



2020

Hydrogen-Related Businesses in the Kansai Region

Introduction

In October 2020, Japan declared the goal of realizing a carbon-neutral, decarbonized society by 2050. Hydrogen is one of the most promising means for achieving this goal.

Hydrogen not only has the environmental feature of not emitting carbon dioxide in the process of generating electricity but also the feature of being able to store, transport, and use renewable energy, etc., as an energy carrier. It is believed that hydrogen will transform and diversify the energy supply structure of Japan where 90% or more of the primary energy is reliant on fossil fuels.

In 2017, Japan decided on a Basic Hydrogen Strategy to accomplish a world-leading hydrogen-based society. The strategy shows future visions that Japan should achieve with an eye on 2050 and also serves as an action plan to accomplish the visions by 2030. The strategy sets a goal that Japan should reduce hydrogen costs to the same level of conventional energy and to achieve the goal. Through achieving a carbon-free society under the strategy, Japan will present hydrogen to the rest of the world as a new energy choice and will lead global efforts for establishing a carbon-free society taking advantage of Japan's strong points.

The Kansai region, in which there are many hydrogen-related businesses, is said to have great technology and market potential in the fields of hydrogen and fuel cells. In industry-academic cooperation initiatives, councils on utilization, etc., of hydrogen are being launched in each area, and active discussions are taking place. In addition, many projects are underway. For example, in 2020-2021, the pilot project demonstrates brown coal gasification and hydrogen refining in Australia, hydrogen liquefaction and storage of liquefied hydrogen at Hastings, marine transportation of liquefied hydrogen from Australia to Japan and unloading of liquefied hydrogen in Japan.

Under these circumstances, the Kansai Bureau of Economy, Trade and Industry has prepared the "2020 Hydrogen-Related Businesses in the Kansai Region" to introduce companies based in the Kansai region that have entered the hydrogen field. Since the technologies, products, and services of such companies are important for the development of hydrogen and fuel cells, we hope that this brochure will prove informative for companies entering the hydrogen field and support organizations that look to support their entry in the future. In addition, we hope that this brochure will be of value for companies, universities, research institutions, and others that look to form alliances with these companies. It is our hope that collaboration between industry and academic will intensify and a hydrogen supply chain will be established.

In closing, we would like to express our gratitude to the featured companies and all concerned for providing us with information on their hydrogen-related businesses, technologies, and services in preparing this brochure.

Ministry of Economy, Trade and Industry, Kansai Bureau (METI-Kansai)

2020 / Hydrogen-Related Businesses in the Kansai Region

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How to refer to and use 2020 Hydrogen-Related Businesses in the Kansai Region

This brochure “2020 Hydrogen-Related Businesses in the Kansai Region” has compiled hydrogen-related company information on 35 companies in the Kansai region. The Kansai region, home to many hydrogen-related businesses for many years, with a broad-based industrial cluster, is said to have great industry potential in the hydrogen and fuel cell-related fields.

As the realization of a hydrogen-based society comes closer to reality, we hope that the use of this information brochure will lead to the greater development and advancement in the hydrogen and fuel cell-related fields.

Company overview is introduced.
Core technology, etc., held by each company are presented.

Hanshinkiki, Co., Ltd.

Contributing to a hydrogen energy-based society with fuel cell power generation systems; Offering system-wide services according to customer demands

Production

Storage & transport

Supply

Usage application

Hydrogen-related products

Sensors & IoT

Parts & materials

Trading companies & analytical consultants

Our company was founded as a sole proprietorship as a manufacturer of nuts and bolts in 1926. Later, business was expanded to include machining, press forming, and electrical equipment, we are now engaged in the production and sales of industrial and infrastructure-related electrical equipment, parts for construction machinery, and general and special machined parts. As relates to our electrical equipment business, we are tackling new fields by making use of know-how of various types of systemization, cultivated in the manufacturing processes of important equipment such as heavy electric machinery. Among them, for the hydrogen-related market, we have established technology to control power generation systems with fuel cells as a core, and we are in the process of rolling out our 1 to 3kW class fuel cell power generation systems.

Technical and service strengths

We offer small-lot fuel cell power generation systems according to various customer demands, such as emergency power sources in the disaster field and commercial mobility. Portable power generation systems can be constructed by packaging high-quality and long-life products as domestically made products are adopted as fuel cells, auxiliaries, and other basic elements. We can provide one-stop system-wide services not only for power generation parts but also as a customer-desired format.

Introductory examples and achievements

We expect not only emergency power sources for shelters and medical equipment, but also applications in commercial mobility, such as uninterruptible power-supply systems (UPS) intended to extend the operating service life of batteries, and power sources for specially equipped vehicles.

Business plan

Currently, we are fabricating prototypes with an eye toward commercialization. In FY2021, while starting field power generation demonstration experiments, we look to expand our product lineup according to various applications and broaden our demonstration projects. Sample shipments are scheduled to being from FY2023.

Company profile

Address: 745 Aza Ichinotsubo, Junno, Ikawadani-cho, Nishi-ku, Kobe-shi, Hyogo 651-2124, Japan
Representative: Ryuuichi Yasuda
<http://www.hanshinkiki.co.jp/>

Department in charge

Department name: Electric Equipment
Manufacturing Department
TEL: +81-78-974-5315
E-mail: Koukatsuyoshi@hanshinkiki.co.jp

Categorization of cases

As being categorized into four applicable areas of “Production,” “Storage & transport,” “Supply,” and “Usage (application)” and into four forms of provision of “Hydrogen-related products,” “Sensors & IoT,” “Parts & materials,” and “Trading companies & analytical consultants” in a hydrogen supply chain, which area of the hydrogen supply chain each product, technology, or service is applicable to is clearly indicated. Each case is categorized based on the self-reporting of each featured company.

Production: By-product hydrogen, reforming of fossil fuels, water electrolysis (fire power, renewable energy), biomass, etc.
Storage & transport: Pipe transportation, transportation to lorries for compressed hydrogen/liquefied hydrogen or filling vehicles, transportation by hydrogen storage alloy, organic hydride, etc.
Supply: Hydrogen stations, etc.
Usage (application): Fuel cells, various FC mobilities, etc.

Strengths of each company’s products, technology, and service are introduced. By looking at these strengths and the core technologies described in the company overview, you will understand the background that connects the technology held by the company and the building of their hydrogen business.

Introductory examples and achievements as well as future business plan are briefly introduced.

Department in charge of hydrogen-related business and contact information are described.

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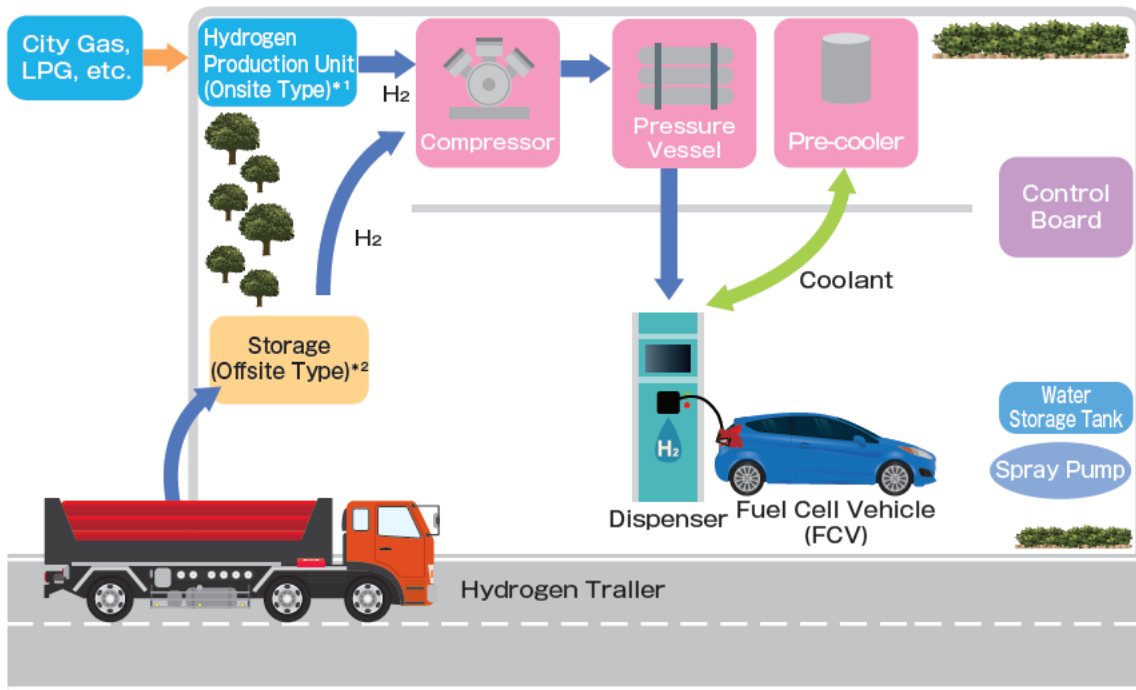
Profile of the featured company

Notes on company information

- Company information, including the address, representative’s name, and capital of each company, is as of the time when this brochure was edited (the end of January 2021). Check the website of each company for the latest information.
- As a general rule, the address described in the company profile section is that of the head office.
- Founding indicates the time when business, including individual business, was started and establishment indicates the time when it was registered as a corporation.

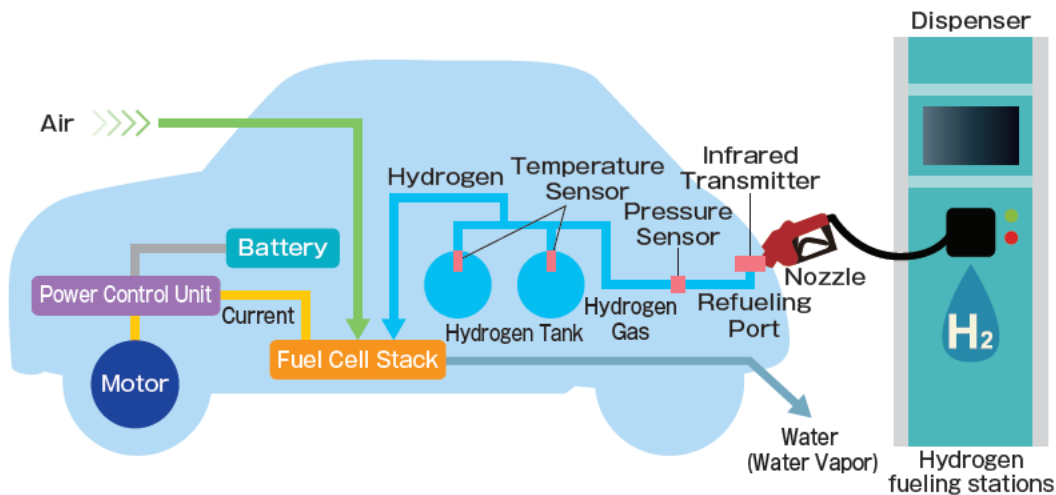
Principal configuration diagram of hydrogen station and fuel cell vehicle (FCV)

Hydrogen fueling stations



* 1 Onsite Type: Hydrogen gas is produced in the hydrogen fueling stations from City Gas or LPG, etc.
 * 2 Offsite Type: Hydrogen gas is produced in the hydrogen production plant outside and is transported to the hydrogen fueling stations.

Fuel Cell Vehicle (FCV)



Terms related to hydrogen and fuel cells that frequently appear in this brochure

- FC: Fuel Cell
- FCFL: Fuel Cell ForkLift
- FCV: Fuel Cell Vehicle
- HHOG: High-purity Hydrogen Oxygen Generator
- LNG: Liquefied Natural Gas
- PEFC: Polymer Electrolyte Fuel Cell
- SOFC: Solid Oxide Fuel Cell
- LPG: Liquefied Petroleum Gas
- PEM: Polymer Electrolyte Membrane

Iwatani Corporation



**Japan's only liquefied hydrogen supplier;
Holder of Japan's largest market share in hydrogen**



Based on the corporate philosophy "Become a person needed by society, as those needed by society can prosper," we deliver various "gas and energy" needs to everyday lives and industry, with a comprehensive energy business focusing on LP gas and an industrial gas & machinery business focusing on oxygen, nitrogen, hydrogen, and helium as our core business operations.

In addition, we have positioned environmental and energy challenges that must be addressed and overcome as our important initiatives, and are committed to providing solutions to these challenges by reducing the burden on the environment by promoting the utilization of hydrogen, which will achieve the ultimate form of clean energy.

Technical and service strengths

Since we started handling hydrogen in 1941, with the understanding that hydrogen will achieve the ultimate form of clean energy, we have advanced our efforts toward the utilization of hydrogen. Starting with the construction of Japan's first liquefied hydrogen production plant in Sakai City, Osaka in 2006, we have brought 6 plants at 3 bases into operation, and we are now providing a stable supply nationwide as the sole liquefied hydrogen supplier in Japan. In 2014, we introduced Japan's first commercial hydrogen station in Amagasaki City, Hyogo. Currently, hydrogen stations operate in 38 locations. In addition, in order to contribute to the realization of net zero greenhouse gas emissions by 2050, which the Japanese government has pledged, we are actively working toward early realization of a hydrogen energy-based society by participating in various projects with multiple companies to build a large-scale low-carbon hydrogen supply chain.



▲ Iwatani hydrogen station in Morinomiya, Osaka



▲ Demonstration liquefied hydrogen storage and unloading facility constructed on Kobe AirPort Island

Introductory examples and achievements

We provide a stable supply of liquefied hydrogen to more than 110 user companies nationwide. In addition, our hydrogen stations now operate in 38 locations in Japan, and we have started construction of 15 new station locations.

Business plan

Toward the realization of a hydrogen energy-based society, we are producing low-carbon hydrogen by utilizing renewable energy overseas. At the same time, by importing large amounts of liquefied hydrogen by use of a dedicated carrier, we aim to supply liquefied hydrogen for power generation and mobility.

Company profile

Address: 3-6-4 Hommachi, Chuo-ku, Osaka-shi, Osaka 541-0053, Japan
Representative: Hiroshi Majima

Capital: 35,096 million yen
Established: May 5, 1930
TEL: +81-6-7637-3131

Department in charge

Department name: Hydrogen Gas
Department
TEL: +81-6-7637-3458

<http://www.iwatani.co.jp>

Air Water Inc.



The industry's only in-house production company from cylinders to generators;
Gas manufacturer with hydrogen production bases from Hokkaido to Kyushu

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants



Hydrogen station on Shioikai Hydrogen Farm

With nine hydrogen production bases across Japan, as a hydrogen gas manufacturer, we provide our customers with a stable supply of hydrogen gas in various forms from cylinders to generators. In addition, by applying our hydrogen-related technology cultivated over many years, we are now working to ensure the realization of a hydrogen energy-based society, including participation in the "hydrogen supply chain demonstration project utilizing biomass-derived hydrogen (Shikaoi-cho, Hokkaido)" and design, production and operation of "mobile hydrogen stations (Sapporo City and Muroran City, Hokkaido)."

