- Fully Pressurized Liquefied Gas Tank Plants
- Semi Pressurized Fully Refrigerated Liquefied Gas Tank Plants
- Research & Development
- Land Based Liquefied Gas Tank
- Bridge

- Hydraulic Gate
- Offshore Self-Elevating Platform
- Steel Structure
- Architectural Steel Structure
- Civil Engineering

IZUMI STEEL WORKS, LTD.

www.izumi-steel.co.jp

Corporate Data

Introduction

The Inland Sea region has a long history of prosperity, mainly due to it being a shipping route.
Many products, led by steel, chemicals, and petroleum, are still produced along the shores of the Inland Sea today, as its nickname, "The Ginza of the Sea," suggests. Since our establishment as a company in 1961, Izumi Steel Works, Ltd.(Izumi) has also reaped the benefits of the Inland Sea in our capacity as one of its shoreline plants, sending various products out to sea to their destinations. For our company, which produces tanks for liquefied gas carriers, offshore platforms, and other large steel structures that cannot be transported over land, this quiet inland sea is an indispensable treasure. The trend in the industry at present is for these products to become larger year by year, and higher safety and performance are also being demanded of them. As a result, all of our employees are working day and night to develop the needed technology and enhance our production skills. In order to manufacture high-quality products, we believe that we must not only perfect our skills, but also become a truly harmonious company where labor and management trust and help each other. We also believe we must be a company where each and every one of us gains happiness from working and producing something. In this way, we expect to be able to build our products and contribute in some significant way to society. We do not wish to merely boast about production volume. We would like to be centered around a small team of engineers that manufactures at a steady pace and sincerely, provides heartfelt after-sales service following delivery, and then utilizes this after-sales service experience to think and develop further.
We ask for your continued guidance and support going forward.

Company Name:	**Izumi Steel Works, Ltd.**
Founded:	March 14, 1961
Paid-in Capital:	96.00 million yen
Major Shareholders:	Fuji Steel Corporation 166,320 shares (69.3%), Sumitomo Corporation 72,000 shares (30%)
Representative:	Takaaki Tomiie, President and CEO
Business categories:	1. Design and manufacture of cargo tanks and gas handling plants for liquefied gas carrier 2. Design and manufacture of land-based tanks for liquefied gas 3. Design and manufacture of various other pressure Vessels 4. Design, manufacture and leasing of Self-Elevating Platform(SEP) 5. Design, manufacture and erection of bridges 6. Design, manufacture and installation of civil engineering structures such as water gates 7. Manufacture and assembly of architectural steel structures 8. Manufacture and assembly of civil engineering products (steel segments, tunneling shields)
Ground Area:	Headquarters and plant: 61,451 m2 Marugame office: 50,223 m2
Number of Employees:	Engineers 40, Field workers 100, Office personnel 20, Total: 160
Affiliated Company:	Fuji Steel Corporation 5-15, 4-chome, Itachibori, Nishi-ku, Osaka City, Osaka President and CEO Yasusuke Tomiie
	Fuji Kozai Steel Center K.K. 2-3, 5-chome, Asahimachi, Takamatsu City, Kagawa President and CEO Takaaki Tomiie

Business Sites:

Headquarters and Plant

2-3, 5-chome, Asahimachi, Takamatsu City, Kagawa 760-0065
Tel: 81 (0) 87-822-1181 FAX: 81 (0) 87-822-1189

Osaka Branch:

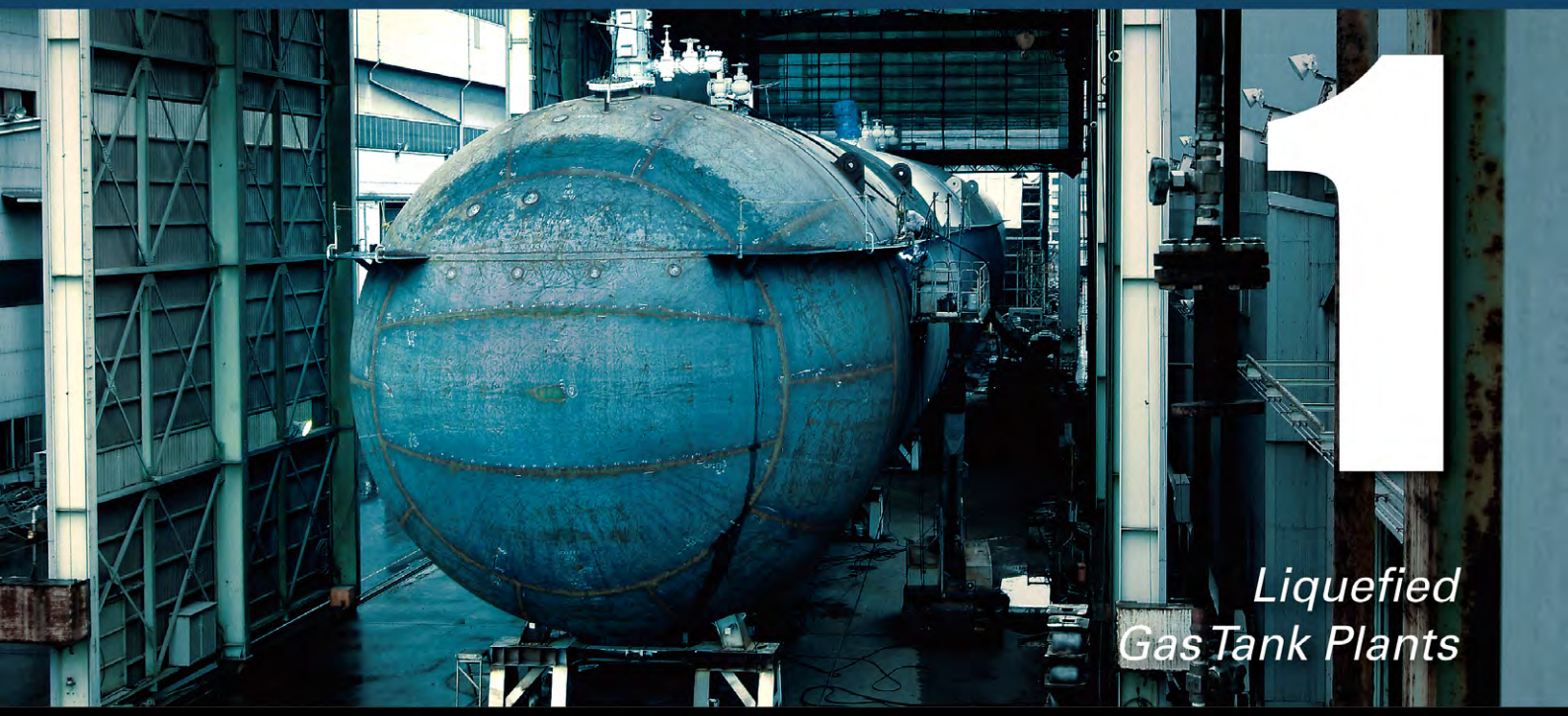
5-15, 4-chome, Itachibori, Nishi-ku, Osaka City, Osaka 550-0012
Tel: 81 (0) 6-6534-4800 Fax: 81 (0) 6-6538-3018

Okayama Branch:

48-1 Izumida, Minami-ku, Okayama City, Okayama 700-0944
Tel: 81 (0) 86-224-2426

IZUMI STEEL WORKS, LTD.

