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OSAKA FUJI Corporation

https://www.ofic.co.jp/en/

VIETNAM OSAKA FUJI CO., LTD（VINA OFIC）

http://vinaofic.vn/

Process Business: Business Guide

Creating the ideal surface

OSAKA FUJI Corporation

OSAKA FUJI has continued to contribute broadly to a wide variety of industries mainly through advanced and innovative technologies that address the surface modification needs of society

Recognizing the importance of fully addressing customers' needs, OSAKA FUJI is guided by a corporate philosophy that places the utmost emphasis on creating unique technologies that society needs. In carrying out its corporate philosophy, the Company draws on its **quality strengths** to ensure complete reliability, its **technological strengths** to build a better tomorrow, and its **development strengths** to engender passion.

OFIC

Quality Strengths
Development Strengths
Technological Strengths

Surface Modification

Ensuring sufficient surface functionality on base components

Overlay Welding

Helping to increase performance and reduce costs through proprietary technology proposals

OSAKA FUJI puts forward overlay welding method technologies and develops proprietary material proposals that best fit each client's specifications and requirements to extend the life of equipment while reducing costs.

Laser cladding

The low heat flux and high irradiation intensity used in laser cladding not only ensures the minimized heat-affected zone but also achieves the crack-free coating of material combinations that are difficult/impossible to weld by conventional electric-welding methods.

Thermal Spraying

Creating new surfaces using a variety of materials

OSAKA FUJI puts forward highly functional sprayed coating proposals that best fit each client's specifications and requirements to extend the life of equipment and overcome problems.

Machining

Extensive equipment lines are capable of machining workpieces that weigh up to 30 tons

OSAKA FUJI has set up a series of machining equipment that are capable of machining workpieces that weigh up to 30 tons. Utilizing an integrated work system that encompasses welding, thermal spraying, and machining, we also maintain strict control over quality and deliveries.

Forged Roll

Realizing both hardness and toughness through the use of proprietary quenching technologies

OSAKA FUJI is able to manufacture every possible type of roll including cold rolling, hot rolling, foil, and grooved steel rolls using unique induction quenching technologies that realize both hardness and toughness.

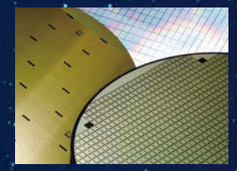
About OSAKA FUJI Corporation

Based on the know-how and experience gained mainly in the manufacture and repair of ironmaking equipment since its foundation in 1955, OSAKA FUJI has continued to improve on its machining as well as proprietary overlay welding, thermal spraying, and other surface modification technologies. Moving well beyond the iron and steel industry, we are currently rolling out a wide range of surface function modification technologies across the paper, energy, semiconductor and IT, aerospace, construction, and various other fields.

In the iron and steel industry

In the paper industry

In the energy industry



In the semiconductor and IT industry

In the aerospace industry

In the construction industry

Addressing Customers' Nationwide Needs through a Network of Four Factories and 12 Offices that Cover All Regions across Japan

OSAKA FUJI maintains a network of four factories, 12 offices, and a technology center located in various regions across Japan. A new overseas factory commenced operations in south Vietnam in 2015. Through these means, we have set up a structure that is capable of responding to the nationwide requirements of customers in a prompt and timely manner.

Amagasaki Factory

- Site area: 9,203 m^2
- Floor space: 5,619 m^2
- Overhead traveling cranes: 10 cranes / 5-30 tons
- Hoists: 8 hoists / 0.5-2.8 tons

Located in Amagasaki City, Hyogo Prefecture, the Amagasaki Factory is equipped with an integrated work system that engages in a wide range of overlay welding, machining, and heat treatment work. Moreover, an engineering department is always on standby in this factory to meet various needs from design to manufacture and installation.

REGISTERED ORGANIZATION No.4325-ISO9001 / JAB CM002

Wakayama Factory

- Site area: 9,850 m^2
- Floor space: 1,650 m^2
- Overhead traveling cranes: 4 cranes / 2.8-10 tons

Located in Wakayama City, the Wakayama Factory is engaged in integrated work including the overlay welding of continuous casting rolls, machining, and heat treatment.

Senboku Factory

[No. 1 Plant]
- Site area: 5,573 m^2
- Floor space: 2,747 m^2
- Overhead traveling cranes: 4 cranes / 5-20 tons

[No. 2 Plant]
- Site area: 2,013 m^2
- Floor space: 1,239 m^2
- Overhead traveling cranes: 4 cranes / 2.8-5 tons

Located in Takaishi City, Osaka, the Senboku Factory is a leading facility in Japan that specializes in thermal spraying. Maintaining a wide range of thermal spraying equipment, the Factory provides optimal thermal spraying methods to the iron and steel, paper, power plant, semiconductor, and other industries. The Senboku Factory employs cutting-edge thermal spraying equipment and is actively engaged in the development of new technologies.

REGISTERED ORGANIZATION No.4450-ISO9001 No.A4210-JISQ9100 / JAB CM002

Omigawa Factory

- Site area: 21,731 m^2
- Floor space: 5,725 m^2
- Overhead traveling cranes: 7 cranes / 10-40 tons
- Bridge crane: 1 crane / 10 tons

Located in Katori City, Chiba Prefecture, the Omigawa Factory is a large-scale facility that engages in a wide range of work including overlay welding, machining and processing, structural welding, thermal spraying, and the manufacture of small forged steel rolls. Fulfilling the role of a service base in eastern Japan, the Factory addresses the needs of every possible genre.

REGISTERED ORGANIZATION No.3212-ISO9001 / JAB CM002

Laser Plasma Joining Institute (LPJ)

- Site area: 3,742.4 m^2
- Floor space: 2,806 m^2
- Overhead traveling cranes: 3 cranes / 2.0-2.8 tons

Located in Amagasaki City, Hyogo Prefecture, the Laser Plasma Joining Institute specializes in laser cladding and powdered plasma arc welding. The Institute engages in a wide range of activities from highly functional surface modification technological development to manufacturing.

Technology Center

Located in Amagasaki City, Hyogo Prefecture, the Technology Center draws on the Company's experience and technologies nurtured over many years, to actively create new surface function modification technologies.

The Company also strives vigorously to develop world-class advanced technologies through joint research in conjunction with other industries and academia. In this manner, we endeavor to contribute to the well-being of society.

VIETNAM OSAKA FUJI CO., LTD. (VINA OFIC)

Located in Dong Nai province, Vietnam, VIETNAM OSAKA FUJI CO., LTD. was established as the Company's first overseas factory and commenced operations in overlay welding, thermal spraying as well as machining and processing in 2015.

Overlay Welding

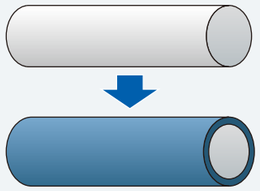
Amagasaki Factory | Wakayama Factory | Senboku Factory | Omigawa Factory

Proposals that help extend the lives of equipment and reduce costs

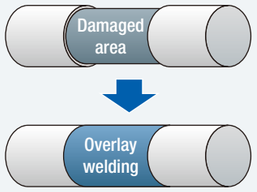
OSAKA FUJI puts forward surface modification proposals that encompass welding, welding parts, and proprietary materials that best fit clients' specifications and requirements to extend the lives of equipment while reducing costs. We are working diligently to provide products at a lower cost and in a short period of time through our in-house integrated production capabilities.