Technical and service strengths

We are the only domestic industrial gas manufacturer that offers hydrogen generators developed in-house. Our next-generation hydrogen gas generator "VHR" realizes the world's highest level of hydrogen gas generation efficiency by adopting an originally developed reformer using city gas as raw material. Compared with other companies' equipment, city gas consumption can be reduced by 8%. In addition, CO₂ emissions can be reduced by 8% including the power reduction effect achieved when operating the equipment, contributing to not only a reduction in hydrogen costs but also conservation of the global environment.

Air Water Group offers comprehensive support from design and production to maintenance and backup, and equipment installation on each customer's premises as our assets, promising a commitment to long-term total cost reductions and stable supply under our responsibility.



▲ Next-generation hydrogen gas generator "VHR"



▲ Hydrogen trailer

Introductory examples and achievements

We started delivery of the next-generation hydrogen gas generator "VHR" in August 2019, and currently two units have been delivered. We offer a demonstrated record of delivery performance with ten total deliveries that include conventional equipment. In FY2021, we look to install five units at semiconductor and steelworks plants, etc.

Business plan

For the next-generation hydrogen gas generator "VHR," we will continue our drive to ensure cost reductions, aiming to install a total of 10 units by the end of FY2022. In addition, we look to contribute to a hydrogen-based society as a hydrogen gas manufacturer by establishing new hydrogen filling plants and reorganizing hydrogen filling plants across Japan.

Company profile

Address: Air Water Building,
2-12-8 Minamimemba, Chuo-ku,
Osaka-shi, Osaka 542-0081, Japan
Representative: Kikuo Toyoda

Capital: 55,856 million yen
Established:
September 24, 1929
TEL: +81-6-6252-5411

<https://www.awi.co.jp>

Department in charge

Department name: Industrial Sales
Department, Industrial Gases
Business Division, Industrial
Company, Air Water Inc.
TEL: +81-3-3578-7832
E-mail: miyano-sat@awi.co.jp

SR Engineering Co., Ltd.

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants



From developing ultrahigh-pressure hydrogen devices with original patented technology; We offer a demonstrated record of performance in deliveries to hydrogen filling facilities



We have the know-how to develop original products that are born from the combination of advanced oil pressure, air pressure, and water pressure technologies and mechatronics as well as electromagnetic and permanent electromagnetic technologies cultivated over many years. One example is the fluid control technology product "HU High Lock Unit," which is a pneumatically-driven hydraulic pump unit that forms the basis of a die change system.

We develop automatic hydrogen gas valves, etc., utilizing our excellent production and quality systems that support the development of these products in conjunction with production technology capabilities including high-precision processing in our own plant.

Technical and service strengths

We manufacture automatic ultrahigh-pressure hydrogen gas valves and hydrogen gas boosters. There are two models of automatic valves; 50MPa and 99.9MPa in design pressure. Both models contribute to space saving at hydrogen stations and other facilities as both models are compact due to our original technology. And, since their structures enable only replacement of the valve seat, they are easy to maintain. Gas boosters are available in two models: a pneumatically-driven 125MPa 1Nm³/hr spec to be used for airtight tests of devices, and a hydraulically-driven 45MPa 4Nm³/hr spec to be used for filling accumulators. For automatic valves and boosters, we offer complete support, including maintenance, as both developed and manufactured in-house. The 45MPa 4Nm³/hr spec is applicable to a suction gas pressure of 0.6MPa, and supports a pressure rise of hydrogen gas derived from renewable energy. In addition to automatic valves for facilities, we also manufacture automatic vessel master valves with a safety valve corresponding to 45MPa composite vessels.



▲50MPa automatic hydrogen gas valve (installed at Toho Gas Co., Ltd.)



▲4Nm³/hr hydraulically-driven hydrogen gas booster

Introductory examples and achievements

50MPa automatic hydrogen gas valves, many of which have been delivered to FCFL filling facilities, can be used with confidence. 125MPa hydrogen gas boosters, the performance of which has been tested at HyTREc, can also be used with confidence. Automatic vessel master valves with a safety valve are in preparation for acquisition of JPEC-S0006.

Business plan

We look to strengthen sales of 50MPa automatic hydrogen gas valves for FCFL filling facilities. And, for hydrogen stations, automatic hydrogen gas valves with a design pressure of 99.9MPa are under development to be placed on the market in 2021. In a similar fashion, 4Nm³/hr hydraulically-driven hydrogen gas boosters are also under development for FCFL filling facilities.

Company profile

Address: 3-2-60 Takatsukadai, Nishi-ku, Kobe-shi, Hyogo 651-2271, Japan
 Representative: Masahiko Hashimoto
 Capital: 48 million yen
 Established: October 1972
 TEL: +81-78-991-4400

<https://sr-engineering.co.jp>

Department in charge

Department name: Development
 Department
 TEL: +81-78-991-4407
 E-mail: srgo@sr-engineering.co.jp

Kaji Technology Corporation



High quality through integrated provision from design and production to after-sales service;
An extensive demonstrated record of performance in compressors for hydrogen stations

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants

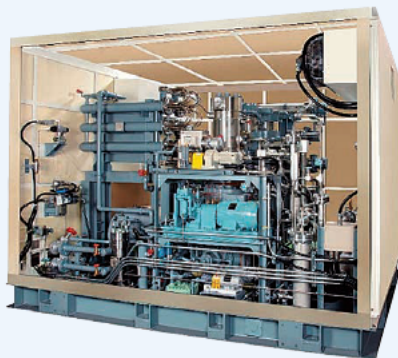


We were founded as a textile machinery manufacturer in 1905, and our current flagship products are high-pressure and ultrahigh-pressure compressors for air and various gases.

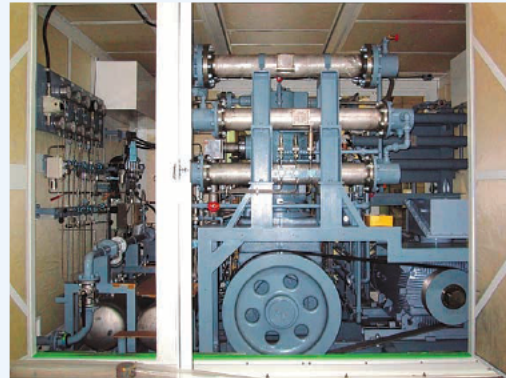
We are a manufacturing company that carries out design, welding, machining, assembly, and operation tests in-house. By investing more of our management resources on research and development, which is the lifeline for any manufacturing company, we are responding to ever-diversifying and sophisticated market needs while strengthening our cost competitiveness to meet the needs of our customers.

Technical and service strengths

In 2001, we started development of compressors for hydrogen stations and in 2005 we succeeded in developing an oil-less reciprocating compressor that can boost pressure up to 110MPaG. Our technological capabilities are not limited to hydrogen stations but are highly valued across a wide range of fields including the petroleum, petrochemical, and gas industries as well as research institutions. Ultrahigh-pressure compressors for hydrogen stations do not require nitrogen purging because there is no gas leakage and a stable boost in pressure can be achieved by our original technology. In addition, gas seal performance is improved by adopting highly reliable in-house welded fittings in place of cone and thread fittings. Compressor units are housed in soundproof cases so that they can even be installed in downtown stations where noise regulations are strict.



▲ Compressor for hydrogen station "HyKom340" (anti-pulley side)



▲ Compressor for hydrogen station "HyKom340" (pulley side)

Introductory examples and achievements

By FY2019, we have commercialized and delivered the ultrahigh-pressure compressor for hydrogen station "HyKom340 (82MPaG)" to 29 locations in total. In addition, we offer an extensive demonstrated record of performance in the production of 40MPaG-class high-pressure compressors (for hydrogen stations, and refueling fuel cell forklifts).

Business plan

We are now in the development phase of our next model that will offer further cost reductions, compactification, shorter delivery times, and lower running costs of compressors for hydrogen stations. We look to continue our efforts in improving value with our flagship products and contribute to the realization of a hydrogen-based society.

Company profile

Address: 6 Bodai, Mihara-ku,
Sakai-shi, Osaka, 587-0064 Japan
Representative: Hiroshi Suzuki

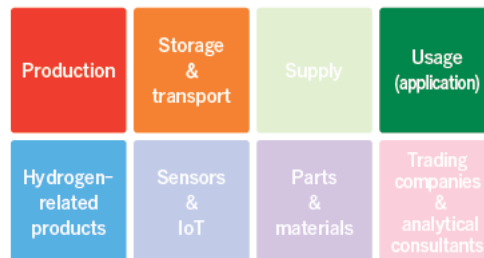
Capital: 1,440 million yen
Established: February 1934
TEL: +81-72-361-0881

<http://www.kajitech.com>

Department in charge

Department name: Sales Department,
Sales Division
TEL: +81-72-361-9500
E-mail: sales_comp_10@kajitech.com

Kawasaki Heavy Industries, Ltd.



Strengths in cryogenic temperature, large-scale constructions, high rotational speed machineries, and clean combustion;
The company has the technology for an entire supply chain



We are a comprehensive engineering manufacturer deployed in diverse businesses including Ship & Offshore Structure, Rolling stock, Aerospace Systems, Motorcycle & Engine, Energy System (Gas Turbine, Gas Engine, etc.) & Plant Engineering and Precision Machinery & Robot. In order to provide solutions for social issues, our Group will focus on three fields; "A Safe and Secure Remotely-Connected Society", "Near-Future Mobility" and "Energy and Environmental Solutions" and will transform our business structure into a form which promises faster growth in line with environmental changes.

Technical and service strengths

We are advancing our expertise in technological development from upstream to downstream of an entire supply chain for "making," "transporting," "accumulating," and "using" hydrogen aiming for the early realization of a hydrogen-based society. Toward this realization, we are working on development of key technologies for an entire supply chain, ranging from production and liquefaction of hydrogen from Australia's unused resource brown coal as well as renewable energy (to make), cargo handling of liquefied hydrogen between land bases and ships, mass transportation by sea (to transport), storage of liquefied hydrogen (to accumulate) to gas turbine power generation optimized for the characteristics of hydrogen (to use), together with cooperative firms through NEDO* subsidized projects. Once this hydrogen supply chain is put into practical use, not only will it be possible to significantly reduce CO₂ emissions, but it will also be possible to supply a large volume of stable clean energy. Kawasaki Heavy Industries contributes to decarbonization as the world's only company that has the technology for an entire supply chain.

(*) New Energy and Industrial Technology Development Organization



▲ Liquefied hydrogen carrier "SUISEI FRONTIER"
NEDO demonstration project:
"Demonstration Project for Establishment of Mass Hydrogen Marine Transportation Supply Chain Derived from Unused Brown Coal" (FY2015 to FY2020)



▲ Hydrogen gas turbine cogeneration system (Kobe Port Island)
NEDO demonstration project:
"Smart Community Technology Development Project Utilizing Hydrogen Cogeneration Systems" (FY2015 to FY2018)
"Development and Demonstration Project for Dry Low-NOx Hydrogen-Fueled Gas Turbine Combustion Technology" (FY2019 to FY2020)

Introductory examples and achievements

From our commitment and effort to "Hydrogen Road," we offer demonstrated achievements including "distributing the first hydrogen liquefier among domestic manufacturers," "launching the world's first hydrogen carrier," "equipping a liquefied hydrogen carrier with a liquefied hydrogen tank for marine transportation," and "succeeding in technical testing of dry low-NOx hydrogen-fueled gas turbine combustion."

Business plan

After completion of a "pilot demonstration" scheduled to be conducted until 2022, we look to perform a "demonstration for commercialization" during the mid-2020s (to determine the feasibility of commercialization including economic efficiency with plant configuration as minimized system) to realize "commercialization" of the hydrogen supply chain in 2030.

Company profile

Address:
(Tokyo Head Office) 1-14-5 Kaigan, Minato-ku, Tokyo 105-8315, Japan
(Kobe Head Office) 1-1-3 Higashikawasaki-cho, Chuo-ku, Kobe, Hyogo 650-8680, Japan
Representative: Yasuhiko Hashimoto, President
<https://www.khi.co.jp>

Capital: 104,484 million yen
Established: October 15, 1896
TEL:
Tokyo Head Office: +81-3-3435-2111
Kobe Head Office: +81-78-371-9530

Department in charge

Department name: Project Promotion Department, Hydrogen Project Development Center, Corporate Technology Division
TEL: +81-78-921-1615
E-mail: oyama_suguru@khi.co.jp

Koatsu Showa Cylinders Co., Ltd.



Comprehensive manufacturer of high-pressure gas vessels, with confidence that ensures reliable technology and performance;
Maker of high-quality vessels and accumulators superior in durability

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants



As a comprehensive manufacturer of high-pressure gas vessels, we manufacture stainless vessels and clean vessels for filling corrosive gas and high-purity gas, which are destined for the semiconductor field, focusing on steel seamless vessels for ordinary use. We also offer many kinds of long vessels and high-capacity welded vessels suitable for mass transport and large-scale consumption of such gases. In addition, we manufacture bundle units in which these vessels are integrated and frames, piping, and other components are incorporated, and we can make consistent proposals.

Technical and service strengths

We jointly developed an ultrahigh-pressure type (design pressure 95MPa, volumetric capacity 300L) hydrogen station-specific accumulator offering features of (1) low cost, (2) high quality, and (3) high durability with The Japan Steel Works, Ltd. This accumulator realized a lightweight and compact structure with the lid portion downsized by drawing at both ends through the application of long-held hot forging technology of end drawing portions of long vessels loaded on hydrogen trailers, enabling cost reductions. Also, by making the end portions larger-bore compared with conventional long vessels, non-destructive inspection and visual inspection of inner surfaces can be performed, which ensures a high level of quality. The world's highest level of durability is realized as the service life is unlimited with more than 300,000 use times or more.



▲ Long vessels loaded on hydrogen trailers



▲ High-pressure type accumulator for hydrogen station (cut sample)

Introductory examples and achievements

In the hydrogen-related field, we have long-manufactured long vessels loaded on trailers (715l at the maximum) and compact bundles (50l, etc.), and hold a high domestic share. In addition, accumulators have been adopted for domestic hydrogen stations since their market launch in 2019.

Business plan

Toward realizing a hydrogen-based society, we look to expand production and sales of hydrogen accumulators as well as achieve further cost reductions. We also aim to expand our product lineup to meet various customer demands.

Company profile

Address: 2-4-12 Nakazakinishi,
Kita-ku, Osaka-shi,
Osaka 530-0015, Japan
Representative: Yoshinori Hara

Capital: 90 million yen
Established: 1972
TEL: +81-6-7711-3360

<https://www.koatsu-showa.co.jp/>

Department in charge

Department name: Osaka Sales

Office

TEL: +81-6-7711-3360

E-mail: sato-m@koatsu-showa.co.jp

Kobe Steel, Ltd.

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants

<Compressors>
Take a closer look!

Comprehensive compressor manufacturer that supports a wide range of applications;
Extensive Demonstrated record of performance backed by technological strength in each application of hydrogen

<Vaporizers and heat exchangers>
Take a closer look!

