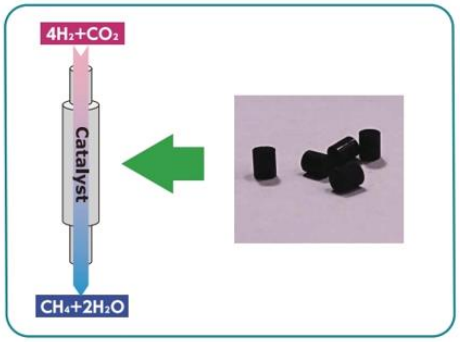
Methanation System

- Kanadevia -

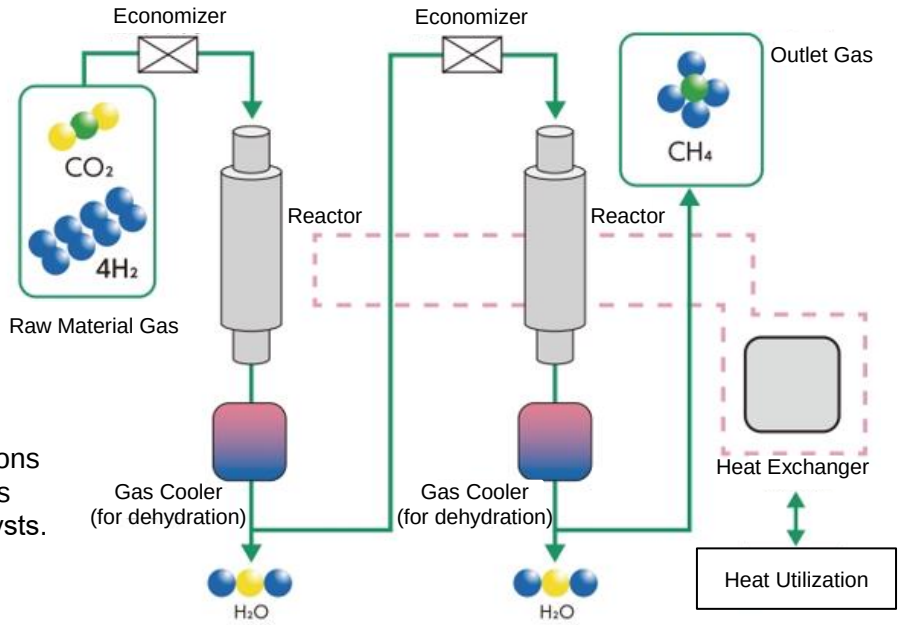
This is a methanation plant that uses CO_2 and hydrogen as raw materials to produce e-methane.

Methanation Catalyst /HiMethz®



- No precious meals are used.
- Our catalysts enable catalytic reactions at lower temperatures and pressures compared to other company's catalysts.

Flow of the Methanation System



Demonstration Plant (12. 5 Nm^3/h)

Features

- The methanation catalyst (HiMethz®) is durable for more than 20,000 hours (about 2 years).
- More than 99% of the CO_2 introduced into the methanation system is converted to methane.
- The energy conversion efficiency by catalyst is 75-80%. The efficiency can be more than 90% when waste heat generated during conversion is recovered and used.

Outline (technical principles, operation, etc.)

1. First, CO_2 and H_2 of the raw gas pass through the first reactor, and about 90% of CO_2 was converted to e-methane. By-product water is removed by cooling.
2. e-methane from "1" (water removed) and unreacted raw material gas pass through the second reactor, where approximately 90% of the unreacted raw material gas is converted into e-methane. As a result, e-methane with a purity of 99% is obtained.
3. Since the catalytic reaction is exothermic, the generated heat can be recovered and used for hot water, etc.

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Team E-Kansai

Performance /specifications of technology / product

Features of methanation catalyst	
■ High conversion:	99% or more
■ High efficiency :	75～80%
■ Reaction temperature :	200℃～
■ High durability:	20,000 hr or higher

