Godo Shigen Co., Ltd.

# COMPANY PROFILE

## Are you familiar with the substance called iodine?

Iodine is a chemical element essential to the maintenance of our physical health.

Iodine is used in a variety of applications such as pharmaceuticals in the healthcare field, display devices in the ICT field, and feed additives in the agricultural field.

Expectations for iodine are growing worldwide with the recent development of its application in materials for lightweight and flexible photovoltaic devices.

## Pioneer in iodine and iodine recycling

Godo Shigen, a pioneer in iodine production, started business in 1934 with proprietary developmental technology that allowed the extraction of iodine from brine found in ancient strata roughly 200 to 2,000 meters underground.

After making a foray into the business of supplying clean natural gas, Godo Shigen brought on stream its first full-scale iodine recycling facility in 1990, ahead of the competition. Today, Godo Shigen provides a safe and stable supply of high-quality products in its four core business areas of iodine, iodine compounds, iodine recycling, and natural gas, catering to the needs of the times.

New possibilities for iodine still abound. Godo Shigen conducts its R&D activities to deliver total solutions involving iodine, with a view to bringing about a more fulfilling future.



### *ICT*

- Polarizing film for LCDs

### *Agriculture*

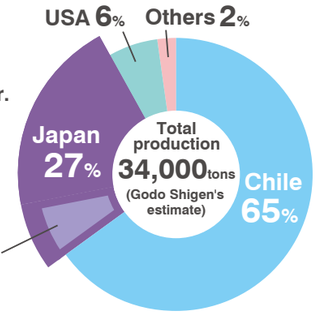
- Feed additives

### *Healthcare*

- Contrast agents
- Thyroid hormone drugs

## Godo Shigen has a 7% share of the world's total iodine production.

**The world's total iodine production is about 34,000 tons annually.
Japan accounts for roughly 30% of the total, producing around 9,000 tons of iodine each year.
As Japan is a country with limited resources, iodine is one of its rare domestically produced natural resources available for export.**




## Business domains

**Iodine business**
High-quality iodine is produced from underground brine.

**Iodine compound business**
Inorganic and organic iodine compounds are stably produced.

**Iodine recycling business**
Efforts are made to recycle iodine as a valuable resource.

**Natural gas business**
A clean, domestically produced energy source is steadily supplied.

# Japan's No.1 iodine facility is Godo Shigen's Chiba Plant in terms of production capacity

**Godo Shigen's iodine plant has the highest production capacity in Japan on a standalone basis, where the blowout method uses the sublimation properties of the chemical element to produce high-quality iodine.**

**As a pioneering iodine manufacturer, Godo Shigen has attained the ability to steadily supply the chemical element over the long term by leveraging its wealth of technology and know-how cultivated over the past 90 years.**

## Blowout plant

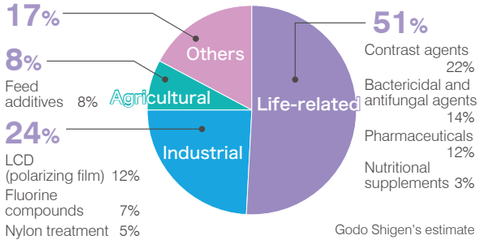
In the blowout tower, which comprises a desorption tower and an absorption tower, iodine is extracted as a gas from the brine. The absorbed liquid that is produced through reduction and absorption has an iodine concentration that is about 1,000 times that of brine.



## What is iodine?

Iodine is a nonmetallic element with atomic number 53, a halogen belonging to Group 17. It's the only halogen that exists as a solid at room temperature. At room temperature, iodine takes the form of scaly crystals with a dark purple metallic luster, and sublimates – or directly turns into a gas without becoming a liquid. Its vapor is purple in color and has a distinct odor.

