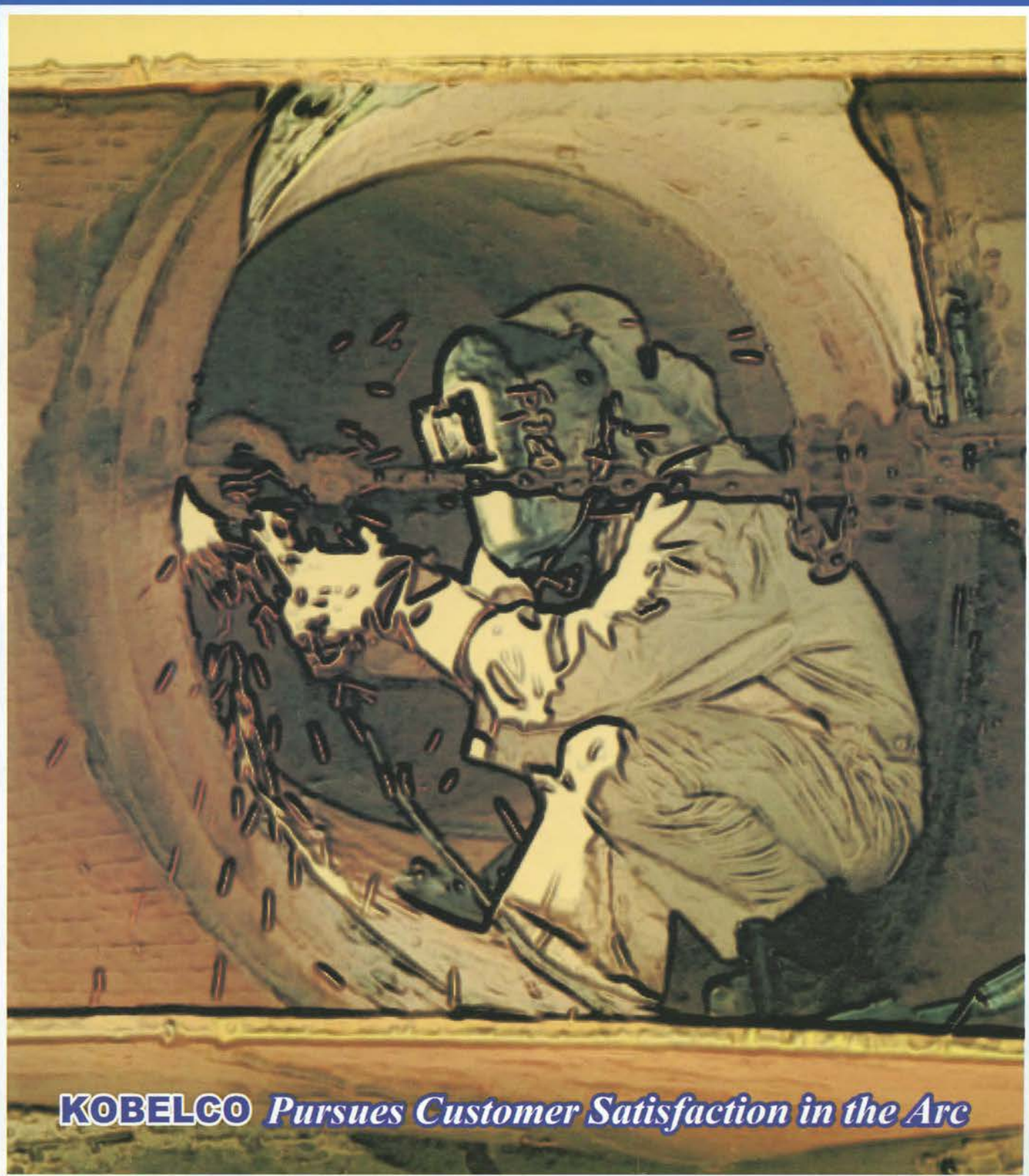


KOBELCO

July 2001
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WELDING TODAY



KOBELCO *Pursues Customer Satisfaction in the Arc*

Building a Better Tomorrow

In 1972, Hyundai Heavy Industries Co., Ltd. (HHI) transformed a quiet fishing village into a giant shipbuilding power, using the spirit of creativity and exploration, as well as the positive thinking, and sheer determination. HHI has grown to one of the world's largest shipbuilding companies by manufacturing the largest number of ships in the world, making Korea one of the greatest shipbuilding countries.



