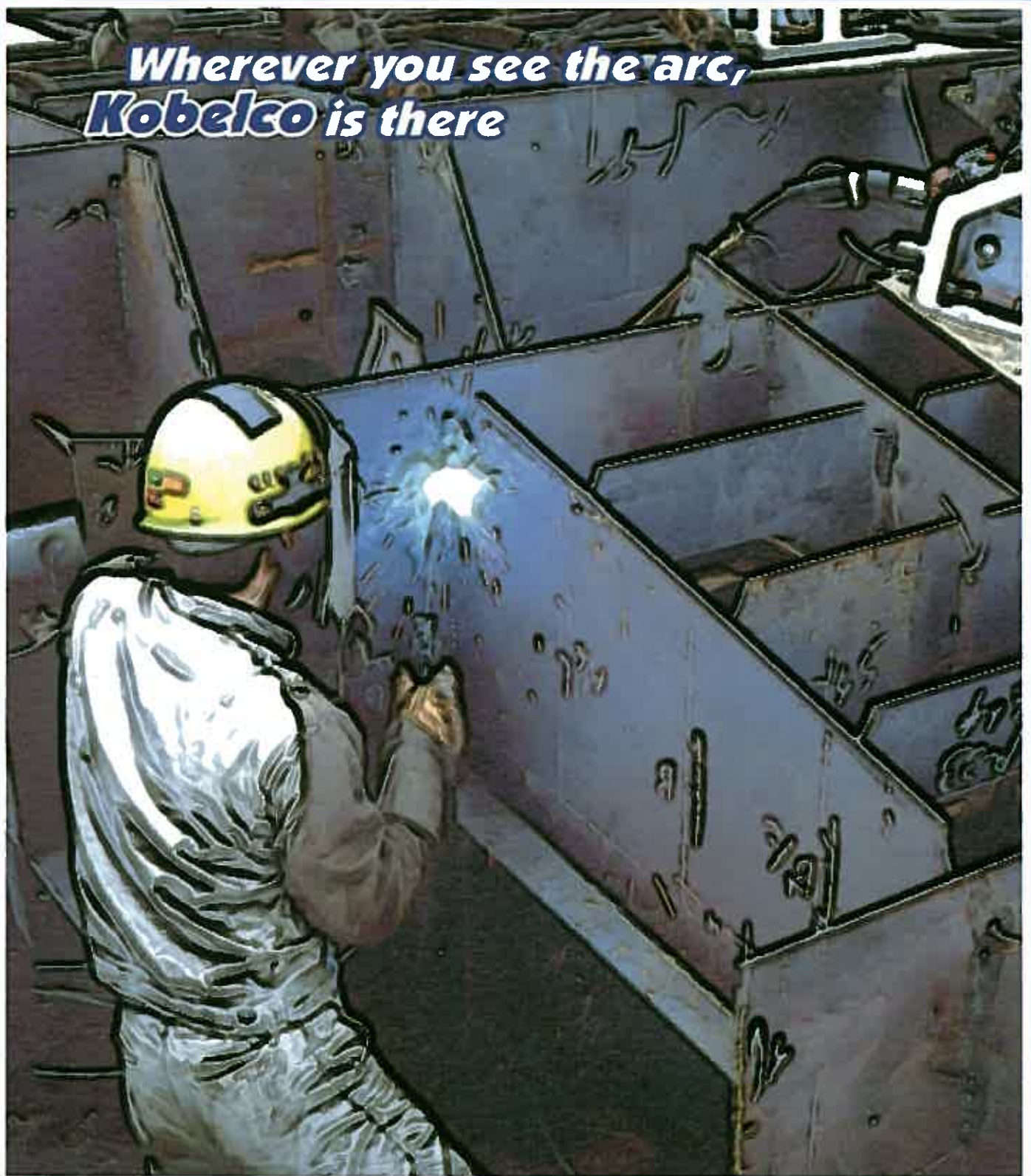


KOBELCO

July 1999
Vol.2 (No.3)

WELDING TODAY

*Wherever you see the arc,
Kobelco is there*



STP&I Constructs "The Symbolic Middle East Bridge" in The Kingdom of Thailand

STP&I (SINO-THAI PRESSURE VESSEL AND IRON WORKS) Public Company Ltd. is a well-known steel fabricator in Thailand, with two factories located near the popular sightseeing place of Pattaya.

STP&I was established in 1975, and they have been the first to qualify in Thailand for the "Class A" Certification by Japan Steel Construction Association



(JSCA). They were recognized for high quality standards by the American Petroleum Institute (API) and the American Society of Mechanical Engineers (ASME) in 1995. In 1997, they obtained the ISO9002 Qualified Management System Certification from AJA EQS for all aspects of their operations. STP&I has just started operations of their second factory in Rayong with a fabrication capacity of around 20,000 metric tons of steel materials per year. The total capacity of their two factories have reached 50,000 metric tons per year.



Fig. 1 - A project of steel construction in Rayong reflects the economic recovery in Thailand

STP&I is accustomed to handling well known projects in Thailand as can be seen in the following examples.

