KOBELCO WELDING TODAY

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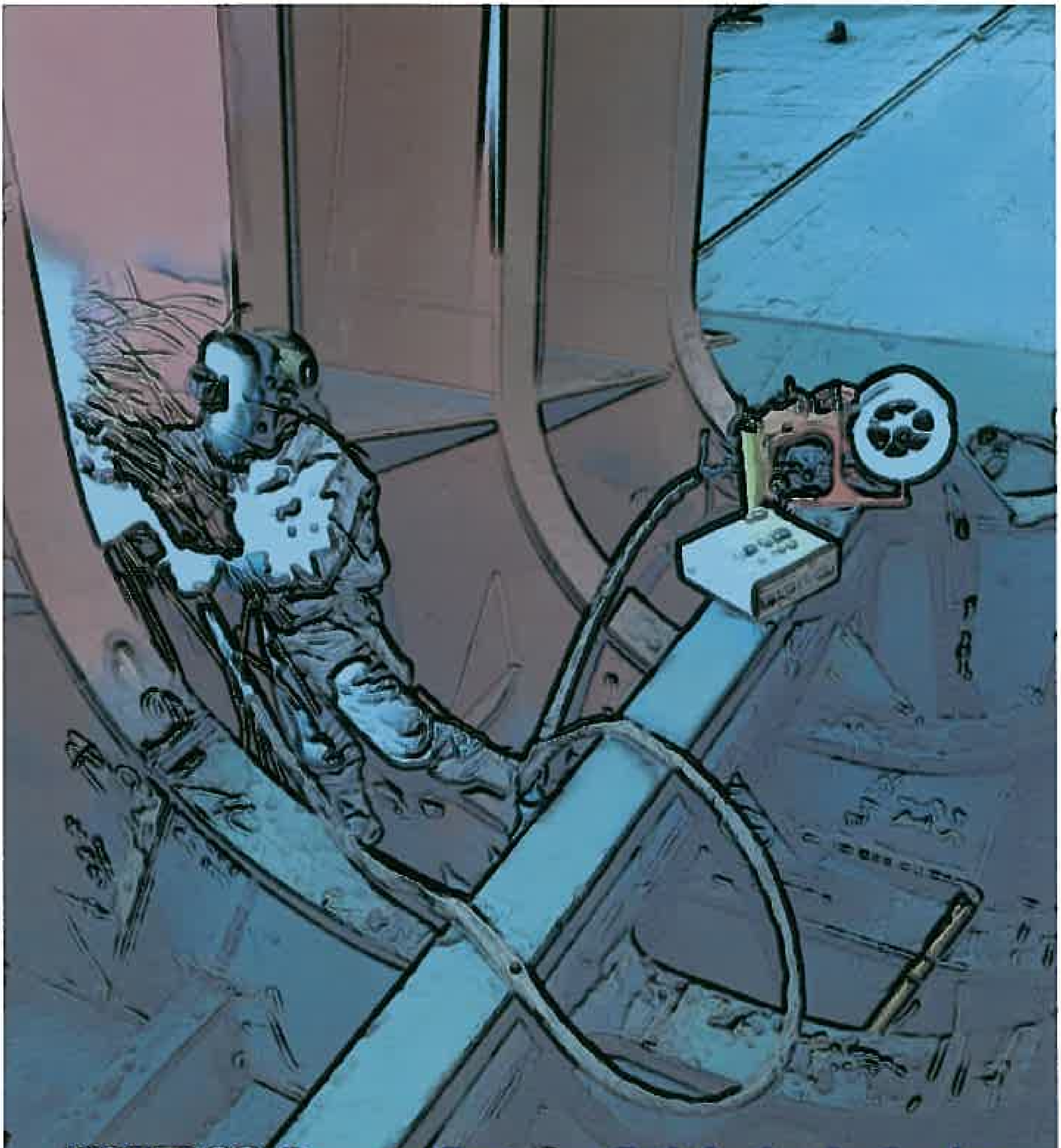
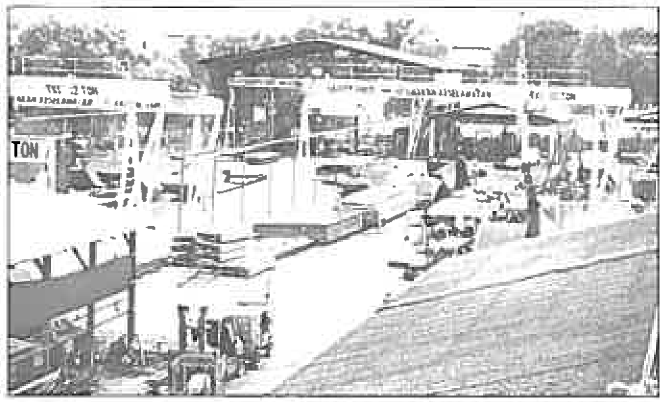


