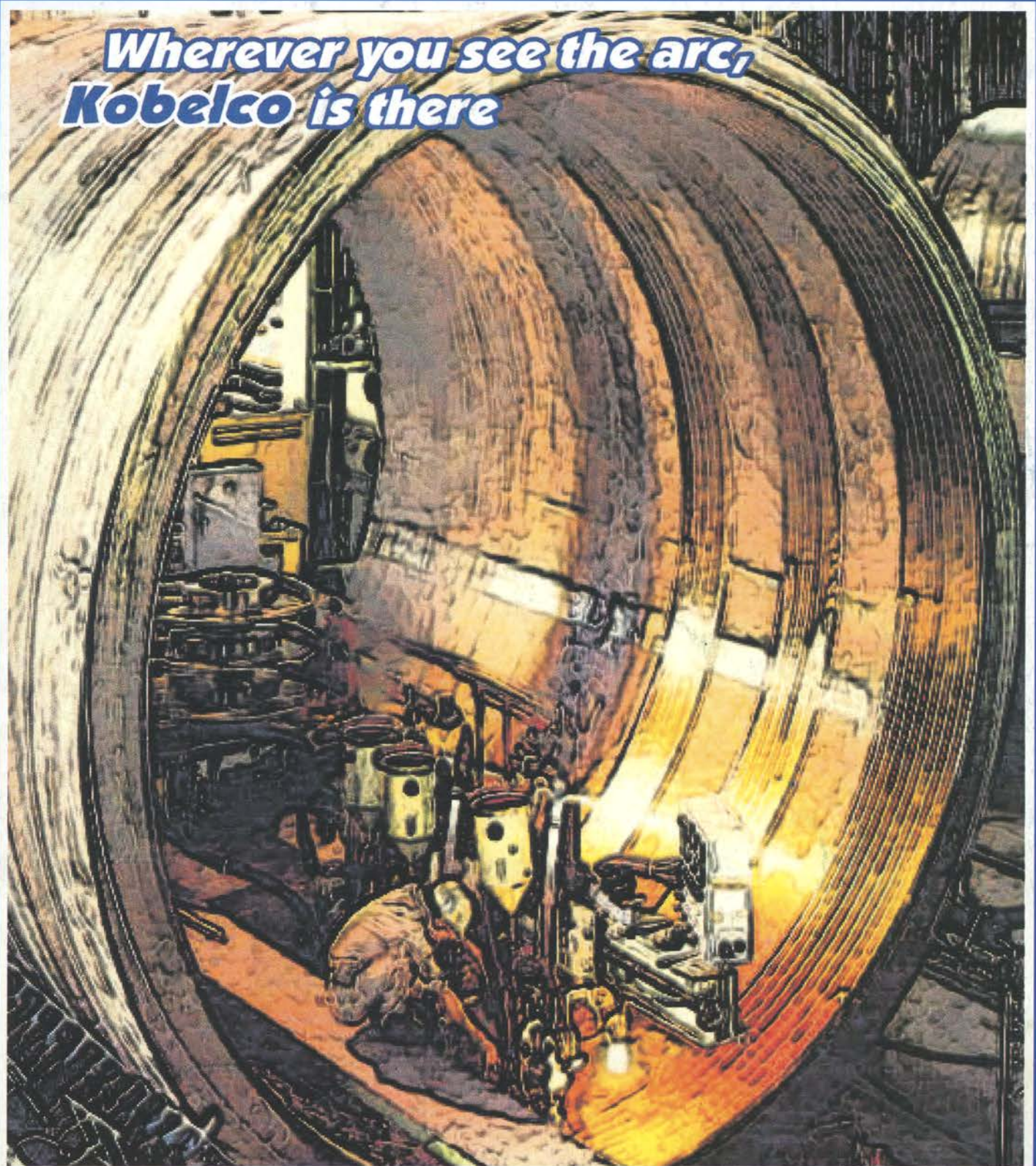


KOBELCO

April 1999
Vol.2 (No.2)

WELDING TODAY

*Wherever you see the arc,
Kobelco is there*



Pipe Fabricating & Supply Co. is Satisfied with Consistent, Delivering Quality of KOBELCO Flux-Cored Wires Including a Low-Temperature Flux-Cored Wire, "DWA-55ESR"

For the companies that are known as customers of Pipe Fabricating & Supply Co. (PIPE FAB), we can list, just to name a few, Bechtel, Chevron (U.S.A.), Fluor Daniel, American Bridge, Phillips 66, Kennecott Utah Copper, and the list goes on. These and many other companies have grown accustomed to the timely delivery of custom designed, pre-fabricated piping with hassle free completion of the job. And they can rest assured that the work will be completed on schedule and in accordance with the terms and conditions of the contract.