Leading manufacturer for large vaporizers and ultrahigh-pressure heat exchangers;
No.1 demonstrated record of performance in heat exchangers for hydrogen stations



Kobe Steel's machinery business began with the development of Japan's first air compressor in 1914, and we have knowledge and technology cultivated in various fields for more than 100 years. We place importance on providing solutions for customers and today's and tomorrow's social challenges by taking advantage of the knowledge and technology. In addition, as a commitment to the transition toward realization of CO₂ emissions reduction by hydrogen, we promote the coexistence of multi-source infrastructures and the creation of parallel infrastructures that start small and grow large.

Technical and service strengths

<Compressors>

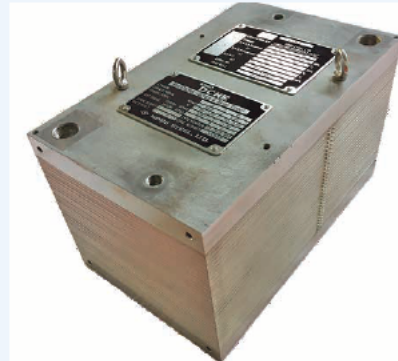
We handle various high-pressure, high-temperature, ultralow-temperature, corrosive, and other gas compression features, and adapt to a wide range of customer demands utilizing our accumulated knowledge and technological strength backed by our manufacturing experience. We have accumulated a wealth of high-pressure technology and gas seal technology cultivated through our manufacturing experience in compressors not only for hydrogen stations but also for hydrogen purification, hydrogen separation and recovery, and LNG (liquefied natural gas) receiving terminals, as well as knowledge related to low-temperature materials and hydrogen embrittlement.

<Vaporizers and heat exchangers>

Dating back to the early days of the introduction of LNG in Japan, we have a long history in the production and distribution of heat exchangers for liquefaction of natural gas and large-capacity vaporizers using seawater as a heat source. With a lineup of heat exchangers that are adaptable to special usage environments, such as ultrahigh pressure and ultralow temperature, we offer products that meet customer demands.



▲ Compressor for stationary hydrogen station "HyAC series"



▲ Micro channel heat exchanger (DCHE)

Introductory examples and achievements

<Compressors>

In the hydrogen production field, we offer a demonstrated record of delivery performance with about 20 units delivered for hydrogen purification equipment and hydrogen filling, and in the hydrogen supply field, we offer a demonstrated record of delivery performance with about 30 units delivered for commercial hydrogen stations, high-pressure hydrogen gas testing facilities, and other installations.

<Vaporizers and heat exchangers>

We have delivered more than 300 diffusion-bonded compact heat exchangers (DCHE) to domestic and overseas hydrogen stations. In addition, as vaporizers (ORV, IFV) and aluminum plate-fin heat exchangers (ALEX) can be used for various applications other than LNG, we look to introduce them as vaporizers and liquefiers for hydrogen.

Business plan

<Compressors>

We offer compressor technology and products that meet various needs for the hydrogen supply chain (production, storage & transportation, supply, and utilization) toward realization of a carbon-free society.

<Vaporizers and heat exchangers>

For economical utilization of liquid hydrogen, effective use of cold energy is required as is the case with LNG. Our heat exchangers can be used in various fields that utilize cold energy, such as turbine suction air cooling, BOG (boil off gas) reliquefaction, and air separation, where we expect further sales expansion.

Company profile

Address: 2-2-4 Wakino-hama-kaigandori,
Chuo-ku, Kobe-shi, Hyogo 651-8585,
Japan

Representative: Mitsugu Yamaguchi

<https://www.kobelco.co.jp/>

Capital: 250.9 billion yen
Established: 1911
TEL: +81-78-261-5111

Department in charge

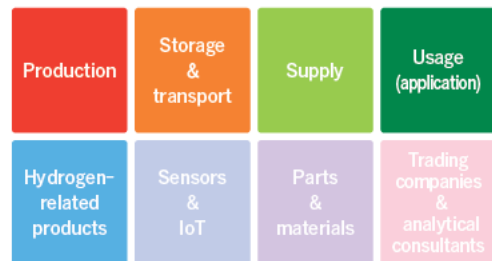
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Department name: Rotating Machinery Office, Energy and Chemical Machinery Sales Department, Sales and Marketing Headquarters, Machinery Business Division
TEL: +81-3-5739-6770
E-mail: ishiyama.takashi@kobelco.com

<Vaporizers and heat exchangers>

Department name: Equipment Office, Energy and Chemical Machinery Sales Department, Sales and Marketing Headquarters, Machinery Business Division
TEL: +81-3-5739-6652
E-mail: iwaki.kurata@kobelco.com

Sansha Electric Manufacturing Co., Ltd.



Contributing to the realization of a hydrogen-based society with advanced power conversion technology;
Offering a demonstrated record of performance in partnerships with leading companies in a wide range of fields from research to hydrogen production

SanRex Fusion of power-supply equipment and power semiconductors



Utilizing our strength in high-efficiency conversion technology, we have created many new products for the electricity market for more than 80 years. In recent years, we have focused on power converters in the environment and energy fields. We have commercialized various power conditioners for solar power generation systems, which have the functions of power storage and system stabilization, and for fuel cells for hydrogen stations, as well as power-supply equipment for hydrogen-generating water electrolysis.

Technical and service strengths

In hydrogen-related fields, high-efficiency and high-precision power conversion technology is required. We offer high-performance power supplies through development and production held by the power supply division and the core power semiconductor division. Our strength is holding the technology to convert power while keeping power loss low, and we have developed power conditioners for fuel cells and power supplies for hydrogen generation, realizing the industry's top-class conversion efficiency by incorporating SiC (semiconductor) first in the industry.

Through active participation in joint development projects with the New Energy and Industrial Technology Development Organization (NEDO), the National Institute of Advanced Industrial Science and Technology (AIST), and other institutions, we constantly respond to market demands with the latest technology. In addition, we offer product proposals that meet customer demands and requirements from small size to large size.



▲High-function and high-precision fuel cell test equipment that realizes a wide range of load conditions



▲DC power supply for water electrolysis that supports various power supply capacities

Introductory examples and achievements

We offer a demonstrated record of performance in power converter technology, we are experienced in offering products from power supplies for fuel cell evaluations for research and development, DC power supplies for hydrogen generation for production, power supplies for organic electrolysis for transportation, to power conditioners for solar-powered parallel hydrogen stations.

Business plan

In partnerships with companies related to the utilization of hydrogen in various fields, we promote the provision of products that can contribute to the realization of a hydrogen-based society by taking advantage of our high-efficiency power supply technology features.

Company profile

Address: 3-1-56 Nishiawaji,
Higashiyodogawa-ku, Osaka-shi,
Osaka 533-0031, Japan
Representative: Hajimu Yoshimura

Capital: 2,774,277,500 yen
Established: 1948
TEL: +81-6-6321-0321

<https://www.sansha.co.jp/>

Department in charge

Department name: Western Japan
Sales Department-1st Section
TEL: +81-6-6325-0500
E-mail: sales-d@sansha.co.jp

Shinko Engineering & Maintenance Co., Ltd.



Holder of Japan's largest market share in the construction and maintenance of hydrogen stations;
Comprehensive support for planning, design, construction, and maintenance of hydrogen stations



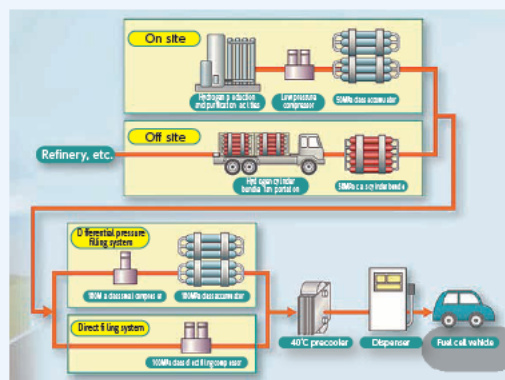
In 1962, we started business focused on manufacturing of equipment and construction at Kobe Steel plants, and since then, we have expanded our business to engineering and maintenance for steelworks-related facilities. In 2004, we merged with Shinko Plant Kensetsu, whose business base focuses on engineering of chemical and energy plants, and we now offer support in design, procurement, construction and maintenance as a comprehensive engineering company.

Technical and service strengths

We have strengths in our original hydrogen filling simulation technology and control system technology, and look to further improvements in the reliability of hydrogen station planning, design, construction, and maintenance. Focusing on Kobe Steel's high-pressure hydrogen compressors and precoolers as well as Kobelco Eco-Solutions' electrolytic hydrogen generators, we offer an extensive demonstrated record of delivery performance to high-pressure gas related plants, natural gas stations, and other energy-related facilities, and hold Japan's largest market share in the construction and maintenance of hydrogen stations.



▲ Low-pressure hydrogen occluding vessel and occlusion/release performance evaluation equipment



▲ Demonstrated record of delivery performance in planning, design, construction, and maintenance of stationary hydrogen stations

Introductory examples and achievements

We offer a demonstrated record of delivery performance to 10 off-site locations and 1 on-site location in planning, design, construction, and maintenance of stationary hydrogen stations. In addition, in collaboration with Kobe Steel and Kobelco Eco-Solutions, we are working on the demonstration and development of hydrogen stations using electrolytic hydrogen by electric power derived from renewable energy to expand our demonstrated record of performance and success.

Business plan

In collaboration with Kobe Steel, we are developing a low-pressure hydrogen storage system using an occlusion alloy. As performance checks on the testing machine are nearly complete, we look to conduct a demonstration operation in FY2021.

Company profile

Address: 4-5-22 Iwayakita-machi,
Nada-ku, Kobe-shi,
Hyogo 657-0846, Japan
Representative: Hideki Asada

Capital: 150 million yen
Established: November
1, 2004
TEL: +81-78-803-2901

<https://www.shinkoen-m.jp/>

Department in charge

Department name: Kazumoto, Plant
Sales Office, Sales Division
TEL: +81-78-881-3357
E-mail: kazumoto.seijiro@kobelco.com

Kobelco Eco-Solutions Co., Ltd.

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants



Meeting the needs for hydrogen supply from production sites to research and development;
Holder of Japan's largest market share for hydrogen generators



We oversee the environmental business within the Kobe Steel Group, and are engaged in the production and distribution of water treatment equipment in water supply and sewerage systems, waste incineration plants, such as gasification melting furnaces, etc. In the hydrogen business, we provide water-electrolysis type high-purity hydrogen generators (HHOG: High-purity Hydrogen Oxygen Generator) that supply high-purity hydrogen gas from tap water on-site by using a solid polymer electrolyte membrane (PEM), which are available as compact types and skid mounted types. We offer a demonstrated record of delivery performance across various fields as hydrogen utilities.

Technical and service strengths

HHOG is an on-site hydrogen generator that can generate high-purity hydrogen on demand. Because of the features of high reliability and simple operability in addition to the generation of high-purity hydrogen gas, we offer a demonstrated record of delivery performance with 200 units delivered in Japan and overseas, including not only for industrial use but also for research and development as well as demonstration applications. In addition, the amount of gas generated is instantaneously and automatically controlled in the range of 0 to 100% depending on the amount used, without use of any hazardous chemicals. As a holder of Japan's largest market share for full-scale industrial solid polymer electrolyte membrane hydrogen generators, we offer various achievements related to production and utilization of hydrogen. We can meet a wide range of needs related to hydrogen supply.



▲ Compact type named "Hydrogen Box" with reduced maintenance space



▲ Skid mounted type with improved hydrogen production efficiency

Introductory examples and achievements

We offer a demonstrated record of delivery performance in fields including hydrogen stations, hydrogen production utilizing renewable energy, various industrial applications (semiconductor manufacturing, manufacturing of metallic products, cooling of power generators in power plants, industrial gas purification, etc.), and hydrogen supply in research and development.

Business plan

We look to make use of high-purity hydrogen, simple operation, and high safety standards featured in our products in fields developing and utilizing hydrogen as energy. In addition, as we think that these features are common to general industries, we look to contribute to providing solutions in every situation that involves the supply of hydrogen.

Company profile

Address: 1-4-78 Wakinohama-cho,
Chuo-ku, Kobe-shi,
Hyogo 651-0072, Japan
Representative: Takao Ohama

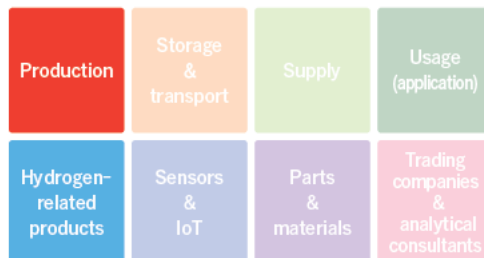
Capital: 6,020 million yen
Established: 1954
TEL: +81-78-232-8018

<https://www.kobelco-eco.co.jp/>

Department in charge

Department name: Hydrogen
Business Promotion section
TEL: +81-3-5931-3704
E-mail: suda.tatsuo@kobelco.com

Daigas G&P Solution Co., Ltd.



Ability to produce high-purity hydrogen in the smallest possible space;
Strengths in catalyst technology and control technology cultivated in city gas production



Our company is broadly comprised of three business units. The LNG Business Unit delivers gas to customers safely and reliably. The Power Generation Unit stably supplies electricity through diverse power generation systems to support comfortable lifestyles and industries. With the Engineering Business Unit, we respond to customer demands with technology accumulated by the Daigas group, such as LNG plant technology, gas supply technology, maintenance technology, energy technology, environmental technology, and overseas projects.

Technical and service strengths

The compact type hydrogen production equipment "HYSERVE series," the development of which was pursued by The Daigas group for hydrogen stations, is available in 3 types according to hydrogen production capacity: 30Nm³, 100Nm³, and 300Nm³. By packaging a set of process equipment with the reliability of the conventional plant type maintained as-is, on-site work at the time of installation is drastically reduced to cut total costs. Also, through the adoption of the high-performance catalyst having been originally developed by Osaka Gas, hydrogen is produced from city gas and LPG with high efficiency. For operation control, a one-button start/stop can be made and automatic load following operation can be performed. In the unlikely event of trouble, the equipment automatically stops operation safely. Moreover, the waiting operation mode is included as standard, and the start-up time can be shortened by hot standby of the reformer.



▲Hydrogen production equipment "HYSERVE300 (1)"



▲Hydrogen production equipment "HYSERVE300 (2)"

Introductory examples and achievements

We launched the HYSERVE series on the market in FY2004, and we have delivered 36 units since that time for hydrogen stations and industrial applications. (As of the end of FY2019)

Business plan

We look to continue to make improvements and cost reductions for the HYSERVE series, and actively promote sales for hydrogen stations and industrial applications.

Company profile

Address: 3-5-11 Dosho-machi,
Chuo-ku, Osaka-shi,
Osaka 541-0045, Japan
Representative: Nobushige Goto

<https://www.daigasgps.co.jp/>

Capital: 100 million yen
Established: 2019
TEL: +81-6-6205-2961

Department in charge

Department name: Domestic
Sales Team, Business Development
Department, Engineering Business Unit
TEL: +81-6-6205-4120
E-mail: at-nakai@osakagas.co.jp

Nakakita Seisakusho Co., Ltd.