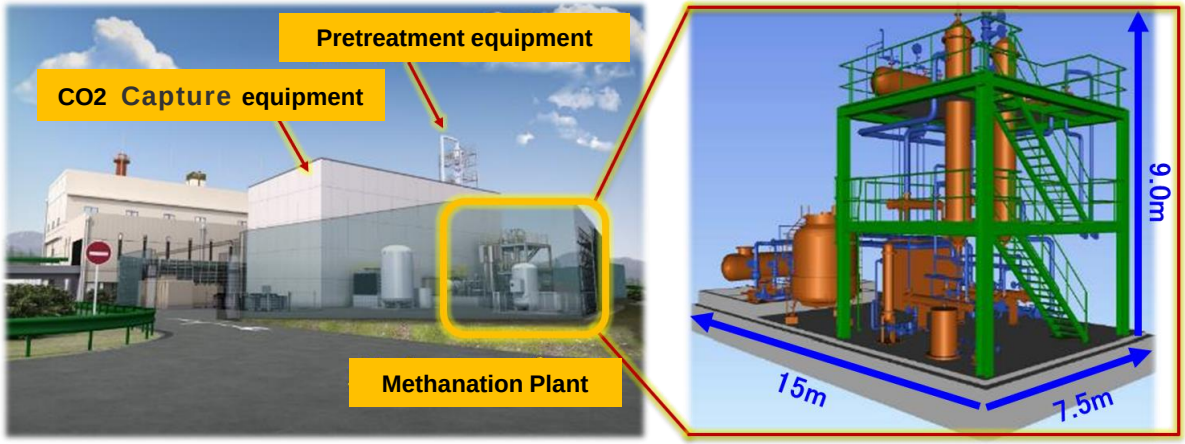
e- Methane production	0.1 Nm^3/h	12.5 Nm^3/h	125 Nm^3/h
Raw gas supply pressure	0.4～0.8 MPaG		
e-methane purity	≧ 95% ※1		
Raw material CO_2 usage	0.1 Nm^3/h	12.5 Nm^3/h	125 Nm^3/h
Raw material H_2 usage	0.4 Nm^3/h	50.0 Nm^3/h	500 Nm^3/h

※1 Depend on inlet gas-purity.

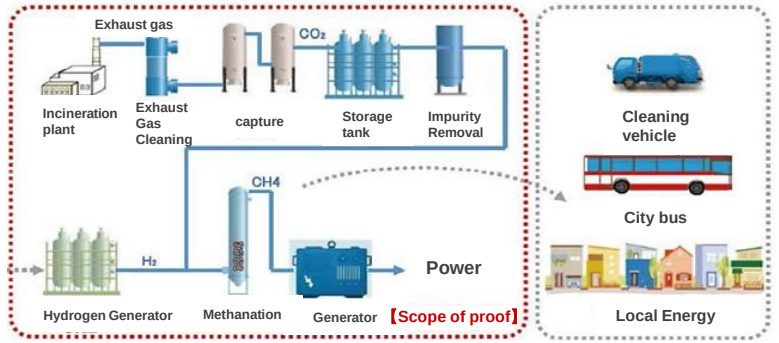
Usage examples / result

- We completed the Ministry of the Environment's "Demonstration project to establish a carbon cycle model through recycling of carbon dioxide collected from WtE (Waste to Energy) Plants" at a waste incineration plant in Odawara City.
- We demonstrated Japan's largest e-methane production of 125Nm^3/h using CO_2 derived from flue gas from an incineration plant.

Demonstration of a carbon cycle model by methanation at a waste incineration plant