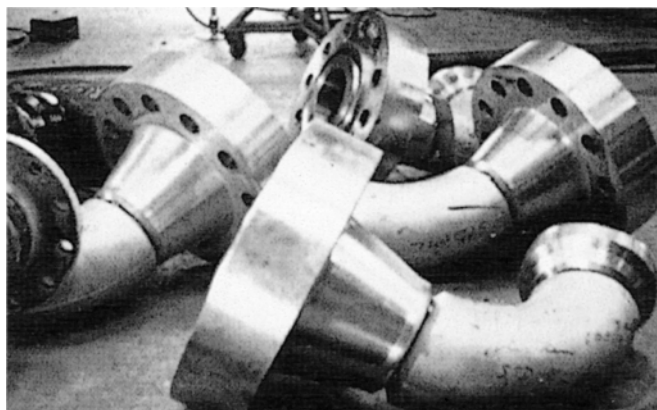
**PIPE FAB
in Santa Fe
Springs, California
(Left)**



**PIPE FAB in
Salt Lake City,
Utah (Right)**

PIPE FAB with fabrication facilities in Salt Lake City, UT, and in Santa Fe Springs, CA, has been satisfying the needs of engineering and construction companies and their clients for over 50 years. A.R. (AL) Simmons, the president of PIPE FAB, and Jeff Huggard, the manager of welding engineering, have demanded KOBELCO welding products to insure that they are fabricating with the highest quality stainless steel and mild steel flux-cored wire in the market. They also know that they can rely on quick delivery of these products through a KOBELCO warehouse located in Salt Lake City and technical support, when needed,

through KOBELCO WELDING OF AMERICA and the welding distributors of KOIKE (PRAXAIR) and BMS (AIRGAS). They, all together, make a strong team in the Salt Lake City market.



Pre-fabricating high quality flanges and fittings (Above)

PIPE FAB's products are designed and engineered and fabricated for the industrial, refinery, chemical, and power plants. In this era of intense competition, more stringent specifications, and a greater demand for perfection, Jeff Huggard (welding engineer) has been more than satisfied with KOBELCO's DWA-55ESR. This flux-cored wire has been used for welding such materials as pipes of ASTM A333 Gr. 6, fittings of A420 Gr. WPL6, and flanges of A350 Gr. LF2, with an impact requirement of 15 ft-lb at -50 degree (F) in as-welded condition. DWA-55ESR fulfills this requirement by a very safe margin.

At the PIPE FAB facilities, quality is a part of the corporate culture. It begins with a strong belief by top management that delivering quality on a consistent basis is inherent to their business success and customer satisfaction, and that the KOBELCO welding products, such as DWA-55ESR and stainless steel flux cored wires, assured them of this quality.

(Reporter: Richard L. Rust, Regional Sales Manager, KWAI)

Message from the Editor



To our dearest readers of KOBELCO WELDING TODAY: I wonder how fruitful the fiscal year 1998 was for your companies. It was comparatively good for our Kobelco Welding Group companies. As you may know the effects of the financial crisis continue to cast a shadow over Asian countries, causing political uncertainty in some nations. In Thailand and Korea, however, many industries are reviving, signaling an economic recovery. Additionally, while the Kobelco Welding Group recorded a decrease in total sales compared with 1997 because of a decrease in demand in the ASEAN region, every company in the group managed to record a profit.

The Kobelco Welding Group will promote the group's common slogan, "Quality products, Technical support, Quick delivery," in all our business activities in order to support the readers' routine welding business. Finally, we sincerely wish for your happiness and business development.

Tetsuo Konohira

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

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..... KOBELCO PARTNERS



With more than 20 Years of marketing experience in the local scene, we have grown from a humble dealer to what is being described as Kobe Steel's ASEAN Market Flagship. Our success is the result of our country's strategic location in the regional hub with vast opportunity to tap the various markets as well as our versatile sales staff and indoor coordinators who are at the helm to handle all local and overseas inquiries. Our basic strategy to maintain the full range of welding products, quick delivery, and customer service could well be known as today's Kobe Steel QTQ marketing strategy. With Kobe Steel's new business foresight and the regional economic revival, we are looking forward to a brighter future in the welding business. "

THE BABBITT TRADING PTE. LTD.

Peter Chua, Managing Director

B-14

(AWS A5.1 E6019)



B-14 is a versatile ilmenite type covered electrode for mild steel, offering unsurpassed usability and weldability in all-position butt and fillet welding and in welding sheet metals and mid-thick (up to 20 mm) plates.

A History of Ilmenite Type Electrodes

Kobe Steel developed, in 1942, an epoch-making ilmenite type covered electrode: "B-17," which used ilmenite (a composition of iron oxide and titanium oxide) as the raw material for the major part of the coating flux. After a period of years, Kobe Steel developed other ilmenite type covered electrodes, B-10 and B-14, so as to satisfy the requirements of a variety of users.