Manufacturing that is close to customers through high-mix low-volume production, built-to-order production;
Comprehensive manufacturer of fluid control devices, with a focus on valves

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants



Since our founding in 1930, we have provided fluid control systems, with a focus on valves, designed for ships, power generation, steelmaking, nuclear power, etc. We are particular about manufacturing individually different items. Among them, the originally developed large tanker-specific butterfly valve, overturning conventional wisdom and realizing compactness, weight reduction, and zero leakage, has been adopted for tankers worldwide. The technological capabilities we have cultivated so far have evolved into manufacturing that meets strict specification requirements that require precision control under high temperature, high pressure, or extremely low temperature environments, such as power plants and steelworks, etc.

Technical and service strengths

We have developed, designed, and manufactured pioneering custom-made valves for hydrogen on a customer required built-to-order basis, while engaged in their quality control. From around the latter half of the 1970s, we were the first to deliver valves that used liquid hydrogen as a fluid to flow through fuel supply lines of refining equipment, liquefying equipment, and rocket launch facilities. We are developing valves that can control hydrogen in all states such as gas and liquid. While maintaining an extensive lineup backed by build-to-order high-mix low-volume production, we actively utilize digital technology such as CAE. We will continue to promote manufacturing that enables speedy development of valves that meet wide-ranging specifications from high temperatures to extremely low temperatures with enhanced QCD of products in our approach.



▲ Butterfly valve and regulating valve for liquid hydrogen

▲ Shutoff valve, regulating valve, and safety valve for hydrogen

Introductory examples and achievements

We have developed and manufactured regulating valves and shutoff valves that control liquid hydrogen at -253°C used in rocket fuel supply lines. In addition, we offer a demonstrated record of performance in deliveries of safety valves, shutoff valves, regulating valves, etc., for hydrogen lines used in power plants, gas companies, chemical plants, and other facilities.

Business plan

While government and industry make a major shift toward a hydrogen-based society, we look to continue to contribute to the establishment of hydrogen supply chains with valves for use as an everyday energy source. In addition, we will proceed with product development in order to meet specifications required by our customers.

Company profile

Address: 1-1 Fukonominami-cho,
Daito, Osaka 574-8691, Japan
Representative: Teruhisa Miyata

Capital: 1,150 million yen
Established: May 1937
TEL: +81-72-871-1331

<https://www.nakakita-s.co.jp>

Department in charge

Department name: Management
Planning Office, Management Planning
Headquarters
TEL: +81-72-871-1331
E-mail: info@nakakita-s.co.jp

Nishiyama-Seisakusho Co., Ltd.



Customized fuel cell evaluation equipment;
More than 20 years of experience in making evaluation equipment

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants



For more than 20 years, we have collaborated with research laboratories and universities to manufacture fuel cell evaluation equipment. Currently, we receive production requests from relevant companies and deliver to them. We provide equipment that incorporates reliable performance, safety provided by companies, and the added value of automation cultivated over many years. We are characterized by flexibility (quick delivery, ability to respond to changes) particular to a small company, creativity, and a sense of unity that is built with customers.

Technical and service strengths

The equipment we provide is customized. For such evaluation equipment, it is necessary to take measures such as improvement in usability and convenience, and compliance with each customer's company regulations on safety requirements. Our service strength allows us to respond to customers even after delivery under the motto "We stick together with the customer all the way, not just until the end of production."



▲ Equipment to evaluate electrical characteristics in oxidation and reduction atmospheres



▲ High-temperature electric furnace with muffle case

Introductory examples and achievements

We offer a demonstrated record of performance in deliveries to gas companies, automobile-related companies, ceramics production manufacturers, public research laboratories, etc.

We also handle test equipment not only for fuel cells but also for high-temperature or high-pressure hydrogen atmospheres, etc.

Business plan

We mainly manufacture test equipment, as well as many types of equipment that use hydrogen. We look to continue to develop and manufacture new test equipment.

Company profile

Address: 2-1-15 Awaji-machi,
Chuo-ku, Osaka-shi,
Osaka 541-0047, Japan
Representative: Yukio Ishida

Capital: 10 million yen
Established: March 25,
1941
TEL: +81-6-6203-0571

<http://www.nishiyama-osaka.co.jp/>

Department in charge

Department name: Sales Department

TEL: +81-6-6203-0571

E-mail: ns@nishiyama-osaka.co.jp

Nisshin Kasei Co., Ltd.

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants



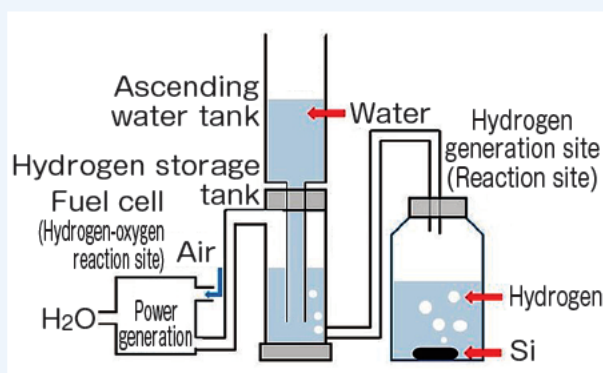
Low-cost hydrogen generation process that supplies high-purity hydrogen;
Low-cost hydrogen generation process that enables hydrogen production anywhere



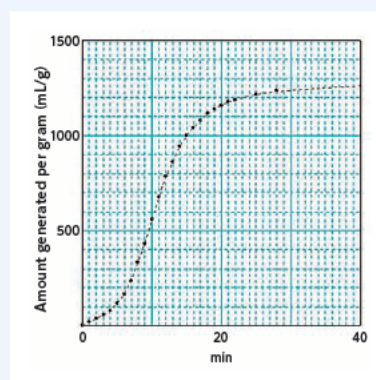
Since our founding, we have cultivated markets focused on specialty chemicals and synthetic resins, and at the same time, we have been engaged in research and development of our original products. As a prime example, we succeeded in developing low-cost and environmentally friendly silicon nanoparticles by using industrial silicon waste generated during silicon wafer production as a raw material and applying special treatment. The high-purity hydrogen generation process we propose is a low-cost process in which high-purity hydrogen can easily be obtained anywhere by using silicon nanoparticles. These silicon nanoparticles are high in surface activity, and readily react with water (oxidation reaction). From 1g of silicon nanoparticles, 1300cc of high-purity hydrogen can be obtained.

Technical and service strengths

Hydrogen gas is a hazardous material and is subject to the Fire Service Act and other regulations in transportation, storage, and use. Since our original low-cost hydrogen generation process is not subject to such regulations in transportation and storage, it can be transported and stored safely. High-purity hydrogen gas can readily be obtained anywhere whenever necessary. In addition, silicon nanoparticles, which are high in formability, can be processed into various shapes depending on the application. They can be provided in the form of powder, bulk, granule, or slurry. Currently, in order to contribute to the hydrogen energy business in the future, we continue to work on the development of a hydrogen generator utilizing our low-cost hydrogen generation process by using silicon nanoparticles. We aim to put this hydrogen generator into practical use in 2021.



▲ Low-cost hydrogen generation process diagram



▲ Low-cost hydrogen generation graph (Si: gram conversion, vertical axis: cc, horizontal axis: min)

Introductory examples and achievements

We cannot yet offer an example or record of introduction of the high-purity hydrogen generation process, but a hydrogen generator utilizing this process is now under development. Once we achieve our development goals, the hydrogen generator will become available as an emergency hydrogen supply system, or an auxiliary supply system for fuel cell vehicles (FCV) and hydrogen stations.

Business plan

We are developing a mobile hydrogen generator utilizing the low-cost hydrogen generation process by using our nano-sized silicon powder. This hydrogen generator will be used for a hydrogen supply system as an infrastructure auxiliary in an emergency or an emergency backup electric power source that combines with a fuel cell (FC).

Company profile

Address: 1-7-10 Dosho-machi,
Chuo-ku, Osaka-shi,
Osaka 541-0045, Japan
Representative: Tadasu Uemura

Capital: 75 million yen
Established: 1958
TEL: +81-6-6203-1891

<https://www.nisshinkasei.co.jp>

Department in charge

Department name: Electronic
Materials Sales Development
Department

TEL: +81-6-6203-1891

E-mail: higo@nisshinkasei.co.jp

Nippon Seisen Co., Ltd.

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants



**Compact MCH dehydrogenation reactor ideal for daily start and stop operations;
Refining extracted hydrogen's purity even higher**

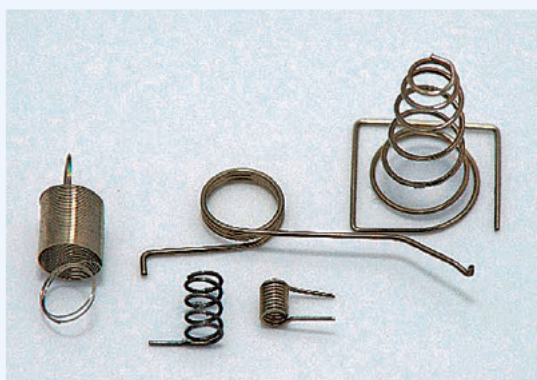


Since its founding, we have supplied stainless steel wire-based metallic fibers as well as high function products, such as high Ni alloy wires and Ti alloy wires. We have manufacturing technology to produce 11 μ m super fine wires and stainless steel wires in the fiber territory, and we can apply these technologies to manufacture composite clad wires with heating wires and aluminum. We continue to proceed with experiments aiming at expanding applications because when an alumite-treated surface and catalyst-supported wire is directly energized, the wire itself becomes a heating element, and controlling the energization enables highly efficient dehydrogenation reaction from organic hydride (MCH) (joint research with Alumi-Surface Technologies Co., Ltd.).

Technical and service strengths

The developed organic hydride (MCH) dehydrogenation reactor uses electrically-heated monolithic aluminum catalyst wires. Significant advantages include miniaturization, rapid reaction, and ability to extract hydrogen with high efficiency. Furthermore, the extracted hydrogen can be highly purified in combination with our hydrogen separation membrane module.

With the advancement and spread of hydrogen stations and fuel cell vehicles (FCV), the safety of devices used under high-pressure environments is important, and the components used are required to have hydrogen embrittlement resistant characteristics. Therefore, we have developed a new kind of stainless steel wire (HYBREM-S) for springs having hydrogen embrittlement resistant characteristics when used in high-pressure and low-temperature range environments. By taking advantage of these strengths, we are accelerating development toward a hydrogen-based society in the not-so-distant future.



▲Hydrogen embrittlement resistant stainless steel wire "HYBREM-S" for spring



▲Hydrogen separation membrane module

Introductory examples and achievements

We are in the stage of continuing demonstration tests to confirm performance, including safety and reliability, by continuous operation of a dehydrogenation reaction apparatus with the hydrogen generation capacity up to 10Nm³/hr. We are seeking applications that are compact and suitable for daily start and stop operations, etc. We offer a demonstrated record of sales performance in hydrogen separation membranes.

Business plan

We look to contribute to society by working on our ESG commitments in the hydrogen and energy field, etc., through further sales expansion of hydrogen separation membrane modules and HYBREM-S in addition to development of endothermic catalytic reactions other than organic hydride (MCH) dehydrogenation reactions.

Company profile

Address: 4-1-1 Koraihashi,
Chuo-ku, Osaka-shi,
Osaka 541-0043, Japan
Representative: Motoshi Shinkai

Capital: 5 billion yen
Established: 1951
TEL: +81-6-6222-5431

<https://www.n-seisen.co.jp>

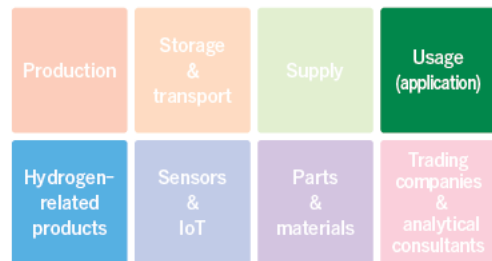
Department in charge

Department name: Research and
Development Department

TEL: +81-72-840-1265

E-mail: customerservice@n-seisen.co.jp

Hanshinkiki, Co., Ltd.



Contributing to a hydrogen energy-based society with fuel cell power generation systems;
Offering system-wide services according to customer demands



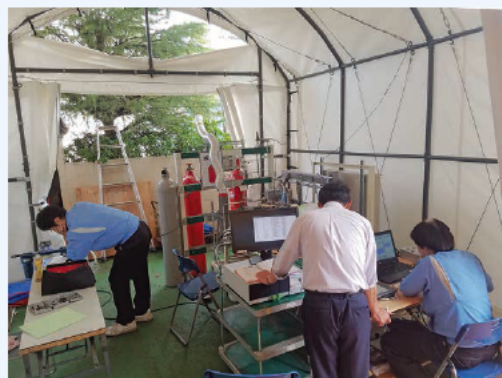
Our company was founded as a sole proprietorship as a manufacturer of nuts and bolts in 1926. Later, business was expanded to include machining, press forming, and electrical equipment, we are now engaged in the production and sales of industrial and infrastructure-related electrical equipment, parts for construction machinery, and general and special machined parts. As relates to our electrical equipment business, we are tackling new fields by making use of know-how of various types of systemization, cultivated in the manufacturing processes of important equipment such as heavy electric machinery. Among them, for the hydrogen-related market, we have established technology to control power generation systems with fuel cells as a core, and we are in the process of rolling out our 1 to 3kW class fuel cell power generation systems.

Technical and service strengths

We offer small-lot fuel cell power generation systems according to various customer demands, such as emergency power sources in the disaster field and commercial mobility. Portable power generation systems can be constructed by packaging high-quality and long-life products as domestically made products are adopted as fuel cells, auxiliaries, and other basic elements. We can provide one-stop system-wide services not only for power generation parts but also as a customer-desired format.



▲ Image of 1kW class fuel cell power generation system (stationary)



▲ Verification of power generation of a fuel cell system

Introductory examples and achievements

We expect not only emergency power sources for shelters and medical equipment, but also applications in commercial mobility, such as uninterruptible power-supply systems (UPS) intended to extend the operating service life of batteries, and power sources for specially equipped vehicles.

Business plan

Currently, we are fabricating prototypes with an eye toward commercialization. In FY2021, while starting field power generation demonstration experiments, we look to expand our product lineup according to various applications and broaden our demonstration projects. Sample shipments are scheduled to be from FY2023.

Company profile

Address: 745 Aza Ichinotsubo,
Junna, Ikawadani-cho, Nishi-ku,
Kobe-shi, Hyogo 651-2124, Japan
Representative: Ryuichi Yamada

Capital: 100 million yen
Established: 1953
TEL: +81-78-974-0037

<http://www.hanshinkiki.co.jp/>

Department in charge

Department name: Electric Equipment
Manufacturing Department
TEL: +81-78-974-5315
E-mail: Kou.katsuyoshi@hanshinkiki.co.jp

Hitachi Zosen Corporation

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants



Japan's largest class solid polymer hydrogen generation system;
CO₂-free hydrogen production by utilizing renewable energy

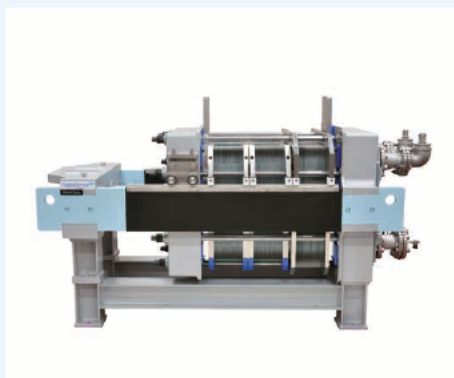


Since the Sunshine Project was launched in 1974, we have been engaged in the development of hydrogen generation systems with an eye toward a future hydrogen-based society. In 2000, we started marketing our solid polymer hydrogen generation system "HYDROSPRING," and offer an extensive demonstrated record of delivery performance. The hydrogen generation system is an on-site hydrogen generator that electrolyzes water to generate and supply high-purity hydrogen gas. We offer an extensive line-up of generated amounts from small capacity (one Nm³/h) to large capacity (several hundred Nm³/h), and we can design the system according to customer demands, including special specifications and remote monitoring systems.

