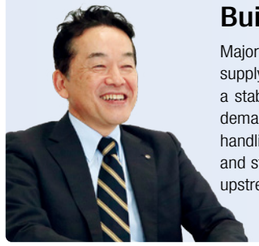
Establishing a Hydrogen Energy-Based Society

Basic Concept



Building a global supply chain

Major obstacles to achieving a hydrogen energy-based society include generating demand and procuring and securing a stable supply of large volumes of inexpensive CO_2-free hydrogen. On the supply side, we have working to reduce costs and achieve a stable supply through large-scale procurements from abroad and by enhancing our domestic supply infrastructure. On the demand side, we are working with multiple partners to generate new demand for hydrogen. By taking full advantage of the handling technologies developed over many years and a liquid hydrogen supply network tailored to address large-scale transport and storage, we are aiming to deliver hydrogen to customers while playing an active role in hydrogen manufacturing and other upstream processes. In this way, we are working to establish an integrated global supply chain from upstream to downstream.

Manabu Tsuyoshi Member of the Board, Senior Managing Officer, General Manager, Hydrogen Business Division

Expanding the Liquid Hydrogen Business to Capture Growing Demand Generated by Decarbonization Efforts

Iwatani entered the hydrogen business in 1941. Since then, we have worked to help establish a society capable of using hydrogen as an energy source. We have built a nationwide network that integrates all processes, from production to transport, storage, supply, and safety, enabling us to smoothly meet user demand. Amid growing interest in hydrogen for decarbonization applications, we will meet new demand by supplying hydrogen in line with customer needs and developing and offering applications such as mixed-hydrogen burners.

Developing hydrogen-refueling stations

Use

We are making progress on developing the nationwide supply infrastructure needed to support the use of hydrogen, focusing in particular on the business of hydrogen-refueling stations for heavy-duty fuel cell (FC) vehicles, including FC buses and trucks. In February 2023, we established Iwatani Cosmo hydrogen station LLC, a joint venture with Cosmo Oil Marketing Co., Ltd., a company currently making progress on developing Japan's first hydrogen-refueling station to be located inside truck terminals. We will also promote the adoption of hydrogen-refueling stations by promoting self-service stations and cutting costs.

Hydrogen-refueling station for FC buses

Artist's depiction of completed Keihin Truck Terminal Heiwajima Service Station

Supplying liquid hydrogen and equipment for demonstration

Use

Companies involved in the RE100 project to use 100% renewables for energy consumed in business activities are undertaking ever-broadening hydrogen energy demonstrations. At Panasonic Corporation's Kusatsu facility, all power used by the production sections at the fuel cell plant comes from solar cells and pure hydrogen fuel cells made by Panasonic itself. We supply the liquid hydrogen used in this demonstration. We plan to boost supplies of liquid hydrogen for use in demonstration projects like this one.

Supplying liquid hydrogen

H_2 KIBOU FIELD (Kusatsu facility, Panasonic Corporation)

Growing power-generation and mobility applications

Use

To decarbonize thermal power generation facilities powered by natural gas, we are developing and testing technologies for the mixed burning of natural gas with hydrogen and for the burning of hydrogen alone. Having set the goal of full-scale implementation of these technologies, we are making progress on initiatives to establish the supply structures and cost levels needed for real-world power generation. In addition, we plan to expand mobility applications beyond motor vehicles, to include ships, aircraft, railroads, and special-purpose vehicles.

Photo of the Kobe Smart Community Hydrogen Power Generation Project (Port Island), a NEDO subsidized project (undertaken by Obayashi Corporation and Kawasaki Heavy Industries, Ltd.)

Hydrogen gas turbine

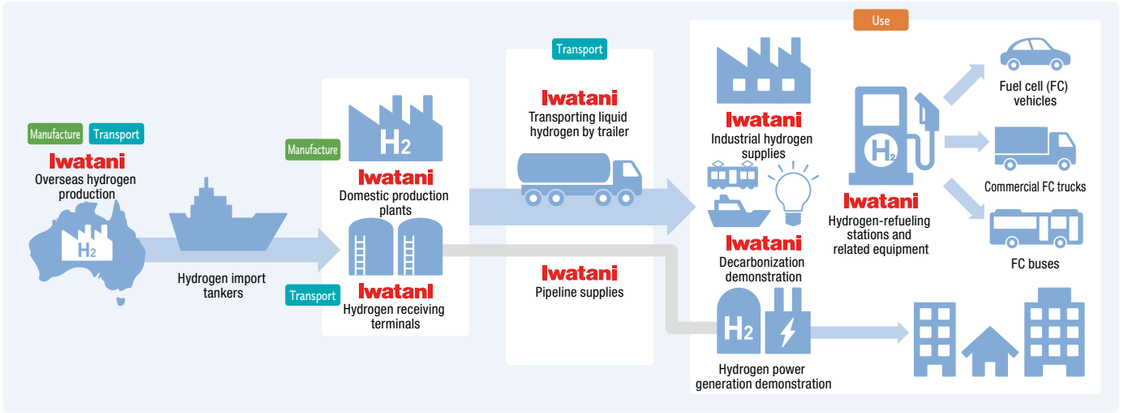
Related Key Issues (Materiality)

Create businesses that will lead to the realization of a sustainable society

Promote innovation with the use of technologies and expertise

Iwatani's roles in a hydrogen energy-based society

Efforts directed at the use of hydrogen as an energy source are expected to expand. In 2023, Japan's Basic Hydrogen Strategy, a national strategy established by the Japanese government, was revised for the first time in six years. Iwatani will pursue efforts across the entire supply chain from perspectives including the manufacture, transport, and use of hydrogen.



Expanding domestic hydrogen production capacity

Manufacture

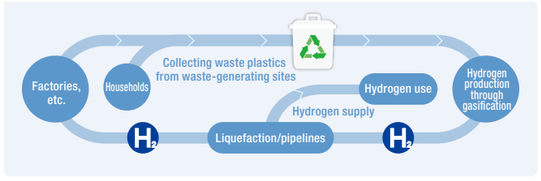
To respond to growing domestic hydrogen demand, including demand for decarbonization applications, we must grow domestic hydrogen production capacity during the transition period up to the time full-scale imports from overseas can begin. We are studying new production facilities in addition to those in Osaka, Yamaguchi, and Chiba.

Hydro Edge liquid hydrogen production plant

Hydrogen production through waste plastic gasification

Manufacture

We are currently examining the feasibility of producing hydrogen via the gasification of waste plastic for use in local markets. In May 2023, in partnerships with Toyota Tsusho Corporation, JGC Holdings Corporation, and 26 local governments, universities, and other organizations, we launched the Study Group on Hydrogen Production through Waste Plastic Chemical Recycling. Using waste plastic from industrial sites, households, and other sources in urban areas offers a rapid path to achieving a stable low-cost hydrogen supply. This will help expand the use of hydrogen, move us closer to becoming carbon-free, and promote the circulation of resources across a wide range of fields.