A quiet fishing village was developed to be the world's most powerful shipbuilding yard that built the largest oil carrier of 365,000 DWT that is listed in the Guinness Book of World Records as the largest cargo ship

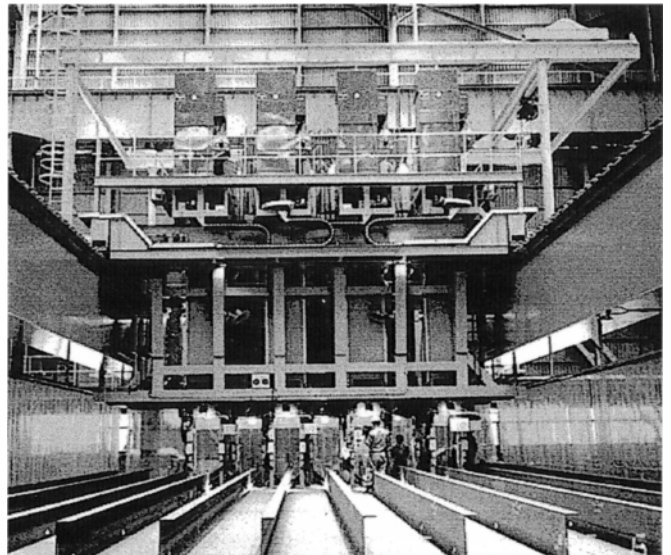
HHI is listed in the Guinness Book of World Records as the world's largest shipbuilding company. HHI has a unique record in the history of shipbuilding. It built two 260,000 DWT oil tankers, while establishing the shipyard even though it had no factory. For three consecutive years (1992-1994), it was ranked as first in the field of transportation equipment by Fortune Magazine. HHI has become one of the best companies in the world, surpassing even Mitsubishi of Japan for the number of ships ordered and constructed. HHI builds about 60 large-scale ships per year.

HHI is an integrated heavy industrial company carrying out various businesses. They include

- *Shipbuilding Business*
- *Engine & Machinery Business*
(Manufacturing engines for ships and industrial power generation, machine tools, industrial machinery, robots, and factory automation facilities)

- *Industrial Plant Business*
(Atomic power facilities, power generation facilities, and chemical facilities, etc.)
- *Offshore & Engineering Business*
(Manufacturing and installation of industrial steel structures, natural gas production facilities, etc.) and other businesses such as production of power line steel towers

The Welding Company of Kobe Steel has served HHI from the beginning of HHI's operations. MX-200H flux-cored wire is used for high-speed fillet welding of longitudinal stiffeners, and DWS-43G and DWS-1LG flux-cored wires are used for the vertical-up SEGARC welding process for fabrication of hull structures. Including these wires, more than 70 tons of Kobelco welding consumables are used per month for shipbuilding only. In addition to the hull structure, LBY-75 and LB-88LT for the SMAW process and PFH-80AK/US-255 and PFH-80AK/US-80LT for the SAW process are our main welding consumables for high strength steels for offshore steel structures such as Jack-up Rig.



A high-speed fillet welding system exhibits a high performance with Kobelco MX-200H flux-cored wire for fabricating longitudinal components in a panel line

Reported by
D. S. Kim, Manager,
McQAN
H.P. (<http://www.hhi.co.kr>)

Message from the Editor

Nowadays, a lot of people go abroad easily. Traveling overseas provides many chances to get know many people, making the world a little smaller day by day. I believe it is a good thing for all of us to know foreign countries. There are so many different nations, cultures, religions, customs, languages, etc. I always hope peoples could have more chances to get know each other in order to maintain peace on our globe.

In the business world, every company has to keep in mind how to meet the various requirements of the customers all over the world. So do we at KOBELCO. I am very proud of supplying KOBELCO welding products to excellent customers like you, the dearest readers of Kobelco Welding Today. KOBELCO promises to supply the quality products and services that you rely on.

All the readers will be our business partners, and at the same time, our treasures. Let me wish all of you and your family happiness and prosperity.



General Manager

International
Operations
Department

Welding Company
Kobe Steel, Ltd.