Pressure Vessels



Imagining and manufacturing from the user's standpoint. That is IZUMI.

This is something important that we have protected to date, and will continue protecting in the future.

From the design stage, we produce meticulous preparatory designs so that customers can understand the initial ideas fully, then digest their desires and conduct the actual design while having numerous meetings so that we can accurately provide what is being requested. Therefore, when the design is completed, that is also when we have completed fully incorporating the customer's desires. The relationships with our customers have been built on trust, as evidenced by our track record of more than 300 vessels, were in fact built up in this way. This is something important that we have protected to date, and will continue protecting in the future.

2

Fully Pressurized Liquefied Gas Tank Plants

We want to build them perfectly because they carry cargoes of hazardous materials.

"Marine tanks" endure harsh conditions

A ship's hull is constantly moving, with vibration from the engines, pitching and rolling due to waves, all resulting in twisting and distorting. Tanks also repeatedly shrink and expand because of the temperature and pressure of the cargo. Furthermore, the liquid surface inside the tank generates sloshing due to the ship's movements, repeatedly adding force onto internal pipes and equipment. "Marine tanks" must endure harsh conditions incomparable to tanks located on land.

World's first fully pressurized Bi-Lobe tank plant

Strength and flexibility

With the ship's hull constantly pitching and rolling, and tanks repeatedly shrinking and expanding, one would think one would want to firmly fix tanks and their internal structures, as well as pipes in loading/unloading plants, but a firm structure with increased strength would only result in damage. The question is how to combine strength and flexibility, and realize a flexible structure overall. This is where our expertise built up over many years lies.