Supply chain model illustration

Further enhancements of liquid hydrogen handling technologies

Transport

The Iwatani Group offers technologies that enable the efficient transport and storage of hydrogen through means including volume reduction, achieved by compression and liquefaction, and hydrogen procurement and supply in line with flow rates, pressures, and other parameters set by customers. In addition, we have production functions and technologies for liquid hydrogen-related facilities within the Group and produce and operate equipment, including ultra-low-temperature liquefied gas storage tanks and tanker trucks. Issues posed by the growing demand for hydrogen energy include the need to expand the scale of related facilities, to increase our capacity to supply gas and equipment, to respond to maintenance demands, and to enhance our transport capacity. We plan to build further on the handling technologies accumulated and refined over the years.

A tanker truck and storage tank, both essential to supplying liquid hydrogen

Building a CO_2-free Supply Chain

To establish a hydrogen energy-based society, we must generate demand and make possible the large-scale procurement and stable supply of inexpensive CO_2-free hydrogen. On the supply side, in addition to procuring large volumes of hydrogen from overseas, we will work to cut costs and enable stable supply by enhancing the domestic supply infrastructure. By fully capitalizing on the in-house handling technologies accrued to date and our liquid hydrogen supply network, which is suited to large-scale transportation and storage, we aim both to deliver hydrogen to customers and play an active role in upstream areas such as hydrogen production, in order to create integrated supply chain covering from the upstream to the downstream.

Liquefied Hydrogen Supply Chain Commercialization Demonstration Project (reducing costs through large-scale transport)

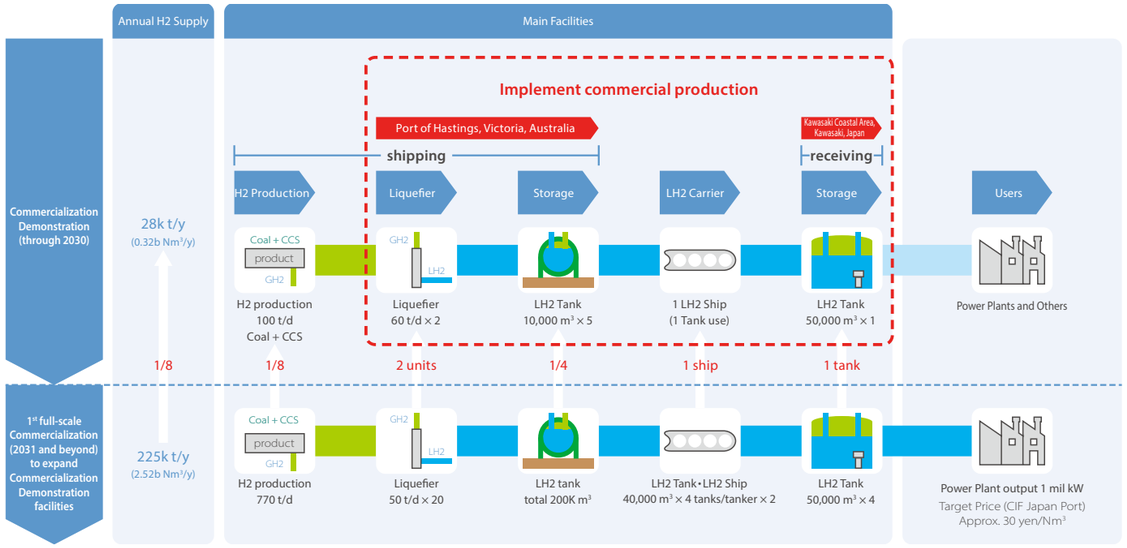
Manufacture | Transport

To move closer to the full-fledged implementation of a CO_2-free hydrogen supply chain, we applied subsidies from the Green Innovation Fund to establish the world's first hydrogen liquefaction and transport technologies on a demonstrated scale of tens of thousands of tons per year. We tested an integrated international liquid hydrogen supply chain from hydrogen production through liquefaction, shipping, sea transport, and unloading. Given the need to reduce costs through expanded facility scale toward the goal of commercialization in FY2030 and beyond, plans call for the tankers for use in this project to be at least 100 times larger than that used for the HySTRA* feasibility testing. We are responsible for the production of liquid hydrogen overseas and the evaluation of terminals in Japan and abroad as well as coordination with the demand side drawing on our customer base.

Project period
FY2021–2030 (ten years)

Implementation structure
Japan Suiso Energy, Ltd. (core company), Iwatani Corporation, ENEOS Corporation

* CO_2-free Hydrogen Energy Supply-chain Technology Research Association
The organization implementing the Demonstration Project
Establishment of Mass Hydrogen Marine Transportation Supply Chain Derived from Unused Brown Coal by NEDO



Source: Japan Suiso Energy, Ltd.

Efforts to procure large volumes of green hydrogen

Manufacture

Since 2021, we have undertaken feasibility studies on large-scale production of green hydrogen and exporting it to Japan, in the Australian state of Queensland. In May 2023, to move forward to studies in preparation for a final investment decision, we began front-end engineering design (FEED) together with five firms, one of which is Stanwell, a power company owned by the state. Intended to achieve stable and low-cost production and supply of green hydrogen over the long term, this project is expected to have a production capacity of at least 800 t/day of hydrogen in 2031 and beyond.

Artist's depiction of hydrogen production facility in Aldoga, Australia

Promoting development in preparation for building hydrogen supply systems

Transport | Use

To build innovative hydrogen supply systems to meet large-scale demand such as that for power generation, we are proceeding with active development together with our business partners. Joint development projects underway include those on liquid hydrogen pressurizing pumps with Mitsubishi Heavy Industries, Ltd., large-scale liquid hydrogen vaporizers with Sumitomo Precision Products Co., Ltd., and large-scale liquid hydrogen storage tanks with Toyo Kanetsu K.K. We will continue moving forward on development of the machinery, equipment, and technologies needed to build large-scale hydrogen supply chains through business partnerships.

Advancing Joint Efforts Inside and Outside the Iwatani Group

Enhancing manufacturing and engineering functions

Use

We are striving to enhance the structures needed to achieve a stable supply and increase profitability by strengthening our manufacturing and engineering functions. In April 2022, we made Tokico System Solutions, Ltd. a wholly-owned subsidiary. Tokico System Solutions, Ltd. holds technologies for measuring and controlling various gases and other materials and offers strengths in the development and construction of dispensers used at hydrogen-refueling stations, as well as robust business foundations in various other areas, including the manufacture and sale of measurement instruments. We plan to further grow the hydrogen business by generating synergies through joint efforts with its engineering functions. We are also partnering with Cosmo Energy Holdings to apply the technologies and knowledge built up by both partner companies in engineering and other fields related to hydrogen-refueling stations and hydrogen production.