KOBELCO *Pursues Customer Satisfaction in the Arc*

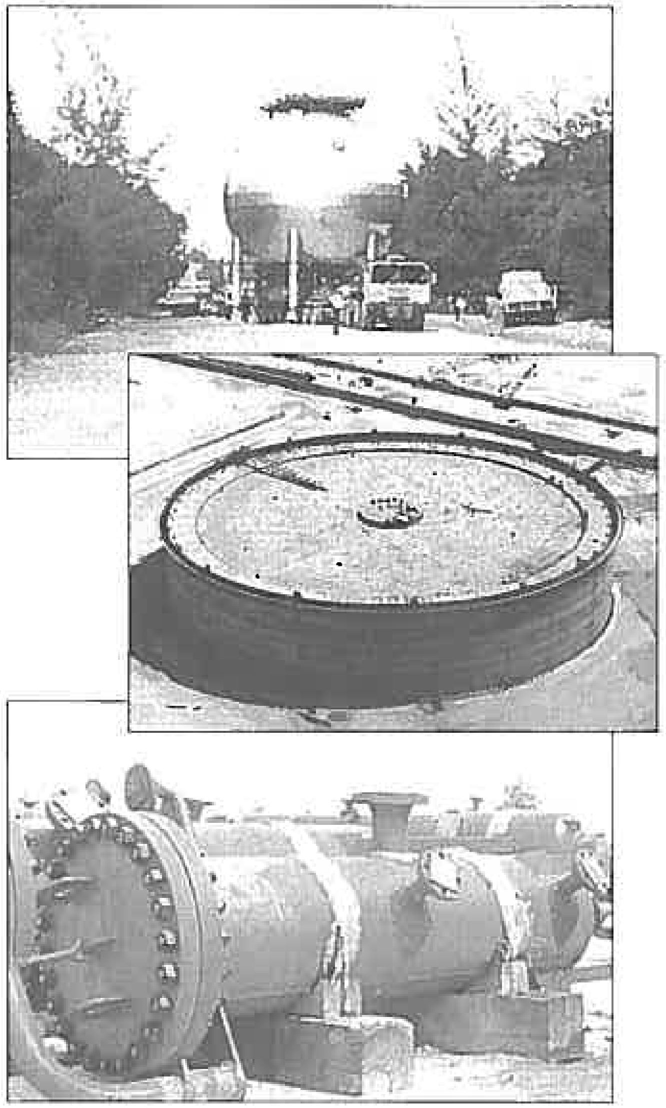
TKI: A Pioneer in the Construction of Spherical Tanks in Indonesia

P.T. TOYO KANETSU INDONESIA (TKI) was established as a joint venture between one of the world's largest oil and gas companies, PERTAMINS, and TOYO KANETSU K.K. (TKK) of Japan in 1974. As you may know, TKK is one of the world's leaders in the construction of oil and LNG storage tanks. With over 4500 storage tank installations across the world, TKK's capability is highly recognized in this industry.



A TKI fabrication shop at the Batam Plant located on Batam Island in Indonesia

TKI is located on Batam Island in the Riau Archipelago of Indonesia and has fabrication facilities equaling 26,505 m^2. They have fabricated and supplied a variety of storage tanks for the oil, natural gas and oil chemical industries in Indonesia, neighboring countries such as Malaysia and Singapore, as well as Algeria and Egypt for many years. TKI also has a reputation for constructing tanks for LNG, a "clean" source of energy, including a world-class, large-sized tank with a capacity of 127,000 m^2 in Indonesia. In addition, in Malaysia, TKI is constructing a 120,000-m^2 class LNG storage tank in the state of SARAWAK, which may be the world's largest source of LNG. In its position as a leader in the construction of LNG storage tanks, TKI is always making an effort to innovate their technology. In addition to cylindrical tanks, their business includes spherical tanks, structural steel facilities, and furnaces. They are well-known as a pioneer in the construction of spherical tanks in Indonesia. In 1999, they were approved as a Full Direct Investment Company (PMA).



A 360-m^3 shop-erected propane sphere ready for shipment to Singapore (Top); A 800,000 bbl floating roof tank constructed in Kalimantan (Middle); A variety of pressure vessels ready for loading (Bottom)

It is an honor for me that Kobe Steel has been supplying TKI with the welding consumables for 9%Ni steel, low-temperature steel and plain carbon steel for LNG storage tanks. Batam Island is located about one hour by ferry from Singapore. The staff of Kobe Welding Singapore (KWS) periodically visit the island as well as the construction site in Malaysia for providing technical services to TKI. Kobe Steel always follows its business slogan of QTQ, supplying Quality Products with Technical Support and Quick Delivery. We wish to continue to be a good and useful supplier to TKI who pursues a commitment to contribute to the Indonesian economy.

*Reported by K. Harada, **KWS***

Message from the Editor

General Manager

International Operations Department

Welding Company
Kobe Steel, Ltd.

It is an honor for me to greet you, succeeding Tetsuo Konohir as the General Manager of the International Operations Department. I came back to Japan in March this year after working for Kobe Welding of Korea for 2 years and nine months.

As you are well aware, the new century has been called the era of the IT revolution. Information Technology will surely improve human life. On the other hand, as tangible objects, such as buildings, automobiles, bridges, power plants remain indispensable to our daily lives. These products can not be fabricated without welding technology. In this sense, welding technology can be regarded as an essential technology for all the industries. In the sphere of welding that possesses such significance, we, KOBELCO GROUP, will continue to supply welding consumables and services that will fulfill customer demand, taking to the heart the motto of QTQ (Quality Products, Technical Support and Quick Delivery).

If you have any requests or questions on Kobelco's products and services, please feel free to contact any Kobelco Group Company in your country or area. As for the articles of Kobelco Welding Today, too, please send your opinions to the International Operations Department of the Welding Company of Kobe Steel as we are all too pleased to improve them constantly for the satisfaction of our dearest readers.

It is my pleasure to declare that we will try further to be a company worthy of your precious patronage.