Instructions for the cargo handling plant

1,380 ㎥ cooled liquefied ammonia gas carrier

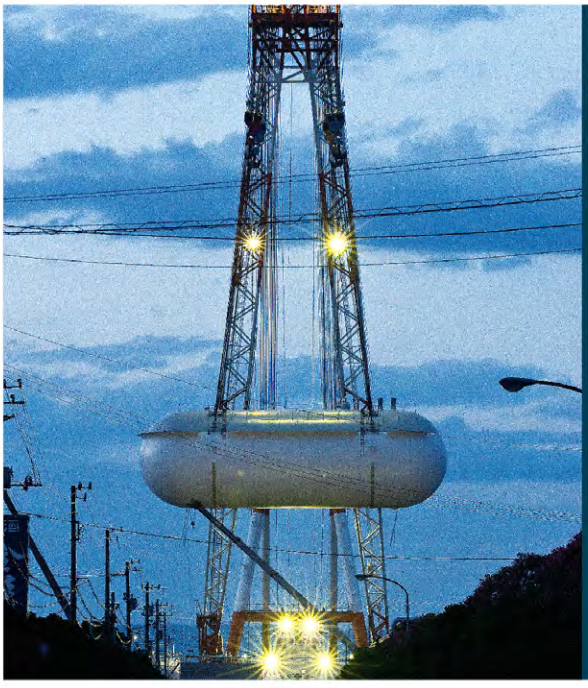
1,450 ㎥ LPG carrier

3,500 ㎥ LPG/VCM carrier

5,000 ㎥ LPG carrier

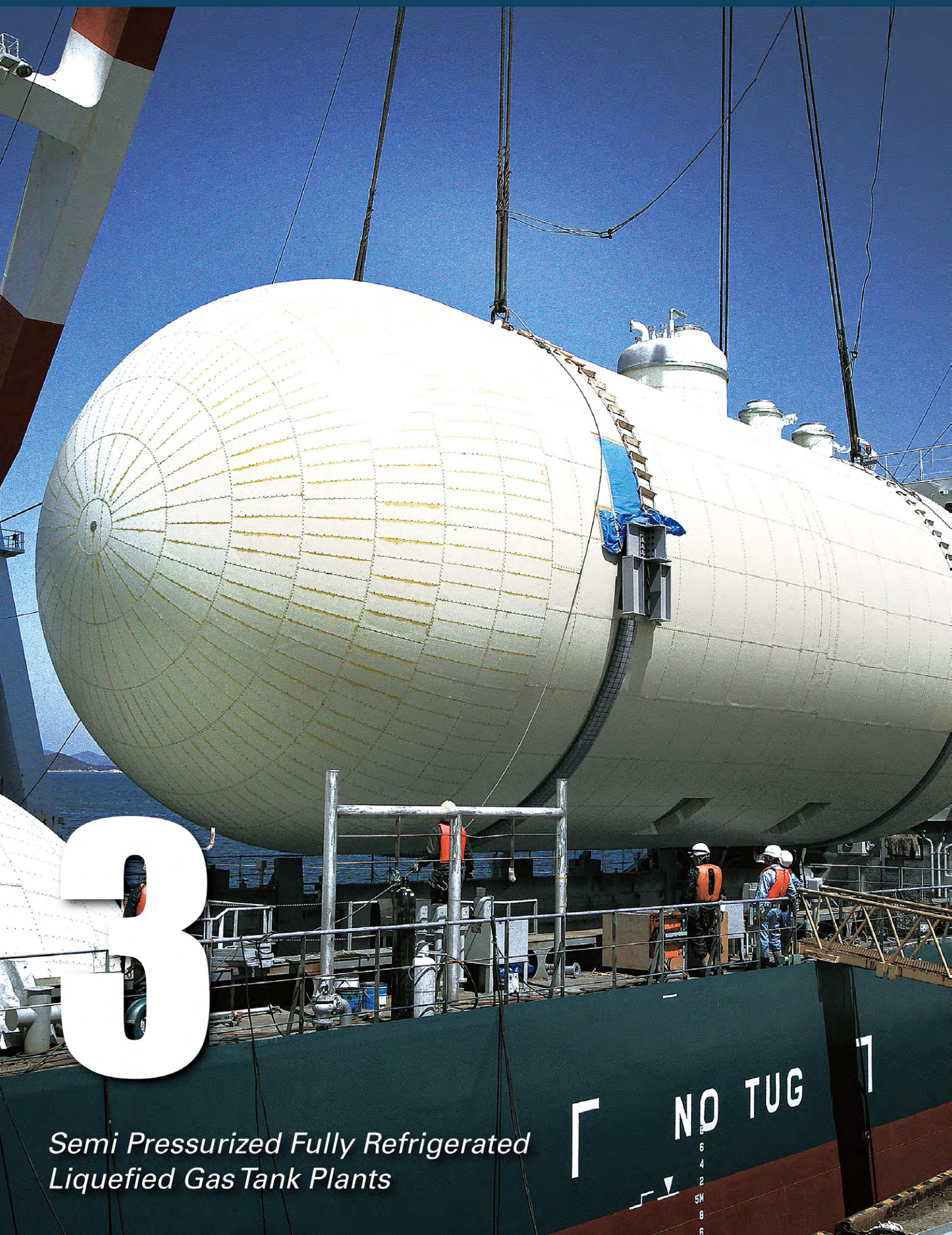
9,500 ㎥ LPG/VCM carrier

11,000 ㎥ LPG carrier



Meticulous attention to detail in every corner of the plant…

A ship that carries cargoes of hazardous materials should always be in perfect condition. Therefore, we have always believed that the structure of a tank plant should be easy to inspect, down to the details. For example, does the structure of each part of the plant make it easy for crew members to perform maintenance against rust, and is there enough space to conduct each inspection stage. Our meticulous attention to detail, where we put ourselves in the customer's shoes, starts from here.



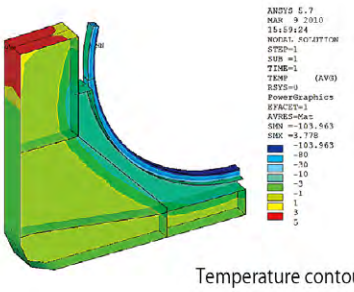
3

Semi Pressurized Fully Refrigerated Liquefied Gas Tank Plants

Producing more reliable products through trial after trial

Enduring low temperature

Semi pressurized fully refrigerated tank plants have different low-temperature capabilities depending on the cargo carried, with ethylene refrigerated to -104°C and propylene cooled to -48°C. Therefore, we carefully select materials for the tank itself according to their resistance at low temperatures and compatibility with cargo, repeatedly consider tank materials and welding materials that can confirm and ensure quality together with material makers, and conduct more than enough trials.



Temperature contour display of tank saddle

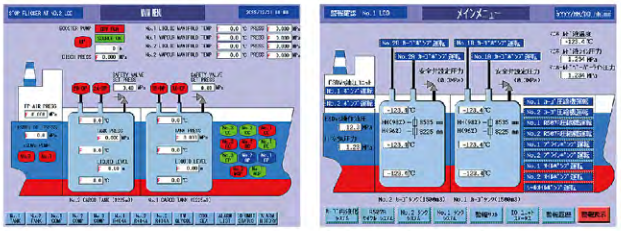
Cooling to low temperature

Re-liquefying equipment is installed to maintain low temperature for cargo, and to cool liquids down from the time of loading. In this area, our goal is to provide equipment that satisfies customer requests regarding the cool-down speed required for each cargo, and that minimizes the maintenance burden. After the ship is completed, we confirm the soundness of the cargo tank plant, including cargo piping systems and equipment such as cargo pumps, through performance tests in the form of gas trials, and we also attend the first cargo loading, which also serves as a full loading test of the cargo. In addition, we confirm the soundness of insulation systems through a cold-spot inspection of insulation materials.

Maintaining low temperature

Semi pressurized fully refrigerated tanks have insulation to prevent heat ingress from the surroundings, and we pay particular attention to measures against strain caused by any differences occurring in the expansion and shrinkage between tanks and insulation materials, and compatibility between the foundation on the ship and the tank supporting system. We do this in order to use insulation suited to the temperature at which the tank is used. We work to ensure quality so that maintenance work can be kept to a minimum during useful life.

Tank plant monitoring panel



Installation of 8,700m³ SP/FR-type liquefied gas tank

1,520m³ liquefied ethylene gas carrier

3,000m³ liquefied ethylene gas carrier

We think of after-service as a product, too.

Of course, what is most desirable for the customer is to receive excellent products that do not require after-service. And equally naturally, that is our objective as well. No matter how well a product is made, however, deterioration and breakdowns, as well as unexpected accidents, cannot be completely avoided over the many years of usage. That is precisely when our responsive, heartfelt after-service offered from the customer's standpoint comes into play. We are constantly thinking of how to provide first-class after-service. Furthermore, since it is something we provide to our customers, we think of after-service as a product, too.

High responsiveness through parts stock

Research & Development

Research & Development – To provide products that live up to our customers' trust

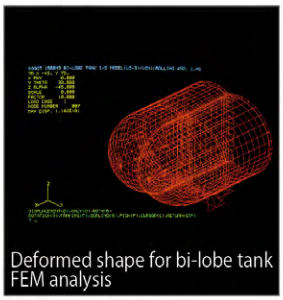
Research & Development

Creating better products

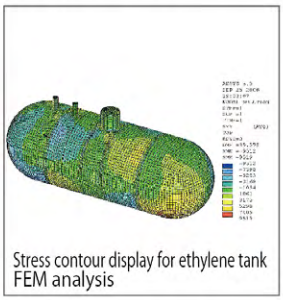
We are working companywide on all quality activities from design, manufacturing to post-handover, aiming to enhance customer satisfaction through the products we provide.

Tank design

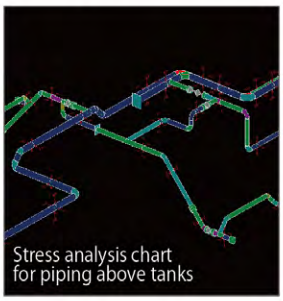
We are constantly striving for optimal design, introducing detailed analysis through FEM structural calculation whenever needed, in addition to normal strength calculations. In particular, for specialized tanks, including large tanks, we use detailed analysis as our base for examining the best ways to implement production. This includes determining the order and method of construction, working on manufacturing products with an emphasis on quality, and ensuring no delivery delays so that we can give our customers peace of mind.