The consumption of ilmenite type covered electrodes increased sharply, particularly in the shipbuilding industry (Fig. 1) as the construction of ships increased through 1960s and 1970s. The annual production of ilmenite type covered electrodes in Japan

increased year by year up to 132,000 MT in 1973, comprising a major portion of the market for mild steel covered electrodes.

However, starting in 1975, right after the first global oil crisis, ship construction began to dry up, after which the consumption of covered electrodes, including the ilmenite type, rapidly decreased. Since then this trend has accelerated, with covered electrodes being superseded by gas metal arc welding wires in order to save welding costs.

But the consumption ratio of ilmenite type covered electrodes is still high. In 1995, the annual production of ilmenite type covered electrodes was approximately 17,000 MT, which is approximately 30% of all 56,000 MT of mild steel covered electrode produced in Japan.

Ilmenite type covered electrodes classified as D4301 in the JIS standard have been also classified as E6019 (iron oxide, titania potassium type) in the AWS standard since 1991. This standardization per AWS is due to Kobe Steel's active work in the Japan Welding Engineering Society and the American Welding Society. Nowadays, ilmenite type covered electrodes are used for welding general steel structures, pipes, and ships in Japan and overseas. Among these ilmenite type covered electrodes B-14 is one of the leading brands, which is produced by Kobe Steel and overseas subsidiary companies: TKW, KWS, and INTIWI.

What Characteristics Highlight B-14

Compared with E6013 electrodes, B-14 features the following characteristics.

- (1) Suitable for welding heavy-duty structures due to superior X-ray soundness, higher ductility, higher notch toughness (Fig. 2), and deeper penetration (Fig. 3).



Fig. 1 — Ilmenite type electrodes shined in shipbuilding throughout the 1960s and 1970s due to excellent usability and weldability

