Asahi Kasei’s Activities for Green Hydrogen Production

Yasuhiro Fujita
Deputy General Manager
Clean Energy Project
Asahi Kasei Corporation
Asahi Kasei Corporation overview

About us

<table>
<thead>
<tr>
<th>Established</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1922</td>
<td>44,497</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sales (FY2020)</th>
<th>Operation Income (FY2020)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$19.1B</td>
<td>$1.5B</td>
</tr>
</tbody>
</table>

Business Segments

- Material
- Homes
- Health Care
Asahi Kasei’s products

**Critical Care**
- Defibrillator
- Temperature management system

**Pharmaceuticals & Devices**
- Prescription Drugs
- Hemodialysis

**Construction Materials**
- Autoclaved aerated concrete
- Thermal insulation
- Structural systems and components

**Health Care**

**Chemicals**
- Petrochemicals
- Performance Materials
- Performance Polymers
- Consumables

**Fibers & Textiles**
- Bemberg
- Roica
- Nonwovens
- Leona nylon 66

**Homes**
- Order-built homes
- Real estate-related operations
- Renovation

**Material**

**Electronics**
- Battery Separators
- Semiconductors
- Sensors

Net sales in FY2020
Asahi Kasei’s decarbonization initiative

Reducing our own GHG emissions

To realize a sustainable society, the Asahi Kasei Group aims to achieve carbon neutrality by 2050.*1

**Main Measures**

- Energy decarbonization (acceleration of R&D for alkaline water electrolysis, CO₂ separation/recovery/utilization, etc.)
- Manufacturing process innovation
- Shift to high-value-added, low-carbon businesses, etc.

**2030 Target**

Reduce GHG emissions by 30% or more (compared with FY2013)*2

**Develop a roadmap to achieve the goal, and accelerate decarbonization initiatives accordingly**

*1: GHG emissions from our business activities (Scope 1, 2)
*2: Presumption that the Japanese power supply structure will be more than 50% non-fossil in accordance with the governmental policy
Carbon neutral way of Asahi Kasei business

- Solar power
- Wind power
- Hydroelectric power
- Alkaline water electrolysis system

GHG reduction

Renewable energy

Consumers

Resource circulation
- Reduce
- Reuse
- Recycle

Chemical recycling
Material recycling

CO₂ separation/recovery/use

Hydrogen H₂

Chemical products

Methanol CH₃OH

Green fuel

Biomass feedstock

Homes

Industry

Mobility
Asahi Kasei’s electrolysis technology

• Started hydrogen production by water electrolyzing for synthesizing ammonia. [Japan Chemical Heritage]

1923

• Launched chlor-alkali electrolysis business. Asahi Kasei becomes only one supplier which can supply all the components.

[Acilyzer™]

2010

• Started the development of alkaline water electrolyzer based on its chlor-alkali technologies.

1975

• Installed 10MW-scale alkaline water electrolyzer into FH2R* and started the operation.
• Joined ALIGN-CCUS project as an electrolyzer supplier.

2020

* FH2R is a project commissioned by the New Energy and Industrial Technology Development Organization (NEDO).
10MW alkaline water electrolyzer system
(under development)

- Aqualyzer is under development, but the basic specifications have already been confirmed.
- Aqualyzer is designed to accept fluctuated power input and can be scaled up by multiplying 10MW base units. We plan to launch Aqualyzer by 2025.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen Production</td>
<td>300 - 2,000 Nm³H₂/hr (27 - 180 kg H₂/hr)</td>
</tr>
<tr>
<td>DC Power Consumption</td>
<td>max. 10MW</td>
</tr>
<tr>
<td>Power Variation Rate</td>
<td>±0.5MW / sec</td>
</tr>
<tr>
<td>Area per cell</td>
<td>2.7 m²</td>
</tr>
<tr>
<td>Number of cells (per unit)</td>
<td>170</td>
</tr>
<tr>
<td>H₂ Purity</td>
<td>&gt;99.97% (after purifier, dry basis)</td>
</tr>
</tbody>
</table>
In general, the specific power consumption of electrolyzer increases with the hydrogen production.

The inversion trend in all equipment base is mainly caused by fixed power consumption of the hydrogen compressor.
Future Hydrogen Energy Research Field (FH2R)

- FH2R is a 10MW-class hydrogen production plant with 20MW PV, started in Feb. 2020.
- It can supply 200 atm and FCV-class (ISO14687-2) hydrogen from fluctuated electricity input.
Activities in Europe

AN ENERGY REVOLUTION: SYNTHETIC FUELS FROM CO₂

Making low-carbon fuel

Our first-of-a-kind project has made the synthetic fuel DME from CO₂ and hydrogen – produced using renewable energy – which could transform how we live and work.

- CO₂ from power plants and industry
- Renewable power, conventional power
- Peak & back-up power & heat

Asahi Kasei has joined ALIGN CCUS project as an electrolyzer supplier.

- The electrolyzer was installed at RWE plant in Niederaußem, Germany, and has been operated since Oct. 2020.
Green chemical demonstration project

Partnership with JGC Holdings

✓ Accepted by NEDO Green Innovation Fund (FY2021-FY2030) [subsidy budget: up to approx. 500 million USD]
✓ Development of large alkaline water electrolysis system (100 MW scale)
✓ Demonstration of green chemical plant using green hydrogen and captured CO2
✓ Integrated control system for optimizing plant operation