Diagram of Surface Modification and the Restoration of Deformed Component Shapes

Application-based surface modification



Restoring damaged areas that have lost their original shape



Advantages of overlay welding

Welding is generally a fabrication process that joins materials together by causing fusion. Overlay welding, on the other hand, is a cladding process that deposits high-function materials to coat part of a substrate in order to improve mechanical/chemical properties. By overlay welding high-function materials on the surfaces of parts, you can achieve the same functions as products manufactured in their entirety using materials at a lower cost. In addition, parts damaged/deformed due to erosion/corrosion can be restored to their original shapes and functions, thereby reducing costs through repeated use. Compared with other coating methods including thermal spraying and plating, overlay welding has the following properties;

- ability to form a thicker coating
- higher adhesion strength due to metal-bonding
- high durability

Application Process

1. Prior consultation
2. Consideration of application details
3. Acceptance inspection
4. Grooving or beveling process
5. Preheating
6. Overlay welding

7. Post-welding heat treatment

8. Finishing

→P17 Machining

9. Final inspection
10. Shipment

Welding Methods

CO_2 welding	Shielded metal arc welding	Laser cladding →P8
Metal active gas (MAG) welding	**Overlay welding**	Plasma transferred arc (PTA) welding →P7
Metal inert gas (MIG) welding	Tungsten inert gas (TIG) welding	Submerged arc welding

A Variety of Application Fields

In the steel industry

Overlay welding is applied to the bearing parts of a variety of rolls used at steel works

In the paper industry

Our factory has been appointed to manufacture raw material supply equipment by major paper companies

In the industrial machinery industry

Overlay welding is used to weld Tungsten-carbide complex alloys to pump sleeves

In the energy industry

Overlay welding is used to weld Inconel alloys to heat exchangers

Also check our video! The OSAKA FUJI Corporation Channel

YouTube

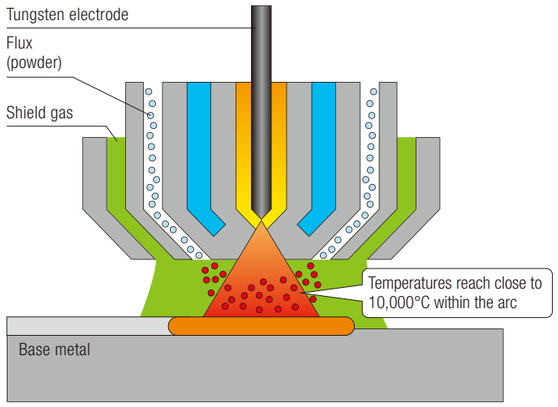
Overlay Welding

High-quality surface treatment using plasma transferred arc and laser methods

By employing powders as welding materials, both the plasma transferred arc and laser welding methods enable overlaying to materials and components that have conventionally been difficult to weld. In addition, positive steps are being taken to develop surface treatment technologies that match customers' needs.

Plasma Transferred Arc (PTA) Welding

Plasma arc welding is an arc welding process wherein coalescence is produced by the heat obtained from a constricted arc setup between a tungsten electrode and the job. The fused welding materials (powders) form a high-performance coating film.



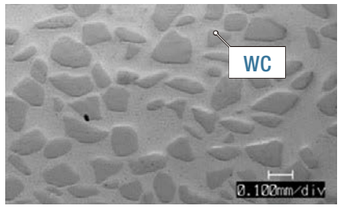
Features

- Due to the low level of weld metal deposits on the base material, the PTA method delivers the desired level of chemical composition from the initial clad layer.
- Mixing ratios of feedstock materials (metallic materials and carbide composites) can be adjusted according to requirements.
- To have suitable shielding protection and avoid atmospheric contamination, inert gas is sent through the outer shielding ring of the torch.
- High bonding strength of the metallurgically fused bond between the base material and clad layer.

Case Study

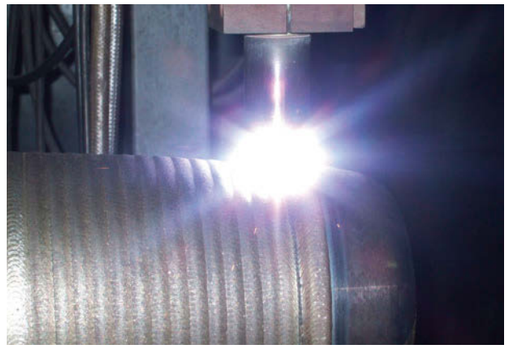
Overlay welding coat of the hard metal alloys (Tungsten carbide complex) on sliding bearing parts used in high-load environments is effective for life extension. Overcoming the issues of spalling or peeling, the excellent sliding properties can be achieved even in high load, high thermal shock, and high corrosive environments through the PTA process.

Sliding bearing



WC complex alloy microstructure

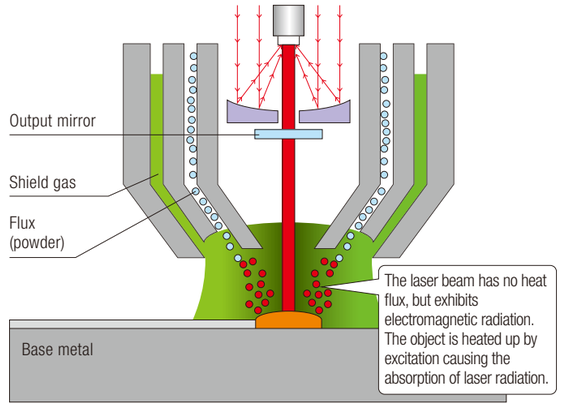
Interior overlay



Exterior overlay

Laser Cladding

Welding material powder is melted and consolidated by laser irradiation/excitation to form a highly functional coating. Compared with the plasma transferred arc method, the heat affected zone is reduced because of its limited heat spot and lower heat flux.



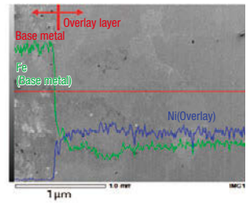
Features

- Base material welding penetration is small due to the low heat flux and high irradiance intensity. As a result, material concentration dilution is less than the PTA method, which in turn helps to produce a thin, high-quality coating.
- Mixing ratios of feedstock materials (metallic materials and carbide composites) can be adjusted as well as the PTA method.
- Low degradation, embrittlement and cracking, in the heat affected zone due to low heat flux.
- Applicable to small objects, cutting edge and thin sheets, because of low heat flux and highly accurate deposition.

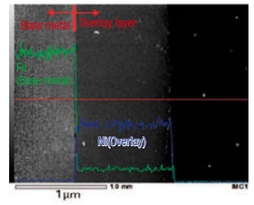
Case Study

Overlay welding with laser cladding is now applicable to thin/small objects, high thermal conductivity materials (copper), and such high thermosensitive materials as cast iron, tool steel, and double-phase stainless steel, all of which are not possible in using conventional electric welding methods due to difficulties associated with welding heat.

Cladding layer base metal dilution (scanning electron microscopy beam analysis)