Dispensers provided by Tokico System Solutions, Ltd.

Operating a Liquefied Hydrogen Marine Carrier at the Expo 2025 Osaka, Kansai, Japan

We plan to operate Japan's first liquefied hydrogen marine carrier at the Expo 2025 Osaka, Kansai, Japan (hereinafter referred as "the Expo"). Unlike conventional internal combustion engine vessels, this vessel will achieve high environmental performance by generating no CO_2 or pollutant emissions during operation, and will also achieve outstanding comfort free of odors, noise, and vibration. This liquefied hydrogen marine carrier is planned as a "floating pavilion" that will transform the trip to and from the Expo into a special experience for attendees from around the world, while also communicating to the world the appeal of hydrogen energy.

Illustration of a liquefied hydrogen marine carrier planned for commercial operation in the Expo

Participation in Hydrogen-related Associations

Hydrogen Council

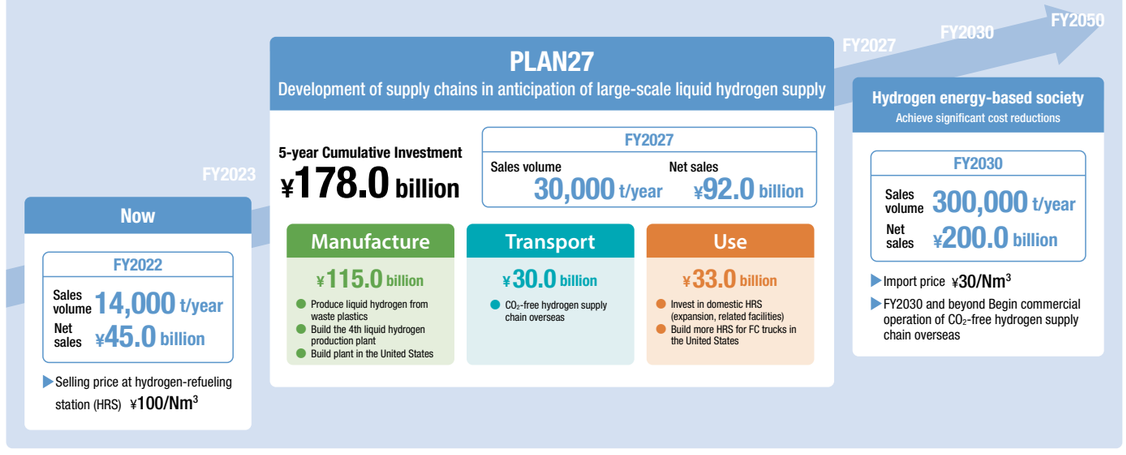
Made up of over 152* leading companies from the energy, transport, and manufacturing sectors around the world, the Hydrogen Council seeks to achieve its shared goals by formulating recommendations for hydrogen use and effective action plans in joint efforts with policymakers, hydrogen-using businesses, international organizations, and citizens' groups in various countries. As a member of the Hydrogen Council's steering committee, Iwatani is active in efforts to expand use of hydrogen in Japan through sharing a global hydrogen vision.

*As of June 2023

Japan Hydrogen Association (JH2A)

Established in December 2020 to develop a hydrogen-based society earlier through various practical projects, the Japan Hydrogen Association (JH2A) started operation as a general incorporated association in April 2022. With a membership of 379 companies and organizations as of May 2023, including not just energy suppliers, automakers, and manufacturers of various types of related equipment but banks, securities firms, and insurers, the JH2A is a truly nationwide organization. As a corepresentative of the JH2A, we are moving ahead with various energetic initiatives in partnership with other members.

Targets of the Hydrogen Strategies – Iwatani Hydrogen Vision



Toward a Carbon-free Society

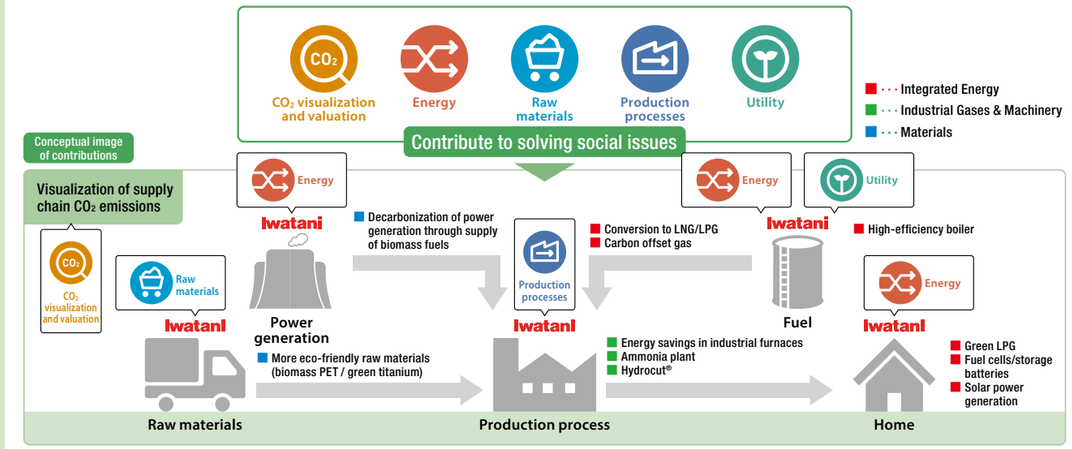
Related Key Issues (Materiality)
Create businesses that will lead to the realization of a sustainable society
Promote innovation with the use of technologies and expertise

Basic Policy

Business expansion through helping customers decarbonize their business activities across the entire Iwatani Group

In line with our corporate philosophy, “Become a person needed by society, as those needed by society can prosper,” our legacy has to date been to find solutions to social issues. Our mission henceforth is to establish a carbon-free society by leveraging the business infrastructure and technological strengths we have amassed to date to deliver low-/zero-carbon solutions to our customers—from industries to individual consumers—to help reduce CO_2 emissions throughout society while also growing our businesses.

Low-/zero-carbon solutions based on our business foundations and technological capabilities



Specific Decarbonization Initiatives

Fuel conversion

Energy Utility

- Helping to reduce CO_2 emissions through conversion from heavy oil and kerosene to LPG and LNG
- Enabling proposal of CO_2-reduction solutions in combination with boilers and other equipment

Applications: Steam boilers, industrial furnaces, etc.