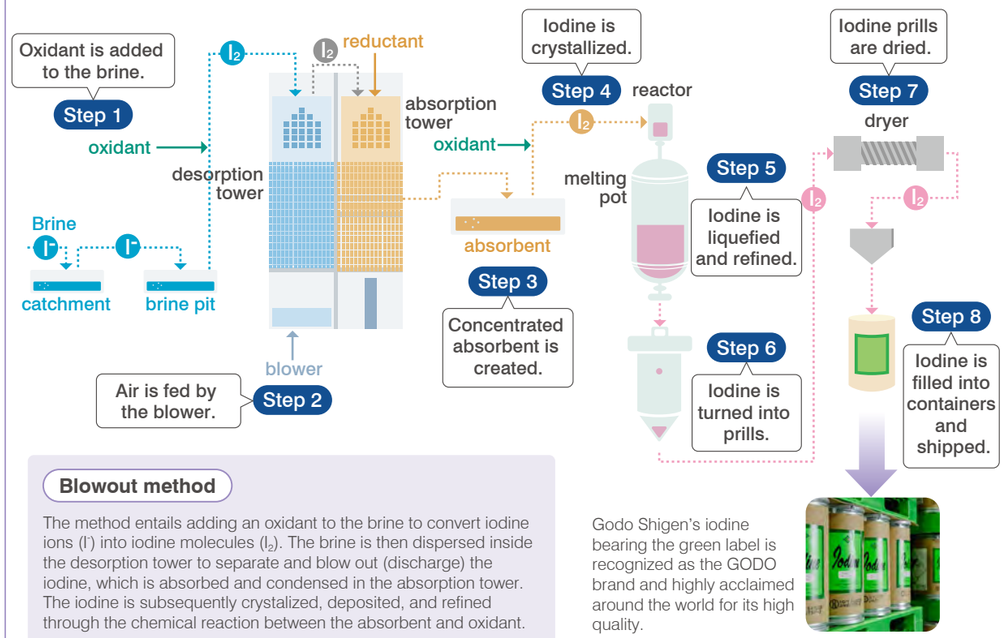
## Main applications of iodine




Godo Shigen's estimate

Iodine is used in a wide range of applications mainly in medicine, manufacturing, and agriculture. In recent years, research has progressed on the application of iodine in solar batteries and other high-tech and biotechnology industries.

## Iodine production process using the blowout method




### Blowout method

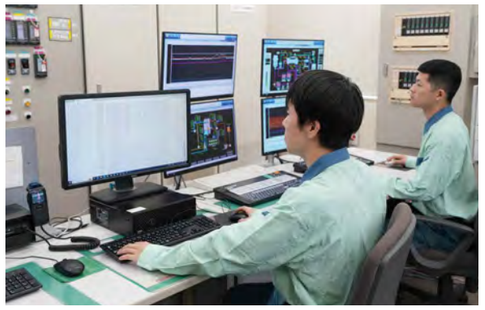
The method entails adding an oxidant to the brine to convert iodine ions ($I^-$) into iodine molecules ($I_2$). The brine is then dispersed inside the desorption tower to separate and blow out (discharge) the iodine, which is absorbed and condensed in the absorption tower. The iodine is subsequently crystalized, deposited, and refined through the chemical reaction between the absorbent and oxidant.

Godo Shigen's iodine bearing the green label is recognized as the GODO brand and highly acclaimed around the world for its high quality.



## Plant control room

All plant operations for iodine extraction, concentration, and refinement are centrally conducted, monitored, and automatically controlled.



## Refinery room

Iodine crystals are heated and melted before being refined to achieve high purity.

# Iodine compound business

## Inorganic iodine compound business

# High quality and stable supply meeting global demand

**Godo Shigen produces a variety of inorganic iodine compounds such as iodides and iodates to meet the global demand.**

**One of Godo Shigen's strengths is its ability to provide a stable supply of high-quality products quickly and at low cost due to its robust management and efficient manufacturing.**

**Godo Shigen actively caters to emerging iodine needs such as iodine compounds for next-generation solar batteries.**

### KI/NaI manufacturing facility

High-quality products are manufactured in large quantities leveraging Godo Shigen's established manufacturing technology incorporating new methods of producing potassium iodide (KI) and sodium iodide (NaI).

### Pharmaceutical ingredient manufacturing facility

At Godo Shigen's second inorganic iodine compound plant, ingredients of superb quality are manufactured in compliance with the stringent GMP management standards required for pharmaceuticals.

### Iodate manufacturing facility

In its effort to meet a wide variety of needs, Godo Shigen has commercialized its line of iodates, etc., for which the demand is expected to grow for use as catalysts and feed additives.

### High-purity hydrogen iodide gas manufacturing facility

Through this precise refining and distilling process, virtually all impurities and moisture remaining in hydrogen iodide gas are removed. The refined gas of 99.999% purity is then supplied to high-tech industries.

### Organic iodine compound manufacturing facility

Godo Shigen is equipped with versatile manufacturing facilities to meet a wide range of needs.



## Organic iodine compound business

# People's lives are transformed by these diverse forms of iodine

**Organic iodine compounds are widely used as ingredients for pharmaceuticals and organic electronic materials. In recent years, its use in the field of semiconductor materials has also attracted attention.**

**Godo Shigen is capable of handling all processes in-house, from R&D to product commercialization, including the synthesis of samples. As a result, it is possible to produce numerous different compounds in small quantities.**

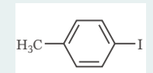
### Contracted manufacturing flow

Inquiry ▶ Requirement verification ▶ R&D ▶ Pilot testing ▶ Manufacture of the product

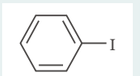
For each contracted manufacturing project, Godo Shigen listens to the customer's requirements, develops the optimal products and processes, and then proceeds to the manufacturing stage, all of which are systematically handled in-house. Godo Shigen also offers compound development suggestions to address a variety of potential needs, fully leveraging its unique expertise and know-how.