Masakazu Tojo
Editorial Chairman

General Manager

Management & Administration Department

Welding Company
Kobe Steel, Ltd.

To our dearest readers of Kobelco Welding Today: Three months have elapsed already since we passed through the gate to a new era, the 21st century. Has there been any change in your life and business environment?

The worldwide business environment that surrounds the welding and related industries is undergoing a rapid transformation with big companies forming bigger groups or existing company groups being realigned. Announcements of the formation of new groups of welding companies may be made at the world's biggest welding and cutting fair to be held in September this year in Essen, Germany.

We, KOBELCO WELDING GROUP, however, will retain our independence and our own management policy: We will always place our top priority on the interests of our customers and shareholders. For this end, we are determined to continue necessary investment into production facilities, research and development, and human resources unwaveringly.

Now, here is a piece of information of personnel change: I have been assigned to the post of the General Manager of the Management and Administration Department as of March this year. I should like to express my heartfelt gratitude for the support that the dear readers have rendered me during my engagement in international operations for the past 20 years. My successor, Mr. Masakazu Tojo possesses both detailed knowledge and abundant experience in overseas activities, having been stationed in USA and Korea for a long time for production and sales of Kobelco welding consumables. On this occasion, I sincerely hope that you will give him the same and kind support as the one that I have received.

Last but not in the least, let me wish all of you, your family and your friends best of luck and ever continuing prosperity.

Tetsuo Konohira

Contents

DW-55LSR

(AWS A 5.29 E81T1-K2)

DW-55LSR: a revolutionary rutile-base flux-cored wire having unsurpassed notch toughness in the SR condition as well as in the as-welded condition at low temperatures down to minus 60℃ and excellent usability in all position welding. Typical applications for DW-55LSR are ships, LPG tanks, offshore structures, and storage tanks.

Figure 1. An example of the applications for DW-55LSR: an LPG tank of an LPG carrier with a maximum plate thickness of 40 mm requiring local stress relief annealing

How Stress Relief Annealing Affects Impact Notch Toughness

Stress relief annealing (SR), one type of postweld heat treatment, can relieve residual stresses raised in welds, thereby improving fatigue strength and fracture toughness of the welds. SR, on the other hand, decreases impact notch toughness of low alloy welds of conventional rutile-base flux-cored wires for low-temperature use. This is because the heat of SR precipitates carbides in the weld metal by combining carbon with, if contained, small amounts of niobium and vanadium, which is known as precipitation hardening. The heat of SR also affects impurities such as phosphorous to diffuse to the grain boundaries of the weld metal, thereby causing embrittlement of the weld, which is referred to as temper embrittlement.

With a sophisticated flux composition design, DW-55LSR maintains impact notch toughness as high in the SR condition as in the as-welded condition in comparison with conventional rutile-base flux-cored wires as shown in **Figure 2**.

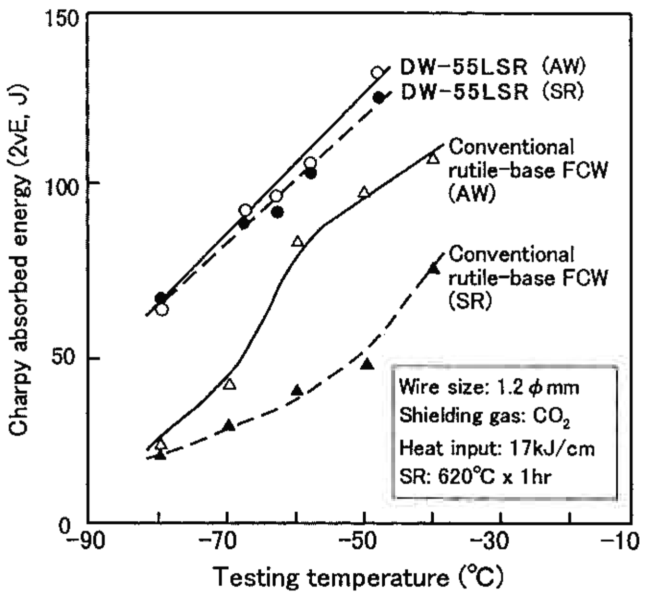


Figure 2. Impact test results of DW-55LSR and a conventional rutile-base flux-cored wire in the as-welded and SR conditions

Consistent Notch Toughness Over a Variety of Welding Positions

DW-55LSR is designed so that the weld metal exhibits minimized precipitation hardening and temper embrittlement in addition to fine crystal grains. The sophisticated design of the chemical composition (containing approximately 1.5%Ni) facilitates quite a high level of impact notch toughness in both the as-welded and SR conditions over a variety of welding positions as shown in **Figure 3**. It is obvious that the SR weld metals show quite high values, though they are a little lower than those of the as-welded weld metals.