- Steel diaphragm wall (NS-box) for the Bangkok Subway Project
- Steel structure for the Ratchaburi Power Plant
- Thai-Japan Fly-Over Bridge/Rama IV

Currently their No.1 factory is occupied with the construction related to the Suez Canal Bridge Project. This project will see the construction of a bridge to link Africa and Eurasia, crossing the Suez Canal in Qantara

city. This project was adopted as an overseas development aid project of the Japanese Government at the request of the Egyptian Government in 1995 as "The Symbolic Bridge of Middle Eastern Peace." It is expected that the bridge shall be completed in 2001. The bridge has a total length of about 3900m with the main steel cable-stayed bridge having a girder length of 730 m and central span

of 404 m. STP&I uses DW-100 flux-core wires for fabricating stiffeners of the deck. Welding is carried out manually and by using portable welding carriages for higher productivity. In addition, they use US-36 and G-80 submerged arc welding consumables for fabricating the H-shape built-up beams.



Fig. 2 - A fabrication area in an STP&I factory, showing a busy atmosphere

STP&I plans to expand its business to small, independent power plants (SPP & IPP) and building gymnasium long-span trusses for the domestic and overseas markets, based on their policy, "We Do World-Class Iron Works with New Technology."

(STP&I E-mail: stpibpk@chonburi.ksc.co.th)

In order to support their expected expansion, the Kobelco Welding Group will have to reply their requests for the development of

- lower spatter and fume welding consumables
- unnecessary-to-redry stick electrodes

(Reported by Keiichi Suzuki and Achadech Lersvanichikool /TKW)

Message from the Editor

To our dearest readers of KOBELCO WELDING TODAY: We are very pleased to send you our July 1999 issue.

In April this year, Kobe Steel changed its divisional structure to a system of internal companies. The Welding Division is now the Welding Company by name, although there is no noticeable change in the organization or staff assignment. However, we, the management and employees, will be able to provide you with better welding products and technical services faster than ever. So, please expect much from us.

In reorganizing ourselves, we have assigned, since April, Japanese staff members of the Welding Company to Shanghai in order to maintain a close relationship with customers. For the U.S. market, we established a KWAI branch office in Chicago this May. We expect the Chicago branch office to cover the midwestern and northeastern areas of the U.S. for customer services.

We will revamp our way of business activities in order to provide all our customers, who may be readers of this KOBELCO magazine, with "Favourite Products and Favourable Services." We expect reorganizing our business as we head toward the 21st century may even have an effect on the world's welding fabrication and construction sites. "Changing the Way the World Welds" is our business slogan in this year.



Tetsuo (Tom) Konohira

General Manager, IOD, Welding Company, Kobe Steel, Ltd.

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..... KOBELCO PARTNERS



"As a partner of Kobe Steel for 25 years, we have done the marketing in Korea. There is a close resemblance between the Korean and Japanese markets: abundant shipbuilding productivity, excellent shipbuilders, and keen business competition. We contributed to establish Kobe Welding of Korea in 1994 and are successfully doing good business for Korean shipbuilders (Hyundai, Daewoo, and Samsung). This result is caused by the close cooperation of the three companies (Kobe Steel, KWK, and McQAN). Especially, we are confident of our contribution to the improvement of welding technology in cooperation with Kobe Steel and Korean shipbuilders. We will make greater efforts to expand our welding business."

McQAN Co.
S.C. Koh, President

DW-100V

(AWS A5.20 E71T-1)



The use of DW-100V flux-cored wire can reduce welding costs due to its superior usability in vertical-up CO₂ arc welding at higher currents, wider root-gap, and higher travel speeds.

DW-100V is Highly Economical

Fig. 1 compares DW-100V with a conventional all-position type flux-cored wire in terms of the total welding cost in vertical-up welding. Total welding cost includes the cost of materials, electric power, and labor. It is clear, in Fig. 1, that DW-100V can reduce the total welding cost by 20-50% (using Japanese wage levels), depending on the joint root gap and required fillet leg length.

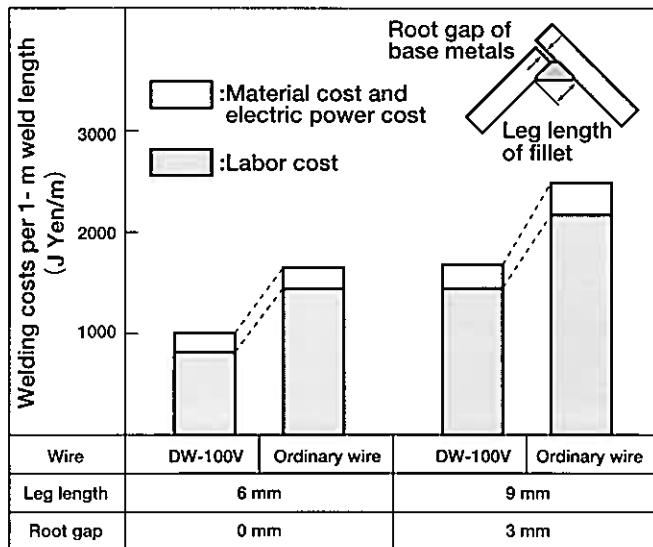


Fig. 1 — Welding costs calculated for vertical-up welding with DW-100V flux-cored wire (wire dia: 1.2 mm ϕ) in comparison with that for a conventional flux-cored wire

How DW-100V Provides Advantages

DW-100V can use higher welding currents and tolerate a larger joint root gap than conventional flux-cored wires, as shown in Fig. 2. That is why DW-100V can weld faster by saving the arc time and the time for strict adjustment of the joint root gap.