### Product examples

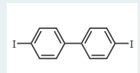
#### Aromatic iodine compounds



4-Iodotoluene

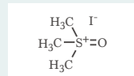


Iodobenzene



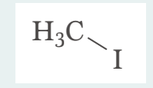
4,4'-Diiodobiphenyl

#### Other iodine compounds

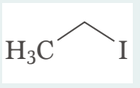


Trimethylsulfoxonium iodide

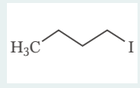
#### Aliphatic iodine compounds



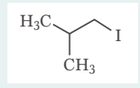
Iodomethane



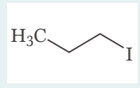
Iodoethane



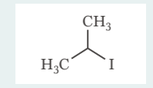
1-Iodobutane



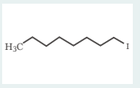
1-Iodo-2-methylpropane



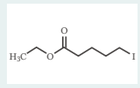
1-Iodopropane



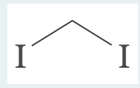
2-Iodopropane



1-Iodooctane



Ethyl 5-Iodovalerate

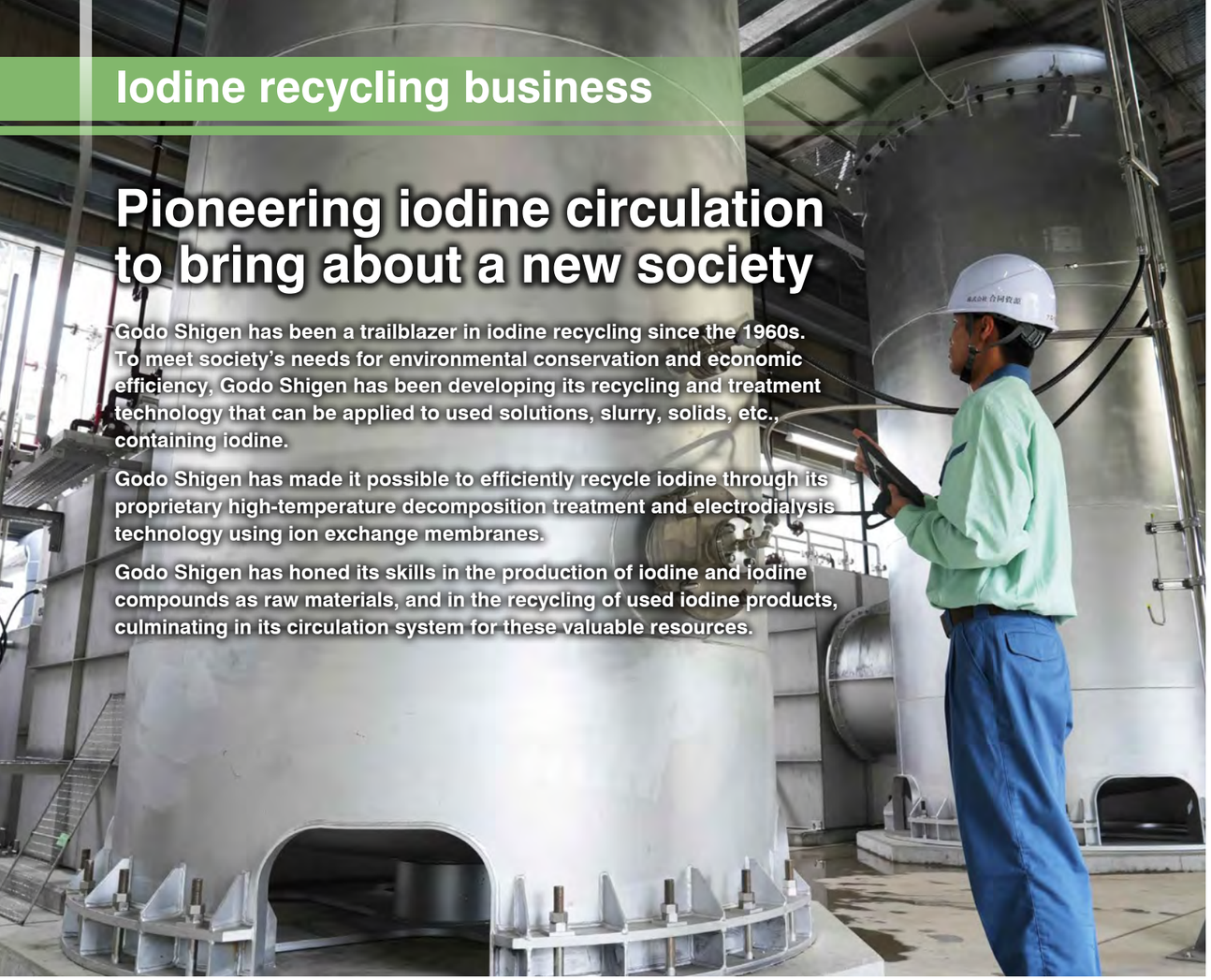


Diiodomethane

### Examples of organic iodine compound manufacturing facilities

| Equipment name | Specifications | Quantity |
|---|---|---|
| Reactor tank | GL2000L<br>GL3000L<br>GL5000L | 2 units<br>2 units<br>4 units |
| Distillation tower (theoretical plates: 7) | GL1000L | 1 units |
| Oil pump | 10pa | 1 units |
| Centrifuge | 30-inch<br>42-inch | 2 units<br>1 units |
| Conical dryer | GL2000L | 1 units |
| Heat exchanger | GL 4–20m$^2$ | – |
| Utility | heat source: Steam, hot water<br>Cooling: Coolant, brine (−30˚C–)<br>Vacuum source: hydraulic rotation, ejector (using both steam and water), liquid ring<br>Other: Nitrogen, argon | – |

# Iodine recycling business

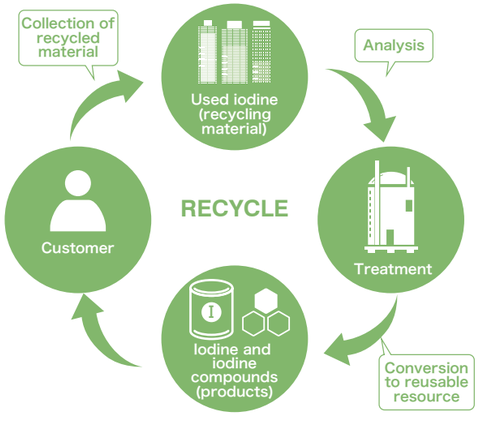


## Pioneering iodine circulation to bring about a new society

**Godo Shigen has been a trailblazer in iodine recycling since the 1960s. To meet society's needs for environmental conservation and economic efficiency, Godo Shigen has been developing its recycling and treatment technology that can be applied to used solutions, slurry, solids, etc., containing iodine.**

**Godo Shigen has made it possible to efficiently recycle iodine through its proprietary high-temperature decomposition treatment and electrodialysis technology using ion exchange membranes.**

**Godo Shigen has honed its skills in the production of iodine and iodine compounds as raw materials, and in the recycling of used iodine products, culminating in its circulation system for these valuable resources.**




### Iodine circulation system

Godo Shigen facilitates recycling through collaboration with its customers while constructing and expanding its efficient iodine circulation system.