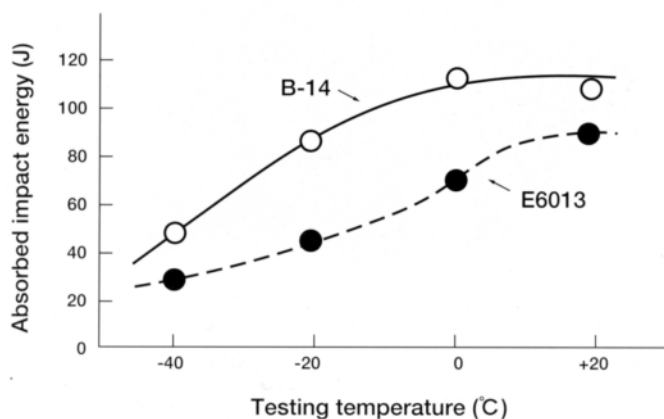


Fig. 2 — Charpy impact test results of B-14 and E6013 deposited metals

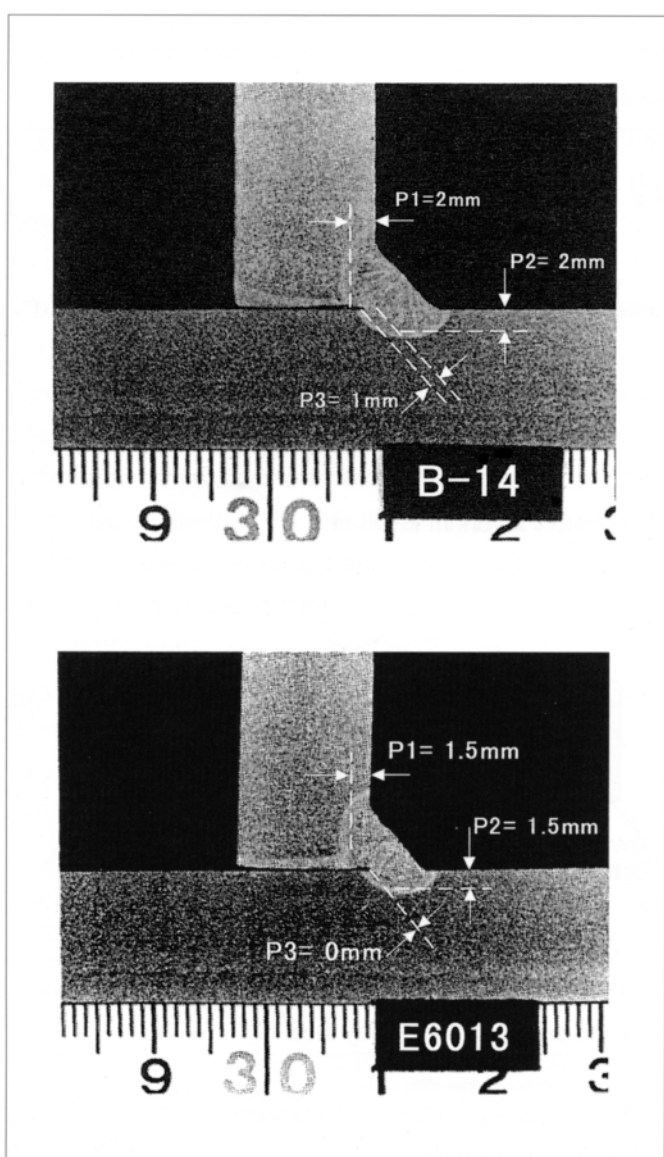


Fig. 3 — A comparison between B-14 and E6013 covered electrodes (4.0 mmØ, 175A) in fillet weld penetration; P1, P2, and P3 show sizes of penetration

- (2) Suitable for welding thicker steel plates due to superior hot crack resistance
- (3) Higher welding efficiency due to longer unit electrode length and higher proper currents (Table 1)

Table 1 — A comparison between B-14 and E6013 covered electrodes on unit length and proper welding current ranges

Brand	Size (mm Ø)	3.2	4.0	5.0
B-14	Electrode unit length (mm)	400	450	450
	Proper current in flat welding (A)	85-140	130-190	180-260
E6013	Electrode unit length (mm)	350	400	400
	Proper current in flat welding (A)	60-125	105-170	150-220

Notes on Usage

The electrode's performance depends greatly on how it is used. In order to get the best welding results, the following key points should be noted.

- (1) Use B-14 with welding currents within the proper ranges, because excessive welding currents may degrade X-ray soundness, increase spatter, and cause undercut and irregular bead appearance.
- (2) Redry B-14 at 70-100°C for 30-60 minutes, if the electrode picked up excessive moisture. This is because excessive moisture in the coating may degrade electrode's usability and cause the occurrence of pits in the weld metal.
- (3) Avoid excessively high temperatures and long time in redrying B-14, because the excessive redrying may damage the coating, causing less penetration, poor X-ray soundness, and electrode burn.

DW-309L

(AWS A 5.22 E309LT0-1, E309LT0-4)



Within the "DW stainless series," DW-309L is an exceptional flux-cored wire; it is an indispensable wire for welding dissimilar metal joints and the buffer layers for clad steel and overlaying.

Basic Characteristics of DW-309L

The AWS classifications shown above will help you know the basic characteristics of DW-309L as follows:

H: designates an electrode

309: indicates 309 type deposited metal (22%Cr-12%Ni as minimum)

L: designates low-carbon type (C% = 0.04 max.)

T: designates a tubular wire or a flux-cored wire

0: indicates the intended welding positions are flat and horizontal

1: indicates the suitable shielding gas is CO₂

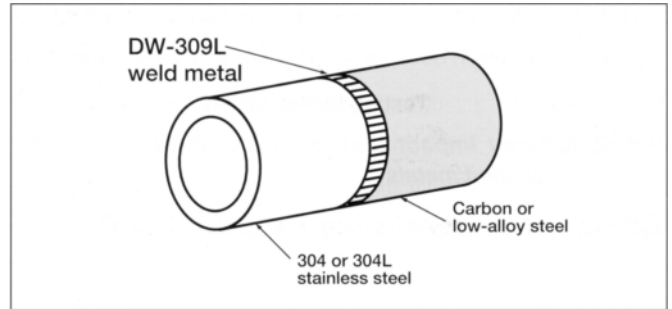
4: indicates the suitable shielding gas is 75-80%Ar/balanced CO₂

What Kinds of Welding Need DW-309L

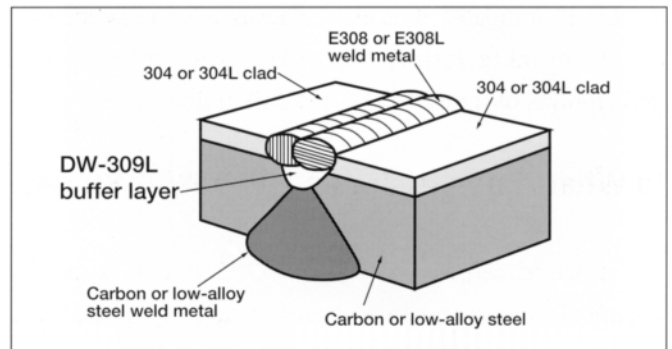
Most plant and equipment in oil refineries, chemical plants, power generation plants, chemical tankers, liquefied gas plants/carriers, and food processing plants consists, on any scale, of dissimilar metal joints and clad steel components. This is to minimize the material costs and, simultaneously, maximize performance.