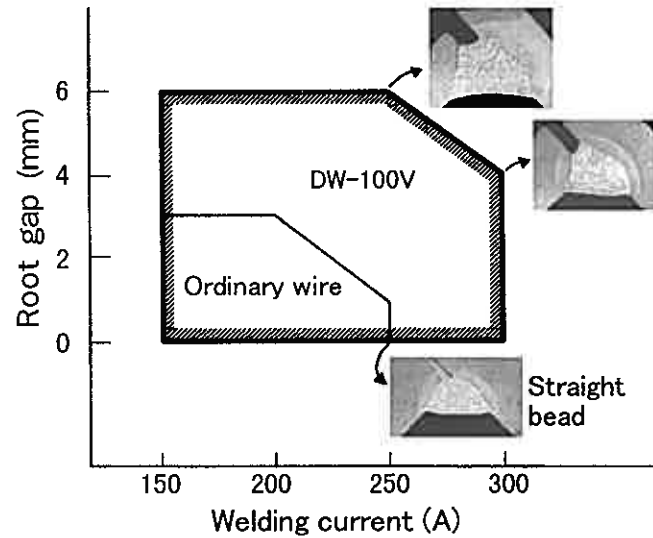


Fig. 2 — Proper welding current ranges of DW-100V and a conventional flux-cored wire in vertical-up welding (wire dia: 1.2 mm ϕ)

DW-100V can weld at higher speeds due to better slag covering in vertical-up welding. This characteristic permits the use of the straight technique in vertical-up welding; therefore, a small leg length fillet can easily be made at faster speeds, as shown in Fig. 3. Welding amperage is another factor that governs fillet leg length; when the welding speed is constant, higher welding amperage results in a larger leg length, because the deposition rate increases. The darker areas in Fig. 3 show proper ranges for the straight technique, using higher travel speeds for smaller leg lengths. In contrast, conventional all-position flux-core wires may cause convex weld beads in the use of the straight technique in vertical-up welding. Therefore, they require the weaving technique to be used in order to make flat beads, which often results in larger leg length and slower welding speeds. Fig. 4 shows typical bead profiles of DW-100V offering smoother bead surfaces and sufficient joint penetration provided by both the straight technique and weaving technique.

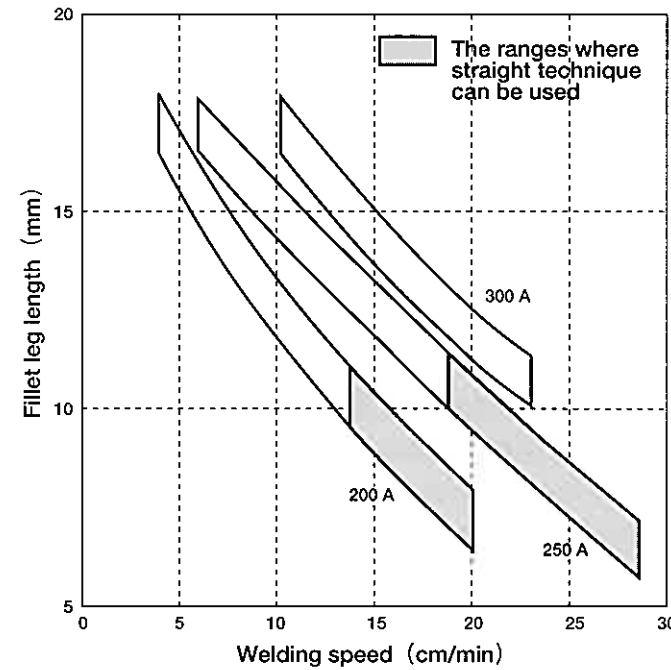


Fig. 3 — The relationship between fillet leg length, welding current, and travel speed in vertical-up fillet welding (wire dia: 1.2 mm ϕ)