Masakazu Tojo
Editorial Chairman

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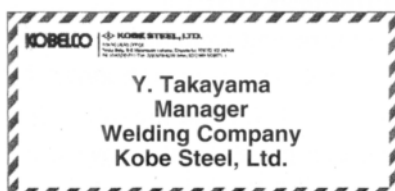
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Letter from Tokyo



Hello, everybody! I am in charge of the Far Eastern market consisting of China, Horn; Kong, Taiwan and Korea. Consumption of Kobelco welding consumables in these areas of the market is increasing with developments in such industrial fields as steel frames, shipbuilding and chemical engineering machinery. This, in my belief is the proof of trust given by customers toward the technological concept and stable quality of our welding consumables. In each area of the market where various projects are planned, we will continue to supply quality products with technical support and quick delivery, practicing our business slogan "QTQ." We thank you very much for your patronage.

Shielded Metal Arc Welding in Transportation Pipelines

The development of oil and natural gas fields is continuously being promoted all over the world. Oil and natural gasses are transported through pipelines from the production fields to refineries and the hub bases for consumers.

In the construction of the transportation pipelines, the girth joints of pipes are increasingly welded using semi-automatic or mechanized gas metal arc welding processes. However, traditional shielded metal arc welding (SMAW) continues as the dominant method. This article discusses various covered electrodes for SMAW used in site welding of pipelines for long distance transportation.

Various Types of Pipes Are Used

Transportation pressure is a factor that determines the type of pipe used. As the transport of oil or gas involves high pressure, the strength of the pipe has to be higher. The typical specification for steel pipes for pipelines is API 5L of the American Petroleum Institute (API), which is widely applied around the world. As shown in Table 1, the pipe grades vary ranging from A25 for mild steel to X80 for high strength steel with a minimum tensile strength of 620 N/mm². The number following to "X" of the pipe grade specifies the minimum yield strength of the steel by an American traditional unit of kilo square inch (ksi): X60 with a minimum yield strength of 60 ksi (413 N/mm²) for instance.

Table 1. Grades of pipes specified by API 5L

Pipe grade	Yield strength ksi (N/mm ²)	Tensile strength ksi (N/mm ²)
A25	25 (172) min	45 (310) min
A	30 (207) min	48 (331) min
B	35 (241) min	60 (413) min
X42	42 (289) min	60 (413) min
X46	46 (317) min	63 (434) min
X52	52 (358) min	66 (455) min
X56	56 (386) min	71 (489) min
X60	60 (413) min	75 (517) min
X65	65 (448) min	77 (530) min
X70	70 (482) min	82 (565) min
X80	80 (551)min	90-120 (620-827)

Several Choices in the SMAW Welding Procedures

The SMAW welding procedures used in site welding for the girth joints of pipes can be classified into three types as shown in Table 2.

Table 2. Typical welding procedures and their features

Welding procedure	DH	UL	DL
Type of: covered electrode	High cellulose	Low hydrogen	Low hydrogen
Welding progress	Downward welding	Upward welding	Downward welding
Resistance to wind	More resistible	Resistible up to 5m/s	Resistible up to 5m/s
Root face tolerance	1.6±0.8 mm	1.4±1.0 mm	1.5±0.5 mm
Root gap tolerance	1.6±0.8 mm	2.6±1.0 mm	3.0±0.5 mm
Misalignment	1.6 mm max	2.0 mm max	1.0 mm max
Root pass stability	Fair	More stable	Less stable
Weld soundness	Fair	More sound	Fair
Cold crack resistance	Less resistant	More resistant	More resistant
Root pass speed	Higher (20-50 cpm)	Lower (5-8 cpm)	Fair (10-15 cpm)
Deposition rate	Higher (20-30 g/min)	Fair (15-20 g/min)	Higher (20-30 g/min)
Arc time ratio	Fair	Higher	Fair

Note: The figures given for root pass speeds and deposition rates are for reference.

Each of the three welding procedures (DH, UL and DL) has advantages and disadvantages in usage. Pipeline constructors, therefore, must select an appropriate single or combined procedure, taking into account several factors including grade, diameter and thickness of the pipe to be used, requirements for weld quality and permissible construction terms. The combined procedures include the uses of downward and upward welding or high-cellulose and low-hydrogen electrodes.