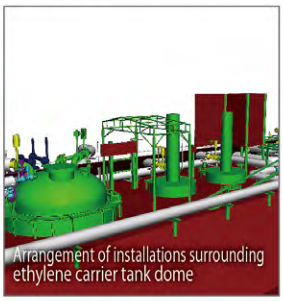
Deformed shape for bi-lobe tank FEM analysis



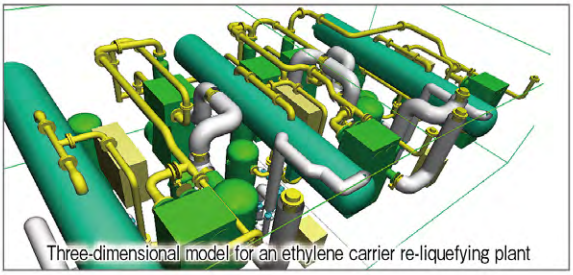
Stress contour display for ethylene tank FEM analysis



Stress analysis chart for piping above tanks



Arrangement of installations surrounding ethylene carrier tank dome



Three-dimensional model for an ethylene carrier re-liquefying plant

Minus 196℃

We use liquid nitrogen to cool our model tank to -196°C, return it to room temperature and cool it again. We repeat this many times, collecting various data during this time. In order to develop a pressure build up type of LNG tank plant aimed at the secondary domestic transport of LNG, we conducted cooling and a full loading test for a large model tank in 1991.

Design of piping systems

Expansion and shrinkage occurs for pipes located above tanks due to the pitching and rolling of ships during rough seas as well as changes in ambient temperature, and changes in temperature caused by the cargo. As a result, various forces, such as tension, compression, and bending, are exerted on pipes and supports, as well as equipment connecting pipes such as pumps. Studies are made so that such forces do not have an adverse impact on pipes. For cargo piping for a semi-ref carrier, for example, which undergoes large expansion and shrinkage, we conduct separate piping stress analysis and so on to maximize the pipe's functions and confirm the soundness of the piping structure.

Land Based Liquefied Gas Storage Tank

Four 500t LPG storage tanks

5

Land Based Liquefied Gas Tank

Producing large land-based storage tanks at our plant

Since these are pressure vessels, we have especially aimed for perfection.

High welding quality lowers running costs.

We produce land-based storage tanks, which were previously produced through assembly and welding at the tank location, at our plant, and then we delivered and installed the finished product on-site. Large pressure vessels produced at first-class facilities and under first-class quality control unaffected by weather require almost no repairs even over many years of use, and enable large reductions in expenses related to tank maintenance and similar. We deliver these land-based storage tanks to our customers based on a detailed transport and installation plan.


450t/750t LPG storage tanks

Five 100t LPG storage tanks

6

Elevated Bridges
Highway Bridges
Pedestrian Bridges

Seto-Chuo Expressway Sakaide Interchange ramp bridge

We are proud to be involved in the construction of bridges.

Bridges are uplifting.

Bridges spanning canyons and rivers create new roads, regardless of their size, and are deeply involved in the lives of local residents. The completion of a bridge means the start of a new life for people, and maybe that is why they are uplifting for us. We are proud to have been involved in their construction, and moreover are uplifted by them as well.


Yawatahama steel bridge pier


Kochi Expressway
Tsubakiyama #2 bridge

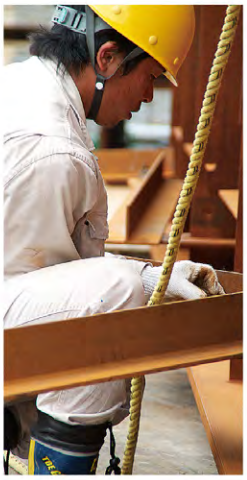

Tokushima Expressway Tokumei elevated bridge


Matsuyama Expressway,
Matsuyama elevated bridge


Kuboki pedestrian crossing bridge

Because they are valuable assets

Our long-held hope, having been involved in steel structures, was to “leave behind some product of ours for the local community” and “have it be something closely connected to everyone’s lives.” The realization of this hope was the production of bridges, particularly because bridges are valuable social infrastructure that are passed onto future generations. We keep a close eye on each process, from design to production at the plant to installation, and conduct our construction work under a constantly administered control structure. We are carefully accumulating a valuable track record, one project at a time.



7

Hydraulic Gate

四国電力(株)加枝ダムゲート


Shikoku Electric Power Co., Inc. Kae Dam gate

Technology accumulated over many years helps protect our lives from disaster.

Living in harmony with water

Hydraulic gates ranging from those for dams and rivers through to hydraulic gates and penstock for hydroelectric power generation are built to prevent water-related disasters, to secure water resources and water energy, and to make people's lives more comfortable and convenient. We provide hydraulic gates and penstock facilities that give a high priority to achieving harmony between people and nature.
Gates for rivers, such as weirs, hydraulic gates, and sluice way gates, are used to adjust water levels but also have the important mission of protecting our lives from disaster during floods. Production of these moving steel structures, which have to be watertight, requires the highest degree of precision. This is precisely when the technology regarding pressure vessels that we have accumulated over many years becomes valuably useful.


Uchinomi Port floodgate


Takamatsu Port floodgate


Hakegawa hydraulic gate

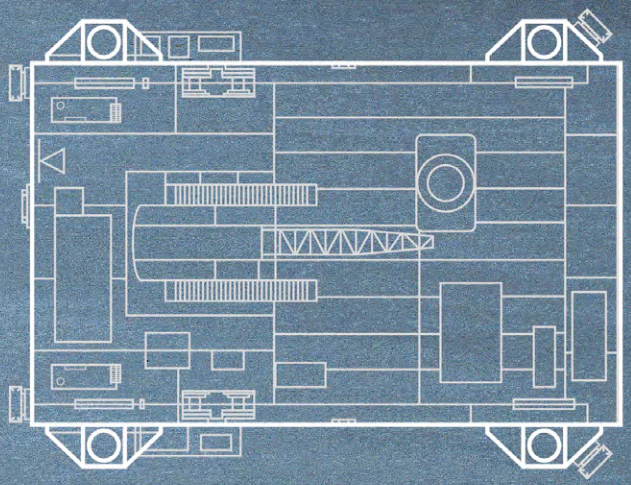

Tadotsu Port floodgate


Mannoukawa bottom hinge flap gate


Hakegawa hydraulic gate


Shinkawa bottom hinge flap gate

Offshore Platform



8

Offshore Self-Elevating Platform: IZUMI SEP

SEP during boring for construction of Tokushima Expressway Lake Ikeda Bridge


来島海峡
潮流の中での海底削孔

Taking on the challenge below the water's surface

Superior maneuverability supports underwater development.