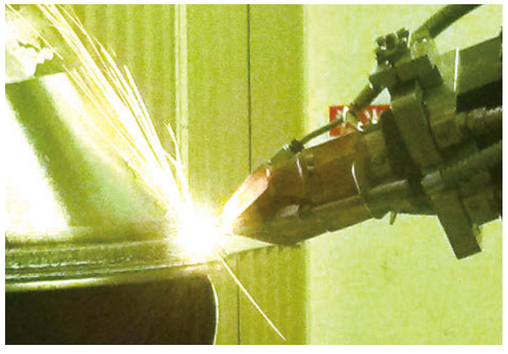


Arc welding



Laser cladding

Thin pipe cladding



Tapered section cladding

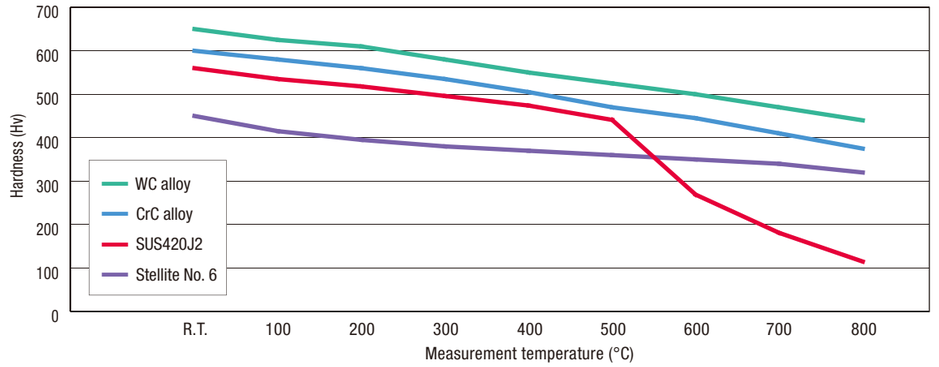
Overlay Welding

Material and Coating Characteristics Data

Classification		Material name	Typical composition wt.%	◎Optimal ○Suitable					Hardness Hv
				Wear resistance	Galling resistance	Heat resistance	Corrosion resistance	Applicable conditions・Features	
Metals・alloys	Fe-base alloy	OF-250	Fe-Cr-Mo-C	○				Fe hardened overlay	250
		OF-300	Fe-Cr-Mo-C	○					300
		OF-400	Fe-Cr-Mo-V-C	○					400
		OF-500	Fe-Cr-Mo-V-C	○					500
		OF-600	Fe-Cr-Mo-V-C	○					600
		OF-700	Fe-Cr-Mo-V-C	○					700
		OF-DS61	Fe-Cr-Mo-V-C	○				Impact and wear resistant	600
		High-speed steel	Fe-Cr-Mo-V-W-C	◎				High hardness and wear resistant	800
		High-chromium cast iron	Fe-30Cr-3C	◎				Erosion, sediment, and wear resistant	700
		High Mn steel	Fe-Mn					Impact and wear resistant	450
		13 Cr-Ni alloy steel	Fe-Cr-1～4Ni	○					350
		SUS420J2	Fe-Cr-C	○		○		Heat and wear resistant	600
		SUS308	Fe-Ni-Cr			○	○	Corrosion and heat resistant	180
		SUS310	Fe-Ni-Cr			◎	○		180
	Cu-base alloy	Pure copper	99.8Cu					Conductive coating	
		Various copper alloys	Cu-Sn, Cu-Ni, Cu-Zn		○			For slide component use	
		Aluminium bronze (aluminum bronze)	90Cu-9Al-1Fe		○				180
	Ni-base alloy	Inconel alloy	Ni-Cr			◎	◎	Corrosion and heat resistant	200
		Hastelloy alloy	Ni-Cr-Mo			◎	◎		200
		Monel alloy	Ni-Cu				◎		180
		Colmonoy No. 5	Ni-Cr-Si-B-Mo-C	○	○	○	○	Heat and wear resistant	500
		Colmonoy No. 6	Ni-Cr-Si-B-Mo-C	○	○	○	○		600
	Co-base alloy	Stellite No. 1	Co-28Cr-4W-3C	○	○	◎	○	Heat, abrasion, and corrosion resistant	600
		Stellite No. 12	Co-28Cr-8W-1.2C	○	○	◎	○		500
		Stellite No. 6	Co-28Cr-4W-1C	○	○	◎	○		450
		Stellite No. 21	Co-28Cr-5Mo-0.3C	○	○	◎	○		350
		Tribaloy T-400	Co-8Mo-28Cr-3Si	○	○	◎	○	Heat, abrasion, and corrosion resistant	450
		Tribaloy T-700	Ni-28Mo-17Cr-3Si	○	○	◎	○		550
		Tribaloy T-800	Co-28Mo-17Cr-3Si	○	○	◎	○		600
Cermet	Carbide alloy	WC+Ni	30～50vol%WC	◎	◎	○	○	Ultra-high wear resistant alloy	550
		WC+Co	30～50vol%WC	◎	◎	○	○		700
		NbC+Ni	30～50vol%NbC	◎	◎	○	○		500
		NbC+Co	30～50vol%NbC	◎	◎	○	○		600
		CrC alloy	30～50vol%CrC	◎	◎	○	○		700
		VC alloy	30～50vol%VC	◎	◎	○	○		800

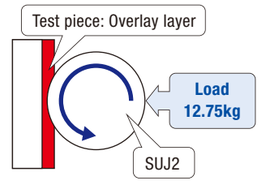
Measurement Results

High-temperature hardness



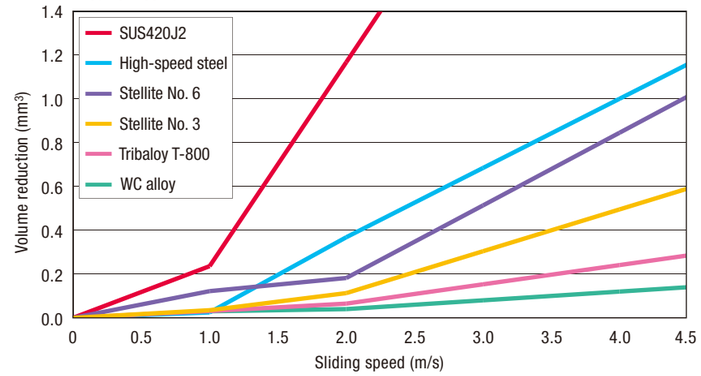
Wear test

Test 1 :Wear test between metals

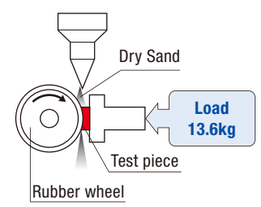


Test conditions

1.Other material	: SUJ2(Hv750)
2.Loan	: 12.75 kg
3.Distance	: 200 m
4.Lubricant	: None

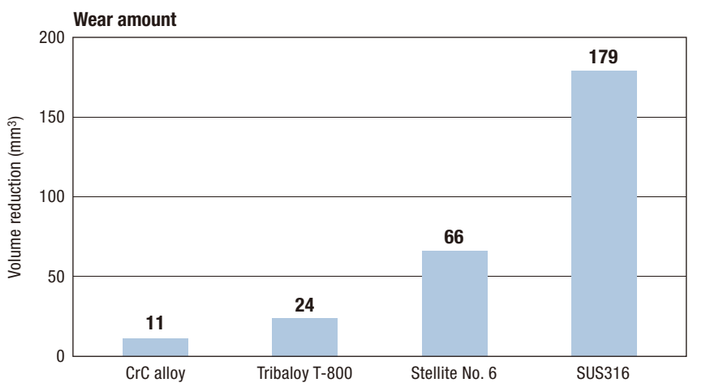


Test 2 :Sand erosion text



Test conditions

1.Load	: 13.6 kg
2.Rotating speed	: 120 rpm
3.Grinding powder	: Silica sand 6
4.Droppage	: 300 g/min