Table 3 shows suitable KOBELCO covered electrodes by API grade of pipe and welding procedure. The combined procedure (DH + DL) uses high-cellulose electrodes for the root and hot passes and low-hydrogen electrodes for the fill and cap passes in the downward position.

Table 3. KOBELCO covered electrodes suitable for API grade pipes

API pipe grade	Welding pass	Welding procedure			
		DH	UL	DL	DH + DL
A25 A, B X42 X46 X52	Root	KOBELCO-6010 (E6010) KOBELCO-7010S (E7010-P1)	LB-52U (E7016)	LB-78VS (E7048)	KOBELCO-6010 (E6010) KOBELCO-7010S (E7010-P1)
	Hot		LB-47 (E7016) LB-52 (E7016) LBM-52 (E7016) LB-52-18 (E7018)		LB-78VS (E7048)
X56	Root	KOBELCO-6010 (E6010) KOBELCO-7010S (E7010-P1)	LB-52U (E7016)	LB-78VS (E7048)	KOBELCO-6010 (E6010) KOBELCO-7010S (E7010-P1)
	Hot		LB-52 (E7016) LBM-52 (E7016) LB-52-18 (E7018)		LB-78VS (E7048)
X60	Root	KOBELCO-6010 (E6010) KOBELCO-7010S (E7010-P1)	LB-52U (E7016)	LB-78VS (E7048) LB-88VS (E8018-G)	KOBELCO-6010 (E6010) KOBELCO-7010S (E7010-P1)
	Hot		LB-52 (E7016) LBM-52 (E7016) LB-52-18 (E7018)		LB-78VS (E7048) LB-88VS (E8018-G)
X65	Root	KOBELCO-7010S (E7010-P1) KOBELCO-8010S (E8010-P1)	LB-52U (E7016)	LB-88VS (E8018-G)	KOBELCO-7010S (E7010-P1) KOBELCO-8010S (E8010-P1)
	Hot		LB-57 (E7016) LB-62 (E9016-G) LB-62D (E9018-G)		LB-88VS (E8018-G)
X70	Root	KOBELCO-7010S (E7010-P1) KOBELCO-8010S (E8010-P1)	LB-62U (E9016-G)	LB-88VS (E8018-G)	KOBELCO-7010S (E7010-P1) KOBELCO-8010S (E8010-P1)
	Hot		LB-62 (E9016-G) LB-62D (E9018-G)		LB-88VS (E8018-G)
X80	Root	Not available	LB-62U (E9016-G)	LB-98VS (E9018-G)	KOBELCO-7010S (E7010-P1) KOBELCO-8010S (E8010-P1)
	Hot		LB-62D (E9018-G)		LB-98VS (E9018-G)
	Fill and cap				

Note: (1) Each parenthesis indicates AWS A5.1 or A5.5 classification respectively.
 (2) KOBELCO-6010, -7010S, -8010S and LB-62D use DCEP only, while the others, excepting LB-52U, use either DCEP or AC.
 (3) LB-52U uses DCEP or AC (DCEN can also be used for the root pass only).

DH: Downward Welding with High-Cellulose Electrodes Is Fastest in Root Pass Welding

In the construction of cross-field pipelines, the highly efficient spread method is used worldwide, in which a series of combined operations proceed continuously in a certain order at a constant speed: leveling the land, ditching, placing the pipe, machining, welding, inspecting, coating, and burying the pipe. In this case, root pass welding efficiency is believed to be a key factor that determines how fast a pipeline is constructed. High-cellulose electrodes offer superior welding speeds as shown in Fig. 1. This is the main reason for the predominant use of high-cellulose electrodes.

However, the weld metal of high-cellulose electrodes contains higher amounts of diffusible hydrogen than that of low-hydrogen electrodes.