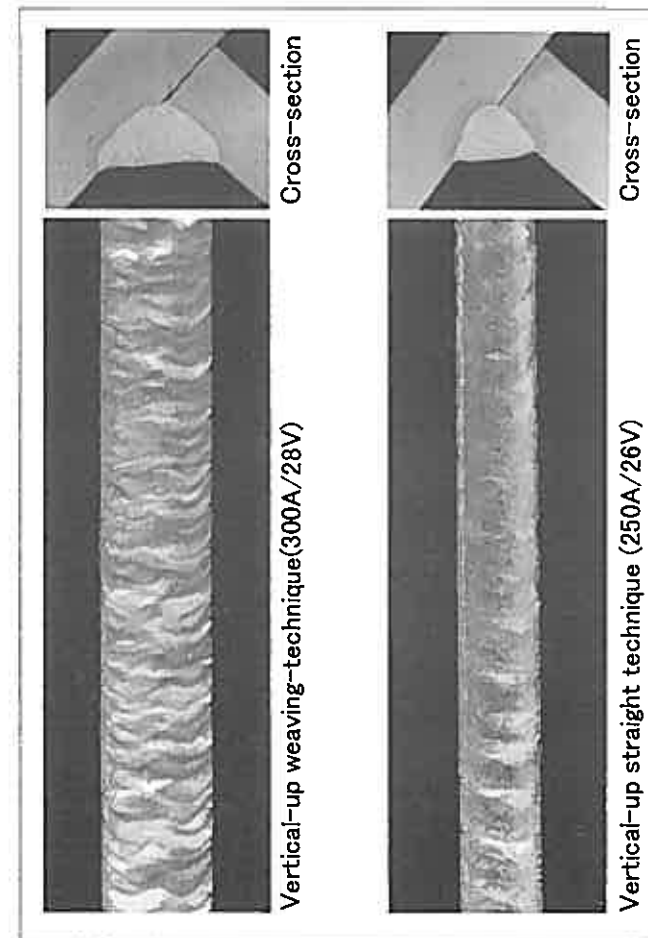


Fig. 4 — Typical bead profiles of DW-100V, offering smoother surface and sufficient weld penetration in vertical-up welding by means of the weaving and straight techniques (wire dia: 1.2 mm ϕ)

What Applications Highlight DW-100V

DW-100V can use a high, proper welding current in the range of 120-300 ampere (for 1.2 mm ϕ wire) in all positions without adjusting the welding current position by position. This advantageous performance makes DW-100V more suitable for a job that, because of the inherent difficulty in positioning the work, requires all-position welding. DW-100V can produce a steady molten crater more resistible against dropping in vertical-up position and tolerate a larger joint root gap. These features of DW-100V are very advantageous in robotic welding (Fig. 5).

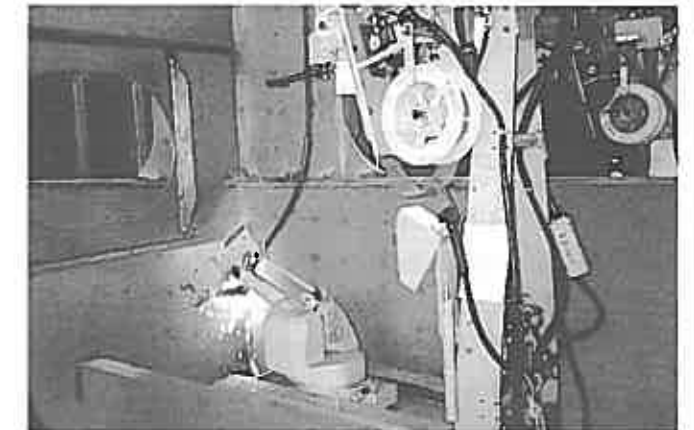


Fig. 5 — The application of DW-100V in robotic welding of cross joints of longitudinal and transverse components (wire dia: 1.4 mm ϕ)

Key Points in Vertical-Up Welding

Use the weaving patterns as shown in Fig. 6 to control leg lengths of fillets, directing the torch horizontal or at up to 10 degree upwards.

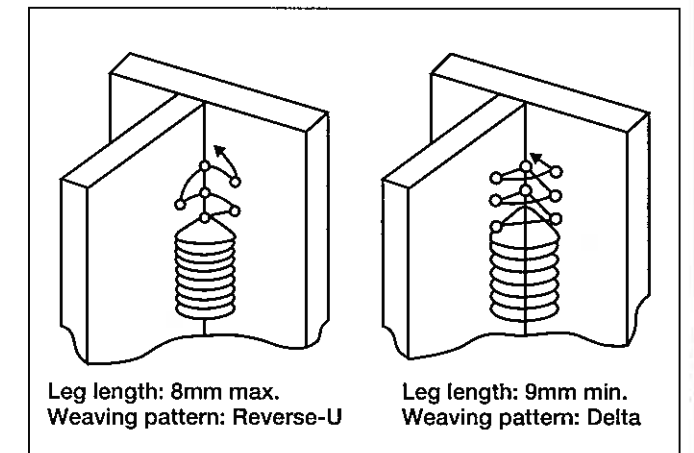


Fig. 6 — Typical weaving patterns suitable for vertical-up fillet welding

NC-39L

(AWS A5.4 E309L-16)



Among KOBELCO stainless electrodes, NC-39L is unique. It is an indispensable electrode for welding dissimilar metal joints and the buffer layers for clad steel and overlaying.

Essential Characteristics of NC-39L

The AWS classification shown above (E309L-16) will help you understand the essential characteristics of NC-39L as follows:

- E: designates an electrode
- 309: indicates 309 type deposited metal (22%Cr-12%Ni as minimum)
- L: designates low-carbon type (C% = 0.04 max.)
- 16: indicates suitable current polarity and welding position: DC-EP (direct current, electrode positive) and AC (alternating current) in all-position welding

What Features Does NC-39L Offer?