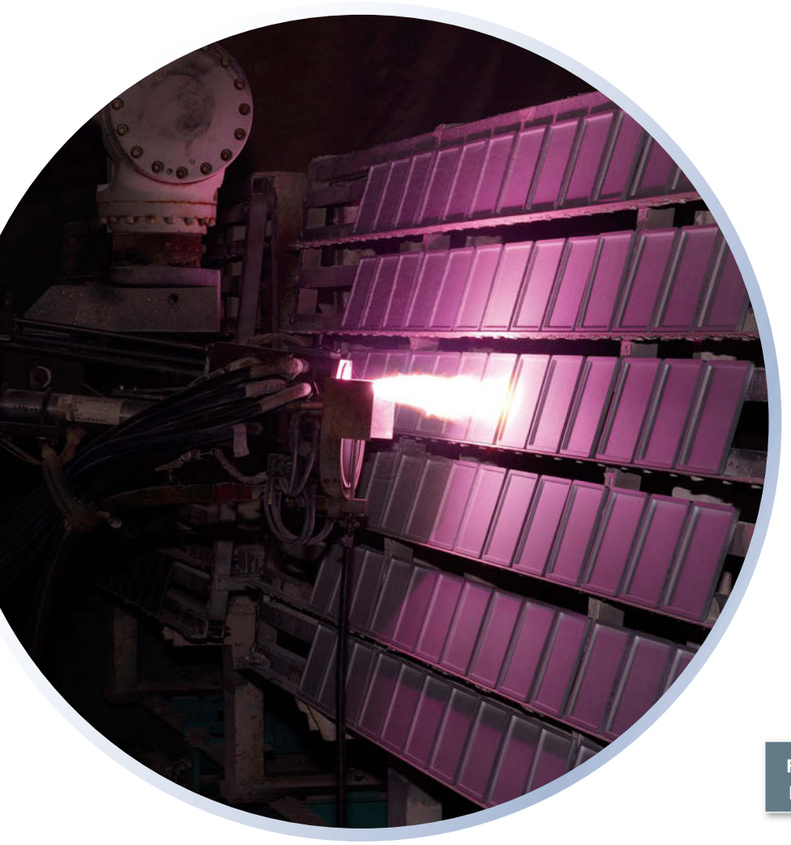


Thermal Spraying

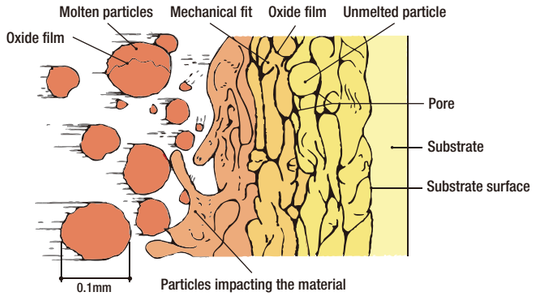
Amagasaki Factory | Wakayama Factory | Senboku Factory | Omigawa Factory

Creating optimal surfaces as requested

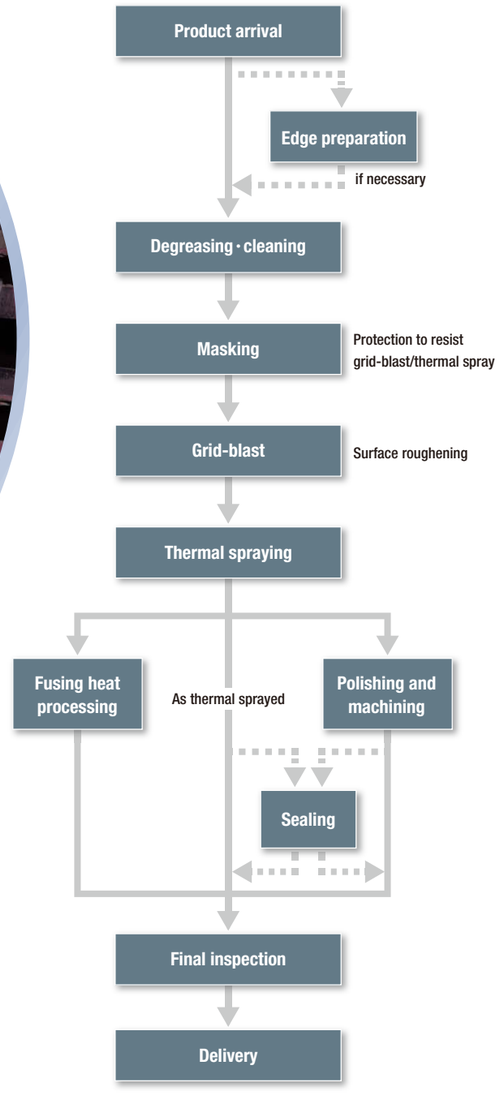
Thermal spraying techniques are coating processes that entail the spraying of melted materials onto various object surfaces. Thermal spraying can provide thick coatings over large areas of various shapes and materials. Optimum surface-functions to meet clients' requirements can be given under selected optimum conditions from among a variety of thermal spraying methods and feedstock materials.



Coating through Thermal Spraying (Enlarged Image)



Application Process



Thermal Spraying Materials and Methods

Applications

Thermal spraying can also help simultaneously combine different applications.

Feedstock materials

To provide high flexibility of material design / combination freedom.

Methods →P13

Selection of the optimal thermal spraying method depending on the materials used and environmental conditions.

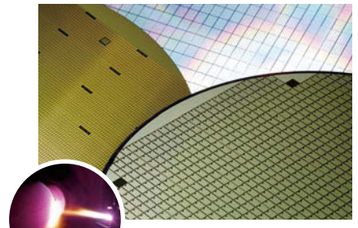
Applications	Feedstock materials	Methods
Wear resistant — Fusion-resistant coating	Ceramics, cermet, molybdenum	Ceramics — Water plasma spraying
Wear resistant — Surface-hardening coating	Ceramics, cermet, self-fluxing alloys, all types of high-hardness metals	Ceramics, Cermet, Metals — Gas plasma spraying
Heat resistant — Ceramic coating	Zirconia based, alumina based, cermet based	
Heat resistant — Heat-resistant alloy coating	Composite alloys (MCrAlY, etc.)	
Corrosion resistant — Rust-proof coating	Aluminum, zinc	Cermet, Metals — High velocity oxy-fuel spraying
Corrosion resistant — Corrosion-resistant coating	Stainless steel, self-fluxing alloys, corrosion-resistant metals (Hastelloy, etc.), resins, ceramics	
Electrical properties — Insulating coating	Alumina, zinc	Metals — Arc spraying
Electrical properties — Conductive coating	Copper, etc.	Metals, Ceramics — Flame spraying (wire rod)
Electrical properties — Shield coating	Aluminum, etc.	
Other — Low wettability coating	Ceramics, cermet	Self-fluxing alloy, Ceramics, Resins — Flame spraying (powder)
Other — Shape restoration coating	Stainless steel, all general types of steel	
Other — Ornamental coating	Copper, all types of metals	

A Variety of Applications

In the aerospace industry

High-velocity oxygen fuel spraying used in the production of turbine blades

In the semiconductor and IT industry



Gas plasma spraying used in the production of semiconductor components

In a variety of industries

High-velocity oxygen fuel spraying used in the production of the ascending pipes used in coke ovens

In the iron and steel as well as energy industries

Thermal spraying used in the production of boiler tubes
(Factories or on-site)

Also check our video!

The OSAKA FUJI Corporation Channel

YouTube

Thermal Spraying

Putting Forward Optimal Thermal Spraying Proposals

Drawing on its abundant track record and technological know-how nurtured over many years, OSAKA FUJI puts forward optimal thermal spraying proposals that encompass the selection of materials, methods as well as substrates to be sprayed together with applications and the necessary functions for every possible condition.

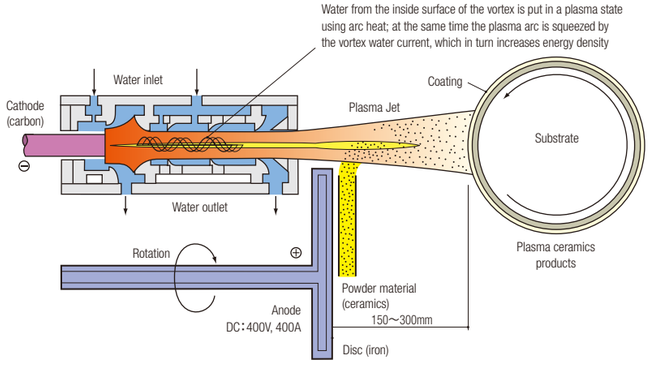
Water plasma spraying

Characteristics

- Maximum spraying capacity of 20 kg an hour
- Enables the formation of a film of up to 20 mm
- Enables the control of substrate temperatures at 200°C or below during the spraying process
- Enables the thick overlay spraying of large areas of large-format substrates due to fast overlaying speed

OSAKA FUJI's capabilities

- ○Undertakes the manufacture of large-scale solid ceramic products
  Maximum size: φ278×4,400L×t14
  (Please contact the Company regarding large-scale products)
- ○Capable of producing thicknesses of 20-50 mm depending on the type and size of materials