DW-309L is designed so that its weld metal can accommodate adverse effects caused by dilution by carbon or low-alloy base metals. The adverse effects include martensite (a brittle structure) formation and fully austenitic structure (non-ferrite-bearing austenite sensitive to hot cracking) formation in the weld metal. This feature makes DW-309L suitable for

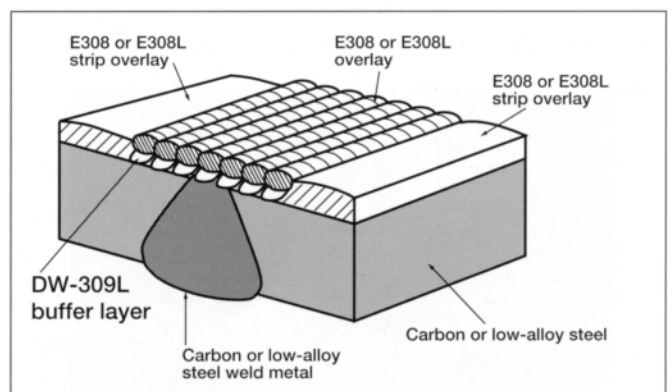
(1) welding 304 or 304L stainless steel to carbon or low-alloy steel



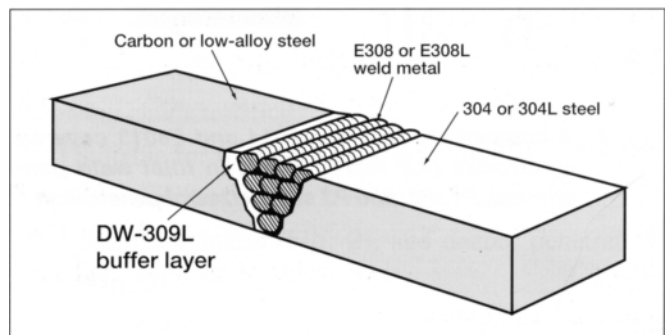
(2) buffer layers in 304 or 304L clad steel welds



(3) buffer layers in E308 or E308L overlay welds



(4) buffer layers in welding 304 or 304L stainless steel to carbon or low-alloy steel





DW-309LP

(AWS A 5.22 E309LT1-1, E309LT1-4)

DW-309LP: an advanced flux-cored wire offering superior usability in all positions including flat, horizontal, vertical-up, vertical-down, and overhead welding.

Basic Characteristics of DW-309LP

The AWS classification of DW-309LP differs from that of DW-309L in only the seventh digit. The seventh digit, "I" indicates that all positions are intended. For other characteristics, the reader may refer to the descriptions of the DW-309L classification.

In What Kinds of Joints DW-309LP Shines

A typical application of DW-309LP is seen in chemical tankers. Chemical tankers are equipped with cargo tanks made of solid or clad austenitic stainless steels such as 304L, 316L, and 317L. Cargo tanks usually contain corrosive substances such as petroleum products, chemical products, acids, alkalis, molasses, animal oil, and vegetable oil.

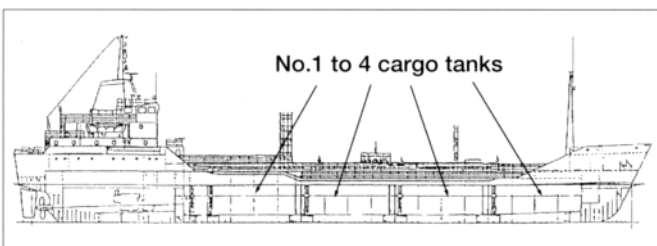


Fig. 1 — Cargo tanks of a chemical tanker

Where 304L stainless steel is used for the cargo tanks, DW-309LP is a well-matched flux-cored wire. DW-309LP provides excellent usability in all positions and is as easy to use as a mild-steel flux-cored wire. Fig. 2 shows a cross sectional view of a cargo tank of a chemical tanker. Fig. 3 and 4 show examples of DW-309LP buffer layers in butt welds of stainless clad steel joints of a cargo tank.

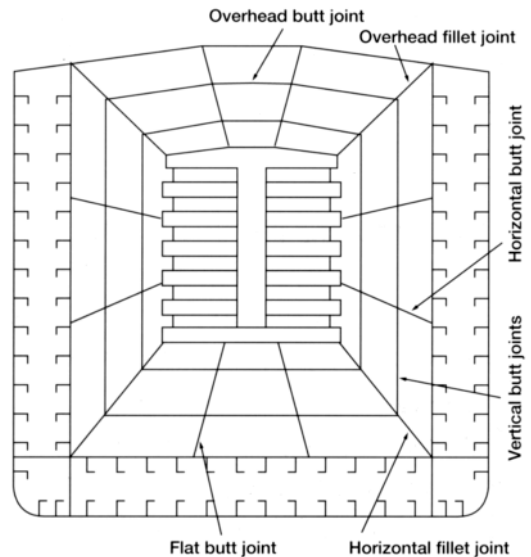


Fig. 2 — A cross sectional view of a cargo tank and a variety of welding joints in all positions