In addition to the essential characteristics stated above, NC-39L offers:

- (1) superior hot-crack resistance due to a higher ferrite content in the austenitic deposited metal (typical ferrite content: approximately 10% by means of a Schaeffler diagram)
- (2) excellent corrosion resistance and heat resistance due to the sophisticated design of the chemical composition with lower carbon content (typical C%: approximately 0.030)
- (3) steady tensile strength and impact toughness of the deposited metal due to strict quality control in production
- (4) constant X-ray soundness in all position welding due to well-designed usability

What Kinds of Joints Need NC-39L

It can be said that almost all machinery and vessels are fabricated and constructed using various combinations of dissimilar metals on any scale. This is because sophisticated equipment, which must offer both efficient performance and competitive material and fabrication costs, is required for industrial advancement. Fig. 1 shows various combinations of metals used for sophisticated equipment such as high-temperature high-pressure boilers, oil industry equipment, synthetic chemical equipment, and high-temperature high-pressure hydrotreating equipment. In fabricating the boilers, for example, 18Cr-8Ni stainless steel must

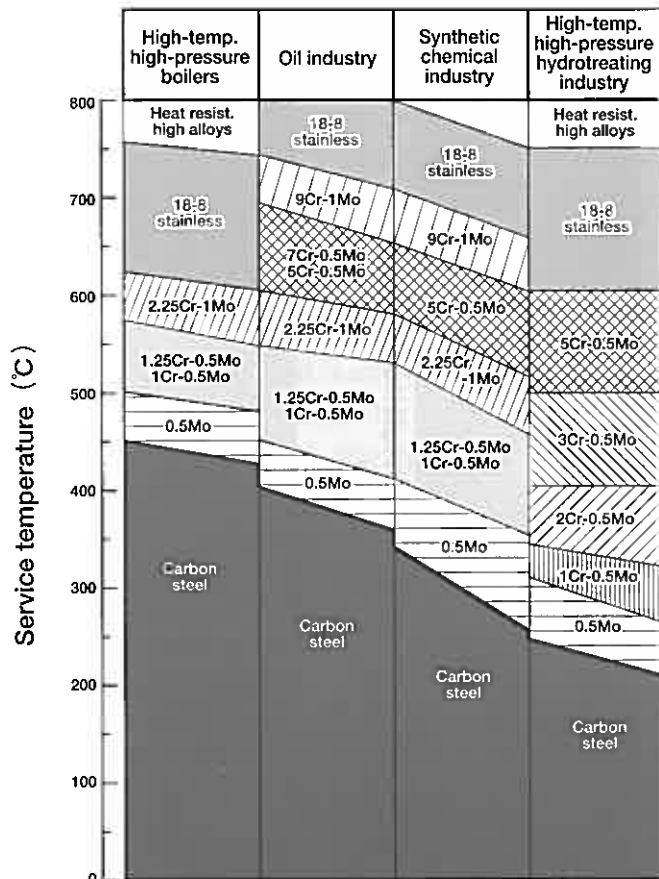


Fig. 1 — Types and applications of various metals used in high-temperature high-pressure equipment

necessarily be joined to 2.25Cr-1Mo steel. In welding this type of dissimilar joint, NC-39L is an appropriate electrode, provided the service temperature is below 800°F (427°C).

In fabricating pressure vessels for high-temperature high-pressure hydrotreating, the inner surface of the vessels is clad by overlay welding with stainless steel welding consumables. Most of the inner surface is overlay welded by either submerged arc welding or electroslag welding. However, the inner surface at the butt joint area of the shell is overlay welded by shielded metal arc welding as shown in Fig. 2.

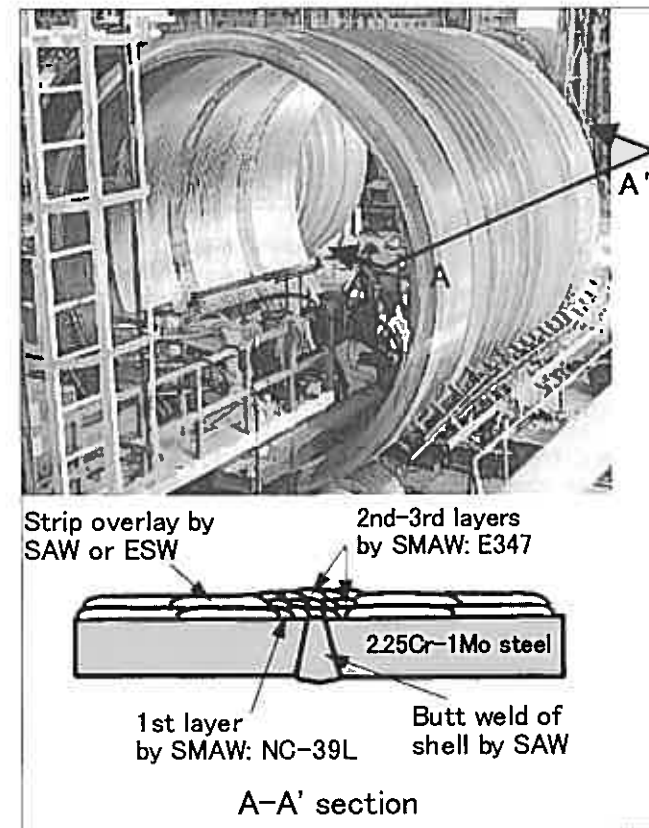


Fig. 2 — The application of NC-39L for the 1st layer (buffer layer) of overlaying the inner surface of high-temperature high-pressure hydrotreating reactor vessels