Under the system, Godo Shigen receives used materials containing iodine from various industries, evaluates the ingredients and recycling treatment processes by leveraging its accumulated technology and analytical systems, and calculates the price at which they can be purchased as recycled materials.

## Creating a society where iodine circulation is achieved

**Reuse of iodine products after their initial use can create a framework for ecological circulation.**

### Recycling process development

A dedicated team of specialists measures the constituent ingredients, iodine form, and content using a host of analytical systems.

The optimal recycling process is determined and developed according to the results, and the used materials are then recycled, mostly into iodine and hydroiodic acid solutions.

| | |
|---|---|
| **Sample form** | **Solution, organic solvent (polar, non-polar), solid, slurry** |
| **Iodine content** | **Low (10 g/L or less) – High (100 g/L or more)** |
| **Iodine form** | **$I^-$, $I_2$, $IO_3^-$, $IO_4^-$, aliphatic iodine compound, aromatic iodine compound, etc.** |



### High-temperature decomposition method

Used organic solvents and iodine solutions including organic iodine compounds are initially filtered to remove insoluble matter and are then decomposed at a high temperature, after which the separated iodine is reduced and absorbed for recovery.

The liquid obtained through reduction and absorption then undergoes the iodine refinement process, after which it is used as a material for iodine manufacturing.

High-temperature pyrolysis furnace

### Electrodialysis method

Used iodine solutions including inorganic iodine compounds are initially filtered to remove insoluble matter and are then sent through dialysis membranes to selectively permeate and condense the iodine compounds.

The permeated liquid is then converted into hydriodic acid before it is condensed and refined to produce a material for inorganic iodine compound manufacturing.

Electrodialysis system

## Facilities

**Godo Shigen is equipped with comprehensive facilities that make it possible to recycle iodine into reusable resources, with all processes in-house.**

### Pretreatment facility

Recovered recycling materials are melted or filtered and dried before being transferred for high-temperature pyrolysis or electrodialysis.