Cogeneration system


Gas heat pump (GHP) air conditioning

Biomass fuel

Energy

- Importing palm kernel shells (PKS) and wood pellets from Southeast Asia

Applications: Fuel for biomass power generation

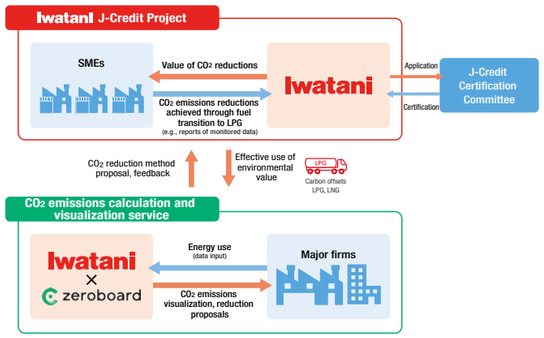

Palm kernel shells (PKS) as biomass fuel

Combining J-Credit scheme and CO_2 emissions calculation/visualization services

CO_2 visualization and valuation

- Valuation of CO_2 emissions reductions achieved by customers, as J-Credits
- Providing services to visualize CO_2 emissions generated by a company’s activities and the overall supply chain in accordance with international standards under the Greenhouse Gas Protocol

Applications: Supporting CO_2 emissions reductions by manufacturing customers



Ammonia facilities

Production processes

- Sales of denitration ammonia supply equipment to power companies in Japan
- Capable of design, construction, safety management, and other tasks for ammonia supply equipment

Applications: Supply equipment for ammonia power generation

Ammonia supply equipment

Hydrocut® eco-friendly mixed fusing gas

Production processes

- Fusing gas developed and produced by Iwatani by mixing ethylene with hydrogen for fusing and brazing applications
- Ability to cut CO_2 emissions by 84% (compared to acetylene based on LCA calculations)

Applications: Steel, shipbuilding, construction, automotive, etc.

Hydrocut®

PET resins with low environmental impact

Raw materials

- Overseas procurement of plant-based PET resins with low environmental impact

Applications: Beverage bottles, films, etc.

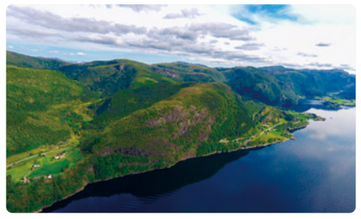

Bottles made from biomass PET resin

Green titanium raw materials

Raw materials

- High-purity titanium ore exported from mining concession in Norway
- Zero CO_2 emissions during extraction made possible by renewable energy

Applications: Titanium metal, titanium oxide pigments, etc.


A Nordic Mining mine

Green LPG

Energy

- Establishing and rapidly testing new technologies to produce LPG by combining hydrogen with CO_2 (propanation, butanation)
- Establishing technologies to produce LPG from dimethyl ether (DME), which has properties similar to LPG

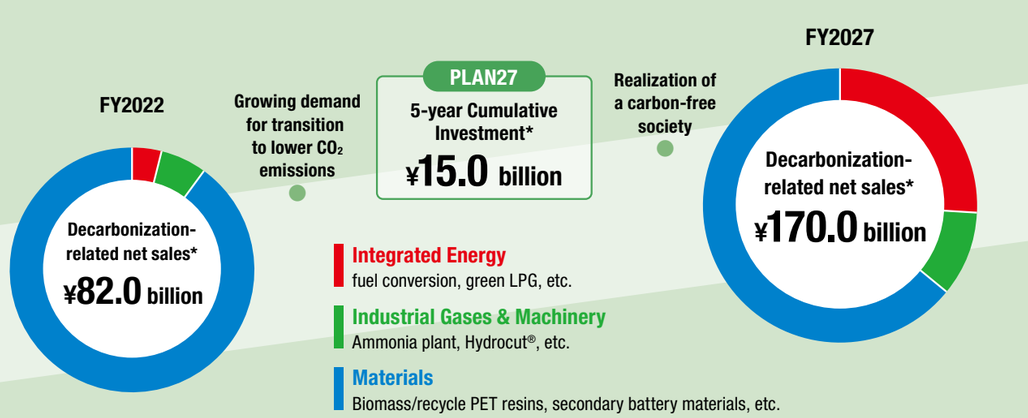
Applications: Supply to LPG customers (general consumers, industrial and commercial customers)

Roadmap toward green LPG production

Source: Prepared based on Japan LP Gas Association data

Stage 1: 2021–2025	Stage 2: 2025–2030	Stage 3: 2030–2050
Project 1: Feasibility studies toward the development of new technologies for direct synthesis of LPG from hydrogen and CO_2 Project 2: R&D on indirect synthesis technologies to produce LPG through a catalytic reaction from DME produced using CO_2 as a raw material	Feasibility studies on expanding scales for practical use in society Target plant scale: 100 kg/day	Launch of practical applications, building commercial plants • First half of the 2030s: Realizing adoption of 10–100 t/day in society • By 2050: Replacing total demand for LPG (approx. 8 million t) with green LPG

Targets of the Carbon-free Strategies



*Net sales and investment amounts related to decarbonization do not include those related to hydrogen.
Net sales and investment amounts related to hydrogen are stated in Hydrogen Strategies (p. 21).

Realizing Sustained Growth by Enhancing Earnings Capabilities and Introducing New Services

Basic Policy

Growing retail market share and enhancing earnings capabilities by promoting M&A activities using our nationwide network

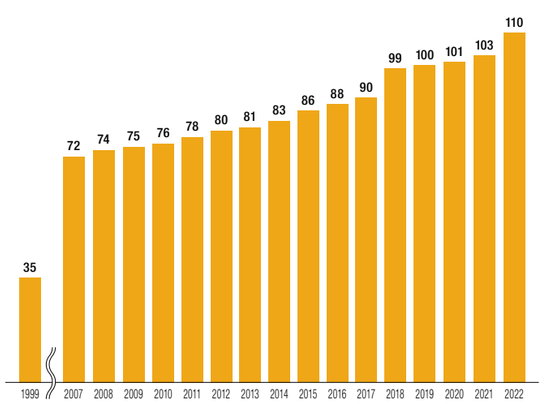
The Iwatani Group began selling LPG nationwide in 1953, as Marui Propane. To maintain stable supplies of LPG lifeline services, we have developed an integrated supply structure, from import through customer delivery, and boast the top nationwide market share in Japan. Concentration of LPG businesses is expected to accelerate as the number of consumer households decreases. Under such conditions, we will aim for further business growth by promoting efforts to strengthen our retail business, centered on merger and acquisition (M&A) activities conducted through now, and streamlining of our LPG business as a whole, including delivery.