Flowchart of CO_2 Resource Recovery



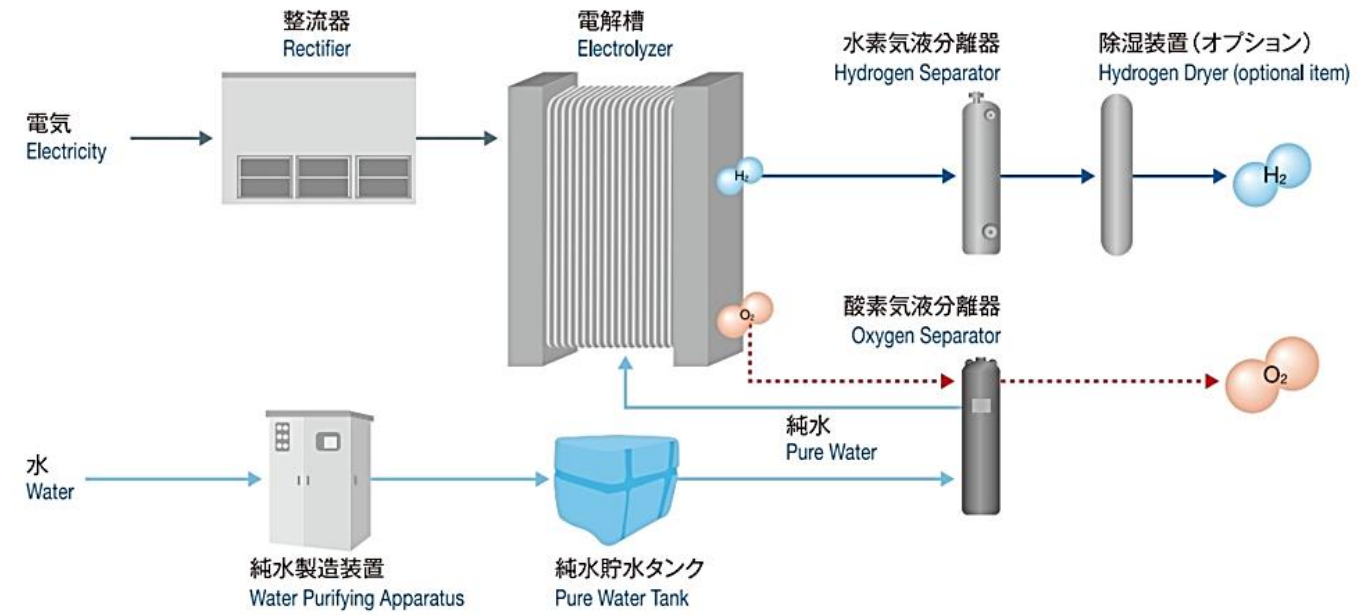
Team E-Kansai

Polymer Electrolyte Membrane (PEM) water electrolyzer

- Kanadevia-

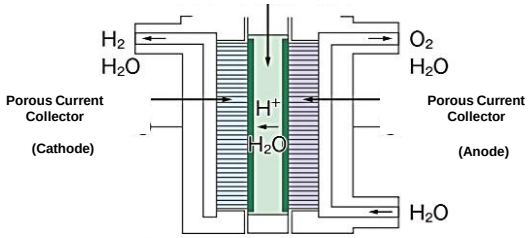
Hydrogen production equipment that generates and supplies high-purity hydrogen by electrolyzing water.

Flowchart of PEM Type Electrolyzer



Electrolytic cell / “Hydro-spring®“

【原 理】 Membrane Electrode Assembly



陽極反応／Anode Reaction : $2H_2O \rightarrow 4H^+ + 4e^- + O_2$

陰極反応／Cathode Reaction : $4H^+ + 4e^- \rightarrow 2H_2$

【HydroSpring 電解槽　100 Nm^3/h 例】

Features

- Hydrogen is produced at pressure (lower than 1MPa) that are not subject to the High Pressure Safety Act. Anyone can use the water electrolyzer immediately after installation.
- High-purity (~99.999%) and dew point controlled (-15°C to -70°C/atmospheric dew points) hydrogen can be produced, which is characteristic of PEM water electrolyzer.
- The instrument can be started and stopped easily by pressing a button, and can be monitored automatically by a remote system (optional).

Outline (technical principles, operation, etc.)

1. In the electrolytic cell, oxygen, hydrogen ions (H^+), and electrons (e^-) are generated from the pure water through reactions on the anode catalyst.
2. The generated H^+ passes through the electrolyte membrane to the cathode, while the electrons generated by the anode reaction travel through circuit to the cathode.
3. H^+ and electrons react on the cathode catalyst to produce H_2.

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Team E-Kansai

Performance /specifications of technology / product

Specification of Hydrogen Gas						
Generation Capacity	1 Nm^3/h	5 Nm^3/h	10 Nm^3/h	50 Nm^3/h	100 Nm^3/h	200 Nm^3/h～
Generated Pressure	0.8 MPaG					
Purity	～ 99.999 %					
Dew point	～ -70 ℃					
Utilities						
Water Consumption ※1	3 L/h	15 L/h	30 L/h	150 L/h	300 L/h	600 L/h～
Pure Water Consumption ※1	1 L/h	5 L/h	10 L/h	50 L/h	100 L/h	200 L/h～
Pure Water Quality	Pure water quality JIS K0557 A2 (conductivity 1.0 μS/cm or less,TOC500ppb or less) ※2					
Power supply						
Power Supply (50/60Hz)	3φ-AC200V		3φ-AC400V	3φ-AC6,600V		