### Submerged combustion furnace

Safe recycling processes are ensured by the combustion of recycling materials that may contain hazardous substances.

### Plant control room

High-temperature pyrolysis furnaces and electrodialysis systems are centrally controlled and monitored to ensure safe operation.

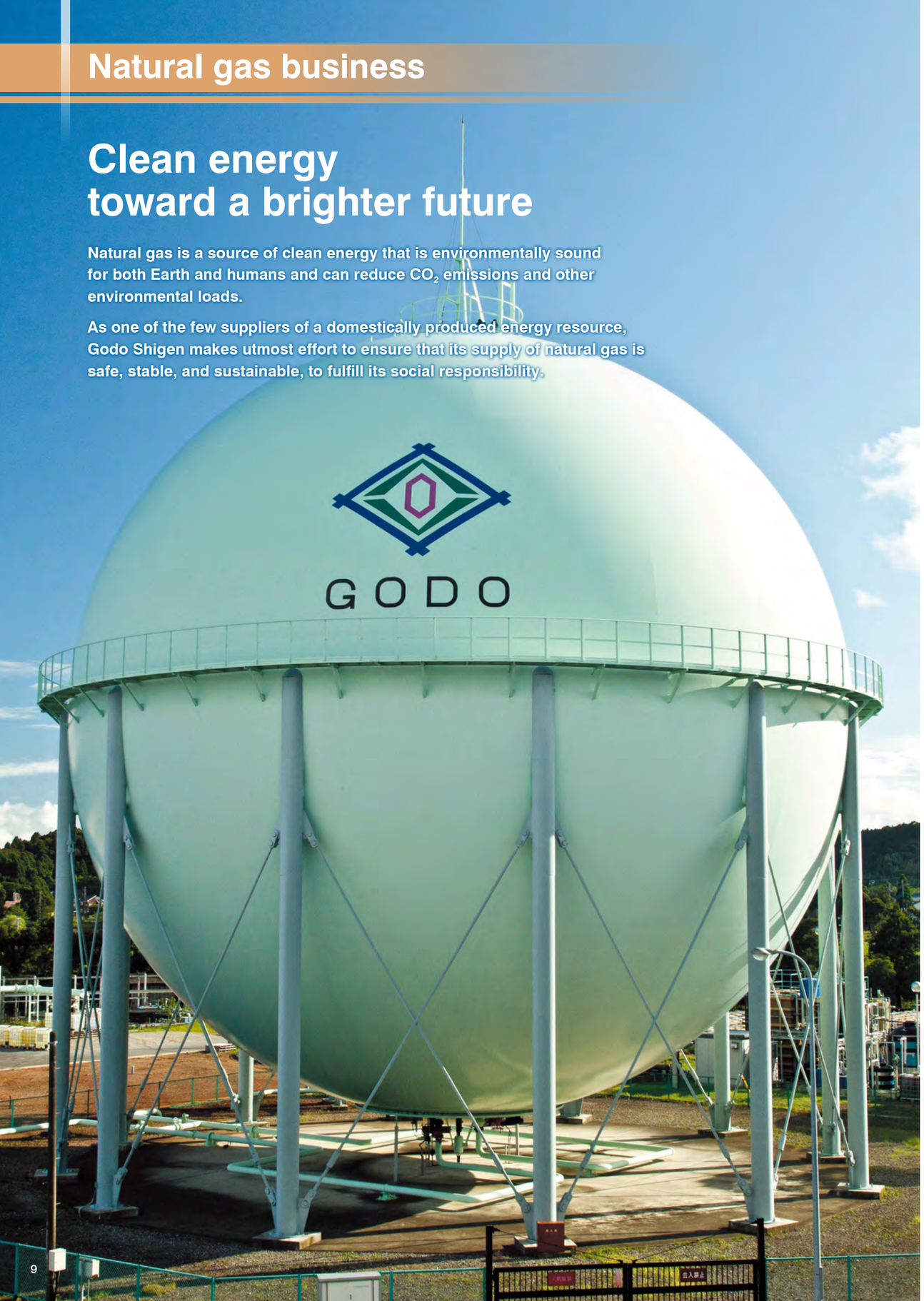
### 57% HI manufacturing facility

HI (hydroiodic acid) produced through electrodialysis is condensed for use in the manufacture of various iodide salts.