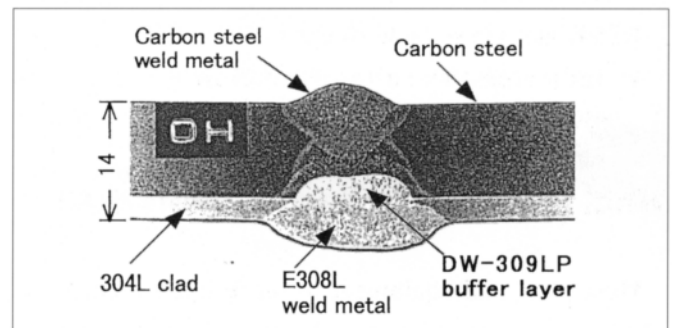


Fig. 3 — A DW-309LP buffer layer in an overhead joint weld of stainless clad steel

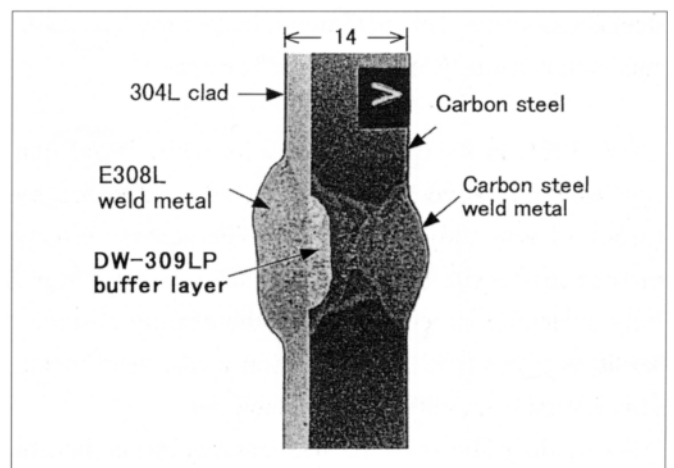


Fig. 4 — A DW-309LP buffer layer in a vertical joint weld of stainless clad steel

Why Dissimilar-Metal Welding is Needed, and How to Select Proper Filler Metals

Since ancient times, people have been joining dissimilar metals. Ornaments and trinkets were made with metals of differing colors and workability, even though the joining methods used in ancient times were very different from those in present.

Nowadays, joining dissimilar metal is indispensable in manufacturing and constructing advanced equipment and machinery. Different kinds of metals feature different chemical, physical, and metallurgical properties: some are more resistible to corrosion, some are lighter, and some are stronger. Joining dissimilar metals is, therefore, to compose different properties of metals in order to minimize material costs and at the same time maximize the performance of the equipment and machinery. Presently, the methods of joining dissimilar metals include fusion welding, pressure welding, explosion welding, friction welding, diffusion welding, brazing, and soldering. This article, however, discusses fusion welding only, because it is used in a wide range of industries.



In selecting a proper filler metal for dissimilar metal welding, estimating probable weld microstructure diluted by both base metals is a key point.

Among various combinations of dissimilar metals, some can readily be fusion welded, but some cannot because of inherent features of particular metals. Joining austenitic stainless steel (more resistible to corrosion) to carbon steel (more easy to process and inexpensive) is a common combination that can readily be fusion welded, provided the welding procedure is proper.

In welding Type 304 to mild steel for instance, the choice of filler metal is a key point. If you use Type E308 filler metal, the diluted weld metal with the formation of martensite (a brittle structure) may contain cracking, because the filler metal cannot tolerate dilution by both base metals. A proper filler metal, in this case, is Type E309 for applications below 800°F (427°C) in general. The procedure of estimating the microstructure of the E309-type diluted weld metal can be done by using a Schaeffler diagram (Fig. 1): the diluted weld metal will contain about 4% of ferrite and no martensite in the austenitic matrix, which is resistible to cracking.