Site Condition

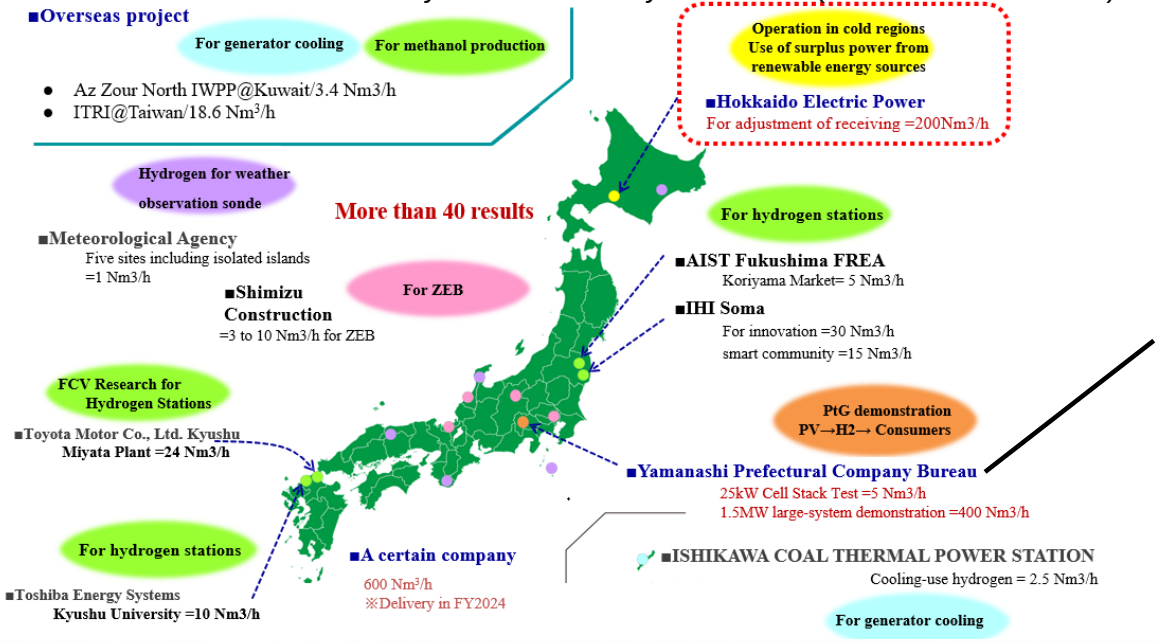
- Temperature / 5 to 40℃
- Humidity / 5% to 90% (No condensation
- We welcome inquiries for outdoor usage.
- Cooling water (35℃ or less) and instrument air are required, also.

※1 Under the standard condition. It may vary depends on the system specifications.

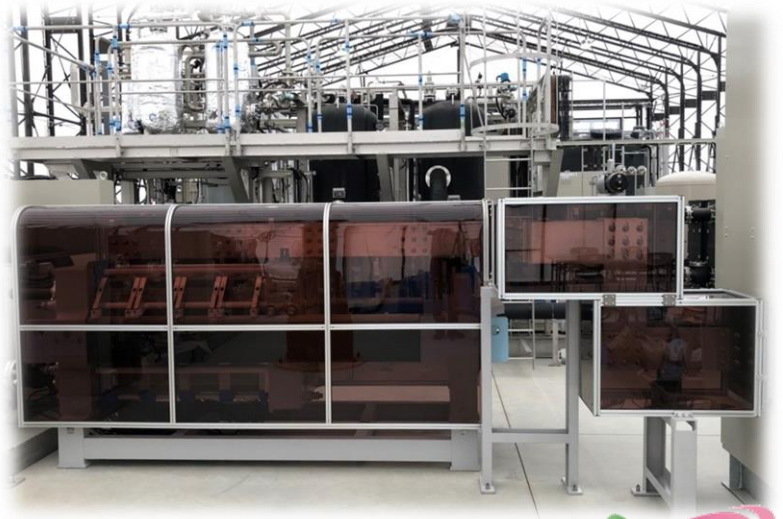
※2 We provide the design for various requirements, such as power supply, water quality and/ or etc.

Usage examples / result

Over 40 PEM water electrolyzers delivered by Kanadevia (as or November 2024)



1.5 MW large-scale water electrolyzer (maximum. 400Nm^3/h)



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