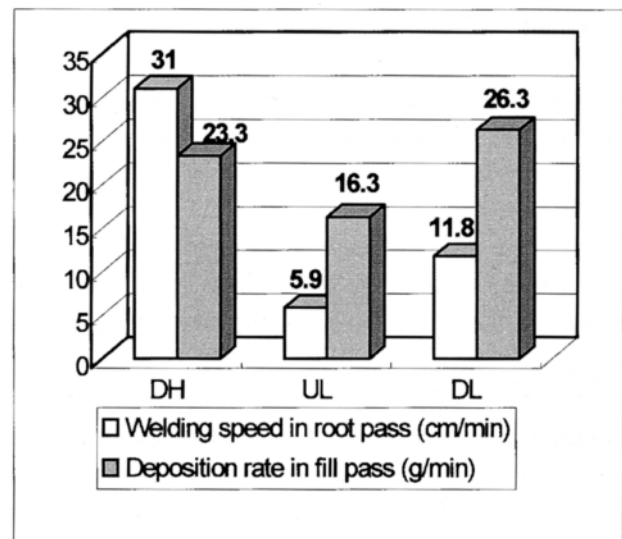


Fig. 1. A comparison between the DH, UL and DL welding procedures on welding speed in the root pass and deposition rate in the fill pass
 ▪ DH: Downward welding with high-cellulose electrodes
 ▪ UL: Upward welding with vertical-up low-hydrogen electrodes
 ▪ DL: Downward welding with vertical-down low-hydrogen electrodes

As the content of diffusible hydrogen increases, the weld metal becomes more susceptible to cold cracking. In addition, high-cellulose weld metals contain more oxygen than low-hydrogen weld metals. Because of its higher oxygen content, the high-cellulose weld metal exhibits lower impact values compared with the low-hydrogen weld metal at low temperatures.

Therefore, the DH procedure is very useful particularly in comparatively low-strength, thin-section pipes for which the impact requirement is not strict and the crack susceptibility is not high. With this procedure, stricter controls of preheating and interpass temperatures are needed to prevent cold cracking than with the procedures using low-hydrogen electrodes.

UL: Upward Welding with Low-Hydrogen Electrodes is Highest in Weld Soundness

In the construction of cross-field pipelines, welding is necessarily carried out in the fixed-pipe position (5G per ASME). This welding position requires expert welding technique in root pass welding to prevent welding defects. Therefore, the performance in root pass welding is quite an important factor for the electrodes for pipelines.

With the upward welding procedure using low-hydrogen electrodes, although the efficiency (welding speed and deposition rate) is inferior as in Fig. 1, electrode manipulation can be easier and weld penetration can be better than with the downward welding procedure in root pass welding. This is because, unlike in downward welding, the tip of the electrode can be kept free from falling molten metal and slag during welding. The upward welding procedure, therefore, can tolerate larger fluctuations in groove size, which ensures regular penetration beads. When such performances are more important, the UL procedure is beneficial.

In upward welding of the root pass, ordinary all-position, low-hydrogen electrodes, such as LB-26 and LB-52, can be used. However, pipeline welding jobs mostly use extraordinary electrodes, in root pass welding, such as LB-52U and LB-62U due to better usability. For the fill and cap passes, ordinary all-position, low-hydrogen electrodes are used, as in Table 3.

DL: Downward Welding with Low-Hydrogen Electrodes Possesses Both Better Crack Resistibility and Welding Efficiency

The downward welding procedure with vertical-down, low-hydrogen electrodes was developed to facilitate higher welding efficiency than with the UL procedure, maintaining the crack resistibility of low-hydrogen electrodes. With the DL procedure, higher welding currents can be used than with the UL procedure in both vertical and overhead positions. Consequently, the DL procedure facilitates welding speeds approximately two times as high as those of the UL procedure, but lower welding speeds than those of the DH procedure, in root pass welding as in Fig. 1. In addition, in fill-pass welding, the DL procedure markedly improves deposition rates by approximately 50% compared with the UL procedure as in Fig. 1. The higher welding efficiency of the DL procedure is also seen in Fig. 2, which shows a comparison between the DL and UL procedures on the arc time for welding pipes in the 5G position.