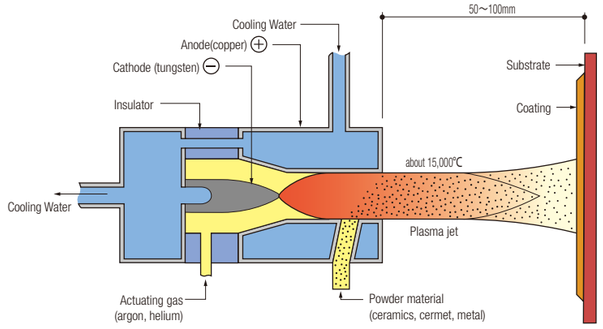
Gas plasma spraying

Characteristics

- Enables the spraying all materials including ceramics
- The delicate coatings produced enhance heat and corrosion resistance
- Extremely low oxidation and material deterioration during the spraying process

OSAKA FUJI capabilities

- ○Able to accommodate on-site spraying
- ○Enables the spraying of large construction structures



High velocity oxy-fuel spraying

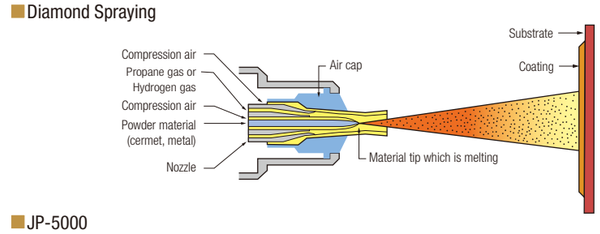
Characteristics

- Perfect for spraying of refractory metal (WC-Co) and other materials
- Delicate coating enhances abrasion and corrosion resistance
- Enables the control of substrate temperatures at 200℃ or below during the spraying process

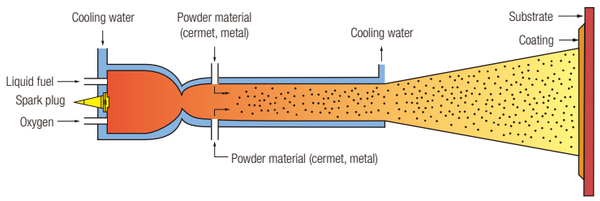
OSAKA FUJI strengths

- ○Able to accommodate on-site spraying
- ○Enables the spraying of large construction structures
- ○Ideal for the mirror finish coating of substrates

■Diamond Spraying



■JP-5000



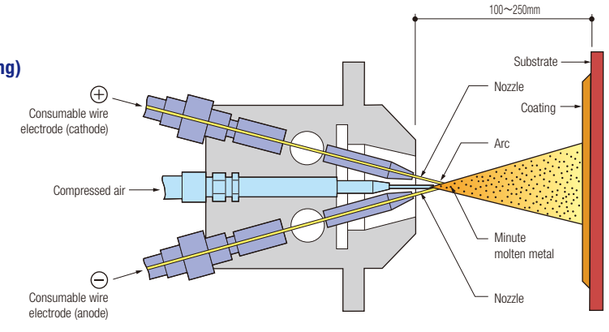
Arc spraying

Characteristics (compared with gas thermal spraying)

- Enables high-speed coating
- High adhesive and coating strength
- Delivers composite materials and quasi-alloy coating

OSAKA FUJI strengths

- ○Enables thick overlay welding of up to 20 mm
- ○Able to accommodate on-site spraying



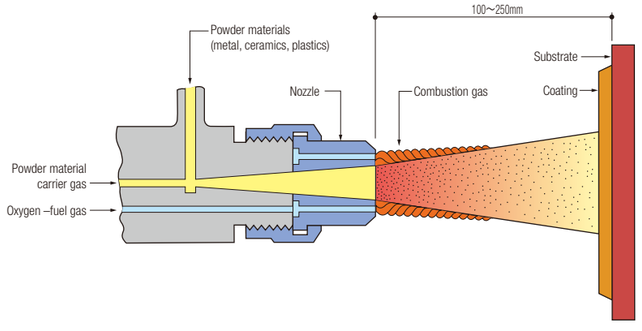
Flame spraying (powder)

Characteristics

- Enables thermal spraying of a variety of materials
- High deposition efficiency for powder materials
- Enables the thermal spraying of highly adhesive self-fluxing alloys

OSAKA FUJI strengths

- ○Enables the spraying of cast iron
- ○Able to accommodate on-site spraying
- ○Enables the spraying of large components and parts



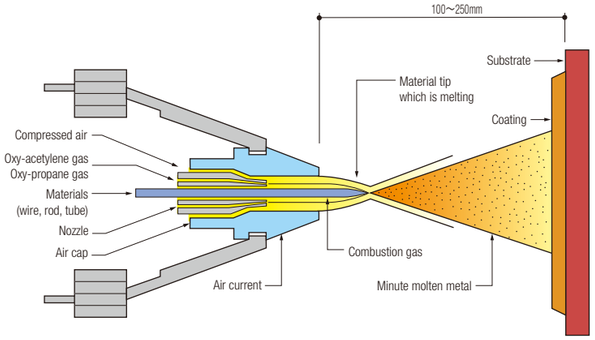
Flame spraying (wire rod)

Characteristics

- Mainly used for rust-prevention thermal spraying
- Minimal substrate deterioration and deformation due to low-heat input
- Enables the use of rod- and tube-shaped materials