Technical and service strengths

In 2018, by fusing our electrolytic technology and filter press technology, we realized the upsizing of an electrolytic cell, the heart of the system, and developed Japan's first large solid polymer hydrogen generation system enclosed in a 40ft container. As a result, we achieved a maximum hydrogen production capacity of 200Nm³/h per unit, making it possible to convert and store MW-class electric power such as renewable energy into hydrogen. Since it is a container type outdoor specification, there is no need for construction of a new building, which enables a reduction in installation costs. This technology was introduced as one of the ICEF 2019 Top 10 Innovations as a climate change countermeasure.

In addition, by combining with our methanation technology, we can expand the usage applications for hydrogen and provide Power-to-Gas technology consistently.



▲ Large electrolytic cell



▲ MW-class hydrogen generation system

Introductory examples and achievements

This is widely used across many fields such as for research and demonstrations related to hydrogen production from renewable energy, hydrogen gas used for radiosonde meteorological observations, and for hydrogen cooling for power plants.

Business plan

We look to continue to develop products, aiming at achieving the goals of "the Strategic Road Map for Hydrogen and Fuel Cells" for future reductions in CO₂ emissions and a hydrogen-based society.

Company profile

Address: 7-89, Nankokita 1-chome,
Suminoe-ku, Osaka 559-8559, Japan
Representative: Sadao Mino,

Capital: 45,442 million yen
Established: 1881
TEL: +81-6-6569-0001

Department in charge

Department name: Industrial
Equipment Sales Department
Electrolysis Business Group
TEL: +81-3-6404-0827

<https://www.hitachizosen.co.jp/english/index.html>

Hirakawa Corporation



Top Runner products with condensing technology;
Compact and high-performance boiler with mixed combustion of
hydrogen and town gas

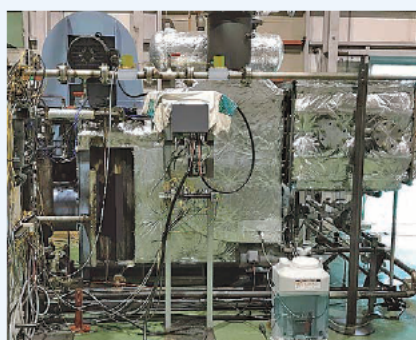
Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants



Since our founding in 1912, we have been a dedicated manufacturer of comprehensive range of boilers and related products from hot-water boilers to steam boilers with extensive experience in development, production, distribution and maintenance. We have a good number of references with condensing steam boilers and hot-water boilers that offer excellent energy saving performance across Japan as the industry's Top Runner product. We find room for improvement on energy consumption of boiler users product and propose optimum energy-saving systems with our products equipped with effective means and cutting-edge technology for the right solutions.

Technical and service strengths

We developed a hydrogen mixed combustion once-through boiler that uses fuel with a volume ratio of 50% between hydrogen and town gas I3A, which was considered difficult to combust in small boilers. At the same time, we applied to this boiler the condensing technology we had developed in steam boilers and hot-water boilers to utilize the condensed energy of steam in combustion gas for efficiency improvement. This raises the boiler efficiency up to 104% (based on lower calorific value) and reduces fuel consumption. In addition, the amount of CO₂ emissions is reduced by 26% compared to existing products, consequently the boiler offers a significant contribution to energy conservation and environmental load reduction. Toward realization of a hydrogen-based society, which has typically been led by the automobile industry, we look forward to contributing to the society by commercializing this boiler.



▲ Appearance of the developed test boiler



▲ Appearance image of the completed product

Introductory examples and achievements

In recent years, there has been a trend of replacing a large boiler into multiple small boilers at district heating and cooling facilities in addition to factories, hotels, and hospitals, to which small once-through boilers have conventionally been delivered. We look to roll out this boiler to these customers as a proposal for CO₂ emissions reduction.

Business plan

In line with the trend toward "realizing a carbon-free society by 2050," we are promoting commercialization of this boiler that uses 50% hydrogen in fuel volume ratio. We aim at its early introduction to the market by increasing its added value, including cost reductions and further improvements.

Company profile

Address: 1-9-5 Oyodokita, Kita-ku,
Osaka-shi, Osaka 531-0077, Japan
Representative: Shinichi Hirakawa

Capital: 90 million yen
Established: 1912
TEL: +81-6-6458-8687

<https://www.hirakawag.co.jp/>

Department in charge

Department name: Technical
Development, Shiga office

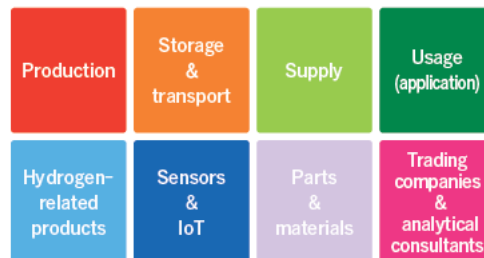
TEL: +81-77-588-2455

E-mail: info@hirakawag.co.jp

HORIBA, Ltd.



Extensive lineup of measurement equipment for hydrogen and fuel cells; Real-time grasp of technology development trends in Japan, the U.S., Europe, and China



HORIBA is a comprehensive manufacturer of analysis and measurement equipment that supports technology development to “make,” “store”, and “use” hydrogen wisely toward realization of a sustainable hydrogen energy-based society. For example, we offer an extensive lineup of analysis and measurement equipment, such as online measurement equipment for process monitoring and impurity monitoring in hydrogen production, material analysis and evaluation equipment for catalysts and electrolyte membranes used in fuel cells, and evaluation equipment that enables performance tests of fuel cells and electrolyzers with a single unit.

Technical and service strengths

With an extensive lineup of high-precision analysis and measurement equipment, we propose optimum equipment that meet customer demands. Our fuel cell/electrolyzer evaluation equipment supports a wide range of outputs from cells to stacks of PEFC (solid-polymer type) and SOFC (solid-oxide type) as standard. In addition, we support improvement in work efficiency with our original software that controls the evaluation equipment and manages measurement data collectively, and also customize various functions that meet customer demands.

HORIBA has positioned its bases in a well-balanced manner around the world, centering on Japan, the U.S., Europe, and China. Taking advantage of this strength, we quickly grasp global trends in technology development related to hydrogen and fuel cells, which differ greatly from region to region, reflect them in our products and service, and offer optimum products and solutions to each region.

Solid-polymer type fuel cell/electrolyzer (PEFC/EC) evaluation equipment

Solid-polymer type fuel cell/electrolyzer evaluation equipment (top) and solid-oxide type fuel cell/electrolyzer evaluation equipment (bottom)

Solid-oxide type fuel cell/electrolyzer (SOFC/EC) evaluation equipment

Introductory examples and achievements

We have delivered various analysis and evaluation equipment mainly related to hydrogen and fuel cells to fuel cell/electrolyzer manufacturers as well as companies across a wide range of fields including automobile-related, electricity & gas-related, hydrogen station & hydrogen storage-related, government-affiliated research institutions, universities, and other entities around the world.

Business plan

In addition to the construction of a new automotive measurement & testing laboratory in China, we will strengthen the production capacity of the increasingly demanded battery & fuel cell evaluation equipment. We look to contribute to realizing a sustainable hydrogen energy-based society by offering new analysis and measurement solutions that meet customer demands.

Company profile

Address: 2 Miyanohigashi-cho, Kisshoin, Minami-ku, Kyoto-shi, Kyoto 601-8510, Japan
Representative: Atsushi Horiba

Capital: 12,011 million yen
*As of December 31, 2019
Established: January 26, 1953
TEL: +81-75-313-8121

<https://www.horiba.com/jpn/>

Department in charge

Department name: Direct Sales Team, Osaka Sales Office
TEL: +81-6-6390-8011

Yamato H2Energy Japan Inc.

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants



Economical hydrogen stations and fuel cell systems;
Established reputation for package-type and small-scale hydrogen stations



Fuel cells characterized by high reliability and low cost

We were established as a core group company for the hydrogen energy-related business of Yamato Sangyo which has a 70-year history and demonstrated record of performance in high-pressure gas equipment. After becoming independent, we gained certification in the Osaka Top Runner Project, and with the support of the Ministry of Economy, Trade and Industry, we are contributing to building a hydrogen-based society by providing economical hydrogen stations and fuel cell systems. Our product lineup includes not only hydrogen stations (package-type, small-scale, and mobile hydrogen stations), but also fuel cell systems for stationary (30W to 10kW), portable, and mobile systems (1 to 125kW).

Technical and service strengths

Taking advantage of the fact that fuel cells can be designed, manufactured, operated, and maintained on a consistent basis, we have realized compact and economic package-type hydrogen stations. As a result, the cost of hydrogen stations has fallen dramatically and delivery times have been shortened due to packaging. In addition, due to the characteristics of compatibility with forklifts manufactured by two major companies, we have received inquiries across a wide range of fields from FC forklift users, FCV (fuel cell vehicle) dealers, road service companies, gas station owners, and other business operators.

We provide systems that meet customer needs (performance, cost, delivery time) based on our many years of experience and demonstrated record of performance. Contact us about our custom-made systems as well.



▲ Package-type hydrogen station



▲ Fuel cell system that can be utilized as an emergency backup power source without excess or deficiency by modularization of the power generation stack

Introductory examples and achievements

Package-type hydrogen stations have been adopted in many factories, such as the Panasonic Kusatsu Farm, and mobile dispensers (small, lightweight hydrogen filling devices) have been adopted by small-scale forklift users, for road services, and for FCV distributors. We offer a demonstrated record of performance in the delivery of our many fuel cell systems characterized by high reliability and low cost as emergency backup power sources for electric power companies, offices, and shelters.

Business plan

We offer package-type hydrogen stations (for FC forklifts, and FCV) and small-scale hydrogen stations at low cost. Fuel cell systems have attracted attention as an emergency BCP (business continuity plan) measure, and we look to expand our sales as stable power sources for regular use, portable power sources or FC for mobile systems in combination with renewable energy.

Company profile

Address: Tenjin Daiichi Bldg. 5F,
4-2-26 Nishinakajima, Yodogawa-ku,
Osaka-shi, Osaka 532-0011, Japan
Representative: Ikuro Hirase

Capital: 6 million yen
(capital increasing)
Established: 2014
TEL: +81-6-7656-1825

<http://www.yh2ej.co.jp>

Department in charge

Department name: Technical
Department
Contact persons: Murakami, Onodera,
Hirase
TEL: +81-6-7656-1825
E-mail: welcome@yh2ej.com

Renaissance Energy Research Corporation



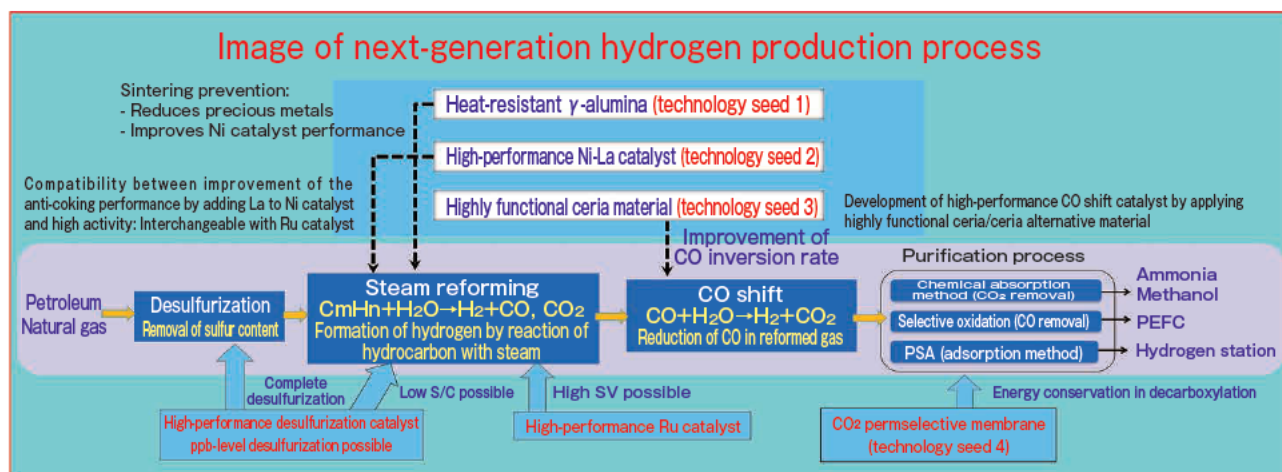
Advanced catalyst technology and membrane separation technology that promote clean and efficient energy use;
Achieves superior performance in terms of both separation performance and speed as a CO₂ separation membrane



The company was established in 2004 for the purpose of expanding the business of catalyst-related technology cultivated by the founder Osamu Okada while he had been employed at Osaka Gas. By utilizing granted production, distribution, and licensing rights under relevant patents by Osaka Gas, we target markets that would prove difficult to enter for a gas company. Currently, in addition to distribution of various catalysts for hydrogen production to domestic and overseas chemical and petroleum companies, we are also developing applications of CO₂ selective permeation membranes originally developed in cooperation with Kobe University to CO₂ separation and capture technology.

Technical and service strengths

The fuel-cell reforming system the founder had developed led to success in the development of an ultrahigh-order desulfurization catalyst, enabling 0.1ppb-level desulfurization for the first time in the world, and a high-performance Ru-based reforming catalyst. This greatly contributed to the commercialization of phosphoric acid fuel cells. These now function as the base of various catalysts used in the reforming systems of growing residential fuel cells (ENE-FARM) in which solid polymer fuel cells are adopted. In addition, as a participant in the Japan Science and Technology Agency (JST) program with Hachinohe College and other institutions, we succeeded in developing a high-performance Ni catalyst using heat-resistant γ -alumina as an alternative to Ru, which has significant resource constraints for the purpose of application for next-generation high-efficiency hydrogen stations. Furthermore, our CO₂ membrane separation method, which is an essential energy-saving process, enabling compactification and cost reduction, greatly contributes to improving the economic efficiency of hydrogen production processes.



Introductory examples and achievements

Various catalysts for hydrogen production have been demonstrated in our record of performance in production and distribution as well as licensing of catalysts and process technologies to many domestic and overseas chemical and petroleum companies, etc.

Business plan

The adoption of the CO₂ membrane separation method enables efficiency improvement, compactification, and cost reduction of hydrogen stations, which currently still face obstacles. In the future, by taking advantage of the characteristics of the CO₂ membrane separation method, we will continue to proceed with the development of applications for various fields, including biogas, DAC (direct air capture), and space, and beyond.