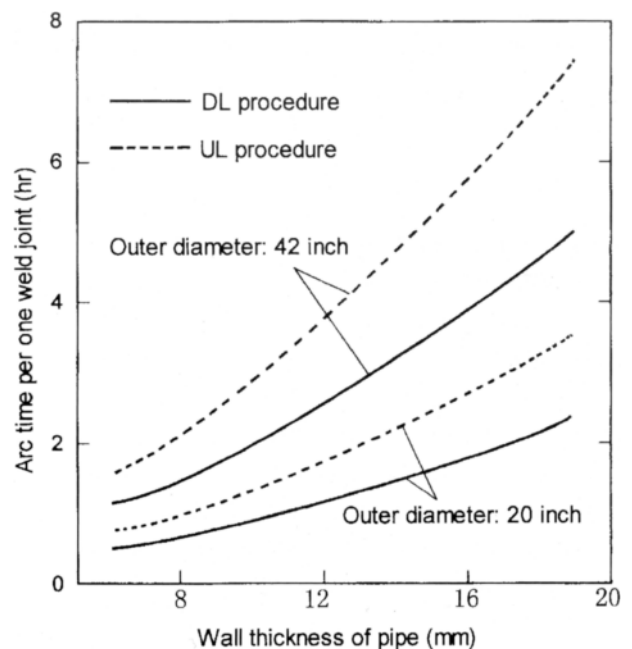


Fig. 2. A comparison between the DL and UL procedures on the arc time in welding pipes in the fixed position (5G)

- DL: Downward welding with vertical-down low-hydrogen electrodes
- UL: Upward welding with vertical-up low-hydrogen electrodes

The DL procedure can be more effective in the welding of high strength pipes and thick-section pipes for which the DH procedure with high-cellulose electrodes is not suitable because of the greater likelihood of cracks. The vertical-down, low-hydrogen electrode used in the DL procedure deposits an amount of diffusible hydrogen in the deposited metal about as low as that of the vertical-up, low-hydrogen electrodes.

Kobe Steel has developed three brands (See Table 3) of vertical-down low-hydrogen electrodes suitable for the DL procedure for various grades of pipe and the performances of these electrodes have been proven in pipelines in many countries (Photo 1).



Photo 1. An application of the DL procedure using a vertical-down, low-hydrogen electrode

DH+DL: The Combined Procedure Increases the Advantages and Overcomes the Disadvantages of Each Procedure

The DL procedure requires stricter accuracy in groove size and alignment to ensure sufficient weld penetration in the root pass, as shown in Table 2 above. This is because of an inherently weaker arc blow of low-hydrogen electrodes compared with high-cellulose electrodes.

In order to overcome this disadvantage of the DL procedure, the use of the DH + DL procedure is recommended. With this combined procedure, the root and hot passes are welded by using high-cellulose electrodes that have an inherently stronger arc blow and the succeeding fill and cap passes are completed with vertical-down, low-hydrogen electrodes for better crack resistance and higher deposition rates.

The strength of the weld joint made by this combined procedure is comparable to that made by single use of the DL procedure. In addition, as shown in Fig. 3, the use of the DH+DL procedure exhibits the highest welding efficiency or the shortest time ratios in both welding time and the total operation time when compared with single use of the DH or UL procedure. This combined procedure has been proven in several pipelines constructed in Canada, Hong Kong, and Germany. These cases will lead to an increased use of this procedure in the future.

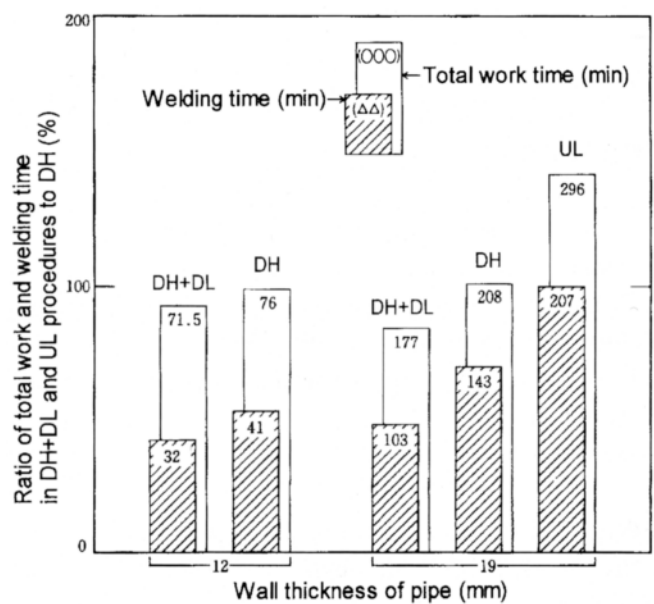


Fig. 3. A comparison between the DH+DL, DH and UL procedures on welding efficiency
 • DH+DL: Combination of DH and DL procedures
 • DH: Downward welding with high-cellulose electrodes
 • UL: Upward welding with vertical-up low-hydrogen electrodes