NC-39L is also use for welding dissimilar metal joints of cryogenic-temperature-service piping for the production and storage of liquefied gases, provided the service temperature is higher than -100°C. These dissimilar metal joints include aluminum-killed steel-to-304 stainless steel joints in liquefied petroleum gas (LPG) equipment and 3.5Ni steel-to-304 stainless steel joints in liquefied ethylene gas (LEG) equipment.

Key points in dissimilar metal welding

In welding dissimilar metal joints and the buffer layers for clad steel and overlaying, the control of dilution is an important issue. Dilution is defined as the change in chemical composition of a deposited metal caused by the admixture of the base metal or previous weld metal in the weld bead. It is measured by the percentage of base metal or previous weld metal in the weld bead as shown in Fig. 3 for bead-on-plate welds.

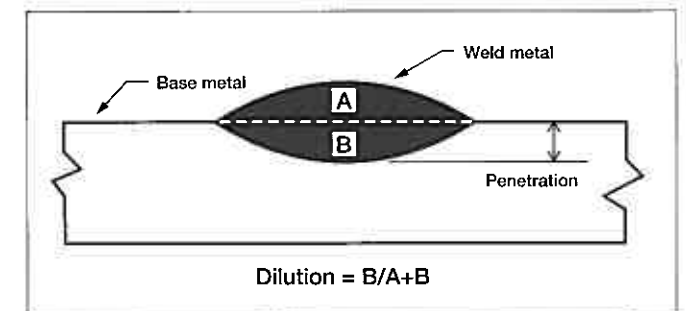


Fig. 3 — A method of calculating the dilution of bead-on-plate welds

Dilution is essentially governed by welding currents. Fig. 4 shows the relationship between dilution and welding current in the case of bead-on-plate welds by shielded metal arc welding. It is obvious that the dilution increases in proportion to an increase of welding current. Fig. 4 suggests the control of welding current is very important in order to control the dilution that causes chemical composition of the weld metal in dissimilar metal welding.

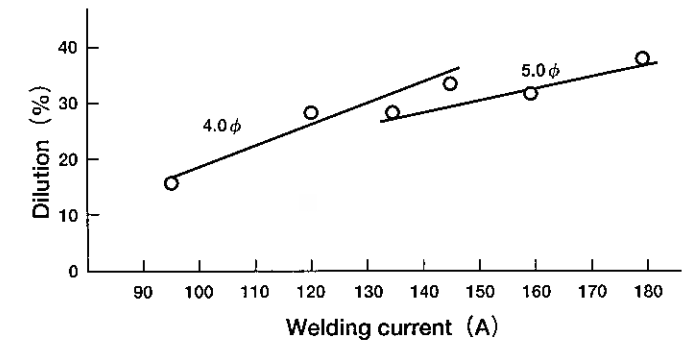


Fig. 4 — The relationship between welding current and dilution in bead-on-plate welds by shielded metal arc welding

What is the Ferrite Contained in Austenitic Stainless Weld Metals, and How Is It Measured?

In discussing the quality of austenitic stainless steel welding consumables, the ferrite content of the weld metals is an important matter. Ferrite is very effective in preventing hot cracking in austenitic stainless weld metals. However, ferrite can also cause embrittlement (σ -phase embrittlement) of the weld metals at high temperatures and decreases impact notch toughness of the weld metals at cryogenic temperatures. The control of the ferrite content, therefore, is very important in the design of chemical compositions of welding consumables. General austenitic stainless steel welding consumables such as Type E308 and E308L are designed so that the weld metals contain approximately 3-10% ferrite in order to prevent hot cracking and minimize the high-temperature embrittlement.

Fig. 1 shows the typical microstructure of an E308 type deposited metal: the dark areas are ferrite and the white areas are austenite.

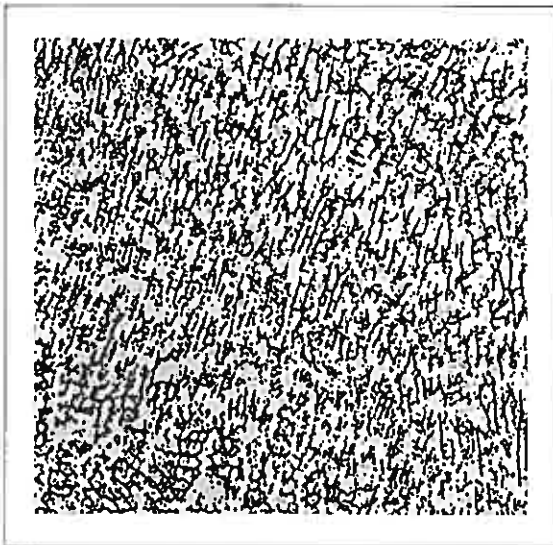


Fig. 1 — Typical microstructure of an E308 type deposited metal: the dark areas are ferrite and the white areas are austenite (200x)



Ferrite and austenite are very different in their respective physical properties. Fig. 2 compares differences between the two on typical physical properties.