Company profile

Address: ACT Kyoto No. 102, 105
Jibu-cho, Fushimi-ku, Kyoto-shi,
Kyoto 612-8374, Japan
Representative: Osamu Okada

Capital: 340.25 million yen
Established: 2004
TEL: +81-75-634-9817

<http://www.r-energy.com>

Department in charge

Department name: Kyoto Development
Center
TEL: +81-75-634-9817
E-mail: nakato@r-energy.com

NEW COSMOS ELECTRIC CO., LTD.



Enabling hydrogen detection according to application from low concentration to high concentration;
More than 80% market share of hydrogen stations

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants



As a gas alarm manufacturer, we are rolling out hydrogen detection and alarm systems for hydrogen stations, hydrogen leak testing detectors for piping, etc., and hydrogen flame detectors that comply with explosion-proof requirements using our original gas detection technology. All contribute to the security of hydrogen stations. In addition, vehicle-mounted hydrogen detectors are adopted in new-model FCVs (fuel cell vehicle).

As a result of our original catalyst technology, achieving both high responsivity and high durability, and with mass-production technology that has been cultivated over many years in the production of home-use gas alarms, we have realized a stable supply of gas sensors.

Technical and service strengths

Various types of originally developed hydrogen sensors, such as hydrogen selectivity/high-sensitivity hot-wire semiconductor type gas sensors, power-saving contact combustion type hydrogen sensors, and high-durability thermal conduction type gas sensors, support detection of trace amounts to 100% of hydrogen according to application. In addition, hydrogen flame detection can be performed with both ultraviolet and infrared rays. We market detectors that distinguish only flames by changing the algorithm and reduce false alarms.



▲ Gas detector for hydrogen station



▲ Explosion-proof UV/IR flame detector

Introductory examples and achievements

Hydrogen alarm systems are adopted in more than 80% of hydrogen stations across Japan. In addition, we supply vehicle-mounted hydrogen detectors to new-model FCVs. Portable gas detectors are used for daily maintenance and inspection.

Business plan

We are developing sensors that detect trace amounts of hydrogen in vacuum in collaboration with the Japan Aerospace Exploration Agency (JAXA). We look to continue to develop products that contribute to safe use of hydrogen in all environments from earth to space.

Company profile

Address: 2-5-4 Mitsuyanaka,
Yodogawa-ku, Osaka-shi,
Osaka 532-0036, Japan
Representative: Yoshinori Takahashi

Capital: 1.46 billion yen
Established: June 15,
1960
TEL: +81-6-6308-3112

<https://www.new-cosmos.co.jp/>

Department in charge

Department name: Industry Sales
Division

TEL: +81-6-6308-2111

E-mail: Make inquiries from our website.

Nanogray Inc.

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants



Measures basis weight (thickness), level, etc., in perfect non-contact; Radiation application measuring instruments that do not require qualifications / controlled area settings



We are a manufacturer of various measuring instruments [basis weight (thickness) gauges, level gauges, and density meters] using weak radiation. Since we are design-certified by the Nuclear Regulation Authority, our instruments can be used without qualifications or a controlled area setting. In addition, due to the use of our unique high-sensitivity detector, (radiation), safety and high accuracy are compatible. Taking advantage of the feature of perfect non-contact, many of these instruments are used to measure points that are typically difficult to measure by other measurement methods or hard-to-measure objects. These instruments are used for chemical, electronic, automotive, power plant, paper-making, and other diverse applications.

Technical and service strengths

We provide online basis weight gauges for Tow Prepreg Rc (resin content) measuring equipment for vehicle-mounted high-pressure tanks, etc. Our X-ray basis weight gauges offer a unique measurement method, with the features such as high safety, compact shape, and no need for water cooling. We also provide weight gauges that control online the amount of catalyst coating, such as Pt, in the process of manufacturing CCM, which is an important component of MEA for fuel cells. X-ray weight gauges also offer a unique measurement method, offering the same features as mentioned above. And, during hydrogen production, which often takes place in high-temperature (high-pressure) processes, our gamma-ray level gauges and density meters are used to measure levels and densities in tanks. Another point of strength is that they can be used without qualifications or controlled area settings.



▲ Gamma-ray level gauge



▲ Basis weight meter for Tow Prepreg Rc measuring equipment

Introductory examples and achievements

The use of gamma-ray level gauges and density meters offers a demonstrated record of performance in hydrogen production processes (biomass, etc.), and the use of MEA catalyst coating gauges (X-ray weight gauges) also offers a demonstrated record of performance in MEA (CCM) production lines for fuel cells. The adoption of basis weight gauges for Tow Prepreg Rc measuring equipment offers a demonstrated record of performance in vehicle-mounted hydrogen tank production lines.

Business plan

On the basis weight gauges for Tow Prepreg Rc measuring equipment, problems in actual production lines are extracted, and improvements are redoubled to make the measuring equipment easier to use. We look to expand our product lineup of gamma-ray level gauges and density meters in order to expand the scope of application.

Company profile

Address: 1-11-16 Senbahigashi,
Minoh-shi, Osaka 562-0035, Japan
Representative: Hiraku Miyashita

Capital: 10 million yen
Established: 2006
TEL: +81-72-726-4000

Department in charge

Department name: Sales Department
TEL: +81-72-726-4000
E-mail: Info@nanogray.co.jp

<http://www.nanogray.co.jp/>

Nissha FIS, Inc.



From installation in the world's first fuel cell vehicle to worldwide adoption; We offer a demonstrated record of performance and a feeling of confidence as a top brand

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants



Nissha FIS is a group of experts in development and production of gas sensors. Since our founding in 1992, with the mission of "providing comfort and safety in people's lives," we have engaged in the development of gas sensors in pursuit of high sensitivity, durability, and reliability, as well as low electric power, and applied equipment using sensors, as well as the development of effective software that ensures optimum use of them. We provide comfortable and safe environments that are indispensable to people's lives.

Technical and service strengths

Prompt detection and notification of leaks from hydrogen-fueled mobility in fuel cell vehicles (FCV) and stationary fuel cells. Extensive applications can be realized by high-speed startup (1 second or less), high-speed response (2 seconds or less), high hydrogen selectivity, long life (10 years or equivalent), environmental resistance, and compact size. We offer not only hydrogen detectors but also other products consistent with market needs, from sensors and sensor modules to finished products, in the form that meets your demands. We also provide solutions for wireless sensor networks, etc. We offer a demonstrated record of performance with installation in the world's first mass-produced hydrogen-fuel cell vehicle and worldwide adoption, and have established an unwavering position as a top brand.



▲ Detection of hydrogen leaks from hydrogen-fuel cell vehicles, etc.



▲ Detection of hydrogen leaks from stationary fuel cell systems, etc.

Introductory examples and achievements

Widely used worldwide in hydrogen-fuel cell vehicles including passenger cars, buses, trucks, and other vehicles, hydrogen fuel cell forklifts, stationary fuel cells, and household fuel cell cogeneration systems, etc.

Business plan

While engaged in miniaturization and electric power reduction, we continue to strengthen solutions for wireless sensor networks, etc. We aim at adoption across a wide-range of fields including hydrogen stations, underground pipelines, and hydrogen fuel as a back-up power source.

Company profile

Address: 2-4-28 Tagawa, Yodogawa-ku, Osaka-shi, Osaka 532-0027, Japan
Representative: Takao Hashimoto

Capital: 320.2 million yen
Established: November 20, 1992
TEL: +81-6-7176-3910

<http://www.fisinc.co.jp>

Department in charge

Department name: Sales Department
TEL: +81-6-7176-3911
E-mail: info@fisinc.co.jp

Murakami Giken Co., Ltd.

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants



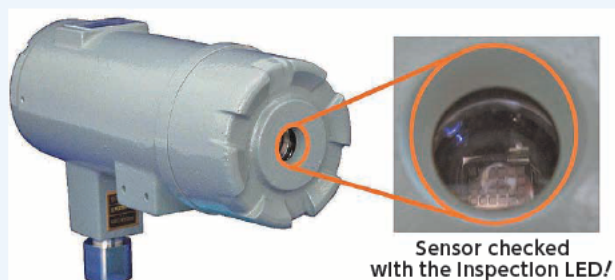
**Original only one sensor device;
Disaster-prevention and security sensors for hydrogen-related facilities**



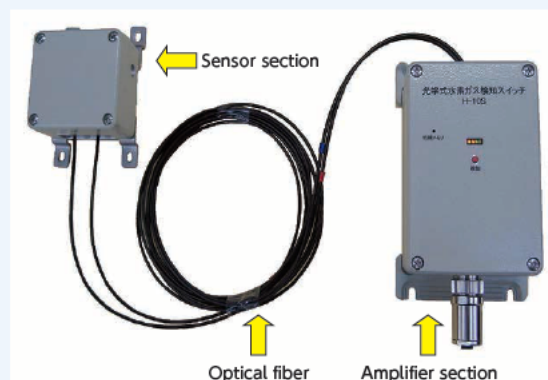
Since our founding, giving priority to “advancing technology, pioneering ideas,” we have been engaged in the development of mechanically and electrically integrated equipment, and have provided society with highly reliable sensors and electronic devices. This has earned us a great deal of credibility. In May 1979, our company was established by changing the company name to the name that stands today. With an enterprising spirit since our establishment, we have overcome many hurdles and honed our technological capabilities in order to face the age of globalization. In the FA field, measurement field, and security field, we offer original only one products, with the aim of making greater leaps forward.

Technical and service strengths

Explosion-proof flame detectors can immediately detect hydrogen flames that are hardly visible to the naked eye. The detection mechanism is based on ultraviolet rays emitted together with the flame, which is characterized by high sensitivity and not easily affected by sunlight, etc., using our original signal analysis technique. This ultraviolet hydrogen flame detection has been patented. In addition, optical hydrogen gas detection switches detect hydrogen gas when the sensor element (alloy thin film) changes in color due to a reaction with hydrogen gas (patented). Since no electric current is passed through the sensor element directly, it is extremely safe in terms of disaster prevention. In addition, hydrogen gas in oxygen-free environments and hydrogen gas in airflow form can be detected, which has also been patented.



▲ Explosion-proof flame detector (with self-diagnostic function, model: BFL-3WW-T)



▲ Optical hydrogen gas detection switch (model: H-10S)

Introductory examples and achievements

Many explosion-proof flame detectors have been adopted as safety facilities to monitor hydrogen flames in dispensers, accumulators, etc., for hydrogen stations as well as other flames. This has been patented as a sensor for hydrogen storage, FCV parking, hydrogen piping, vessels carrying hydrogen and FCV, etc.

Business plan

Our products are not limited to hydrogen station sensors, but will be adopted and deployed as safety devices from hydrogen production to transportation and storage. We also look to proceed with the development of sensors that are compatible with use in the marine field on the assumption of use of hydrogen at sea in addition to on land.

Company profile

Address: 3-9-55 Ikegami-cho,
Izumi-shi, Osaka 594-0083, Japan
Representative: Isao Murakami

Capital: 10 million yen
Established: 1979
TEL: +81-725-45-0321

<https://www.murakamigiken.co.jp/>

Department in charge

Department name: Sales/Technology
Department
TEL: +81-725-45-0321
E-mail: murakami@murakamigiken.co.jp

Osaka Rasenkan Kogyo Co., Ltd.

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants



Pioneer of ultrahigh-pressure and ultralow-temperature metallic flexible hoses;
Ultrahigh-pressure spec with a high rate of utilization as filling hoses



Since our founding in 1912, as a specialized manufacturer of flexible hoses and bellows, we have grown not only with the advancement of Japan but also with the advancement of the world and continue to manufacture superior products.

We contribute to society by creating products that are closely related to every aspect of life and industry: key industries, such as steel, shipbuilding, petrochemical, gas, water, and electricity; high-tech industries, such as hydrogen-related, solar power, and other energy alternatives, as well as semiconductor manufacturing equipment, superconductivity, ultralow temperature, nuclear power, and space development; industries that protect human life, including medical equipment and disaster prevention.

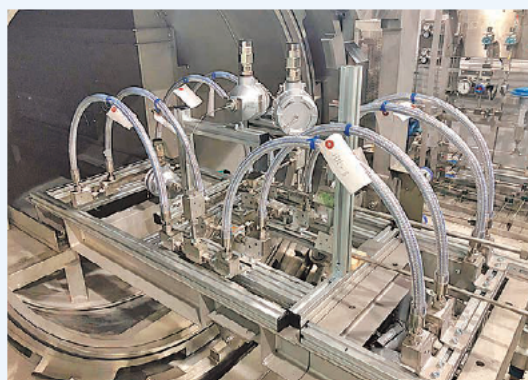
Technical and service strengths

We provide 50MPa/90MPa ultrahigh pressure spec metallic flexible hoses for hydrogen station facilities and for various test stations of vehicle-mounted tanks, etc.

In addition to the features of zero hydrogen permeation and high flexibility under high pressure, our hoses support precooling and comply with the High Pressure Gas Safety Act. In addition, since SUS316 and SUS316L (Ni equivalent of 28.5 or more) are used for gas contact parts, they are used as filling hoses of hydrogen filling facilities and filling hoses of vehicle-mounted tank leak test facilities.



▲ Flexural state of flexible hose



▲ Hydrogen impulse test (durability test at Iwatani R&D Center)

Introductory examples and achievements

We offer a demonstrated record of performance in the adoption of ultrahigh pressure spec metallic flexible hoses as filling hoses of hydrogen filling facilities and filling hoses of vehicle-mounted tank leak test facilities.

Business plan

We aim at the adoption of ultrahigh pressure spec metallic flexible hoses as hoses to refuel FCVs (fuel cell vehicle) at commercial hydrogen stations. In addition, we look to increase the pressure to 99MPa, increase the size, and reduce the weight.

Company profile

Address: 3-12-33 Himesato,
Nishiyodogawa-ku, Osaka-shi,
Osaka 555-0025, Japan
Representative: Seiji Koizumi

<https://www.ork.co.jp>

Capital: 80 million yen
Established: December
1937 (Founded March 1912)
TEL: +81-6-6473-6151

Department in charge

Department name: Engineering
Department, Head Office
TEL: +81-6-6473-6151
E-mail: orkhq1@ork.co.jp

Shinko Seiki Co., Ltd.



Manipulating film formation, plasma, and heat based on vacuum technology;
Vacuum professionals work together to solve problems

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants



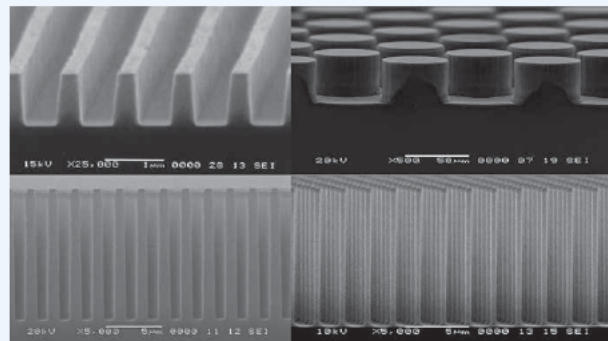
We are engaged in the development, design, and production of equipment for film forming, plasma processing, heat treatment under vacuum, including various components, such as vacuum pumps, vacuum valves, and vacuum gauges. For more than 70 years since our founding, we have been involved in vacuum technology, contributing to social and industrial manufacturing process innovations with cutting-edge technology based on trust. We are known as a development-oriented company that connects new functions. We contribute to society by "making No. 1 products" as a general vacuum technology company.

