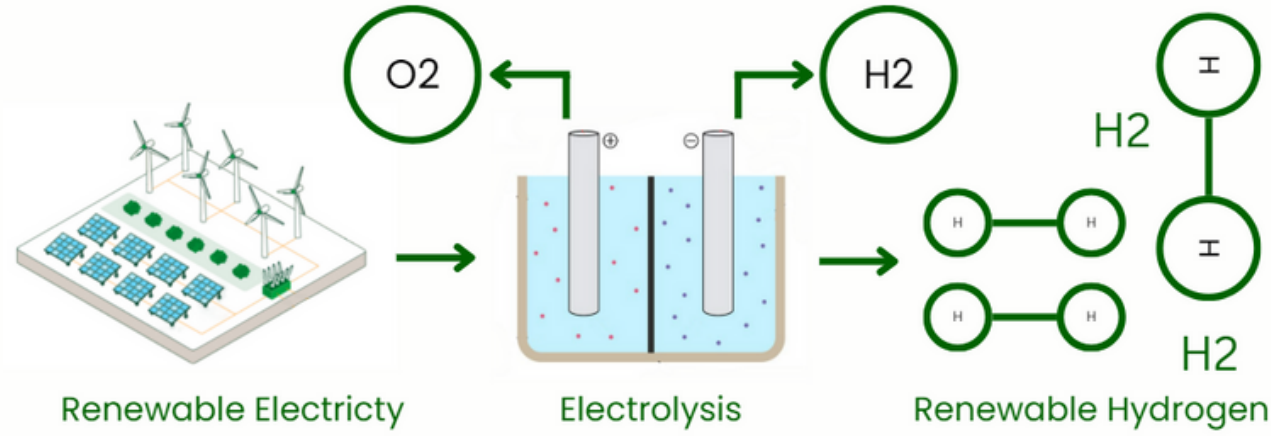
Hydrogen is the most abundant chemical element on earth, it is found in 75% of all matter. It does not produce greenhouse gases when used, and it's easy to store and extremely light. Its qualities make it a great option for a fuel. However, it isn't a primary energy source, but an energy vector. Hydrogen is never found in isolation, as it's always in company with other chemical elements, such as carbon or oxygen.

Our equipments are focused on hydrogen production through water electrolysis, using renewable energy, such as solar, wind, hydraulic, or biomass. This process is used to produce renewable hydrogen, which is the most sustainable type of hydrogen, as it doesn't generate any carbon emissions during its production.

The electrolyzers use energy to break down water into its compounds, oxygen, and hydrogen. The electrical potential breaks the bonds between both atoms, liberating them in gaseous form.

The hydrogen generation systems are composed of three parts:

- Main equipment: Electrolyzer, separation equipment, and purification equipment.
- Electric control equipment: Rectifier cabinet, control cabinet, transformer, etc.
- Auxiliary equipment: Water tank and water pump.



ALKALINE WATER ELECTROLYZER

Alkaline Water Electrolysis uses electricity and demineralized water to produce hydrogen. The equipment structure is suitable for one integrated cabinet or containerized solutions according to the client's requirements.

Performance features

- Compatible with renewable energy; quick start-up and second-level dynamic response at a wide load of 30% ~ 100%.
- The maximum capacity of a single set is 1,500Nm³/h. Multiple sets can be combined for parallel operation.
- Suitable for large-scale hydrogen production plants.
- Electrolysis process is designed with a bipolar pressure filter structure and strong insulation sealing gasket.
- Modularized BoP system with a precise process to achieve easy installation, operation, and maintenance.
- Intelligent control system to achieve reliable remote control and management.
- The purity of hydrogen after purification reaches 99.9995%, and oxygen reaches 99.2%.

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Technical specifications

H_2 Capacity (Nm^3/h)	O_2 Capacity (Nm^3/h)	Total water consumption	Total power consumption	Cooling water consumption	Operating temperature	Operating pressure
5	2.5	5 L/h	27 kWh	1 m^3/h		
10	5	10 L/h	52 kWh	2 m^3/h		
15	7.5	15 L/h	78 kWh	3 m^3/h		
20	10	20 L/h	105 kWh	4 m^3/h		
30	15	30 L/h	155 kWh	6 m^3/h		
50	25	50 L/h	260 kWh	10 m^3/h		
60	30	60 L/h	310 kWh	15 m^3/h		
100	50	100 L/h	512 kWh	20 m^3/h		
150	75	150 L/h	764 kWh	30 m^3/h		
200	100	200 L/h	1012 kWh	40 m^3/h	85±5 °C	≤3.2 MPa (adjustable)
250	125	250 L/h	1212 kWh	50 m^3/h		
300	150	300 L/h	1515 kWh	60 m^3/h		
350	175	350 L/h	1760 kWh	70 m^3/h		
400	200	400 L/h	2115 kWh	80 m^3/h		
500	250	500 L/h	2520 kWh	100 m^3/h		
600	300	600 L/h	3860 kWh	120 m^3/h		
800	400	800 L/h	4040 kWh	160 m^3/h		
1000	500	1000 L/h	5030 kWh	200 m^3/h		
1200	600	1200 L/h	6020 kWh	240 m^3/h		
1500	750	1500 L/h	7540 kWh	300 m^3/h		

PEM ELECTROLYZER

Proton exchange membrane electrolysis uses electricity and demineralized water to produce hydrogen. The equipment structure is suitable for operations based on the customer´s input current command, adjustable output to meet demand, and power conservation during standby.

Performance features

- Suitable for large-scale hydrogen production plants. Containerized solutions for outdoor and indoor.
- Modularized BoP system with a precise process to achieve easy installation, operation, and maintenance.
- Intelligent control system to achieve reliable remote control and management.
- The purity of hydrogen after purification reaches 99.9995%, and the dew point at -70°C.
- Hydrogen production range 0 ~ 100% (adjustable).
- Hydrogen production pressure 0 ~ 3MPa (adjustable).
- Hydrogen production 5 ~ 500Nm³/ h (adjustable).

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THANK YOU

Thank you for exploring our Renewable Hydrogen Generation Systems Section!

We hope this journey has provided valuable insights into the different renewable hydrogen generation systems. As we continue to innovate and drive forward the transition to a greener future, your interest and support are invaluable.

Stay connected with us for the latest updates and developments in renewable energy and sustainable transportation. Together, we can create a brighter, cleaner, and more sustainable tomorrow. Thank you once again for joining us on this journey towards a methanol-powered future.

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