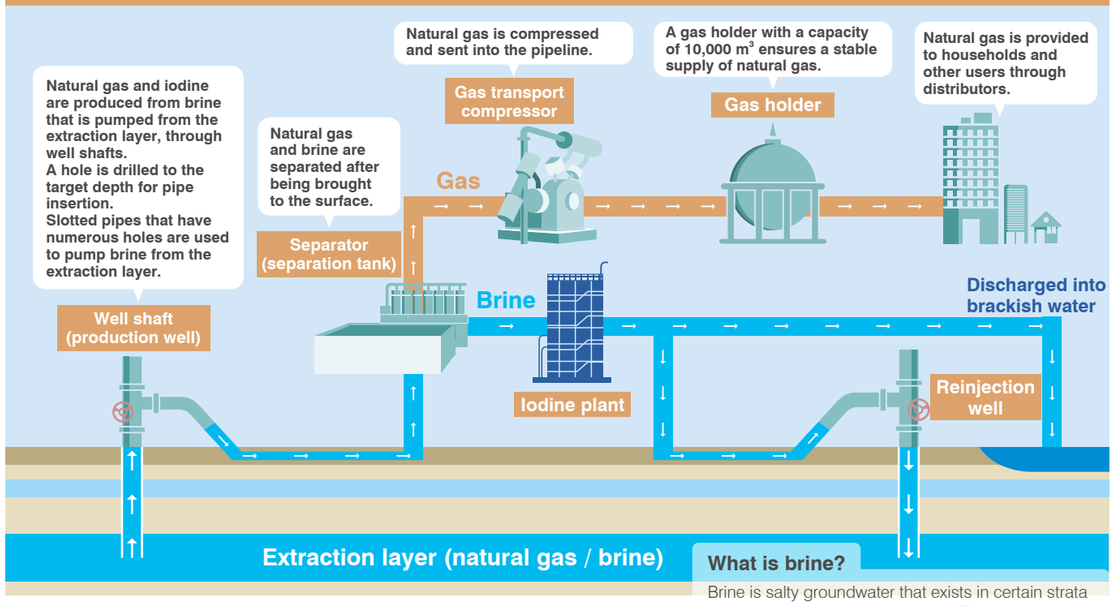
# Clean energy toward a brighter future

**Natural gas is a source of clean energy that is environmentally sound for both Earth and humans and can reduce $CO_2$ emissions and other environmental loads.**

**As one of the few suppliers of a domestically produced energy resource, Godo Shigen makes utmost effort to ensure that its supply of natural gas is safe, stable, and sustainable, to fulfill its social responsibility.**




## Operation flow from production to supply, starting with brine




### What is brine?

Brine is salty groundwater that exists in certain strata 200 to 2,000 meters underground. The natural gas in Chiba, Japan is dissolved in such groundwater and is thus called water-soluble natural gas. Brine is thought to be ancient seawater, and its iodine concentration is roughly 2,000 times that of regular seawater.

## Safe and stable supply enabled with telemeter systems

Godo Shigen uses telemeter systems to comprehensively manage all its processes from production to supply.

Safe and stable supply is possible because all processes are controlled by computers.

Well shaft

Separator (separation tank)

Gas transport compressor


## Effective utilization of energy

While much of the natural gas produced by Godo Shigen is supplied to households and factories across Chiba Prefecture as town gas, a portion is sent to Mutsuzawa Smart Wellness Town, a spa facility, through the local municipality for natural hot-spring bathing (brine) and fuel for generating electricity (natural gas).

## Southern Kanto Gas Field

In Chiba Prefecture in the southern Kanto region lies a mineral deposit field of water-soluble natural gas known as the Southern Kanto Gas Field.

Accounting for 90% of Japan's total water-soluble natural gas production, it is the country's crucial underground natural gas resource, the largest in terms of both production volume and total deposits.

Natural gas is dissolved in the brine based on the depth-specific pressure.

The Southern Kanto Gas Field yields high-quality natural gas that mostly consists of methane (99.0% and above) and does not contain any corrosive or toxic gases.

# R&D and quality assurance

## Raising the power of iodine to the next level

**Constantly striving to provide total solutions involving iodine, Godo Shigen has been cultivating its diverse know-how and high technological competence since its founding.**

**Godo Shigen seeks to unleash the full potential of iodine by leveraging its host of analytical instruments with high analysis capabilities, and test facilities capable of meeting the various needs of fundamental research, industrial processes, and contracted synthesis projects, while actively collaborating with universities and businesses.**







### Quality management system design

Since obtaining ISO9001 certification in 1996, Godo Shigen has been enhancing its quality management system with the participation of all employees, while striving to create products that meet customer needs.

### Technology Development Center

R&D for iodine compound manufacturing and new products takes place here.

### Inorganic Iodine Compound Pilot Plant

Pilot-scale tests are performed to verify laboratory experiments, as efficient manufacturing processes are formulated accordingly.

### From fundamental research to pilot testing

The facility is fully equipped to conduct not only laboratory-level fundamental research but also pilot-scale tests for process formulation.