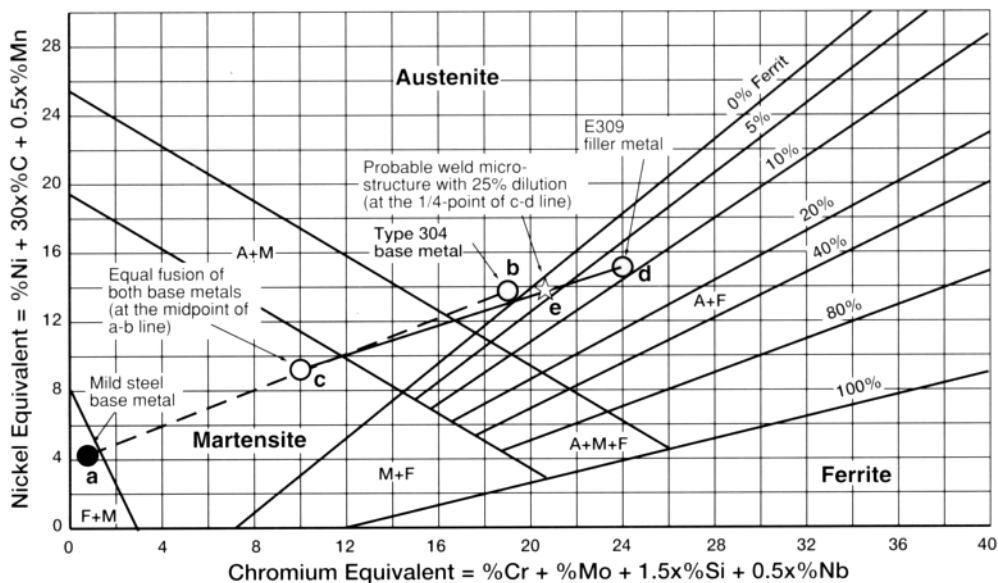


Fig. 1 — A Schaeffler diagram and the procedure (a→b→c→d→e) of estimating the microstructure of E309-type diluted weld metal in welding Type 304 to mild steel.

KWK of Korea: Towards a Stronger Asian FCW Production Base



Fig. 1 —
KWK locates in
Changwon-city in
the southern part
of Korea (Right)

The Republic of Korea (area: approx. 100,000 km², population: approx. 45 million) promotes a number of industries but must import most mineral resources such as iron ore and petroleum. Major industries include the electronic industry, represented in particular by semiconductors, and the heavy industries, led by car manufacturing, machinery fabrication, and shipbuilding.

Since the 1970s Korean enterprises have entered into the shipbuilding business on a large scale. As a result, there are presently 14 docks that can construct VLCCs (Very Large Crude Carriers): these docks are all in the southern regions of Korea. In the 1990s Korean shipbuilders began to compete directly with Japanese shipbuilders for shipbuilding orders: they have since built Korea into one of the world's leading shipbuilding countries. It surprised me to learn that East Asian countries, in particular Korea, Japan, and China, share three-fourths of the worldwide shipbuilding market.

With respect to welding consumables, flux-cored wire is so popular that in Korean shipyards it accounts for approximately 70% of all welding consumables consumed. Due to high investment in equipment by Korean shipyards during the period of rapid economic development, the shipyards employ a lot of automatic equipment. The automatization ratio of welding processes, therefore, is as high as any in the world. Kobe Welding of Korea Co., Ltd. (KWK) was established as Kobe Steel's first joint venture company in Korea in 1995. KWK has been producing mainly flux-cored wires for mild steel and 490N/mm² high strength steel, and supplying them steadily to domestic

and overseas markets. This steady supply is due to the customers' approval of KWK's products as superior to those of competitors, in addition to the tenacious efforts of the employees to overcome the competitor's buy-Korean campaign. Because of our remarkable progress over these years, a good image of "KWK of Korea" has gradually and firmly been penetrating the market. At the occasion of celebrating the fourth birthday of KWK on March 4th this year, I hope for "The World's KWK" in the future.



Fig. 2 —
The entrance
to the main
office and
factory of
KWK (Left)



Fig. 3 —
A view of the
ceremony for the
KWK's forth
anniversary held
on March 4th,
1999 (Right)

Since Korea accepted the financial reform program recommended by the International Monetary Fund (IMF) at the end of 1997, the Korean economy got into trouble with the abrupt devaluation of the Won and the successive bankruptcies of some *chaebol* (giant financial/industrial combines). However, Korea seems to have overcome the crippling financial crisis through the economical reform campaign under the slogan, "Found the Nation Again." In the past, Korean people accomplished the miracle economic progress known as "The Miracle of Han River." This experience reminds me of the incalculable potential power of the people.

(Reported by K. Suenaga, Asst. Manager, KWK)

KOBELCO Cr-Mo Electrodes with Long-Year-Supply Experience in the Indian Market Shine in Weld India International '99



Fig. 1 — The venue of the WII welding fair

An international welding fair, "Weld India International (WII) '99," was held at Pragati Maidan in New Delhi from February 12th to the 17th. This welding fair was included in the Indian Engineering Trade Fair (IETF). The IETF included four other sectors' fairs of highlighted industries such as autos and computers. During the time, about 200,000 people visited the IETF fair, and around 10,000 visitors enjoyed the WII fair.