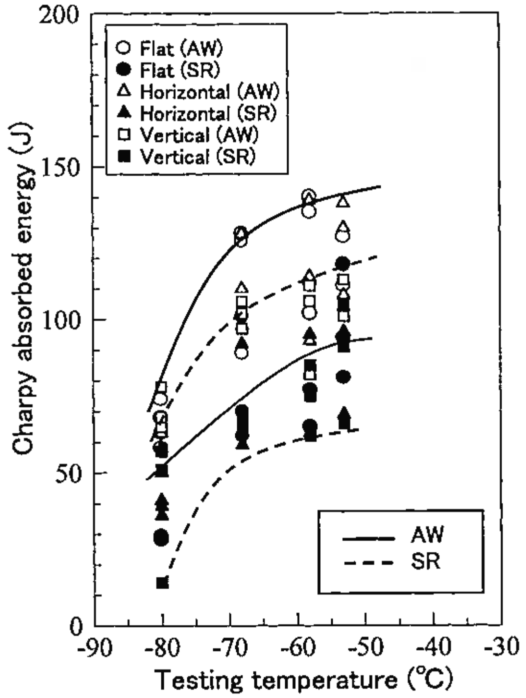


Figure 3. Charpy impact test results of DW-55LSR weld metals in the following conditions:
- *Base metal: LR grade DH40, 20mm T*
- *Groove: 60-degree V • Wire size: 1.2φ mm*
- *Heat input: av. 14.9kJ/cm for flat; av. 10.2kJ/cm for horizontal; 18.6kJ/cm for vertical position*
- *Shielding gas: CO_2, 25 l/min*
- *Interpass temperature: 145-155℃*
- *Impact specimen: 2mmV-notch, 1/2T location*

DW-55LSR Exhibits the Excellent Usability Peculiar to Rutile-Base FCWs

DW-55LSR demonstrates a smooth, spatter free arc, featuring self-peeling slag removal in all position welding, as does DW-55L. Such excellent usability provides sound welds in every welding position as shown in **Figure 4**.

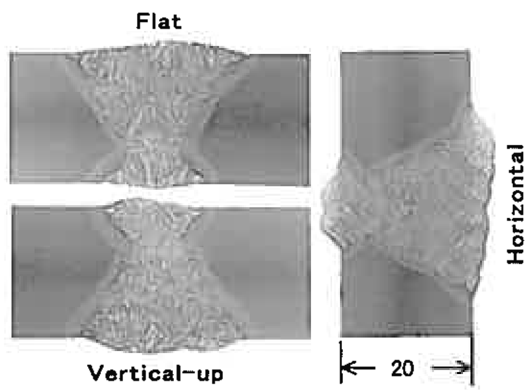


Figure 4. Macrostructure of DW-55LSR weld metal made in flat, horizontal and vertical-up welding

DW-55LSR Offers Consistent CTOD Values Due to Fine Microstructure

Table 1. Typical CTOD values of DW-55LSR weld metal (AW)

Welding position	Heat input (kJ/cm)	δat -20℃ (mm)
Flat	18	0.72
Horizontal	13	0.48
Vertical	25	>1.10

Note: • Testing method: BS7448-91, full-size specimen with side -notch at the center of the weld metal,
• Base metal: SM490A (80mm), 45-deg-double-K groove
• Wire size: 1.2mmφ • Preheating temp: 100℃
• Interpass temp: 100-150℃

Low Diffusible Hydrogen Content Ensures Good Cold Cracking Resistance

Diffusible hydrogen is one of the major factors that cause cold cracking of welds. DW-55LSR features diffusible-hydrogen content as low as that of low-hydrogen type covered electrodes, as shown in **Table 2**.

Table 2. Typical diffusible hydrogen content of DW-55LSR deposited metals (Gas chromatographic method)

Diffusible hydrogen content (ml/100g)				
3.6	3.9	4.3	3.3	Average 3.9

Note: • Wire size: 1.2φmm • Welding current: 250A
• Welding speed: 35cm/min • Wire extension: 25mm
• Shielding gas: 100% CO_2, 25 l/min

Control of Heat Input, Preheating and Interpass temperatures are Essential Factors

In order to prevent cold cracking and assure mechanical properties of weld metals, the control of heat input, preheating and interpass temperatures is indispensable. **Table 3** shows how to control such factors in relation to plate thickness of the work.

Table 3. Proper ranges of heat input, preheating and interpass temperatures where SR is required after welding

Welding position	Plate thick. h (mm)	Heat input (kJ/cm)	Preheat temp. (℃)	Interpass temp. (℃)
F, H	15≦h<25	13-20	≧50	50-150
	25≦h<30		≧75	75-150
	30≦h<40		≧100	100-150
V-up	15≦h<25	20-30	No need*	≦150
	25≦h<30		≧50	50-150
	30≦h<40		≧75	75-150

Note: *Where the ambient temperature is 5℃ or lower, preheating by 40℃ is needed.

TGX-308L AWS A 5.22 (R308LT1-5)
TGX-309L (R309LT1-5)
TGX-316L (R316LT1-5)

The TGX series of flux-cored stainless steel filler rods can eliminate gas purging for back shielding the root pass weld in one-side TIG pipe welding, cutting the costs for back shielding gases and gas purging downtime including the setting time for gas purging jigs. Process pipelines of Type 304, Type 316 and dissimilar metals are typical applications for TGX-308L, TGX-316L and TGX-309L respectively.

How TGX Filler Rods Can Eliminate Back Shielding

With a typical solid filler rod, back shielding is required in welding stainless steel pipes, or the root pass weld would not penetrate the backside of the joint properly. This can be attributed to significant oxidation of the root pass weld due to high chromium content of the weld. Therefore, back shielding with an inert gas is a must.

In contrast, unlike the typical solid wire, a TGX filler rod contains a specific flux inside a tubular rod of stainless steel. The flux can be fused by the arc heat to become molten slag. This molten slag can flow smoothly to the reverse side of the root to cover uniformly the penetration bead extruded inside the pipe. This molten slag protects the molten weld metal and red heated bead from the adverse effects of nitrogen and oxygen in the atmosphere. When the weld cools down the slag solidifies to become thin, fragile slag, which can be removed easily by lightly hitting the face of the joint with a chipping hammer. Then a quality bead will appear on the face and reverse sides of the root with a smooth, uniform ripple without oxidation as shown in Figure 1. TGX filler rods provide regular penetration through the entire part of the pipe in all positions as shown in Figure 2.