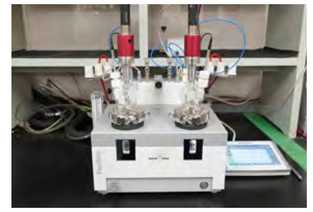
### Organic synthesis pilot test facility

This is where industrial processes are examined for organic iodine compound manufacturing.



### Techno Research Center

Here, iodine compound products are developed and iodine recycling technology is constantly improved.



### Automated synthesizer system

Optimal reaction conditions are examined here at each stage of process development.

### Inductively coupled plasma mass spectrometry (ICP-MS) system

This is used to analyze various forms of specimens, with emphasis on those containing iodine, for which Godo Shigen has accumulated a wealth of technology and know-how.

### Nuclear magnetic resonance (NMR) system

This is used to conduct structural analysis of organic compounds, track their chemical reactions, and analyze their purity based on their quantifiability.

### X-ray diffraction (XRD) system

This is used to determine the crystal structure and analyze impurities in the crystal through structural and component analysis.

## Striving to become a creative company rich in vitality

**Aware that humanity's shared mission is to maintain and improve the Earth's rich environment, Godo Shigen conducts its business activities accordingly while seeking co-prosperity with local communities and executing environmental initiatives with a view to achieving a carbon-neutral society.**

Godo Shigen contributes to enriching people's lives and the development of society by reusing valuable resources without waste.
As a community-based company, Godo Shigen strives to gain everyone's understanding and trust while ensuring stable business continuity.
Godo Shigen continuously strives to develop technology and new products that reduce environmental loads.


## Examples

### Society / communities

- Provision of gas and brine to a nearby spa facility
- Plant tour for local elementary and middle schools
- Support for local disaster prevention activities
- Musical performance at a corporate facility
- Donations to local municipalities, etc.


Lobby concert


Plant tour for elementary school

### Safety / human resources

- Stable supply system design
- Activities to enhance operational capabilities
- Disaster prevention and safety training programs
- Facility maintenance/management system operation and utilization promotion
- Employee education and self-improvement support
- Risk management system


Patrol for operational capability enhancement


Air breathing apparatus training

### Environment

- Reinjection of brine into the ground
- Recycling of used iodine
- Promotion of energy conservation and $CO_2$ emission reduction
- Adoption of electronic manifests for industrial waste management


Energy-saving boiler


Commemorative tree planting for carbon neutrality



Social / community outreach

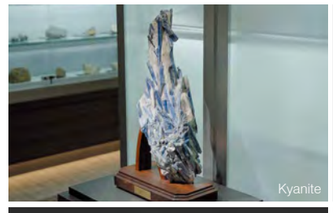
## Minerals from mines across Japan on display Ore Museum

Coinciding with the relocation of its head office in October 2022, Godo Shigen opened this ore museum in the new building as part of its social outreach initiatives. The museum is open to the public and features as many as 1,400 ore specimens.

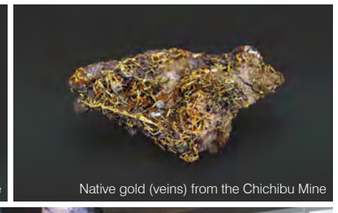
For about 40 years from the inception of its predecessor Isobe Kogyo Co., Ltd. until 1988, Godo Shigen was engaged in metal mining, mainly for gold and silver, throughout Japan. During that time, a huge number of ore and mineral specimens, including gold and silver ores, were collected under the leadership of Dr. Kiyoshi Isobe, the first president of Godo Shigen Sangyo. More than 3,000 specimens were collected, many of which are from closed mines in Japan, making them extremely valuable.

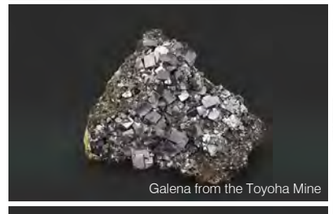
About 1,400 ore specimens, including 1,100 specimens from 860 mines across Japan and 300 specimens of 200 types of minerals from Japan and abroad, are on permanent display. The exhibit of ore specimens from 840 domestic mines, arranged by prefecture, is unique and extremely rare.

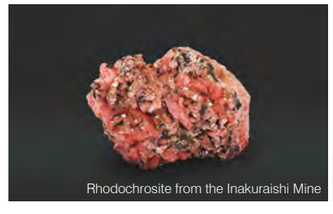
**Open** Monday through Friday (excluding holidays) **Hours** 9:00–16:00 **Admission** Free