Table 4 shows an example of the welding procedure qualification record in which an X52 pipe joint in the 5G position is welded by using KOBE-7010S high-cellulose electrode for the root and hot passes and LB-78VS vertical-down, low-hydrogen electrode for the fill and cap passes. Material test results of the pipe weld joint, conducted in accordance with API 1104 (Standard for Welding Pipelines and Related Facilities) that is the most common standard for pipeline construction in the world, are detailed in Table 5. Photo 2 shows macroscopic structures of the test specimens removed from the 12 and 3 o'clock positions in the weld joint. These nondestructive and destructive tests show sufficient results to the requirements of API 1104.

Technical Report

Table 4. A welding procedure qualification record (WPQR) of an X52 pipe weld joint employing the DH+DL procedure

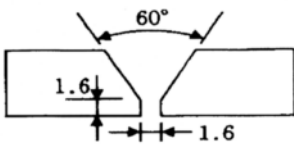
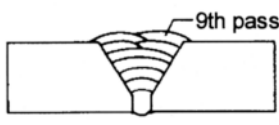
Pipe grade: API 5L X52				Wall thickness: 12.7 mm				
Pipe outer diameter: 610 mmØ				Welding position: 5G (Downward welding)				
Groove preparation:				Pass sequence:				
								
Layer No.	Pass No.	Brand	Size (mm)	AWS classification	Polarity	Welding current (A)	Arc voltage (V)	Welding speed (cm/min)
1	1	KOBE-7010S	4.0	A5.5 E7010-P1	DCEP	120-160	24-29	37
2	2					140-170	24-30	32
3	3					LB-78VS	4.0	A5.1 E7048
4	4							
5	5							
6	6,7							
7	8,9					160-200	22-26	33

Table 5. Test results of an X52 pipe weld joint by the DH+DL procedure

Tests per API 1104					Charpy impact test			
X-ray test	Bend test	Nick break test	Weld joint tensile test		Specimen location	vE-40°C (J)	vE-20°C (J)	vE0°C (J)
			Tensile strength (N/mm ²)	Fracture position				
Meets API 1104 standard (Accepted)	No defect in 4 specimens for face bend and 4 specimens for root bend (Accepted)	No defect in 4 specimens (Accepted)	503	Base metal	Around 12 o'clock position	73	91	149
			503			95	110	153
			505	Base metal		93	112	152
			508	Base metal	Around 3 o'clock position	85	121	145
				Base metal		108	141	171
						112	148	175
						102	137	164

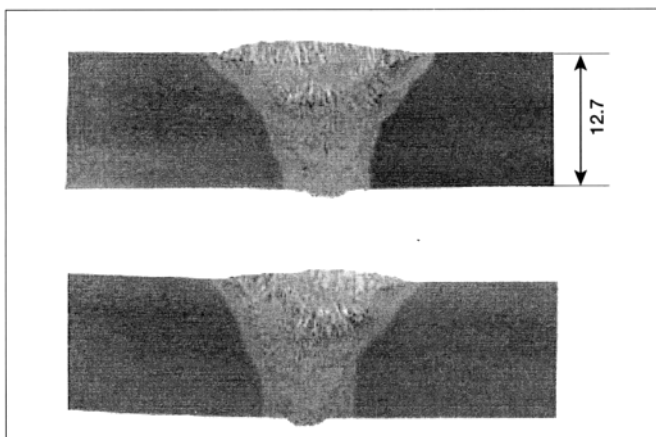


Photo 2. Macroscopic structures of the test specimens removed from the 12 o'clock position (Top) and 3 o'clock position (Bottom) of the pipe joint welded by the DH+DL procedure (KOBE-7010S + LB-78VS)

The welding procedures discussed in this article are used and highly reputed in many pipelines constructed in China, Russia and other countries all over the world.

As long as oil and natural gases are produced, pipelines will be constructed for transmission of these fuels. In selecting appropriate welding procedures and welding consumables, crack resistibility, welding efficiency and weld joint characteristics should be carefully examined.