Technical and service strengths

We propose optimum vacuum exhaust systems according to various applications and purposes as well as usage environments, such as drying and filling pearlite in step with vacuum insulation. We work to solve problems with our unique technology that combines surface treatment and heat treatment in order to suppress gas emission and develop materials. In addition to extending the service life of parts by developing materials that can withstand embrittlement under hydrogen environments and surface treatment applications such as film forming, plasma processing, and heat treatment to driving parts, we have also established a valued reputation for making proposals that can contribute to energy saving by reducing friction coefficients.



▲ Application examples of DLC and other hard films for various parts



▲ Application examples of various types of surface microfabrication

Introductory examples and achievements

- Our DLC films has been adopted for driving and sliding parts of H2 high-pressure valves.
- Our vacuum pump, which is one of the largest class in Japan, was used to construct a liquefied hydrogen plant on Kobe Airport Island.

Business plan

In addition to the deployment of already-proven various technologies, we look to solve problems by making excellent use of various surface treatment technologies with the aim of applying vacuum technology under extremely low temperature (liquefied hydrogen) environments and improving tribological characteristics and the service life of parts.

Company profile

Address: 3-1-35 Takatsukadai,
Nishi-ku, Kobe-shi,
Hyogo 651-2271, Japan
Representative: Tadashi Mashimo

<http://www.shinko-seiki.com>

Capital: 375 million yen
Established: 1949
TEL: +81-78-991-3011

Department in charge

Department name: Sales Department,
Equipment Division

TEL: +81-78-332-3400

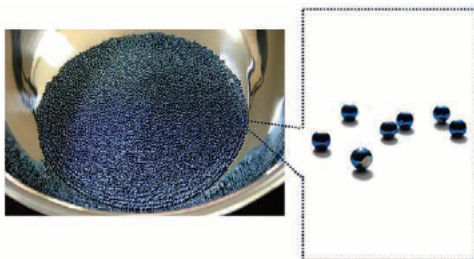
E-mail: a-nisimura@shinko-seiki.com

Sphelar Power Corporation

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants



Generation of water-electrolysis hydrogen and oxygen by natural energy; Realization of a water-electrolysis hydrogen generation system that does not require the use of fossil fuels



Sphelar is a solar cell that enables the world's first three-dimensional light receiving because the entire light-receiving surface is spherical. We offer various modules from ultra-small to large, and from transparent to three-dimensional by configuring cell arrays with use of microscopic spherical cells with a diameter of 1 to 2mm. By integrally incorporating freely shapeable modules, we can provide unique high-value-added and highly functional products. Sphelar can be widely applied from ultra-small power generation modules to large built-in construction materials, contributing to the utilization of renewable energy.

Technical and service strengths

With a structure in which 3 series or 4 series skewed dumpling-shaped modules are sealed with transparent resin using Sphelar cells which are spherical solar cells, electrodes can be provided at both ends. When this module is immersed in an electrolyte at a prescribed concentration and subjected to light, hydrogen is generated from the cathode side and oxygen is generated from the anode side, respectively. It is a self-contained solar water-electrolysis device requiring no external solar cell, control circuit or dedicated electrolytic cell. Water electrolysis can be achieved with a Sphelar module, electrolytic cell, and sunlight. In addition, when a large amount of generated gas is required, it is only necessary to increase the number of modules, which makes a scalable installation possible. A 3 series module can obtain 7.4% STH (Solar To Hydrogen) (published in Nature in April 2016). In the future, we aim at STH exceeding 10% by optimizing the module layout, matching with the electrolytic cell, and optimizing the electrode material.

Self-contained solar water-splitting device

Cathode: $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$

Anode: $4\text{OH}^- \rightarrow 2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}^-$

Transparent resin

3PVs →

← 4PVs

Φ : 3.2mm

▲Water electrolysis by Sphelar module (generation of hydrogen and oxygen)

▲Efficiency improvement in Sphelar module (downsizing, joint research with the University of Tokyo)

Introductory examples and achievements

Since water electrolysis using the Sphelar module is structurally simple, scalable installation can be performed depending on the application. In addition, maintenance is relatively easy. Due to these characteristics, we aim for hydrogen production suitable for local production and local consumption, in place of ultra-large-scale water electrolysis.

Business plan

We look to improve the Sphelar module and dedicated electrolytic cell, aiming for an STH value of 10%, and seek partner companies that can handle generated hydrogen and partner companies that can support technological development and commercialization.

Company profile

Address: Room No. 310, KRP Building
No. 6, 93 Chudoji Awata-cho,
Shimogyo-ku, Kyoto-shi,
Kyoto 600-8815, Japan
Representative: Soichiro Imoto

Capital: 99,077 million yen
Established: May 17, 2012
TEL: +81-75-874-1474

<http://sphelpower.com/>

Department in charge

Department name: President
TEL: +81-75-874-1474
E-mail: s.imoto@sphelpower.com

Takaishi Industry Co., Ltd.

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants



We offer a demonstrated record of performance in adoption for hydrogen stations in domestic and overseas;
Rubber O-rings with unprecedented hydrogen-resistant sealing performance



We are an industrial rubber packing manufacturer that specializes in and excels at precision rubber packings, O-rings, etc., for water faucet devices, gas devices, air pumps, and more, and have many years of experience partnering with major manufacturers in the industry. From kneading of rubber materials, molding, and finishing to inspections performed consistently in our factories, we meet customer demands by responding flexibly to not only mass-produced products but also prototypes. We are also committed to research and development, and recently, we have developed hydrogen station-specific rubber material that withstands high-pressure hydrogen. This has been adopted for hydrogen refueling stations for domestic and overseas.

Technical and service strengths

In 2014, we developed unprecedented rubber sealing material for high-pressure hydrogen. The O-ring using this material was adopted for breakaway devices for hydrogen refueling stations. This O-ring boasts of high performance that can withstand -40°C and 70MPa conditions, and overturns the conventional wisdom that “only a metal seal can withstand 70MPa high-pressure hydrogen.” With such a level of performance, it is highly regarded internationally. We have also developed rubber that can withstand 150°C and 70MPa conditions for hydrogen compressors, and this product has also been adopted for compressors for hydrogen refueling stations. For these O-rings, we use our uniquely designed compound.



▲ O-rings that can withstand high-pressure hydrogen at -40°C and 70MPa



▲ Realizes high-pressure hydrogen sealing by our uniquely designed compound

Introductory examples and achievements

Today, O-rings for hydrogen that can withstand -40°C are adopted for many devices for hydrogen refueling stations, such as breakaway devices and dispensers. Also, for hydrogen compressors, FKM O-rings that can be used at up to 150°C have been adopted.

Business plan

To further advance quality improvement, we continuously collect experimental data from cycle tests under high pressure hydrogen, in cooperation with various hydrogen device manufacturers and academia. Looking ahead, we will actively contact overseas companies with an eye toward future market growth not only domestically but overseas as well.

Company profile

Address: 3-18 Arujihara-cho,
 Ibaraki-shi, Osaka 567-0897, Japan
 Representative: Hideyuki Takaishi

Capital: 10 million yen
 Established: 1948
 TEL: +81-72-632-3365

<https://takaishi-ind.co.jp/>

Department in charge

Department name: Marketing
 Department

TEL: +81-72-632-3365

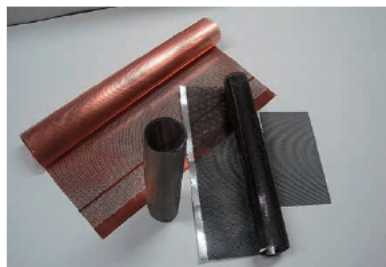
E-mail: inquiry@takaishi-ind.co.jp

Nikken Lath Kogyo Co., Ltd.



Production and distribution of precision expanded metals and perforated metals;
In-house design and development of dies to quickly respond to the speed of customer development

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants

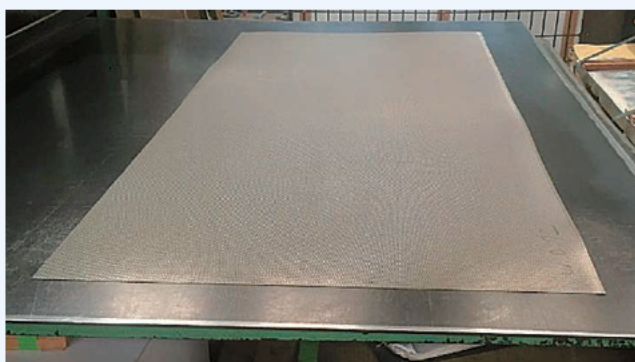


We are engaged in the production and distribution of various mesh products, focusing on precision expanded metals and perforated metals, and offer a demonstrated record of delivery performance to a wide range of industries, including light electric appliance, automobile, and plant manufacturers. In addition, we offer a demonstrated record of performance in equipment and materials for secondary cell and primary cell electrodes, various energy-related electrode members, and filters. We specialize in the processing of foil materials of 100 μ m or less, and offer a demonstrated record of performance in the mass production processing of various materials, including iron, stainless steel, nickel, titanium, copper, aluminum, inconel, PVC, and various resins. Currently, we are working on materials with higher levels of difficulty, and one of our characteristics is that we design and fabricate dies for processing these materials in-house.

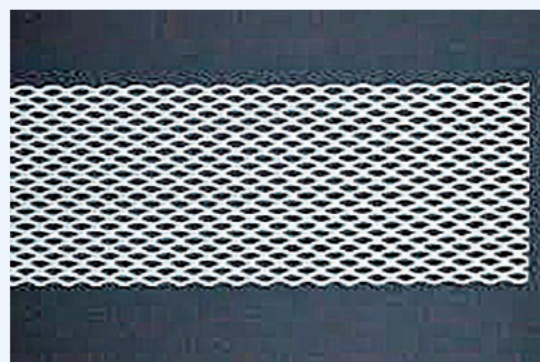
Technical and service strengths

As electrode substrates (current collectors, feeders, etc.) used for hydrogen production equipment and fuel cells, we offer lath substrates (precision expanded metals) and perforated metals using titanium and nickel as materials. One of our strengths is that we can handle electrode substrates of various sizes tailored to small, medium, and large-size hydrogen production equipment. While high flatness is required for electrode substrates, this requirement is met by our technical know-how cultivated for more than 50 years in mass production processing of electrode members.

In addition, our substrates can be surface-treated, such as plating in collaboration with partner companies. Specifically, we offer plating with nickel, tin, copper, silver, etc.



▲ Titanium lath substrate for hydrogen production equipment electrode (large size)



▲ Titanium lath substrate for hydrogen production equipment electrode (small size, Pt-plated surface)

Introductory examples and achievements

We have started supplying titanium lath substrates as electrode substrates to some hydrogen production equipment manufacturers. In addition to existing mass-produced products, we are jointly working on next-generation development projects.

Business plan

The scale of electrode substrates used in the hydrogen fuel cell market is extremely large from a worldwide perspective. We look to meet wide-ranging market needs by focusing our efforts on market development and technological development.

Company profile

Address: 2-10-2 Hashirii,
Toyonaka-shi, Osaka 561-0891,
Japan

Representative: Tadataka Fukushima

Capital: 13 million yen
Established: 1924
TEL: +81-6-6843-6133

<http://www.nikken-lath.co.jp/>

Department in charge

Department name: Yoshinori Ota,
Deputy Director General, Sales
Department

TEL: +81-6-6843-6133

E-mail: ota@nikken-lath.co.jp

Nippon Shokubai Co., Ltd.

Production	Storage & transport	Supply	Usage (application)
Hydrogen-related products	Sensors & IoT	Parts & materials	Trading companies & analytical consultants




Offers water-electrolysis materials with excellent gas barrier properties and ion conductivity;
Original organic-inorganic composite technology that supports flexible material design



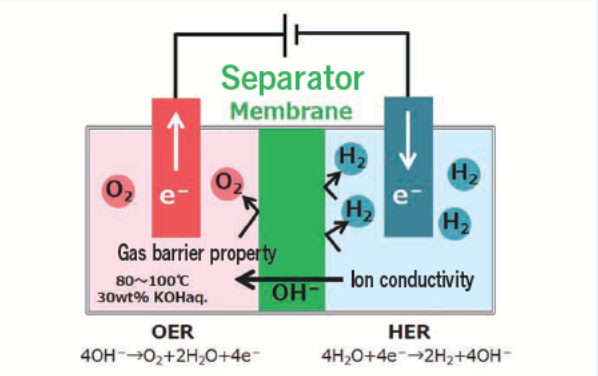
Nippon Shokubai is a company that manufactures and markets a wide range of chemical products around the globe by taking advantage of organic synthesis technology and polymer synthesis technology based on our original catalyst technology. In energy-related fields, we are rolling out electrolyte sheets for SOFC (solid-oxide fuel cells), electrolyte "LiFSI" (IONEL) for lithium-ion cells, and other products. Recently, we have devoted our energies to expanding business in energy-related fields, and developed a separator for alkaline water electrolysis, which is a key material in green hydrogen production.

Technical and service strengths

Nippon Shokubai's separator for alkaline water electrolysis offers excellent gas barrier properties and ion conductivity, and is a dry type that is easy to handle. Expected advantages by using this separator are improvements in hydrogen production per unit of electric power and higher purity in the generated hydrogen. We have original organic-inorganic composite technology and sheet forming technology, so that a wide range of customer demands can be met by flexible material design and physical property control. In addition, based on the assumption of potential customer applications to actual equipment, we have introduced a large pilot facility. This enables us to offer up to 1.2m-wide separators for alkaline water electrolysis. With bases in Europe and the U.S., we look to strengthen support for our customers for global expansion.



▲ Separator for alkaline water electrolysis (1.2m-wide roll)



▲ Schematic diagram of alkaline water electrolysis

Introductory examples and achievements

Now in the development stage, we are conducting sample work with domestic and overseas alkaline water electrolysis-related manufacturers, from whom we have received positive feedback. We look to continue to incorporate improvements with the aim of meeting further customer demands.

Business plan

Since there is a limitation on practical separators for alkaline water electrolysis, there are high expectations from potential customers. With the early commercialization of this separator, we look to support the dissemination of green hydrogen, and contribute to reducing CO₂ emissions.