Iwatani's LPG sales

	Retail	Wholesale
Industry ranking	**No.1**/ 16,381 companies	**No.1**/ 1,100 companies
Market share	**4.6%**	**13.8%**
Households using MaruiGas	**1.10 million**	**3.30 million**

(As of March 31, 2023)

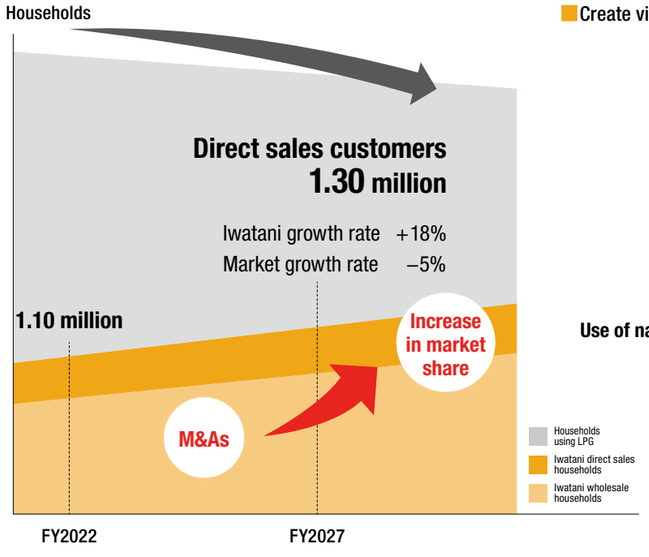
Historical number of direct sales customers (unit: 10K households)



LPG Business Measures

Growing retail market share

Drawing on our nationwide network, the Iwatani Group will set its sights on continuing growth by expanding its market share in the retail sector, primarily through its M&A activities. The LPG market is projected to shrink by about 5% in the years through FY2027; nevertheless, the Iwatani Group will seek to achieve growth of 18% in direct sales customers, targeting a figure of 1.30 million households. To grow the retail business, we will leverage our nationwide network of 110 supply facilities and the Iwatani Group's strengths in delivery, safety, and sales networks to grow the wholesale customer base and to build relationships to contribute to business succession and M&A activities.



Create virtuous cycle for enhancing customer base

Use of nationwide network

Iwatani
Group supply facilities: 110*
*As of March 31, 2023

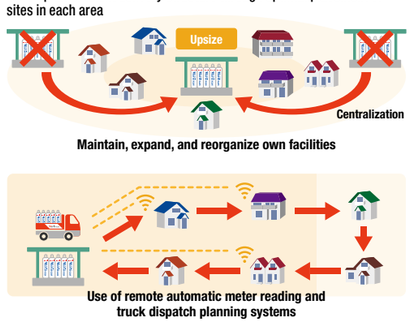
Related Key Issues (Materiality): Provide infrastructure and services that will enrich people's lives

Streamlining delivery

The Iwatani Group operates a logistics structure that delivers gas to households in every corner of Japan. We will cut business costs to grow earnings while implementing the measures necessary to maintain a stable supply. We will also expand delivery facilities through mergers and consolidations as well as by updating delivery facilities to be more disaster-resistant. In this way, we will streamline delivery structures and draw on remote meter-reading systems and delivery route planning systems to achieve more efficient delivery. Partnerships with other companies (delivery subcontracting) in specific regions are also under consideration, to build comprehensive and efficient delivery structures and establish strong stable delivery networks on which customers can rely.

Iwatani initiatives

Develop an efficient delivery structure through optimal placement of sites in each area

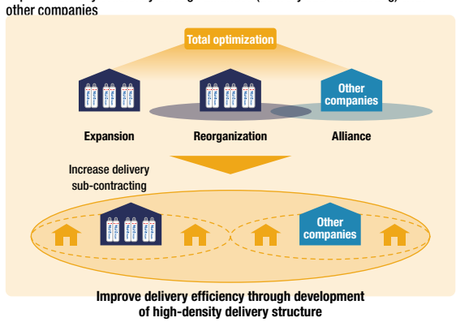


Dual-strategy promotion

Streamlining of delivery

Initiatives with other companies

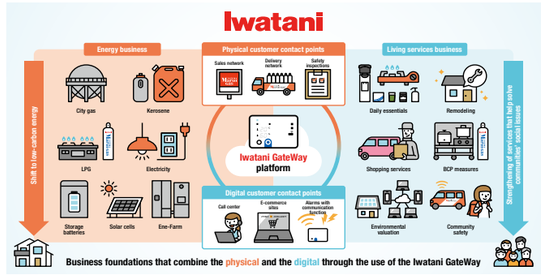
Improve delivery efficiency through alliances (delivery sub-contracting) with other companies



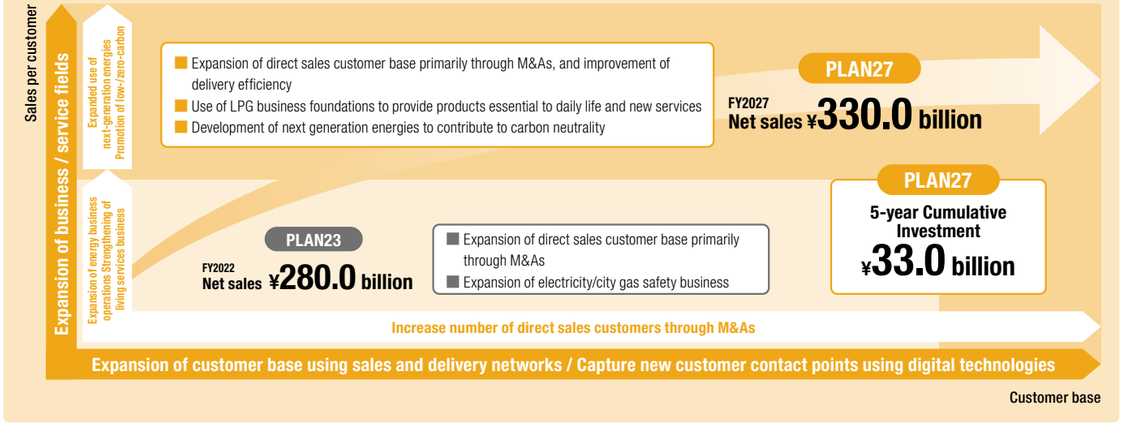
Creating New Services to Support Communities

Evolving into an energy & living total service provider essential to customers and communities

Drawing on our supply infrastructures for delivering LPG nationwide, we are moving forward with efforts to advance solutions to social issues within each region. In addition to supplying energy such as solar PV and green LPG to contribute to decarbonization, we use the Iwatani GateWay IoT platform to provide services supporting everyday life, including community safety and shopping services, to help address shrinking populations, aging, and other community issues. By providing comprehensive solutions to community issues, including the need to become carbon-free, we plan to evolve into an energy & living total service provider while building the infrastructures to contribute still further to society as an essential member of our communities, essential to our customers.