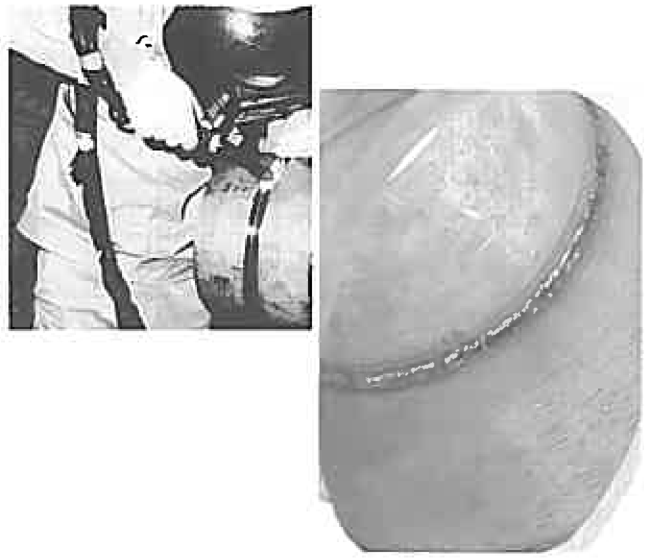


Figure 1. The reverse side of the root pass weld (right) made with a TGX-308L filler rod on a Type 304 pipe joint without back shielding.

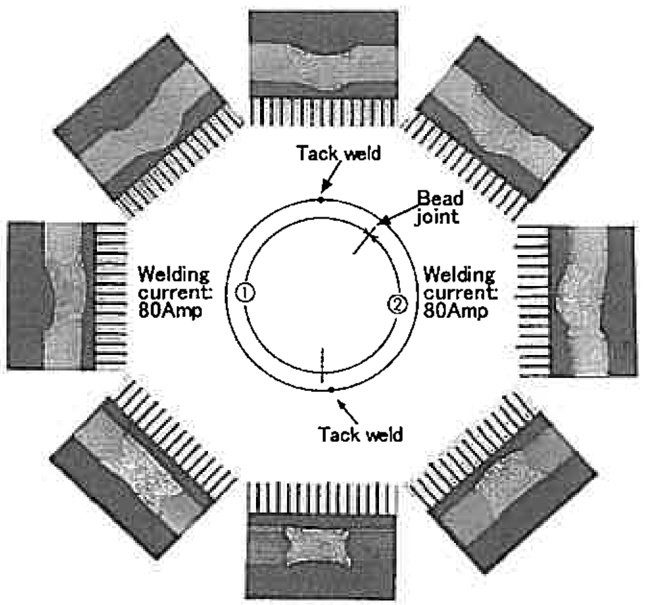


Figure 2. Macrostructure of TGX-308L welds made on a 304-type stainless steel tube (4T × 50mmφ) in horizontally fixed position (5G position per ASME)
The terminal of the 2nd pass was joined with the terminal of the 1st pass at the point between the 1 o'clock position and the 2 o'clock position.

How TGX Filler Rods Can Cut Costs for Gas Purging and Back Shielding

The use of a conventional solid filler rod needs back shielding with an inert gas: normally argon gas. Though the time and the amount of an inert gas needed for purging the inside of the pipe vary depending on the inside diameter and the length of the pipe to be purged, they affect markedly the total welding cost. Table 1 compares the uses of a usual solid filler rod and a TGX filler rod on the factors affecting the welding costs in root pass welding on a pipe with an inside diameter of 305 mm. It is obvious that the use of a TGX filler rod can noticeably reduce labor (man-hour) by 23-74% and the consumption of back shielding gas by 55-91% in a comparison with typical solid filler rods.

Table 1. A comparison between TGX and solid filler rods on man-hour, argon gas consumption, filler rod consumption and power source consumption in root pass welding of a pipe

Filler rod	TGX	Solid	
Groove preparation	70° 1 3	70° 1 2.5	
Back shielding length of pipe	Without back shielding	300 mm for local shielding	6000 mm for entire shielding
Prepurging (1)	No need	5.2 min	104 min
Setting jigs	No need	10 min	No need
Welding (2)	35 min	30 min	30 min
Arc time rate	50%	50%	50%
Total man-hour	**35 min**	**45.2 min**	**134 min**
Total Filler rod consumption	**120 g**	**100 g**	**100 g**
Prepurging (1)	No need	122.2 liter	2444 liter
Welding (2)	263 liter	225 liter	225 liter
Back shield (3)	No need	240 liter	240 liter
Total Ar gas consumption	**263 liter**	**587.2 liter**	**2909 liter**
Total Power source consumption	**0.405 kwh**	**0.358 kwh**	**0.358 kwh**

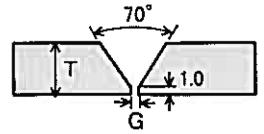
Note:
(1) The prepurging condition is per AWS D10.11-7X (Guide for Root Pass Welding and Gas Purging)
(2) Shielding gas flow rate for welding: 15 liter/min
Welding condition: 110 Amp. × 13 Volt
(3) Shielding gas flow rate for back shielding: 8 liter/min.