Kyanite


Gold-bearing silicified ore from the Koryu Mine


Native gold (veins) from the Chichibu Mine


Galena from the Toyoha Mine


Rhodochrosite from the Inakuraishi Mine


Study tour for local elementary school students

# Company profile

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|---|---|
| **Company name** | Godo Shigen Co., Ltd. |
| **Address** | 1545-1 Nanaido, Chosei-mura, Chosei-gun, Chiba 299-4333, Japan<br>TEL 0475-32-1111　FAX 0475-32-1115 |
| **Establishment** | July 25, 1934 |
| **Business description** | Manufacture and sale of iodine and iodine compounds, recycling of iodine, and development, production and sale of natural gas |
| **Capital** | 630 million yen |
| **Employees** | 207 (as of September 30, 2025) |
| **Site area** | 80,000 m² (Head office and the Chiba Plant) |
| **U R L** | https://www.godoshigen.co.jp/en/ |

## Group companies

**Godo Shoji Co., Ltd.**

| | |
|---|---|
| Address | 2792-1 Mutsuno, Mobara-shi, Chiba 297-0012, Japan |
| Establishment | October 1966 |
| Business description | Purchase and sale of industrial chemicals, management and leasing of real estate, management of parking lots |
| Capital | 100 million yen |
| U R L | https://www.godoshoji.com/ |

**Sogo Kaihatsu Co., Ltd.**

| | |
|---|---|
| Address | 440-11 Oshiba, Mobara-shi, Chiba 297-0033, Japan |
| Establishment | September 1973 |
| Business description | Environmental and geological survey (groundwater and soil contamination) and remedial construction service, development of groundwater and hot springs, civil engineering and geological survey, geophysical exploration, mineral and magnetic analysis, well drilling service, installation of water and gas pipelines |
| Capital | 50 million yen |
| U R L | http://www.sogo-geo.co.jp/ |

**Iodo-Finechem Corporation**

| | |
|---|---|
| Address | 1545-1 Nanaido, Chosei-mura, Chosei-gun, Chiba 299-4333, Japan |
| Establishment | September 2004 |
| Business description | Development, manufacture, and sale of bactericidal and antifungal agents, industrial catalysts, pharmaceuticals, stabilizing agents, colorants, electronic materials, and other chemicals for various applications |
| Capital | 90 million yen |
| U R L | http://www.iodo-finechem.com/ |

**Shinwa Sekkei Co., Ltd.**

| | |
|---|---|
| Address | 880 Hanazawa, Yonezawa-shi, Yamagata 992-0021, Japan |
| Establishment | February 1968 |
| Business description | Construction consultancy (sewerage, roads, urban planning, bridges, river sand erosion control, and coastal/port/agricultural civil engineering/soil/foundation/geology, etc.), surveying, and soil contamination analysis |
| Capital | 73 million yen |
| U R L | https://www.shinwasekkei.co.jp/ |



# History

**1934** Aioi Industry was established (Otaki-machi, Chiba).
The company constructed the Kamitaki Plant in Otaki-machi, Chiba and started the first production of iodine from underground brine in Japan.


Kamitaki Plant in full view

**1948** Isobe Mining was established. The company developed metal mining sites in Yamagata Prefecture.

**1952** The Yatsumi Plant was constructed in Chosei-mura, Chiba. The company increased its iodine production and also commenced natural gas development.

**1957** The company started supplying natural gas, as a raw material for chemical production, to Toyo Koatsu Industries (currently Mitsui Chemicals).


Metal mine development in Yamagata Prefecture

**1965** Isobe Mining and Aioi Industry merged and became Godo Shigen Sangyo.

**1966** Godo Fudosan was established.

**1973** Sogo Kaihatsu was established.

**1974** The company updated its iodine manufacturing facilities, switching from the copper method to the blowout method.

**1983** The Kamitaki Plant in Otaki-machi was integrated into the Yatsumi Plant.


Switch to the blowout method

**1988** The company exited the metal mining business.

**1990** The iodine recycling facility began operation.

**1997** The company started participating in the management of Shinwa Sekkei.

**2001** The prilled iodine manufacturing facility began operation.

**2004** The joint venture company Iodo-Finechem was established.

**2005** The inorganic iodine compound production facility began operation, adopting a novel manufacturing method.


New blowout tower

**2006** The new Techno Research Center building was completed.

**2007** The company merged with Toyo Kosan Life through absorption.

**2010** The Technology Development Center was completed.

**2013** The HI & Iodide Center began operation.

**2014** The company was renamed Godo Shigen.


Expanded recycling facility

**2017** The new blowout tower began operation.

**2022** A new office building was completed in Chosei-mura, Chiba. The company relocated its head office from Chuo-ku, Tokyo to Chosei-mura.

**2023** Godo Fudosan was renamed Godo Syoji, adding its trading function.

**2024** The iodine recycling facility was expanded.

**2034** The company will celebrate its 100th anniversary


**Godo Shigen strives to enhance the value of precious resources while contributing to the creation of a secure future society. Godo Shigen will continue to take on new challenges as it approaches its 100th anniversary in 2034.**

Head office and the Chiba Plant

Toward the 100th anniversary