OSAKA FUJI strengths

- ○Undertakes on-site spraying of aluminum and zinc



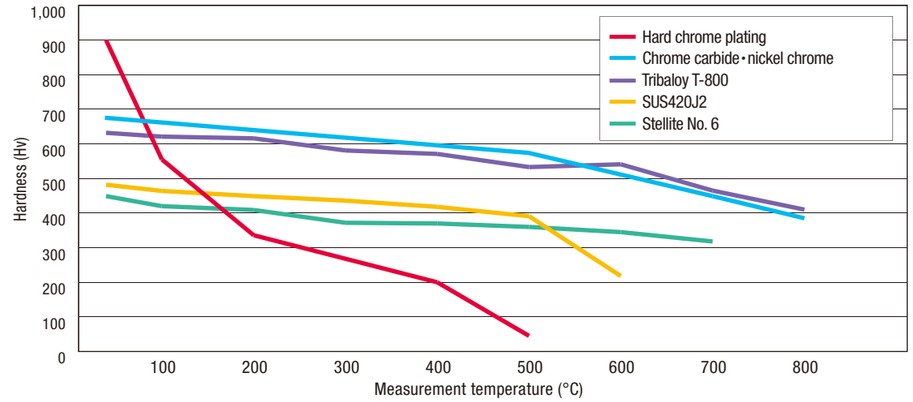
Thermal Spraying

Material and Coating Characteristics Data

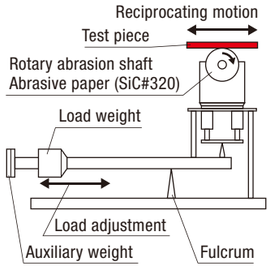
Classification		Material name	Typical composition wt.%	◎Optimal ○Suitable			Characteristics and properties	Hardness Hv
				Abrasion resistance	Heat resistance	Corrosion resistance		
Metals・alloys	Metals with a low melting point	Zinc	99.9-Zn			○	Rustproof PH6 – 12	HRh46
		Aluminum	99.7-Al			○	Rustproof PH4 – 8	HRh80
		Zinc-aluminum alloy	Zn-15Al			○	Rustproof	HRh80 or less
	Carbon steel	Low-carbon steel (mild steel)	Low C	○			IH coating, thick maintenance coating	150
		High-carbon steel (piano wire)	0.8C	◎			Hardened thick maintenance coating	360
	Stainless steel	SUS410	13Cr-0.1C	◎			Standard overlay repair material	250
		SUS420J2	13Cr-0.4C	◎			Harder than SUS410	350
		SUS316	18Cr-12Ni-2.5Mo-0.06C			○	Non-magnetic, highly corrosion resistant	240
		Fe-Cr family of amorphous alloy	Fe-28Cr-3.7B-2Mn-1.7Si-他	◎		○	Abrasion resistant to dust	900
	Copper alloy	Pure copper	99.8Cu				Conductive line covering	70
		Brass	63Cu-36Zn				Highly modifiable	
		Aluminum bronze	90Cu-9Al-1Fe	○			Highly resistant to seizure	150
	Heat-resistant alloy Corrosion-resistant alloy	Nickel aluminum	Ni-5Al		○		Undercoating material	120
		Nickel chrome 80-20, 50-50	80Ni-20Cr		◎	○	High-temperature oxidation resistant, high-temperature corrosion resistant	200～300
		Hastelloy C-276	Ni-15Cr-16Mo-4W-5.5Fe		○	◎	Acid resistant (all types of acids)	350
		Inconel-625	Ni-21.5Cr-9Mo-2.5Fe-3.7(Nb+Ta)		○	◎	Chloride corrosion resistant	340
		Monel	67Ni-30Cu-2Fe			○	Salt water corrosion resistant	140
		Stellite #6	Co-28Cr-4W-1C-3Fe	○	○	○	Heat resistant, abrasion resistant	400
		Tribaloy T-800	Co-28Mo-17Cr-3Si	○	◎		High-temperature lubricity	700～800
	Metals with a high melting point	Molybdenum	99.5Mo	○			Highly seizure resistant	400
		Tungsten	99.5W				Molten Cu, Zn resistant	400
	MCrAlY alloy	CoNiCrAlY	Co32Ni21Cr8Al0.5Y		◎		High-temperature oxidation corrosion resistant	400
		NiCrAlY	Ni22Cr10Al1Y		◎		High-temperature oxidation corrosion resistant	400
Self-fluxing alloys	Ni-based	METCO 16C equivalent (4 types)	Ni16Cr4Si4B3Cu3Mo2.5Fe0.75C	◎	○	○	High bond strength, can be applied thickly	HRc60
		METCO 15E equivalent (5 types)	Ni17Cr4Fe4Si3.5B0.9C	◎	○	○	High bond strength	HRc62
	Co-based	METCO 18C equivalent (1 type)	Co27Ni18Cr6Mo3.5Si3B2.5Fe0.2C	◎	○	○	High tensile strength due to Ni base	HRc60
		Stellite SF20 equivalent (2 types)	Co13Ni19Cr15W3Si3B4Fe1.3C	◎	○	○	Highly molten Zn - resistant	HRc60
	Ni-based + WC	METCO 31C equivalent (2 types)	Ni11Cr2.5Fe2.5Si2.5B0.5C+35WC	◎			Excellent abrasion-resistance including WC	HRc60～65
Cermet	Carbide family	Tungsten carbide 12 cobalt	WC-12Co	◎			Corrosion resistant to molten zinc	1,000～1,300
		Tungsten carbide nickel chrome	WC-27NiCr	◎		○	Highly water resistant	1,000～1,200
		Chromium carbide nickel chrome	Cr3C2-25NiCr	○	○	○	High-temperature abrasion resistant	800～1,000
Ceramics	Alumina based	White alumina WA	99.8Al2O3	○	○		Electrical insulation properties	900～1,000
		Gray alumina A	Al2O3-3TiO2	○				900～1,000
		Alumina titania AT	Al2O3-13TiO2	◎				750～1,000
		Alumina zirconia AZ	Al2O3-25ZrO2-2TiO2	◎				900～1,000
		Mullite WM	Al2O3-22SiO2		○		Low thermal expansion coefficient	900～1,000
	Zirconia based	Calcia zirconia Z	ZrO2-5.4CaO		◎		Thermal barrier coating	700～800
		Yttria zirconia YZ8	ZrO2-8Y2O3		◎		Thermal barrier coating	700～900
		Magnesia zirconia MZ	ZrO2-25MgO		○		Thermal barrier coating	
		Zircon ZR	ZrO2-33SiO2		◎		Corrosion resistant to molten metal	600～700
	Others	Titania (oxidized titanium) T	99.2TiO2	○			High-density-structured coating	700～800
		Chromia (oxidized chrome) CR	99.6Cr2O3	◎		◎	Self-lubricating properties	1,000～1,300
		Yttria (oxidized yttrium) Y	99.9Y2O3		◎		High thermal stability	

Measurement Results

High-temperature hardness

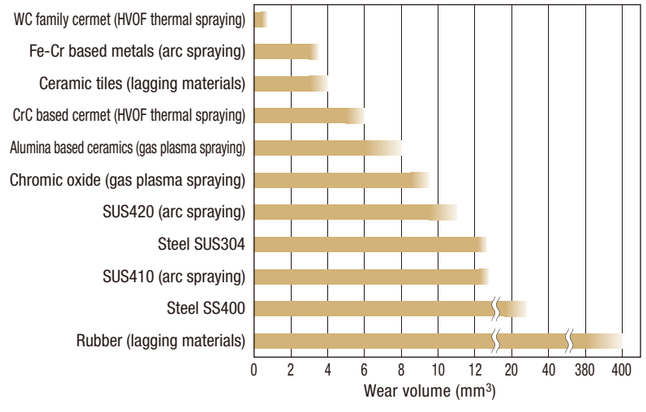


Suga abrasion test



Test conditions

1. Counter material: SiC#320
2. No. of test rotations: 2,000



Rust-prevention effects based on salt spraying tests

○: No red rust ×: Red rust present

Test specimen	1,000 hours	2,000 hours	3,000 hours	6,000 hours	Weight change	Evaluation
Al thermal spraying (80,160,200 μm)	○	○	○	○	Small amount	2
Same as above, silicon or epoxy resin-sealing treatment	○	○	○	○	Least amount	1
Zn thermal spraying (80,160,200 μm)	○	○	○	○	Substantial	6
Same as above, silicon or epoxy resin-sealing treatment	○	○	○	○	Slightly substantial-substantial	5
Zn/Al alloy thermal spraying (80,160,200 μm)	○	○	○	○	Slightly substantial	4
Same as above, silicon or epoxy resin-sealing treatment	○	○	○	○	Small amount-slightly substantial	3
Dissolved zinc plating (50μm)	○	×	×	×	Most substantial	7

Test conditions Air saturator temperature: 47°C Test chamber temperature: 35°C Saltwater concentration: 5% saltwater
Spray amount: 1.5±0.5ml/80cm 2 /hr

Machining

Amagasaki Factory | Wakayama Factory | Senboku Factory | Omigawa Factory

Extensive equipment lines are capable of machining workpieces that weight up to 30 tons

Each of OSAKA FUJI's factories maintains a full range of specially designed small to large mechanical equipment. The Company actively addresses the various and diverse needs of customers.

Small and medium sized equipment

Drawing on its wide selection of lathes, 5-axis control machining center, vertical milling machines, polishing machines and other equipment, OSAKA FUJI is capable of meeting a broad array of customers' needs from volume production to multiple small lot products.


NC boring machine


NC lathe


General-purpose lathe


5-axis grinding machine


Machining center

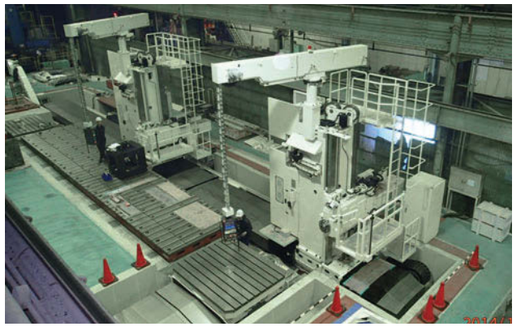
OSAKA FUJI's strengths

Drawing on its integrated work system that encompasses welding, thermal spraying, machining, and final inspection, OSAKA FUJI offers flexible delivery while helping to reduce costs.