Company profile

Address: (Osaka Office)
Kogin Bldg., 4-1-1 Koraibashi,
Chuo-ku, Osaka-shi, Osaka 541-
0043, Japan
Representative: Yujiro Goto

Capital: 25 billion yen
(as of the end of March 2020)
Established: 1941
TEL: (Osaka Office)
+81-6-6223-9111

<https://www.shokubai.co.jp/>

Department in charge

Department name: New Business
Planning Department
TEL: +81-6-6317-2285
E-mail: shokubai@n.shokubai.co.jp

Maruhachi Corporation



Strengths in integrated production, including design, manufacturing, cycle & burst tests, and evaluations;
We are developing Japan's first Type 4 large-bore, long 1600L transportation container



We were founded and started marketing of textile machinery and parts in 1936. After that, in 1975, we advanced into the circular knitting industry, and grew into a top-class knitter (currently Fukui Textile) in the Hokuriku area. In 1999, we introduced carbon fiber spread fabric technology from Fukui Prefecture, and took the opportunity to branch out into the advanced composite material field. Receiving a subsidy from the Ministry of Economy, Trade and Industry as well as the New Energy and Industrial Technology Development Organization (NEDO) and other support, we established a mass production system for thermoplastic and thermoset prepregs, and continue to work on the development of an automated robotic laminate-molding system using thermoplastic CFRP tape. In addition, we are developing high-pressure containers for transportation of hydrogen through joint research with the Japan Atomic Energy Agency (JAEA).

Technical and service strengths

In 2000, we jointly developed a sodium metal fire extinguisher with JAEA, and made inroads into the area of high-pressure containers. In 2003, we obtained KHK certification for Type 3 small oxygen containers. After that, we started development of Type 4 pressure containers jointly with Osaka University, and received an award in the high-pressure container category at the world's largest exhibition dedicated to advanced composite materials "JEC World 2014." Our high-pressure container technology has been recognized internationally. For the past few years, we have been engaged in research and development of Japan's first large-bore, long, large-capacity 1600L container for transportation of high-pressure hydrogen. Through the Strategic Core Technology Advancement Program (Supporting Industry Program) and NEDO project, we have established core technology for a burst pressure of 175MPa and a pressure cycle of 20,000 times, and now, we are aiming to acquire special approval certification for 1600L-class containers from the High Pressure Gas Safety Institute of Japan (KHK) with an eye toward regulatory requirements concerning Type 4 containers. We continue to tackle the development of a system that can transport three to four times the volume of existing steel container trailers.

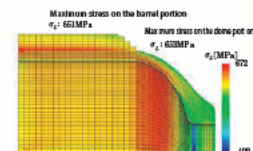


▲ Awards ceremony at the world's largest exhibition dedicated to advanced composite materials "JEC World 2014"

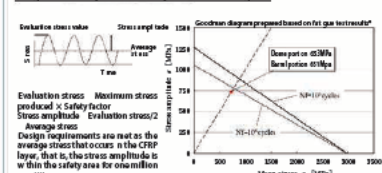
◆ Design of CFRP Type 4 composite accumulator container by the finite element method and fatigue reliability evaluation

Stress evaluation by the finite element method

Stress in the fiber direction at gas filling time [MPa]



Fatigue reliability evaluation by a Goodman diagram



*Technology Development for Hydrogen Production, Transport and Storage Systems etc. "Research and Development Related to Establishment of Standards for Hydrogen Infrastructure etc." in FY2012 NEDO Report (reference No. 2013000000467)

◆ Conclusion

- Establishment of technology to manufacture long resin liner by fusion
- Establishment of stress analysis technology by the finite element method, and fatigue reliability evaluation technology by a Goodman diagram

▲ Simulation of design analysis of high-pressure container

Introductory examples and achievements

We offer a demonstrated record of delivery performance for prototypes to research institutions and automobile manufacturers, etc. With top-class technology for Type 4 containers, we are expanding our business, aiming for their adoption into new products and development of new markets.

Business plan

Taking advantage of the ultra-lightweight, high-strength, long-life, and low-cost of Type 4 containers, we look to develop large pressure containers for buses, trucks, ships, and trains, etc., by 2025. In addition, we continue to tackle the development of applications for Type 4 containers with an eye toward the advent of a hydrogen-based society.

Company profile

Address: 12-1 Gennyō, Maruoka-cho, Sakai-shi, Fukui 910-0276, Japan
Representative: Toshihide Sugahara

Capital: 80 million yen
Established: 1968 (founded in 1936)
TEL: +81-776-67-0808

<http://www.maruhachi.co.jp>

Department in charge

Department name: High-Pressure Container Division

TEL: +81-776-67-0808

E-mail: m.sugahara@maruhachi.co.jp

Yamashin Steel Co., Ltd.



Supports small lots and short delivery times for stainless steel for high-pressure hydrogen;
Supplies high-strength spec by drawing (secondary processing)



We are a manufacturer of cold drawn finished steel bars. With the technology for drawing difficult-to-machine materials based on our technology and know-how cultivated over many years, we can supply products that require a high degree of straightness and accuracy. In addition, we offer the advantage of being able to respond to various shapes, including round bars, hexagonal bars, and flat bars, and manufacture them in a wide range of dimensions.

Regarding stainless steel for high-pressure hydrogen, in cooperation with Aichi Steel, we have built a supply system for two types: JIS G 4303 "stainless steel bars" and JIS G 4318 "cold finish stainless steel bars (high-strength spec)," which are used for hydrogen station-related facilities and FCVs, etc.

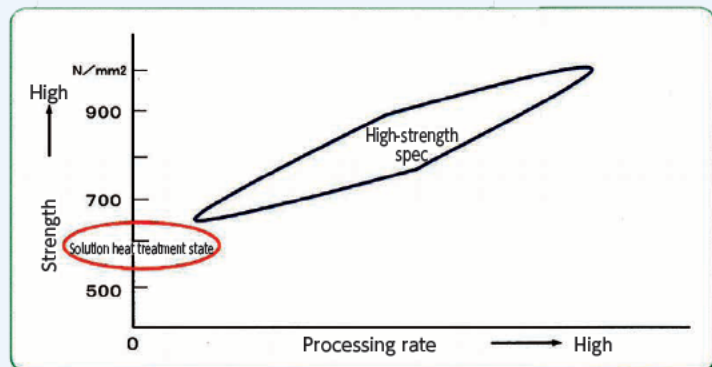
Technical and service strengths

Since 2013, we have stocked and held materials that are permitted for use under high-pressure hydrogen environments (SUS316/SUS316L, Ni equivalent) based on the Regulation on Safety of General High Pressure Gas, and market them to various customers. As material, Aichi Steel-manufactured AUS316L-H2 is used. In cooperation with Aichi Steel on the manufacturing side, delivery time, and quality, we offer an advantage of being able to supply products that meet customer demands.

We are engaged in secondary processing (drawing), and we can supply high-strength spec by cold drawing. By drawing to optimum dimensions and shapes, we contribute to total cost reduction, including function and processing of members.



▲ Supply of stainless steel for high-pressure hydrogen in diverse uses



▲ Image of high strength by drawing

Introductory examples and achievements

We supply materials to manufacturers of compressors, valves, dispensers and other hydrogen station-related facilities as well as parts. In addition, our high-strength spec stainless steel has been adopted for FCVs.

Business plan

We will strengthen our supply system so that we can contribute to the realization of a hydrogen-based society in terms of materials. In addition, we look to propose materials that meet various customer demands, including adjustment of mechanical properties, by responding to manufacturing of new shapes and dimensions, and secondary processing.

Company profile

Address: 1-19-5 Uemachi, Chuo-ku, Osaka-shi, Osaka 540-0005, Japan
Representative: Eiji Yamauchi

Capital: 90 million yen
Established: 1939
TEL: +81-6-6763-1395

<http://www.yamco-yamashin.com/>

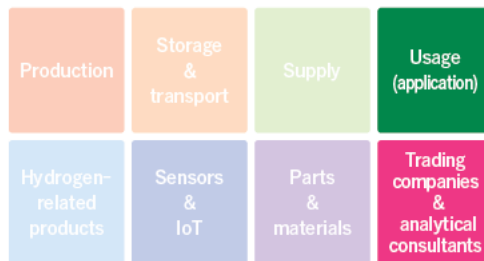
Department in charge

Department name: Yusuke Ueno,
Sales Department
TEL: +81-6-6763-1395
E-mail: y-ueno@yamaco.co.jp

KRI, Inc.



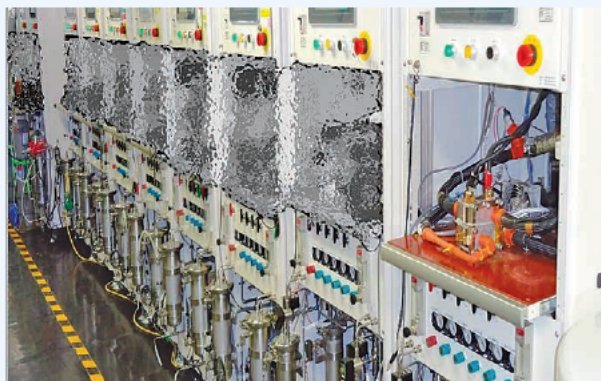
Comprehensive support for technology development, analysis, evaluation testing, and simulations;
Contributing to innovation in hydrogen-related fields



As an affiliated company of Osaka Gas, we have conducted environment and energy-related catalyst evaluations, fuel cell and storage battery evaluations, chemical process development, bench facility development, evaluations/basic design/analyses/troubleshooting related to the development of anticorrosion and corrosion technologies, various processes and devices. We also excel at research, data analysis, and simulations. Experts in their respective fields work together to solve problems in support of realizing a hydrogen-based society.

Technical and service strengths

With many years of accumulated experience and technological achievements in the energy, environment, and chemical process fields, we conduct application research on hydrogen, technology research (including patents), research and development of hydrogen-related technology (fuel cells, hydrogen generation, hydrogen separation membranes, hydrogen storage, etc.), basic process designs and feasibility studies (FS) of hydrogen-related facilities to fabrication of bench experiment facilities. As examples, we manufacture conceptual designs of chemical heat pumps using the heat of hydrogen absorption and desorption, and fabricate experimental equipment. We can also perform simulations of hydrogen-related systems, and degradation analysis of metals, plastics, and elastomers, etc., from hydrogen, and provide support for various types of hydrogen-related development in a comprehensive manner.



▲ Fuel cell evaluation testing facilities



▲ Thermal analysis equipment that enables testing with various gases

Introductory examples and achievements

- Research and feasibility studies: Research on fuel cells, hydrogen generation, applications of hydrogen, and market; feasibility studies of hydrogen stations, etc.
- Research and development: Support for development and evaluation of fuel cells (cell stacking systems), development of hydrogen generating equipment, development of organic hydride processes, development of hydrogen storage materials, etc.
- Simulations: BEMS and process simulations, etc.
- Analysis: Analysis of various component members of fuel cells, degradation analysis and evaluations of materials by hydrogen
- Data analysis: Analysis of degradation data, measurements related to equipment interconnection, fault predictions of related equipment, etc.

Business plan

We look to conduct hydrogen-related investigations, research and development, test evaluations, and feasibility studies. Since we have the facilities and equipment that can feed hydrogen and various other gases (steam, ammonia, etc.) and thermal analysis equipment, we can test the reaction behavior of hydrogen. In addition, we can conduct degradation evaluations to maintain fuel cells and hydrogen facilities, and it is our intention to proceed with the above-mentioned commitments by taking advantage of our know-how.

Company profile

Address: Kyoto Research Park,
 134 Chudoji Minami-machi,
 Shimogyo-ku, Kyoto 600-8813, Japan
 Representative: Shinichi Kawasaki

<http://www.kri-inc.jp>

Capital: 300 million yen
 Established: 1987
 TEL: +81-75-322-6830

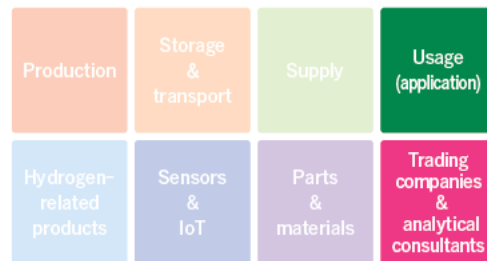
Department in charge

Department name: Environment and
 Chemical Process Research Laboratory

TEL: +81-6-6466-2911

E-mail: ec-proce@kri-inc.jp

Kobe Material Testing Laboratory Co., Ltd.



Comprehensively undertaking from test plan proposals to after-sales follow-up services;
Japan's largest independent testing organization based on various accreditations and certifications



Kobe Material Testing Laboratory is one of the largest independent industrial testing laboratories in Japan. We test and evaluate whether structural materials and functional materials meet certain standards from various perspectives. Under a high quality assurance system, we comprehensively undertake the entrusted process from test plan proposals to implementation and evaluation of testing, the results of which have earned the trust and admiration from customers worldwide. In addition, we offer design and production of various types of devices and equipment, including special test equipment, based on both high-precision processing technology and advanced testing technology cultivated over many years.

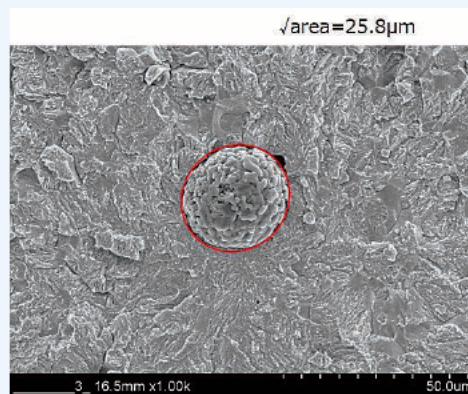
Technical and service strengths

In order to realize a hydrogen-based society, the impact of hydrogen on metals and composite materials must be properly be evaluated. Kobe Material Testing Laboratory specializes in the evaluation of structural materials and functional materials used in hydrogen environments (various strength tests, fatigue tests, material tests, chemical tests, etc.). We can also investigate the impact of hydrogen on materials according to evaluations in hydrogen environments.

Furthermore, Kobe Material Testing Laboratory develops technology jointly through industry-government-academia cooperative efforts to meet customer demands for various testing applications, including new testing techniques and testing under non-traditional environments. We are also engaged in developing and manufacturing single-item testing machines and prototype machines, and in recent years, we have achieved satisfactory results in the development of applications that utilize hydrogen storage alloys.



▲ Photo of the appearance of fatigue test equipment under high-pressure hydrogen



▲ Example of emergence of inclusion by a hydrogen charging method

Introductory examples and achievements

- Joint development of fatigue test equipment under high-pressure hydrogen, which enables testing in a high-pressure hydrogen atmosphere with installation on a general-purpose servo testing machine
- Implementation of inclusion inspection by a hydrogen charging method that can capture the largest inclusions in volumes subject to evaluation, etc.

Business plan

Anticipating the advent of a hydrogen energy-based society in the future, we look to actively support the R&D initiatives of manufacturers that will arise at that time. Currently, we are engaged in operations related to the development and maintenance of hydrogen stations, etc., however, we look to expand the scale of our hydrogen-related business severalfold over the next few years. In addition, we look to collaborate with companies and research laboratories overseas with an eye toward not only domestic growth but global expansion as well.

Company profile

Address: 3-2-24 Wadamiya-dori,
Hyogo-ku, Kobe-shi,
Hyogo 652-0863, Japan
Representative: Masaaki Tsurui

<http://www.kmtl.co.jp>

Capital: 50 million yen
Established: 1950
TEL: +81-79-435-5010

Department in charge

Department name: Administration
Department
TEL: +81-90-4031-3277
E-mail: n-tsurui@kmtl.co.jp

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2020

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Hydrogen-Related Businesses in the Kansai Region