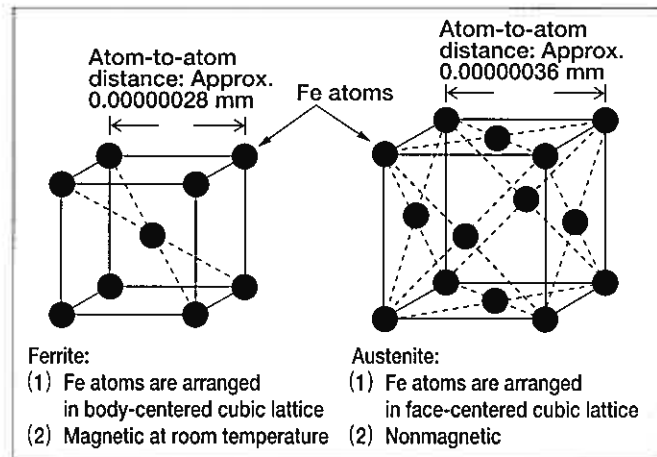


Fig. 2 — A comparison of ferrite and austenite in unit crystal lattice and magnetic properties

The difference in magnetic properties is a very important in the discussion of the ferrite content of an austenitic weld metal, because magnetic methods (besides chemical and metallurgical methods) are often used for measuring ferrite content. Of magnetic measuring methods, a Feritscope (Fig. 3) is most useful to measure directly the percentage of ferrite in welds at site.



Fig. 3 — A Feritscope is most useful for measuring ferrite content of weld metals at site, because the probe is small enough to put on a small area of weld metal

KSL Project Team Tackles the Marketing for the Shipbuilding Industry in China

Growing Chinese Shipbuilding Industry

Together, the Japanese and Korean shipbuilders share an overwhelming share of the worldwide shipbuilding market. However, these shipbuilders seem to have no plan to increase the shipbuilding capacity for the time being. In contrast, China is increasing the shipbuilding capacity, based on government policy. This is because shipbuilding in China is reportedly a valuable industry that earns foreign currency. Chinese shipbuilders have been increasing their share of the world market for newly built ships; they have 7% now but have a target of 10% for the near future. Table 1 shows the plan for the expansion in shipbuilding capacity in China. This plan is for large-scale ships only.

To strengthen our marketing in China, we have opened an office for routine activities from April. This new office is staffed by at least one person from Japan at any time.

Mailing address:
Room 1412, Shanghai Ruijin Bldg, 205,
Moming South Road, Shanghai 200020, PRC.



Fig. 1 — Active marketing has started from a corner of the international city of Shanghai, overcoming cultural barriers (way of thinking, language, food) between Japan and China. After struggling in business, Japanese restaurants can be a kind of oasis for a Japanese working in a foreign country. (left: M. Konishi, right: M. Sakata)

Table. 1 — Shipbuilding expansion projects in China

Progress (Year of completion)	Location	Shipbuilder	Shipbuilding dock capacity		
			DWT max.	Length x Width (Crane cap: x No.)	
On-going	Waigaoqiao, Shanghai	Jiangnan shipyard	700,000	470m x 80m, (600T x 2900T x 3)	
			500,000	360m x 76m, maybe for repairing ships	
	Partly finished, (End of 2000)	Yangzhou, Jiangsu	Jiangyang shipyard	250,000	250m x 60m first, 550m x 60m finally
	(End of 1999)	Yantai, Shandong	Yantai shipyard	500,000	372m x 120m, (Crawler crane: 2000T x 1), maybe for offshore structures
	Partly finished (End of 2000) (in 1999)	Nantong, Jiangsu	NACKS	150,000	350m x 57m
Plan	Shanghai	Hudong shipyard	150,000	260m x 50m	
			300,000	Maybe for new ships and repair	
	Zhejiang	Guangzhou shipyard	250,000	550m x 60m	
			300,000	650m, and other three docks in planning	
			150,000	Maybe expansion for increasing the steel processing capacity	
Planning, 1999	Ningbo, Zhejiang	Samsung Heavy Ind. Ningbo shipyard	150,000	Maybe expansion for increasing the steel processing capacity	
Planning	Xingang, Tianjing	Xingang shipyard	100,000		

KWAI Appeals to Customers at the AWS Welding Expo

The 80th Annual AWS Convention & International Welding & Fabricating Exposition was splendidly held at America's Center in St. Louis, Missouri, April 12-15, 1999. The newest equipment and latest products from over 600 corporate exhibitors attracted record 18445 attendees. This was the largest welding trade show held in the United States.