On the other hand, with a TGX filler rod, because of the flux-cored rod, the filler rod consumption increases a little and power source consumption slightly increases because of a little lower deposition efficiency (Approx. 90%) than with a solid filler rod. In addition, the unit price of TGX filler rods is higher than that of solid filler rods. However, if you would calculate the total welding cost by multiplying the unit prices for each factor, you may notice that the TGX series can save a great deal in terms of total welding costs.

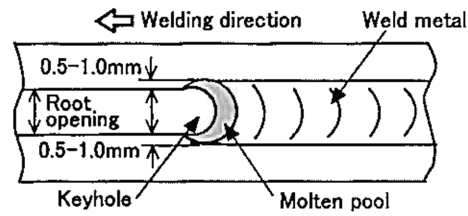
Tips for Using TGX Filler Rods

TGX filler rods can be used in almost the same way as solid filler rods. The following are the specific techniques for root pass welding with a TGX filler rod.

(1) Prepare proper root opening to assure a sound penetration bead.

Groove preparation			
Plate thickness (T)	4 mm	6 mm	≧10 mm
Root opening (G)	2.0 mm	2.5 mm	3.0 mm

(2) Use the proper keyhole technique to help the molten slag flow to the backside of the root.



(3) Feed a TGX filler rod little by little with a higher pitch, than with a solid filler rod, to ensure adequate fusion of the rod and a sound penetration bead. This technique is to compensate a little lower deposition efficiency of TGX filler rods, too.
(4) Keep the solid slag on the crater and the reverse side bead when re-starting an arc to join the preceding bead. The re-arcing point should be stepped back from the edge of the crater by approximately 10 mm. This technique protects the reverse side bead from oxidation. In 5G position welding, the termination of the succeeding bead onto the crater of the preceding bead should be done in the uphill positions to help create the keyhole.
(5) TGX series is suited for only root pass welding.

PWHT Determines the Quality of Weldments

Postweld heat treatment (PWHT) includes any heat treatment after welding. The objectives of PWHT of carbon steel and low-alloy steel weldments are to relieve welding residual stresses, decrease hardness of the heat-affected zone, improve ductility and notch toughness, and release diffusible hydrogen. Among these objectives, stress relieving is the main purpose, and PWHT is also referred to as "stress relief annealing (SR)."

Austenitic stainless steel welds are not subject to PWHT in general. However, when the weldment is to be used in a severe corrosive environment, PWHT is applied in order to dissolve chromium carbides by solid solution heat treatment, stabilize niobium carbides (NbC) and titanium carbides (TiC) by stabilizing heat treatment, and relieve residual stresses by SR.

Essential factors to be noted in PWHT are heating rate, soaking temperature and period, cooling rate, and temperature difference in the weldment during the heating and cooling cycle. The soaking temperature and time are primary factors because they determine the stress-relieving rate and the quality of the weld. **Figure 1** shows how the soaking temperature and period affect the stress-relieving rate in the case of 2.25Cr-1Mo steel welds. In order to ensure a uniform temperature distribution and minimize thermal stress, maximum heating and cooling rates and a maximum temperature difference are specified, too.

While the metallurgical effects of PWHT are generally beneficial, there are some negative features. Extended heating may reduce the tensile strength and notch toughness of welds. Certain types of Cr-Mo steel welds may develop "SR cracking."

In most fabrication, PWHT is carried out in a furnace as in **Figure 2 (Top)**. In the case of large construction sites, it may be economic to erect temporary, tailor-made furnaces for annealing pressure vessels and piping spools. On large, site-erected vessels such as coke drums and storage spheres the work itself may, in effect, become the furnace. Furnaces are usually gas or oil fired.

Normally a furnace will be fitted with a number of fixed thermocouples but for major pressure vessels thermocouples may also be attached to the vessel itself to control the temperature more precisely. Field joints in pipework are frequently given a local PWHT as in **Figure 2** (Bottom).

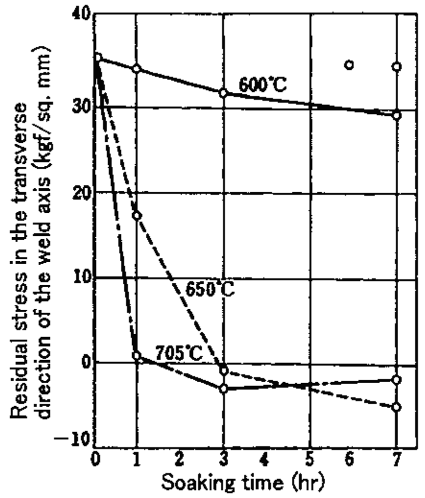


Figure 1. *The effect of PWHT on stress relief of 2.25Cr-1Mo steel welds [The Complete Book of Welding, Sanpo Publishing, Japan]*