Large workpiece equipment

Utilizing 30 ton cranes and large-scale equipment, the Company is able to process work of considerable weight and length.

NC boring machine



- Able to machine long workpieces up to a maximum length of 21 m utilizing multiple boring machines in tandem
- Able to machine workpieces up to a maximum weight of 30 tons

Large NC lathe

- OSAKA FUJI maintains multiple large lathes including large NC lathes up to 10 meters in length
- Able to accommodate a wide range of machining including inside/outside diameter milling, threading and tapers

Turning machine (vertical lathe)

- Able to accommodate workpieces up to a maximum of 4 m in length utilizing a 3.5 m diameter table
- Able to polish tapers with a high degree of precision through adjustments to the angles of columns

Five-surface grinding machine

- Able to accommodate work with a machining height and width of up to 900 mm and 2,600 mm, respectively

Also check our video! The OSAKA FUJI Corporation Channel

YouTube

Forged Steel Roll

Amagasaki Factory | Wakayama Factory | Senboku Factory | **Omigawa Factory**

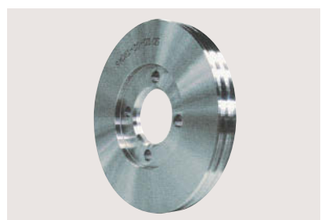
Realizing both hardness and toughness through our unique technologies

OSAKA FUJI provides thick hardened high-performance rolls using unique induction quenching technologies. Our product lineup extends from cold and hot mill rolls, grooved rolls and other general-purpose hardening (quenching) rolls to special-purpose rolls that offer a hardness of around Hs100 and foil rolls.

A variety of products

Drilled roll

4H work rolls



Roll for steel wire use

Continuous hardening equipment

Tempering furnace

Grinding machine

NC lathe

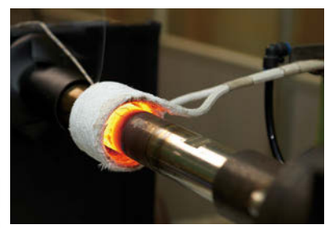
Research and Development

Technology Center | **Laser Plasma Joining Institute (LPJ)**

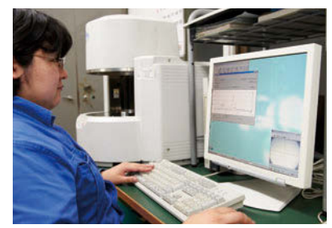
Drawing on its experience and technologies nurtured over many years, OSAKA FUJI creates innovative technologies

OSAKA FUJI works diligently to uncover and grasp the needs of industry throughout the world while developing innovative technologies and designing products that overcome a host of issues. The Laser Plasma Joining Institute (LPJ) is actively engaged in the development of cutting-edge laser cladding materials and processing technologies. At the same time, the Company also strives to contribute to society by vigorously developing advanced global technologies through the industry-government-academia joint study.

Thermal spray particle monitoring system
(Accuraspray-gs manufactured by TECNAR)



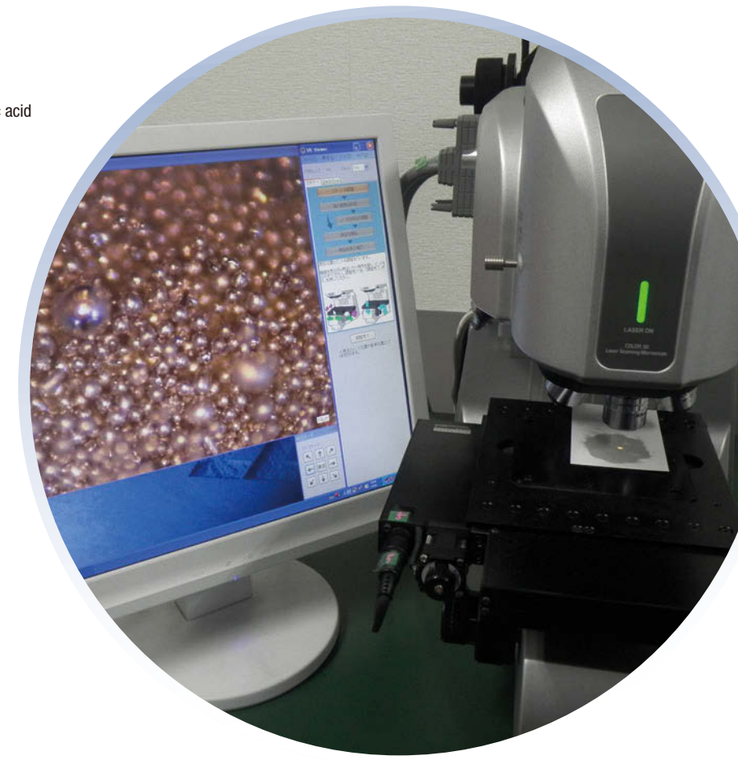
High-temperature abrasion testing equipment



Energy dispersive x-ray fluorescence spectrometer
(Shimadzu Corporation)

Testing equipment

- Laser microscope
- Digital microscope
- Vickers hardness tester
- Micro Vickers hardness tester
- Rockwell hardness tester
- Surface roughness tester
- Ferrite scope
- A variety of electric furnaces (up to 1,280°C)
- Welding and thermal spraying equipment
- High-temperature abrasion testing equipment
- Dye bath abrasion testing equipment
- Pin-on-disk wear tester
- Suga abrasion tester
- Copper-accelerated acetic acid salt spray tester
- Special tensile tester
- Thermal spray particle monitoring system
- X-ray fluorescence spectrometer
- Particle size distribution measuring equipment
- Automatic sample polishing equipment



Also check our video!

The OSAKA FUJI Corporation Channel

YouTube

Main facilities

Overlay Welding

Model	Manufacturer	No. of units	Capacity
Semi-automatic welder	Panasonic Corporation / DIAHEN Corporation	52	DC Rating: 500A, 350A, 200A
DC TIG welder	DAIHEN Corporation	4	DC Rating: 500A・200A
AC-DC TIG welder	Panasonic Corporation / DIAHEN Corporation	10	AC-DC Rating: 500A, 300A, 200A
AC arc welder	Panasonic Corporation / DIAHEN Corporation DAIDEN Co., Ltd.	30	AC Rating: 500A, 400A, 300A
DC arc welder	DAIHEN Corporation	8	DC Rating: 1500A, 800A
Arc gouging equipment	Panasonic Corporation / DIAHEN Corporation	14	DC Rating: 800A, 600A, 500A
Thyristor controlled gouging equipment	Panasonic Corporation	2	DC Rating: 800A
Air plasma cutting and gouging equipment	DAIHEN Corporation	1	
Band welder	DAIHEN Corporation+OSAKA FUJI Corporation	16	DC Rating: 1500A, 1000A
MAG welder	Panasonic Corporation+OSAKA FUJI Corporation	3	DC Rating: 1000A, 500A
PTA welder		6	DC Rating: 500A
Robot	Kawasaki Heavy Industries, Ltd.	1	Weight capacity: 300 kg
	Kobe Steel, Ltd.	2	ARCMAN™ Positioner, load capacity: 10t
	Panasonic TAWERS	1	Open fastener method: 2 units Load capacity: 1t
Carriage type heat treatment furnace	Yoneda Iron Works Co., Ltd.	1	10t LPG 2m(W)×7m(D)×2m(H)
Carriage type electric furnace	JEMIX Co.,Ltd.	1	300kW(25kW∗12)
Batch type electric furnace	TEKUNO MINAMI	1	60kW
Top hat type electric furnace	TEKUNO MINAMI	1	150kW
Positioner (with fastener)	Matsumoto Denki Co., Ltd.	1	PM100
Turning roller	Matsumoto Denki Co., Ltd.	4	20t 10t 5t
Turntable	OSAKA FUJI Corporation	1	Table dimensions: 1.8m×2.5m Load capacity: 20t 7.5kW
400t hydraulic press	Matsumoto Iron Works Co., Ltd	1	Bed dimensions: 1,000×3,000 Stroke: 300 7.5kW