Kobelco Welding of America Inc. (KWAI) stood out by presenting high performance in the new formulas of DW stainless series, DW-60, and DW-100V. These products were exhibited at a new, high-tech, state-of-the-art twin tower display, with custom-designed rotating wire spools spinning above each of the tower as shown in Fig. 1.



Fig. 1 — KWAI's new, high-tech, state-of-the-art twin tower display, with custom-designed rotating wire spools spinning above each of the tower. This unique display reflects the high quality, advanced flux-cored wires we supply.

KWAI also appealed to customers a new slogan for this year, "KOBELCO...Changing the Way the World Welds." The conventional slogan, "QTQ" was also shown on the overhead graphics in the tower booth. We feel the show was a tremendous success, as measured by the number of quality leads received during the show.

At KWAI's annual Distribution Reception, which is always held in conjunction with the show, a record number of guests attended, indicating a growing distributor base and ever-stronger relationships. We took this opportunity to introduce "Duke" Kawae who is the newly assigned president of KWAI. In addition, we

disclosed the schedule of opening KWAI's Chicago Sales Office.

KWAI's Chicago Sales Office Opens

In response to continued growth and our commitment to the welding wire market in the U.S., Kobelco Welding of America Inc. has announced the opening of the Chicago Sales Office on June 1, 1999. The new office (Fig. 2) is expected to be an effective sales base for customers' satisfaction and is staffed by Brad Beck (Mid West Regional Sales Manager) and Andrew Sawada (Regional Marketing Manager).

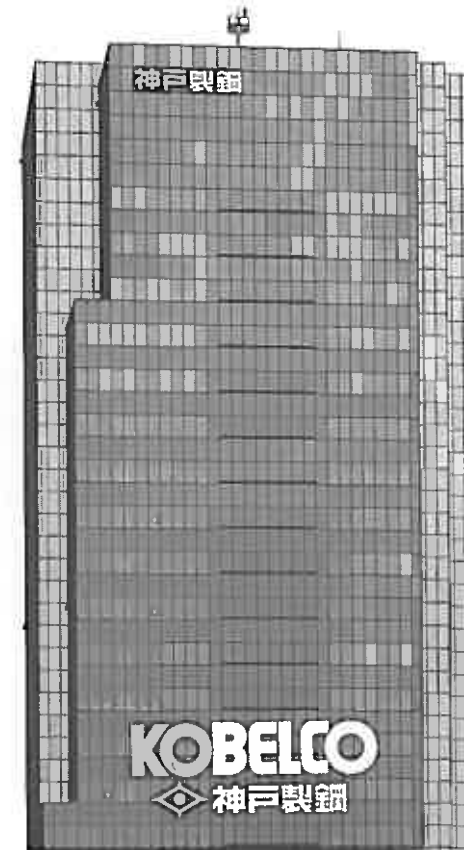
The mailing address and telephone number of the office:

501, West Golf Road, Arlington Heights,
Illinois 60005
(Telephone: 847-439-8450)



Fig. 2 — KWAI's Chicago sales office : a small office, a big coverage for customer satisfaction.

Welding Company Moves to Kobe Steel's New Tokyo Head Office



From May 10 this year, Kobe Steel's Tokyo Head Office moved to Shinagawa-Ku, Tokyo. The new head office is a 21-story building, which houses the corporation's diversified businesses including the Iron & Steel Company, the Aluminum & Copper Company, the Machinery Company, the Electronics & Information Company, in addition to the Welding Company.

Switching from the conventional divisional organization to an internal company system will help speed up information sharing and improve various services for customer satisfaction.

All of us at the Welding Company will do our best using new ways of thinking and targeting new aspects of the welding markets for the future. And those of us on the staff of the International Operations Department and the editorial staff of this magazine will continue to communicate actively with our customers around the world from this corner of the Tokyo metropolis.

Editorial Postscript

The back cover of this issue shows Yokohama Landmark Tower. This tower, 296 meters tall, is the highest skyscraper in Japan, and was built at the "Minatomirai 21" district in Yokohama City in 1993. "Minatomirai 21" literally means "A Port Town in the 21st Century." The tower has 70 stories above and three floors under the ground, and contains offices, hotel rooms, shopping areas, and an observatory floor called the "Sky Garden" on the 69th floor at 273m above the ground. In the construction of this building, KOBELCO welding consumables were used quite much including PHI-52ES/US-36L, PHI-53ES/US-36L, PHI-53ES/US-

49, MF-53/US-36, MG-50, MG-60, and MF-38/ES-50 for welding high strength steel materials (HT50, HT60) with a maximum thickness of 80mm.

You may have been to the Essen Welding Fair, an every-four-year event in Germany. This event will alternate every two years with the Essen Welding Asia, which is scheduled to open at the Expo Center in Singapore, October 19-21, 1999. Kobe Steel and Kobe Welding Singapore, as a corporate exhibitor, will welcome customers from all over the world.

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1440, Philippines
Tel. (63)2-292-6968 Fax. (63)2-292-6974

Landmark Tower In Japan

THE
KOBELCO
GUARANTEE.

QTEQ

QUALITY PRODUCTS
TECHNICAL SUPPORT
QUICK DELIVERY



International slogan of Kobelco Welding Group