Targets of the Domestic Energy & Service Strategies



The Iwatani Group: Expanding Internationally

Related Key Issues (Materiality)

Create businesses that will lead to the realization of a sustainable society

Provide infrastructure and services that will enrich people's lives

Basic Policy

Leveraging our domestic business foundations to grow our international businesses

To date, the Iwatani Group has grown its businesses by providing products and services to domestic customers. Based on strengths amassed over the years, including the expertise of the Integrated Energy Business in fuel conversion and industry decarbonization, our Industrial Gases & Machinery Business boasts industrial gas production and sales networks and the capacity to promote machinery and equipment solutions, while our Materials Business can procure environmental products and implement the measures needed to maintain a stable supply of mineral resources. Drawing on our strengths and domestic business foundations, we will continue identifying business opportunities and pursuing market development on the international stage.

Key Points of International Business Development

Response to changes in world affairs

- Further strengthen stable supply system / Diversification of procurement sources
- Identify growth potential and changes in industrial structure in each region

Priority areas for expanding business foundation

- China: Delve deeper into mega market
- Southeast Asia: Expand production and supply facilities for growing markets with increasing populations
- Other regions: Venture into American market (world's largest industrial gases market)

China

Business environment Mega production/consumption market

Strategy Sales expansion of key products

- Expand sales channels for portable gas cooking stoves/cassette gas canisters
- Expand production plants for air separation gases and hydrogen
- Expand supply facilities for specialty gases, such as helium
- Strengthen sales of industrial gases in growth fields
- Expand raw materials business in growth fields


Southeast Asia

Business environment Fast-growing market

Strategy Business expansion by increasing production and supply facilities

- Expand sales and production facilities for portable gas cooking stoves/cassette gas canisters
- Develop new business based on supply and safety expertise in LPG and LNG
- Expand supply facilities for specialty gases, such as new refrigerants and helium
- Expand manufacturing plant for air separation gases
- Expand manufacturing functions of metal processing business
- Expand procurement sources for biomass fuel



North America

Business environment World's largest industrial gases market

Strategy Expand business, including through M&As

- Expand sales of cartridge gas products for outdoor market
- Consider entering LPG market through dealership acquisitions, etc.
- Expand HRS business
- Strengthen production and sales of air separation gases
- Expand supply facilities for helium and other specialty gases


Europe

Business environment Eco-conscious market

Strategy Creation of resource circulation-based business

- Create resources and metal recycling/processing businesses
- Supply parts and raw materials to environment-related industries



Australia

Business environment Rich in energy and resources

Strategy Explore procurement source

- Expand investment in development of liquid hydrogen supply chain
- Develop new mining lot for mineral sands
- Use carbon credits from afforestation activities



Africa

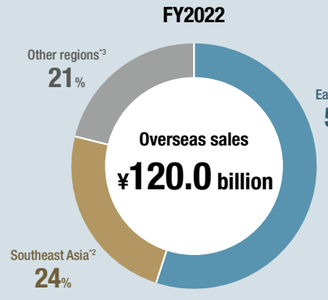
Business environment Rich in resources

Strategy Explore new procurement sources for resources

- Expand procurement sources for mineral resources, such as rare earths and rare metals

- Integrated Energy
- Industrial Gases & Machinery
- Materials

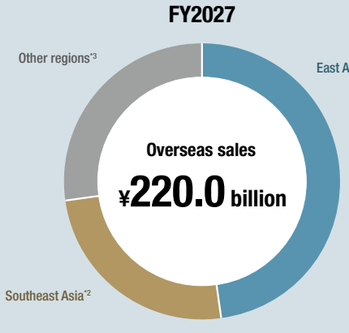
Targets of the Overseas Strategies



PLAN27

5-year Cumulative Investment
¥94.0 billion

Overseas sales
nearly doubled



*1 China, South Korea, Taiwan
*2 Singapore, Thailand, Malaysia, etc.
*3 The United States, Australia, etc.

Building an Organization in Which Diverse Individuals Can Thrive While Growing on Their Own

Related Key Issues (Materiality)

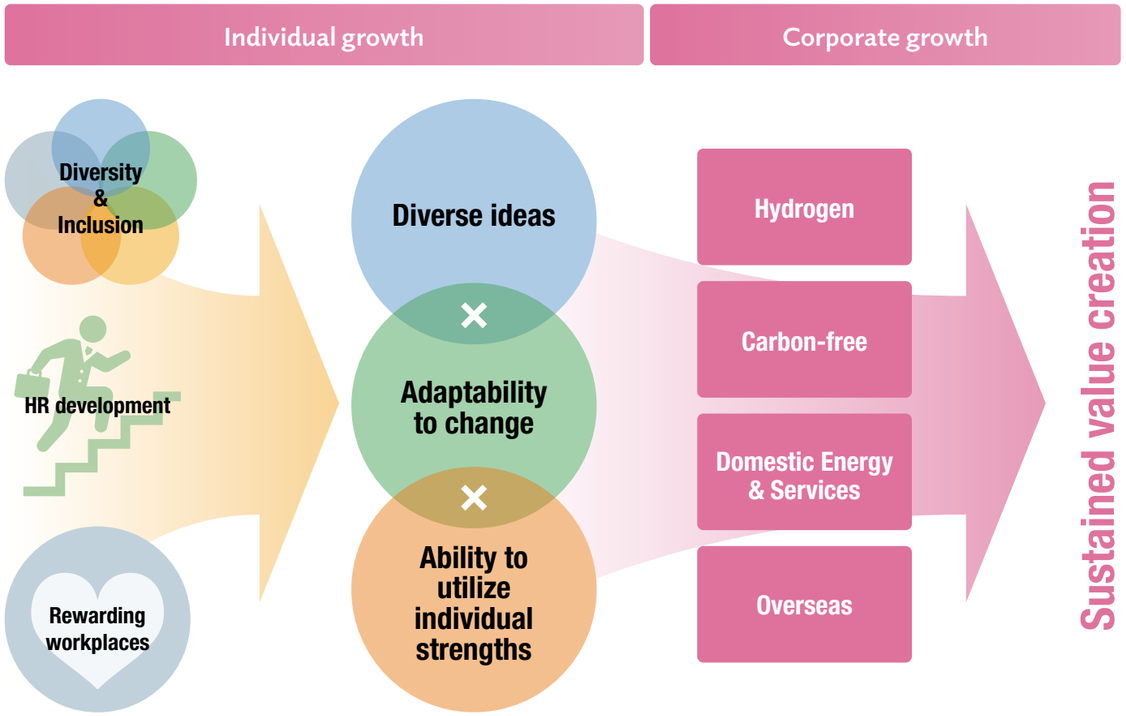
Develop an environment and systems in which diverse human resources can thrive

Develop more transparent governance

Basic Policy

Realizing a virtuous circle of organizational growth through recruitment, development, and active participation of our people

The source of sustained value creation is human resources. Our goal is to be an organization in which each and every employee can thrive and grow. To do so, we will hire diverse human resources, including international human resources, those with IT skills, and those with external experience, regardless of gender, and build an environment that accepts and accommodates their values and allows them to demonstrate their individual abilities to the fullest. We support the autonomous career development of our employees to maximize their abilities, while strengthen employee satisfaction and motivation by realizing flexible work styles. Through this cycle of overall organizational growth based on securing, training, and utilizing human resources, we will continue to deliver value to the world by growing our businesses and putting our strategies into practice.