Thermal Spraying

Model	Manufacturer	No. of units	Capacity
Arc spraying equipment	Coaken Techno Co., Ltd.	4	EAS-PS, EAS-500-type, EAS-350-type
	Metallisation Ltd.	3	140
	TAFA	1	8850
Flame spraying equipment	Oerlikon Metco Japan Co., Ltd.	21	12E, 10E, 6P, 5P
	SNM Asia Co., Ltd.	2	TOP-JET, TOP-JET2
	Coaken Techno Co., Ltd.	1	M-Jet5
	Eutectic Japan Ltd.	1	12E
Gas plasma spraying equipment	AMT	2	MP200, MP100
	Oerlikon Metco Japan Co., Ltd.	3	9M, 7MCⅡ
	Shimadzu Corporation	8	TPA
Water plasma spraying equipment	Czechoslovakia	4	AC-160
High-speed flame spraying equipment	Eutectic Japan Ltd.	2	JP5000
	AMT	1	JP5000
	Oerlikon Metco Japan Co., Ltd.	6	DJ2700
Oxy-fuel type spraying gun or interior diameter use	MOGAL Co., Ltd.	1	ME-2
Robot	DAIHEN Corporation	8	
	YASKAWA Electric Corporation	4	
	Panasonic Corporation	1	VR-008A
Rotating table		9	L=2,000～8,000
Turntable		5	φ600～2,000

Research and Development

Model	Manufacturer	No. of units	Capacity
Laser powder overlay welding equipment (LMD welding equipment)	TRUMPF Co., Ltd.	2	Laser output: 5kW・4kW
PTA welder		1	DC Rating: 500A
Robot	KUKA Roboter GmbH / Kawasaki Heavy Industries, Ltd.	2	Weight capacity: 60kg

Machining

Model	Manufacturer	No. of units	Capacity
NC horizontal boring machine BF-130B	TOSHIBA MACHINE CO., LTD.	2	・Spindle diameter: φ130 ・Spindle stroke: 1,000 ・Spindle vertical fluctuation: 2,500 ・Column movement: 15,100 ・Rotating table: 2,000-2,500 ・Maximum load capacity: 30t
NC floor-type horizontal boring machine BF-130A	TOSHIBA MACHINE CO., LTD.	1	・Spindle diameter: φ130 ・Spindle stroke: 1,000 ・Spindle vertical fluctuation: 2,500 ・Column movement: 6,000 ・Rotating table: 2,000×2,500
NC floor-type horizontal boring machine BF-150B	TOSHIBA MACHINE CO., LTD.	1	・Spindle diameter: φ150 ・Spindle stroke: 1,000 ・Spindle vertical fluctuation: 2,500 ・Column movement: 6,000 ・Rotating table: 2,000×2,500
NC table-type horizontal boring machine BTD13F-R22	TOSHIBA MACHINE CO., LTD.	1	・Spindle diameter: φ130 ・Spindle stroke: 700 ・Spindle vertical fluctuation: 2,300 ・Rotating table: 1,800×2,200
NC horizontal boring machine BTD11ER-13	TOSHIBA MACHINE CO., LTD.	1	B-axis specifications: 1,120x1,250
NC horizontal boring machine BTD-9	TOSHIBA MACHINE CO., LTD.	1	・Spindle diameter: φ90 ・Spindle stroke: 1,200 ・Spindle vertical fluctuation: 1,000 ・Column movement: 800 ・Rotating table: 900×1,050 ・Maximum load capacity: 2,500kg
Table-type horizontal boring machine Milling machine	NOMURA MACHINE TOOL WORKS, LTD.	1	・Spindle diameter: φ130 ・Spindle stroke: 900 ・Spindle vertical fluctuation: 1,300 ・Column movement distance: 2,000 ・Rotating table: 1,400×1,600
Vertical lathe TMD-30/45	O-M Ltd.	1	・Table diameter: φ3,000 ・Maximum cutting diameter: φ4,500 ・Maximum cutting height: 2,100
NC lathe W16L	DAINICHI KINZOKU KOGYO CO., LTD.	4	・Inter-center: 5,950～10,000㎜ ・Bed vibration: 950～1,800㎜ ・Carriage vibration: 630～1,300㎜
NC lathe FNC-5811T	DAINICHI KINZOKU KOGYO CO., LTD. Seibu Koki Co., Ltd. / Okuma Corporation	6	・Inter-center: 2,000～4,000㎜ ・Bed vibration: 610～1,450㎜ ・Carriage vibration: 340～1,100㎜
NC lathe LC30	Okuma Corporation	4	・Inter-center: 350～1,000㎜ ・Bed vibration: 200～700㎜ ・Carriage vibration: -
General-purpose lathe	DAINICHI KINZOKU KOGYO CO., LTD. NISHIMORI INDUSTRY Co., Ltd.	6	・Inter-center: 6,000～8,000㎜ ・Bed vibration: 1,200～2,000㎜ ・Carriage vibration: 800～1,500㎜
General-purpose lathe	DAINICHI KINZOKU KOGYO CO., LTD. / Seibu Koki Co., Ltd. Okuma Corporation / TSUDA Co., Ltd. / YAMAZAKI Co., Ltd.	15	・Inter-center: 1,250～4,100㎜ ・Bed vibration: 540～1,250㎜ ・Carriage vibration: 360～900㎜
General-purpose lathe	YAMAZAKI Co., Ltd. / OKK Corporation	2	・Inter-center: 800～850㎜ ・Bed vibration: 370～460㎜ ・Carriage vibration: 180～260㎜
5-axis machining center MILLAC800VH	Okuma Corporation	1	800(W)×800(D)
Vertical machining center MB-66VB	Okuma Corporation	1	1,500(W)×660(D)
Vertical machining center MCV520	OKK Corporation	2	1,300(W)×550(D)
Vertical machining center MCV410	OKK Corporation	2	1,000(W)×450(D)
Portal machining center Five-surface grinding machine MPC-8	TOSHIBA MACHINE CO., LTD.	1	・Table: 2,200×4,000 ・Cutting height: 900 ・Maximum cutting width: 2,600 ・Maximum movement distance: 5,000
3MLV-type universal milling machine	Hitachi Seiko, Ltd.	1	1,600(W)×355(D)
Cylindrical grinding machine GUV	Okuma Corporation	1	・Inter-center: 1,100㎜ ・Bed vibration: 400㎜
Internal grinding machine YIG-20M	YAMADA KOGYO CO.,LTD.	1	・Inter-center: 520㎜ ・Bed vibration: 540㎜
Internal grinding machine T-133	TOYO KOGYO CO., LTD.	2	・Inter-center: 600㎜ ・Bed vibration: 800㎜
Surface grinding machine GK-800	AMADA CO., LTD.	1	Rotary 800
Surface grinding machine GHL-B306	Hitachi Seiko, Ltd.	1	600(W)×300(D)
Grinding machine	TOSHIBA MACHINE CO., LTD.	1	・Inter-center: 4,000㎜ ・Bed vibration: 525㎜
Open sided planing machine	Marufuku Tekkosho Co., Ltd.	1	・Table: 1,600×6,500 ・Cutting height: 1,700 ・Maximum cutting width: 2,000 ・Maximum movement distance: 8,500
Radial drilling machine	Ogawa Tekko Co., Ltd.	1	・Boring capacity: 80 ・Arm vertical movement: 900 ・Spindle head horizontal movement: 1,620
Sawing machine	DAITO SEIKI CO.,LTD.	1	S5,070 maximum cutting dimension: 500×750