Living in the water

As a result of our efforts to find a new area to utilize our experience in marine products, we introduced a small offshore platform assembled with locking equipment. This product installs and assembles two floats, large and small, and elevating equipment with locking equipment in accordance with use. This platform has been used in various domestic and overseas sites since 1972 as an offshore platform with unique functions and unusual flexibility and maneuverability.

Transportation

Float assembly

Leg assembly

Completion
(construction of lower portion of New Inuyama Bridge)

Performance in Extreme Conditions

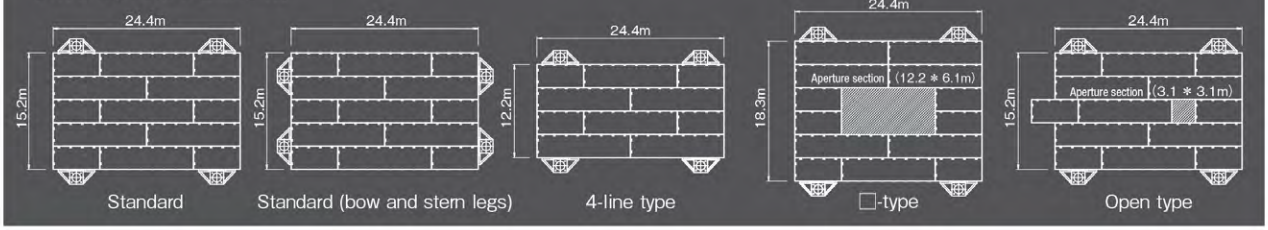
	Case 1	Case 2	Case 3
Water depth (m)	30	20	26
Wind velocity (m/s)	30	51.5	36
Wave height (m)	—	8	1.5
Displacement	596	538	590
Water environment	Dam lake	Greater coasting area (restricted)	Smooth water area

Enduring nature's harsh conditions

The ocean, with its ever-changing waves, wind, and currents, requires a solid structure as regards platforms. The Izumi SEP has undergone careful strength calculations from every angle, such as water depth, current, wave height, and wind velocity, and is designed to provide ample resistance to such elements without losing the flexibility characteristic of such an SEP, all achieved through use of special connecting devices made of high-tensile cast steel.

Platforms can be formed into various shapes to handle various needs.

[Assembly Pattern Examples]

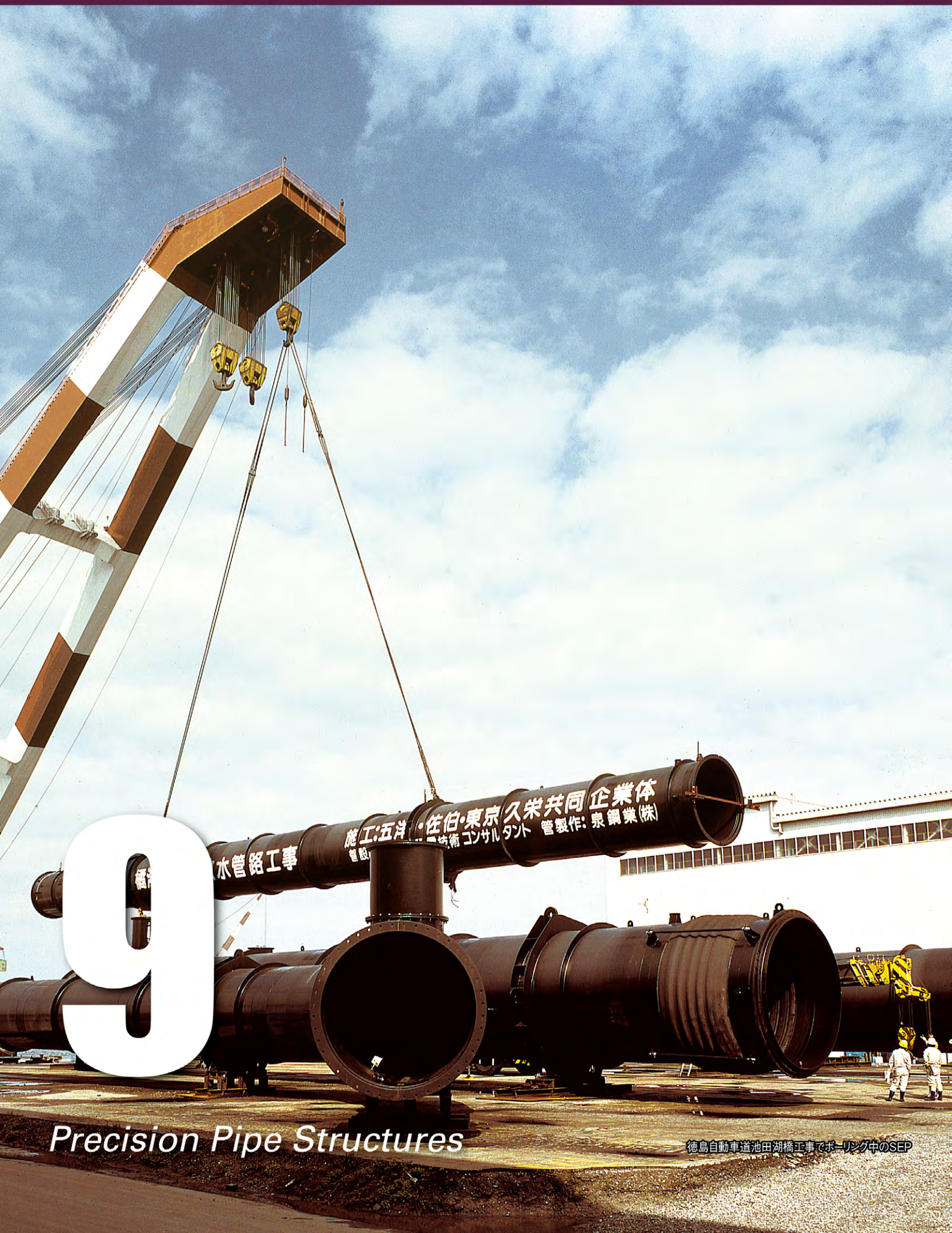



Construction of D runway at Tokyo International Airport

Living in maneuverability

Changing the size and other specifications of normal fixed offshore platforms after completion is generally unthinkable without fundamentally rebuilding them, but the Izumi SEP can be wholly assembled by combining float structure units and elevating equipment. The various units can be assembled on-site and used at dams and lakes in the mountains, as long as the required units can be transported there.