Fig. 2 — The staff of the companies concerned appeal strong collaboration

Kobe Steel, Ltd., Nikko Boeki Kaisha, Ltd., and Weldwell Speciality Pvt. Ltd., collaborated to work for a corporate exhibitor of the WII fair. The Kobelco exhibition attracted the visitors' attention very much. In particular, KOBELCO Cr-Mo welding consumables, which are suitable for the fabrication of such stricter quality machinery as pressure vessels, heat exchangers, and reactors, were highly evaluated with high popularity and reliability. The KOBELCO group

exhibited the following welding consumables in order to appeal higher welding efficiency for general applications and higher quality for oil refinery projects.

- Cr-Mo welding consumables ranging from Type 1.25%Cr-0.5%Mo to Type 9%Cr-1%Mo for shielded metal arc welding (SMAW), flux-cored arc welding (FCAW), tungsten inert gas welding (TIG), and submerged arc welding (SAW)
- DW stainless series flux-cored wires (introduced in the technical reports of the KOBELCO WELDING TODAY)
- DW-100 (E71T-1): titania type flux-cored wire for all-position welding (introduced in the technical report of the KOBELCO WELDING TODAY, January '98, Vol. 1, No. 1)
- LB-52U (E7016): a low-hydrogen-type covered electrode for uranami welding (SMAW) (introduced in the technical report of the KOBELCO WELDING TODAY, October '98, Vol. 1, No. 4)



Fig. 3 — The slogan, "QTQ," appeals reliability on Kobelco welding consumables in the booth

Korea was invited as the "Partner Country" by the Indian Engineering Trade Fair organizer this year (Japan was invited in 1997). Kim Jong-pil, the prime minister of Korea attended the fair. In addition, many Korean beauties in folk costumes added color to the fair.

Advanced Welding Technology Seminar Welcomed by the Bangladesh Government and Private Sectors

A seminar entitled "Bangladesh-Japan Training Course in Advanced Welding Technology" was held in Dhaka, Bangladesh, from the 14th through 18th of February, 1999. There were as many as 40 participants: government and private sector engineers working in such industrial fields as steel construction, shipbuilding, food processing, textile processing, steel mill, and vocational training.

This course was organized jointly by the Association for Overseas Technical Scholarship (AOTS) of Japan, Bangladesh AOTS Alumni Society (BAAS), and Modern Erection Limited of Bangladesh, and was conducted by a Japanese expert on welding technology, Shigeaki Yamamoto (who is on the editorial staff of KOBELCO WELDING TODAY).

Muhammad Ahsan Ali Sarkar, Secretary, Ministry of Labor and Employment of Bangladesh attended the inaugural function as the chief guest. "This technology transfer programme is the manifestation of Bangladesh's friendship with Japan. It would help develop participants' professional efficiency mainly in fabrication industry," said Ahsan Ali Sarkar. He added.

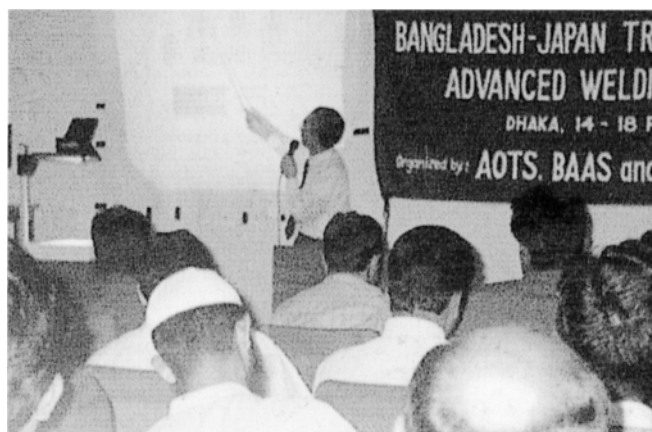


Fig. 1 — The lecture is given with audiovisual aids.

"I hope the participants will be greatly benefited in the area of welding technology and apply their acquired knowledge in their respective organizations."

The curriculum included (1) Fundamentals of arc welding, (2) Practical welding procedures for high strength steel, Cr-Mo steel, stainless steel, cast iron, and hardfacing. During the course the participants were eager to listen to the lectures, and they felt the course was instructive. On completion of the course, AOTS awarded a certificate to every participant.

Editorial Postscript

An AWS Show, "80th AWS Annual International Welding and Fabrication Exposition," was held at America's Center in St. Louis in the US from April 13th through the 15th, 1999. Kobelco Welding of America Inc. (KWA) attended as a corporate exhibitor. The details will be reported in the next issue of this journal.

An international welding fair, "Essen Welding Asia," is scheduled to open in Singapore from the 19th through 21st of October, 1999. Kobe Steel and Kobe Welding (Singapore) Pte. Ltd. (KWS) will attend as a corporate exhibitor.

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THE
KOBELCO
GUARANTEE:

QTA

QUALITY PRODUCTS
TECHNICAL SUPPORT
QUICK DELIVERY



International slogan of Kobelco Welding Group