Diversity and Inclusion

Diversity management that draws out the full capabilities of diverse employees will enable Iwatani to continue meeting societal needs. Accordingly, we are pursuing various initiatives to promote diversity and inclusion, under the slogan “Toward an organization of acceptance and mutual respect of diverse values.”

Major initiatives

Organizational culture

To be an organization capable of continuing to create new value, we are promoting efforts in areas such as workplace promotion of women and people with disabilities, participation by men in raising children, and more diverse work styles. We are increasing employee understanding of diversity and inclusion through internal training on the subject.

Promoting women in the workplace

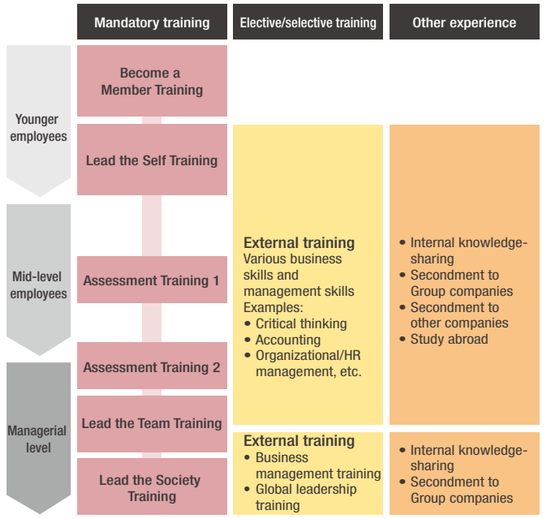
Through proactive hiring of women, support for balancing work and life events, and broader choices of work styles, we are enhancing efforts to promote the role of women in the workplace. As of March 31, 2023, women made up 6.0% of managers, and we are implementing a wide range of initiatives including measures targeting younger and midlevel staff to increase the percentage of women in management. In addition, under our Plan of Action for a General Employer we are making progress on building workplaces in which women can demonstrate their individuality and capabilities to the fullest.

Employment and promotion of people with disabilities

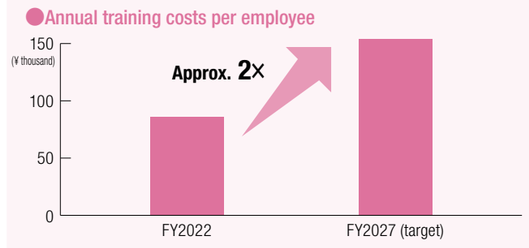
We are proactively hiring employees with disabilities through both new graduate and midcareer hiring programs. As of March 2023, those with disabilities accounted for 2.78% of employees—a level higher than the percentage required by law. We are also making progress on improving working environments and providing various kinds of support to enable employees with disabilities to demonstrate their capabilities to the maximum.

HR Development

Support for employees’ autonomous career development, which is essential to ensuring that our human resources can continue to meet society’s needs as called for in our corporate philosophy, is one of our priorities. We plan to use the new training center under construction in Kobe to implement a reformed training structure to encourage autonomous career development.



Concepts of the training system to encourage autonomous career development



Rewarding Workplaces (fulfilling working environments)

To build workplaces in which diverse individuals can thrive, it is essential to secure psychological safety and realize flexible work styles to balance work with life events. To support this balance between work and life events, we are enhancing systems related to flexible work styles and childcare and long-term care, as well as fostering an appropriate organizational culture.

Programs related to flexible work styles	Details
Remote working program	Employees may work remotely from home or elsewhere under certain conditions.
Program for taking leave in hourly units	Employees can take annual paid leave, child nursing-care leave, and short-term nursing-care leave flexibly in hourly units.
Other leave programs	Refreshment leave (awarded as special leave to those who have been employed for a certain number of years), summer vacation (awarded separately from annual paid leave), bereavement leave, transfer leave, etc.

Programs related to work/life balance	Details
Shortened working hours	Enables employees with children through the third grade of elementary school to shorten their designated working hours
Childcare/babysitting subsidies	Subsidies for childcare by partner babysitting firms and childcare facilities
Partner maternity leave	Up to three days of special leave for spousal childbirth
Early return support allowance	Pays the actual cost of childcare services, up to 50,000 yen/month, when an employee returns from childcare leave before the child reaches the age of 12 months.

Examples of efforts to foster a culture of sound work/life balance

- Publishing childcare and long-term care handbooks
- Posting reports on childcare leave by fathers and reports on balancing work with childcare on the internal bulletin board
- Participation in joint events with other companies (on supporting subordinates with children and women’s careers)

Targets of the Non-financial Strategies (Human Resource Strategy)

Items	Indicators	Targets	FY2022 results
Diversity & Inclusion	Ratio of female managers	10% or higher	6.0%
HR Development	Annual training costs per employee	¥150 thousand	¥86 thousand
Rewarding Workplaces	Percentage of childcare leave taken by male employees	100%	30.6%

External Evaluations

Platinum Kurumin
We have earned Platinum Kurumin certification for our efforts to support balancing work and family life.

Eruboshi
We have earned Two-Star Eruboshi certification for our efforts to promote women in the workplace.

Enhance Technological and Safety Capabilities That Leverage Iwatani's Strengths

Related Key Issues (Materiality)

Develop an environment and systems in which diverse human resources can thrive

Develop more transparent governance

Basic Policy

Enhancing the technological and safety capabilities needed to grow the Gas & Energy businesses

Key to growing our core Gas & Energy businesses and leveraging the strengths in hydrogen business is enhancing our technological and safety capabilities. Toward this end, we have identified technology strategies among our non-financial strategies. We are striving to demonstrate technical capabilities and engineering functions as our expertise; to enhance and pass down technical capabilities; and to improve our earnings abilities by leveraging intellectual property. By demonstrating our technological and safety capabilities, we will fulfill our everyday business operations more safely and efficiently and propose solutions well-suited to customer needs, thereby promoting the creation of new businesses and new value.