Kami-igusa Bridge removal



9

Precision Pipe Structures

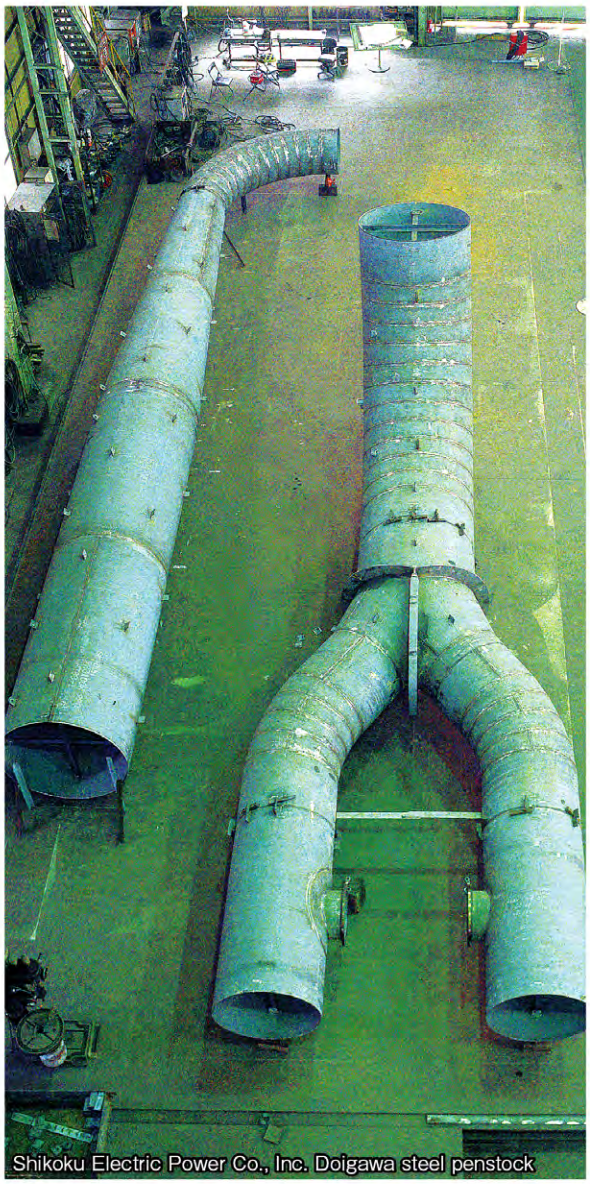
徳島自動車道池田湖橋工事でボーリング中のSEP

Izumi's technology is utilized here as well.

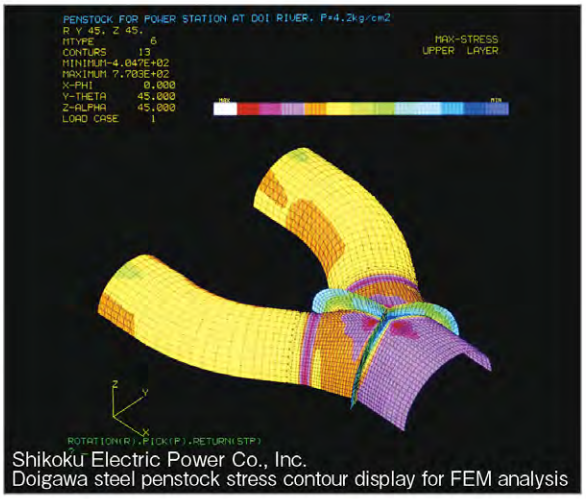
Technology accumulated in producing tanks for ships takes on the challenge of diverse steel structures.

Staying true to the basics

The difficulty in manufacturing Liquefied gas carrier tanks lies in realizing high-quality, precision production using thick plates of 600-800MPa-class high-tensile steel. We keep a close eye on the various stages of processing, assembly, and welding, which are constantly in a cause-and-effect relationship, and have all employees participate in quality control, centered on the quality assurance department. In other words, staying true to the basic principles of fabrication opened the way for us to build precision steel structures.



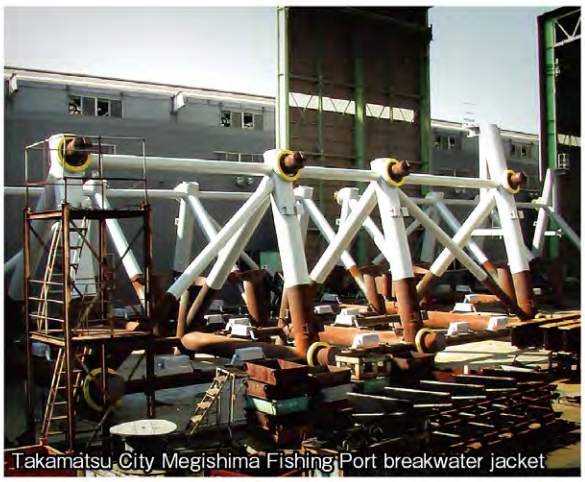
Shikoku Electric Power Co., Inc. Doigawa steel penstock



Shikoku Electric Power Co., Inc.
Doigawa steel penstock stress contour display for FEM analysis

Utilizing large-scale facilities

Our tank manufacturing facilities, including a 2,000-ton press, large bending machine, and big assembly plant with 150-200-ton overhead crane, can also be used to produce large steel structures.