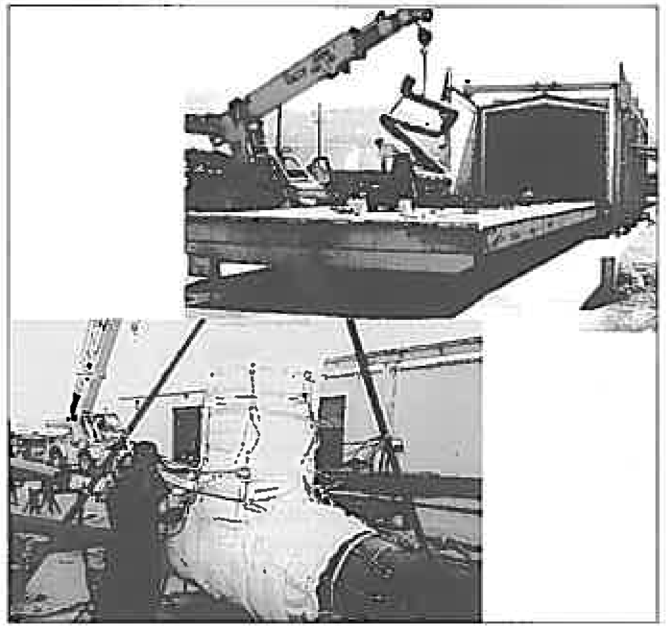


Figure 2. *(Top): A computer-controlled furnace*
(Photo source: Pipe Fabrication & Supply, USA)
(Bottom): Local annealing of a tee
(Photo source: Technical Heat Treatment Services, Canada)

Growing Pains

KWE's office and factory are located in a desirable area to deliver their products quickly to their customers.

As Kobe Steel's first European production subsidiary, Kobelco Welding of Europe (KWE) has already established a considerable reputation in the European market after starting production in October 1995. After a good start, KWE suffered a setback in 1998 and 1999 due to stagnation in the economy, which had an influence on shipbuilding, in particular. Total demand in the European market for stainless steel FCW decreased, impacting sales at KWE. It is now believed that the market has reached the bottom, and growth can be expected for the coming years.

Establishing an Asian company in the European Community never comes easy. A huge effort was made to integrate Japanese management philosophies into a Dutch workforce in such a manner that the best of both worlds would thrive. The main goal was, and still is, the establishment of a stable and highly skilled workforce as a firm basis to build on. While technology and knowledge transfer from Japanese partners continues, KWE is now concentrating more on how to capture more technical know-how, and how to integrate this in a European way of thinking. Clear documentation is the keyword at this moment.

Because the management of KWE aims to establish a desirable working environment for the employees, human resources development will be a key investment.

KWE has to increase training and development for employees, in order to maintain a high level of skill. To satisfy the need for education of KWE's employees, KWE is considering the implementation of a Company Education Plan (CEP). In-company education will enable KWE to secure the quality as well as the quantity of our product into the 21st century.

All employees of KWE, including office staff and factory operators, pose for the readers of Kobelco Welding Today. An integrated power derived from the things Japanese and Dutch has provided with the best of both worlds, promising a big stride in the future.

Kobelco wires are famous because of their high quality. To become the No.1 supplier of stainless steel FCWs in Europe was difficult, but to stay No.1 in Europe will be even more difficult. As competition is tough, KWE is always on the move to improve their products as well as their machines to make sure the customer will get the highest quality welding consumables available on the market.

As a growing child and still overcoming its so-called "growing pains," KWE has become a firm and steady production unit, which can combine high quality products with a highly flexible capacity for delivery.

Reported by Richard Boumans, John Wijnands, Stefan Barendregt, ***KWE***

New, Competitive Cr-Mo Flux-Cored Wires Are Launched for Overseas Markets

The main types of Cr-Mo steels used in high-temperature use equipment such as boilers and pressure vessels are 1.25Cr-0.5Mo and 2.25Cr-1Mo. Kobe Steel has a long history of supplying the matching SMAW covered electrodes, GTAW filler rods, and SAW wires and fluxes to overseas markets. In addition to these traditional welding consumables, new, competitive GMAW flux-cored wires have been launched in order to cope with the specific demands in the overseas markets for welding accessories of high-temperature use equipment.

Newly developed Cr-Mo flux-cored wires are **DW-81B2** (AWS A5.29 E81T1-B2, -B2M) for 1.25Cr-0.5Mo steels and **DW-91B3** (AWS A5.29 E91T1-B3, -B3M) for 2.25Cr-1Mo steels. Both wires use either 75-80%Ar/Bal. CO_2 or 100%CO_2 shielding gases in out-of-position welding. The available size is 1.2mmϕ for both wires. In addition to consistent mechanical properties and fine microstructure of postweld-heat-treated weld metals, these wires are characterized by a spray transfer, low spatter loss, flat to slightly convex bead configuration, and a moderate volume of slag, which completely covers the weld bead and exhibits self-peeling slag detachability.

Table 1. Typical chemical composition of weld metals (Shield gas: 75%Ar+25%CO_2; Welding condition: DCEP 230-250A/28-30V/Approx. 20cm/min; 1G position) (wt%)

Brand	C	Si	Mn	P	S	Ni	Cr	Mo
DW-81B2	0.06	0.62	0.57	8×10^{-3}	10×10^{-3}	0.02	1.27	0.50
DW-91B3	0.06	0.60	0.60	9×10^{-3}	12×10^{-3}	0.02	2.21	0.97

Table 2. Typical mechanical properties of weld metals at room temperature (Shield gas: 75%Ar+25%CO_2; Welding condition: DCEP 230-250A/28-30V/Approx. 20cm/min, 1G position)

Brand	PWHT	0.2%OS (MPa)	T.S. (MPa)	El. (%)	R.A. (%)
DW-81B2	690℃ × 1hr	578	659	26	65
DW-91B3	690℃ × 1hr	606	701	22	65

Typical chemical composition and mechanical properties of both wires are shown in **Tables 1** and **2** respectively, tested in accordance with the AWS standard.