3 themes of Technology Strategy

Specialization

- Advance joint efforts within the Iwatani Group for the development of a liquid hydrogen supply chain
- Acquire expertise to make quick response to market needs

Technological capabilities

- Acquire knowledge and experience with the use of new in-house academy
- Promote gas and energy businesses by leveraging technological capabilities
- Pass down safety control technologies accumulated in production, transport, etc. of gases

IP strategy

- Secure competitive advantage by bringing research results from the Iwatani R&D Center and the Iwatani Advanced Hydrogen Technology Center to market
- Strengthen alliances by leveraging the Company's own intellectual property

Internal University of Technology and Safety

In October 2023, to build on the knowledge and capabilities in technology and safety fundamental to our gas business, we will open an internal university. This facility will train human resources capable of providing powerful support for Iwatani's strengths in safety and technology through programs that allow any employee, regardless of job description or age, to master the advanced skills needed in workplaces across business fields, including LPG, industrial gases, and hydrogen.

Training system

Courses
Video lessons and e-learning

Practice
Group training at the R&D centers and other sites

Lectures
In-person and video lecture formats

Required courses

Elective courses

Choice of subjects with reference to model courses for student affiliated sections

Earning in-house qualifications

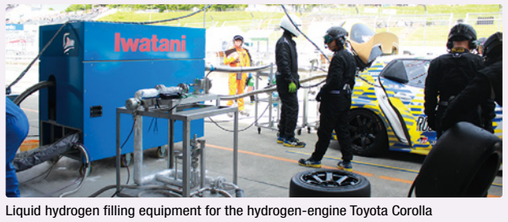
Use on the job

The Technology & Engineering Division: The Core of Group Engineering Functions

Established in April 2015 as a cross-functional organization serving the entire Iwatani Group, the Technology & Engineering Division is involved in tasks across the entire sphere of engineering: from business research through project management, design, operations, safety, and quality assurance. The division also cooperates with sales sections to address customer carbon neutrality topics and needs through engineering.

Sample projects

- ○ Planning and installing hydrogen supply facilities for major customers aiming for decarbonization
- ○ Hydrogen supply/filling equipment for the liquefied hydrogen marine carrier at the Expo 2025 Osaka, Kansai, Japan
- ○ Development and study of filling equipment for liquefied hydrogen powered vehicles
- ○ Ammonia-supply equipment to reduce NOx emissions from thermal power stations
- ○ Overseas filling and shipping equipment for special gases and other materials



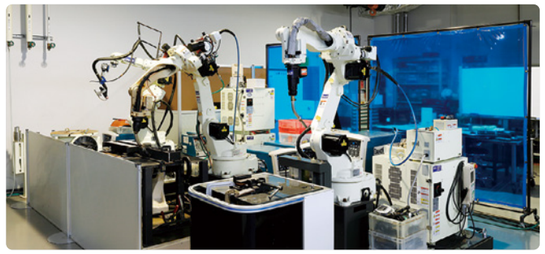
Liquid hydrogen filling equipment for the hydrogen-engine Toyota Corolla

Iwatani R&D Center: Pursuing Its Mission to Further Develop Our Technologies

The Iwatani R&D Center aims to be an R&D site that is open to the public. Building on Iwatani's strengths as both a trading company and a manufacturer, the R&D Center carries out R&D across a wide range of areas, from fundamental research through development of applications and products, by fusing at a high level its information capabilities, which enable us to identify society's needs, and the unique technological capabilities, based on gas technology, that we have built up over the years. Leveraging the unique R&D structure built by handling a wide range of gases and our unique capacity to propose innovative systems based on years of experience, we create new value alongside our customers and partner companies, as well as universities, public institutions, and government agencies.

Advanced welding technologies and demonstrations

At the Iwatani R&D Center, equipped with welding demonstration rooms, we propose unique technologies and products in areas such as welding robots and shield gases to meet diverse needs at welding worksites in terms of automation, quality improvements, and cost cutting. We undertake experiments to evaluate shield gases, welding materials, and other substances on customer request. We are developing technologies for hydrogen cutting to contribute to decarbonization and welding technologies using collaborative robots.


Welding robots

Hydrogen analysis equipment for hydrogen-refueling stations

Hydrogen-refueling stations analyze the densities of 14 ingredients to prevent admixture of impurities when filling fuel cell vehicles. The Iwatani R&D Center has developed equipment based on time-of-flight mass spectrometry (TOF-MS), which is more efficient and affordable than traditional analytical methods. The Group is planning the full-fledged introduction of this technology in FY2023, as we aim to contribute to realizing a hydrogen energy-based society by enhancing our technological capabilities Groupwide.


TOF-MS analysis equipment

Technologies for joining dissimilar metals

Amid growing demand for air conditioning due to global warming, we are pursuing R&D on technologies for joining copper and stainless steel as an alternative to pure copper, in response to growing global demand for that metal. Currently, in cooperation with customers, we are pursuing various efforts, including durability testing and the expansion of applications to develop products using this technology.

Life Science Research Laboratory

We are developing technologies and equipment for cell storage and transport to leverage the gas application and low temperature control technologies we have developed in the field of industrial gases to contribute to the industrial development of regenerative medicine technologies. In February 2023, we established an onshore aquaculture facility at the Iwatani R&D Center, where we are developing optimal onshore aquaculture systems capable of stable production using oxygen gas.
(See Industrial Gases & Machinery Business, p. 41.)

Iwatani Advanced Hydrogen Technology Center: Exploring the Possibilities of Hydrogen

Opened in October 2021, the Iwatani Advanced Hydrogen Technology Center accelerates the development of new technologies related to decarbonization—including green hydrogen and green LPG, as well as hydrogen-related technologies—needed to establish a hydrogen energy-based society. As a technology center of Iwatani, Japan's sole supplier of liquid hydrogen, this facility is equipped with a testing environment unmatched in Japan and is capable of handling liquid hydrogen at extreme low temperatures of -253°C and hydrogen gas at high pressures of up to 135 MPa.

Equipment related to hydrogen energy

The center undertakes R&D on technologies essential to hydrogen-refueling stations. It uses some of Japan's most advanced testing equipment for liquid hydrogen and ultra high pressure hydrogen gas for purposes including evaluation of the suitability of metals and other materials for use with hydrogen and durability testing of equipment. Through these means it is examining ways to reduce costs and increase the safety of building hydrogen-refueling stations and pursuing research that will contribute to regulatory revisions. It is also focusing on new technological development in areas such as developing equipment and capture of cold heat from gasification of liquid hydrogen for reuse—efforts targeting the coming age of large-scale hydrogen supplies.

Testing equipment for liquid hydrogen


Testing equipment for ultra high pressure hydrogen gas