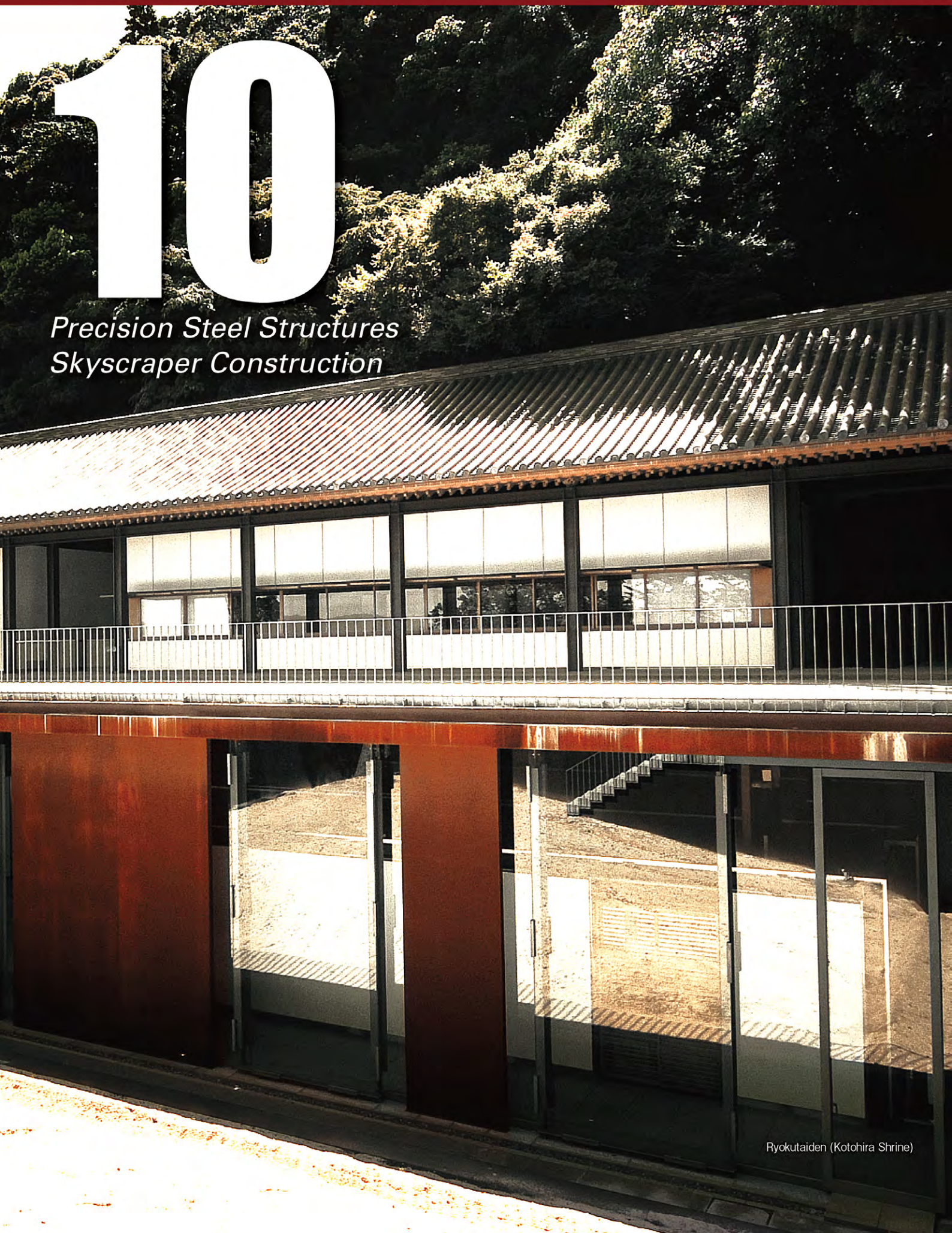


Takamatsu City Megishima Fishing Port breakwater jacket

Sumitomo Metals Kashima Thermal Power Station
IPP seawater retrieval equipment

10

Precision Steel Structures
Skyscraper Construction



Ryokutaiden (Kotohira Shrine)

Taking on the challenge of precision steel structures

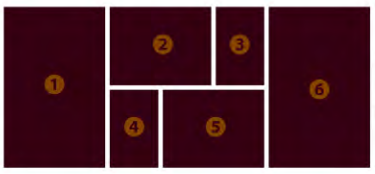
Skyscraper construction demands precision steel structures.

Ryokutaiden (Kotohira Shrine)

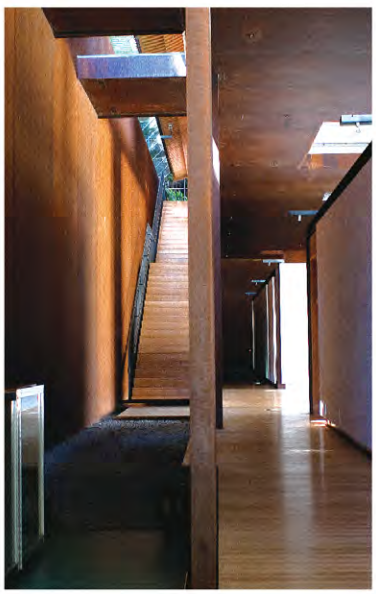
Talisman issuance office (Kotohira Shrine)

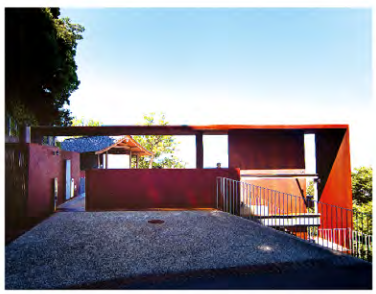
Responding to ever-changing modern architectural technology

Izumi has handled production of numerous precision steel structures to enable efficient use of urban spaces through skyscraper construction, while also acting as an engineering team that can respond to the diverse values in demand today, such as handling the construction of Kotohira Shrine's main building as steel structure specialists. We are earnestly forging the way to the architecture of tomorrow using very reliable technology, aiming to provide high-quality products that can satisfy our customers.



①②③Ryokutaiden (Kotohira Shrine)
④⑤Sunport Takamatsu Decks Galleria
⑥Kobe Steel, Ltd.' s Kobe Works Crane girder





Steel Structure for Civil Engineering

11

Steel Segments Tunnel Support

Only strict self-management can protect the value of spec products.

Steel segments

The most common way to construct sewage, electricity and communications tunnels is to use the shield method, whereby a tunnel-boring machine pushes forward underground like a mole. Steel segments are produced separately (in segments), and are assembled in rings within the tunnel to be used as covering material in the shield method. Therefore, the assembled segments must be highly watertight, and also able to endure stresses such as soil and water pressure.
As a plant certified by the Japan Sewage Works Association, we employ automating welding by using robots to produce uniform, high-quality products.