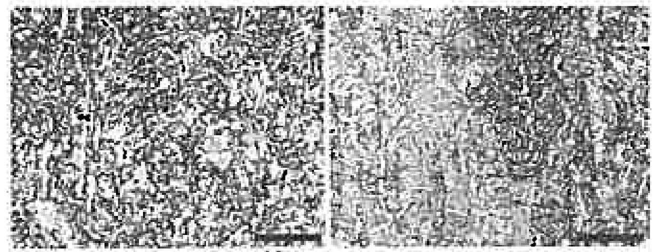


Figure 1. Typical microstructure of weld metals (Shielding gas: 75%Ar+25%CO_2; PWHT: 690℃ × 1hr)

Figure 1 shows typical microstructure of postweld-heat-treated weld metals, exhibiting fine bainitic structure. **Figures 2** and **3** show fillet bead appearance and macrostructure of the cross section of the weld respectively in straight-run vertical-up welding

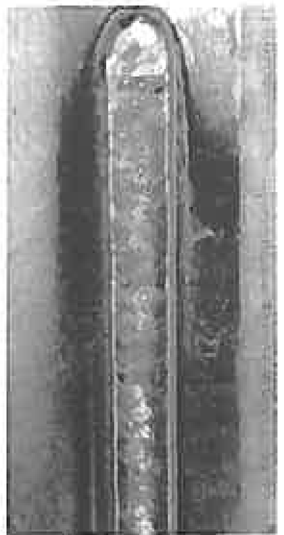


Figure 2. Bead appearance made in straight-run vertical-up fillet welding, having a smooth regular surface with no undercut
- *Brand: DW-81B2*
- *Wire size: 1.2mmϕ*
- *Welding condition: 220A (DCEP)-25V*
- *Shielding gas: 75%Ar + 25%CO_2 25 liter / min*
- *Leg length: Approx. 7mm*

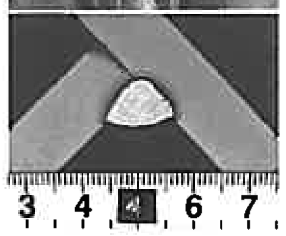


Figure 3. Macrostructure of the central cross section of the weld shown in Figure 2, having sufficient penetration and smooth fusion with the base metal with no undercut

Proper preheating and interpass temperatures in fabrication are, depending on plate thickness of the work, 150-250℃ for DW-81B2 and 200-300℃ for DW-91B3.

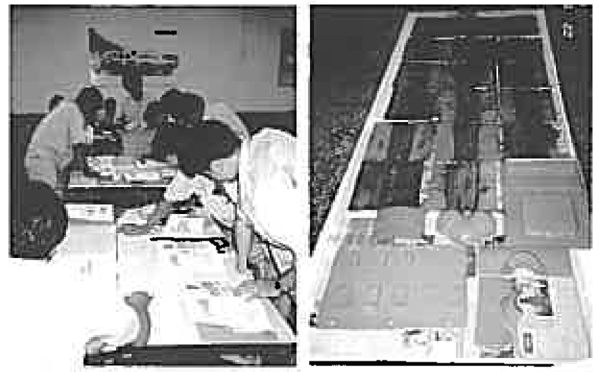
Shinko Welding Service Holds a Special Welding Seminar for a Kindred Group of Participants

Shinko Welding Service Co. Ltd. (SWS), a subsidiary company of Kobe Steel, provided a special welding seminar for 15 employees of Isuzu Motors Company (Thailand) Ltd. (IMCT) in Phrapradaeng City in Thailand from the 16th to 26th of January 2001. This training course was organized, as a Specialized Industrial Technology Program, by the Association for Overseas Technical Scholarship (AOTS) of Japan and implemented by SWS. I, a consultant for SWS, was the instructor for this seminar that combined lecture and welding practice.

This seminar, titled Quality Control in Arc Welding, consisted of 25 hours of lecture, 3 hours of welding practice, plant tour, and group activities respectively. The seminar focused on gas metal arc welding technology, taking into account that IMCT specializes in the fabrication of autos. Included with the lectures were textbooks containing many figures, lots of colorful OHP transparencies and a few vides. During the welding practice, the participants were given a chance to apply the essential factors necessary in CO_2 arc welding.

Participants observing the demonstration by the instructor in hands-on-practice

Thai-Kobe Welding (TKW) collaborated with SWS in the plant tour program, presenting the production processes and quality control activities in their factories. The group activity, titled QC card training, included small group discussions on the causes and cures for weld imperfections, using a set of specially prepared QC cards that included weld samples containing various discontinuities.



Participants (Left) working on the QC cards, discussing the causes and cures for weld discontinuities, observing the weld samples (Right)

(Reported by S. Yamamoto, KWT editorial staff)

Editorial Postscript

The new picture decorating this back cover is the Minato Ohashi Bridge in Nan-Ko Harbor in Osaka City. The bridge was built in 1974, using 35,000MT of steels including HT80 and HT70. A large amount of Kobelco's welding consumables was used, too. This truss bridge has a maximum span of 510m, which is third longest following those of Quebec Bridge (549m) in Canada and Force Bridge (521m) in the UK. Minato Ohashi Bridge can allow the passage of a 40,000DWT-class container carrier.

AWS Welding Expo will open together with Precision Metal-Forming Expo in Cleveland from the 6th to 10th of May 2001. This combined tradeshow, MAX International (Manufacturing Application Expo), represents the core of the manufacturing industry. Kobelco Welding of America and Kobe Steel will be there as a cooperate exhibitor of "The Spool of Excellence." We will welcome the readers of Kobelco Welding Today to our new booth there.

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