Tunnel support

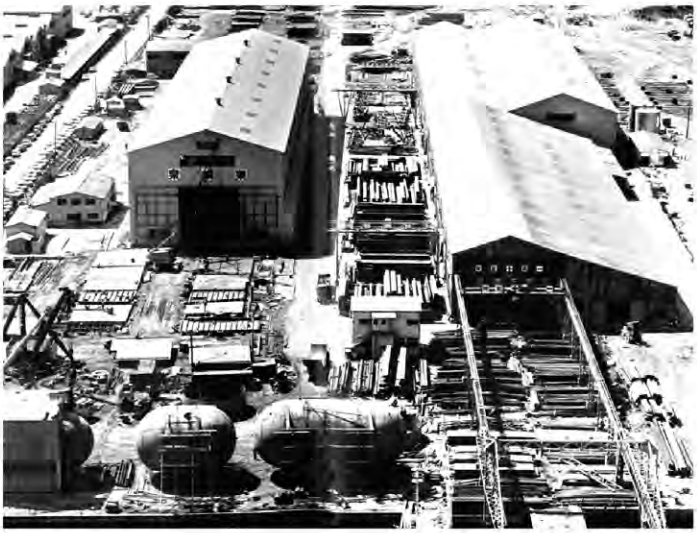
Arch-shaped tunnel supports are installed as supports to secure underground space while the tunnel is being bored, and must be strong enough to resist pressure from the surrounding soil. Therefore, precise rounding is crucial, and we are able to utilize our bending technology, accumulated over many years, in our manufacturing in the pursuit of perfection.

鋼製セグメントのロボット溶接工程

支保工の自動曲げ工程

12

History of IZUMI to Date



Headquarters plant around 1970

We have been building reliable products for more than 50 years.

March 1961	IZUMI established with capital of ¥30 million as Fuji Steel Corporation's steel processing and warehouse division
October 1962	Work on phase 1 construction started; receives license for construction of steel structures
March 1963	Sea berth (water depth 5.5m), 10-ton crane yard, and #1 plant (warehouse/steelworks plant building, 3,369m2) completed; starts production of architectural steel structures and straight processing of round bars
November 1963	#1 plant expanded (1,880m2) and forming mill installed; starts production of lightweight formed steel
March 1966	License as operating warehouse received; starts warehousing business Starts production of high-pressure tanks for LPG tankers started
March 1967	#2 plant (2,464 m2) constructed and lightweight formed steel division moved there
November 1967	#2 forming mill installed; 2,500-ton capacity system established for lightweight formed steel
April 1968	Capital increased to ¥50 million
February 1969	#3 plant (steel structures division, 1,780m2) completed
January 1970	Pressure Vessels manufacturing plant (3,200m2) completed
November 1970	Lightweight formed steel division receives permit to display Japanese Industrial Standards (JIS) certification
December 1971	150-ton overhead crane installed next to Pressure Vessels manufacturing plant Construction of large Pressure Vessels manufacturing plant (2,332m2) and dedicated sea berth
July 1972	Capital increased to ¥80 million
April 1974	Capital increased to ¥120 million
June 1974	Outside assembly yard (9,000m2) and movable structure (1,080m2) constructed, 100-ton bridge crane installed
December 1975	50,223m2 of land for plants purchased from Marugame City
April 1977	Production of tunneling shields started; completes dedicated warehouse for formed steel and steel plate (2,400m2)
November 1978	Receives certification from Japan Sewage Works Association; starts production of steel segments
July 1979	60-ton bridge crane installed in outside assembly yard
January 1980	Marine equipment division established; signs technical co-operation contract with Robbie Shaw Engineering of US and starts production, sales and leasing of Flexi-float SEP
January 1980	Completes construction materials plant (2,400m2) and moves tunneling shield and steel segment divisions there
April 1981	Completes one building (2,160m2) in phase 1 of Marugame plant construction
July 1982	Production of steel segments by robots started in construction materials plant
November 1984	U and U2 pressure vessel stamp certification received from American Society of Mechanical Engineers (ASME)
October 1985	R&D for Bi-Lobe Tank started
February 1986	CAD/CAM system introduced; program development by in-house system engineers started
October 1987	Welded H-beam production line installed, production started
November 1987	U and U2 pressure vessel stamp certification renewed by American Society of Mechanical Engineers (ASME), S stamp certification received
November 1988	200-ton overhead crane installed in large Pressure Vessels manufacturing plant
January 1989	Japan's first Bi-Lobe tank completed
September 1989	Starts cutting at Marugame plant
December 1989	Completion of world's first chlorine carrier tank plant based on IGC code
July 1990	#1 plant addition dismantled; constructs new Pressure Vessels manufacturing plant (1,880m2)
July 1991	Warehouse building (12,000m2) constructed at Marugame plant; warehouse division and tunneling shields moved there; plant becomes Marugame Works together with cutting division
November 1991	#1 plant, #2 plant, #3 plant and new Pressure Vessels plant renovated; completes steel structure plant (8,310m2) and starts operations
March 1992	Japan Steel-rib Fabricating Association's H grade acquired
February 1995	Receives certification as approved maritime works by Nippon Kaiji Kyokai (ClassNK)
March 1995	Pressure Vessels manufacturing plant (1,382m2) renovated into large Pressure Vessels manufacturing plant
July 1995	Receives the Minister of Construction's permission for designated construction work
November 1995	Pressure test facility for large tanks installed
January 1999	Welfare building (dining room, offices) completed
January 1999	Acquires certification of pressure vessels and pipe equipment based on ISO9001 (Nippon Kaiji Kyokai)
March 1999	Pressure test facility for large tanks and movable structure (1,000m2, height 22m) added
October 2001	Large bending roller installed
October 2001	Enlarges Pressure Vessels manufacturing plant (2,696m2) and installs plasma cutting machine
June 2003	World's largest-capacity pressurized 11,000m3 tank plant (2 tanks) completed
February 2006	Refrigerated 1,520m3 ethylene tank plant completed
March 2006	Movable shack for producing large tanks (22mx20mx26m) completed in T district
April 2006	150-ton/75-ton, 10-ton, 10-ton bridge crane completed in T district
April 2007	Marugame Works warehouse section and manufacturing section closed as part of business re-organization
March 2008	Capital reduced to ¥96 million
December 2008	Goods-handling facility (parts warehouse: 1,042m2) completed
June 2009	#2 Pressure Vessels manufacturing plant (3,021m2) completed; 150-ton/75-ton/10-ton overhead moving crane installed, 30-ton/15-ton/10-ton overhead crane installed
June 2009	Extends T district concrete flat base and 150-ton crane rail
September 2009	Starts manufacturing of ethylene tank plant using Hi nickel steel
November 2009	Osaka office opened

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