Market-Cultivation Campaign (MCC): Attracts TKW's Customers



- Though Thailand faced the same economic crisis as the other Asian countries, Thai-Kobe Welding Co., Ltd. (TKW) managed to emerge in good shape. The strong sales net work of the Thai-Shinyokai has been one of the keys to our success. TKW has used a number of marketing tools to support the Thai-Shinyokai net work since it started nearly 10 years ago. The Market-Cultivation Campaign (MCC) has been one of the more successful and popular programs applied in the Thai market since the first member joined the network in 1992.
- MCC is a sales promotion activity, the main purpose of which is to cultivate and support pro-Kobe users of the main brands, RB-26 (E6013), LB-52 (E7016), and MG-51T (ER70S-6), by means of welding seminars, welding contests and cheerful entertainment, targeting a certain area of the Thai market.
- In the year 2000, we enthusiastically promoted this activity, eventually inviting over 4,000 users to participate the MCC programs. We are continuing MCC this year, too.

Slag Removal Contest

- RB-26 covered electrode possesses advantages over competitors in the Thai market. However, because of its higher price, we must continually point out the many attractive visible characteristics of RB-26.
- MCC, however, is an excellent way to prove directly to users the good characteristics of RB-26 such as self-peeling slag removability. We conduct a contest, in which welders compete to lay a weld bead on a steel plate. The winner is the one who can lay the weld bead in such an expert way that the tip of the slag peels up most as in the photo (left).
- Most of the welders enjoy attending this program and, in turn, seem to develop a preference for RB-26.

Shows and Entertainment

- MCC includes a stage show with songs and dances that are particularly popular with Thai people. Sometimes the customers get on stage to join the entertainment. Even our president, Mr. Takagi, joined the participants in the culture show.
- Beside the entertainment, we organize a lucky draw, featuring attractive prizes. All the customers get excited about winning a lucky prize, which may includes a TV, refrigerator or other valuable goods.
- In Thai society, many companies offer various prizes as part of their marketing efforts. However, among the welding electrode companies, only TKW continues to do so today. Several simple games are also provided to help customers develop warm-hearted relationships.

Movies of Interviewing Customers

- We use a video camera when we visit our customers and interview them for comments on our products, services and other marketing activities.
- In the photos (left), we use a big movie screen to show, at night-time, the interview movies of our customers in MCC activities.
- We have found that this is the most powerful advertising for our company, products and services.

Reported by A. Ushijima, TKW

KWAI Participates in Newly Born MAX INTERNATIONAL

The International Welding and Fabrication Exposition, known as the AWS Welding Show, was jointly held with the Precision Metal-forming Expo of the Precision Metal-forming Association (PMA) for the first time this year.

This combined Manufacturing Application Expo International (MAX) symbolizes the driving force at the core of manufacturing industry at the outset of the 21st century.

The annual show, the biggest among welding expositions in North America, was held at I-X Center in Cleveland, Ohio near Lake Michigan from May 6 through 10.

With the effect of joint sponsorship, its scale was bigger than past AWS shows, with the numbers of participating companies totaling 1,200 and visitors surpassing 20,000.

Kobelco Welding of America (KWAI) exhibited and demonstrated flux-cored wires (FCW) for stainless steel, mild steel, and Cr-Mo steel and made an emphatic appeal for its well-known slogan, "QTQ."

This year, six new products were introduced together with FRONTIARC-711 (FCW for mild steel) and DW Stainless Series (FCWs for stainless steel), all of which captured the visitors' interest.

The six new products are

- **DW-50** (AWS A5.20 E71T-1/-1M):
A FCW for all position welding with especially good usability in vertical welding of mild steel and 490N/mm²-class high strength steel
- **FRONTIARC-701** (AWS A5.20 E70T-1/-12):
A FCW with a large diameter of 5/64" (2.0 mm) suitable for higher currents for mild steel and 490N/mm²-class high strength steel
- **MXA-70C6** (AWS A5.18 E70C-6M):

A metal-cored wire for flat and horizontal fillet welding of mild steel and 490N/mm²-class high strength steel

- **DW-329AP** (AWS A5.22 E2209T1-1/-4):

A new product of DW Stainless Series, suitable for duplex stainless steel

- **DW-81B2** (AWS A5.29 E81T1-B2/-B2M):

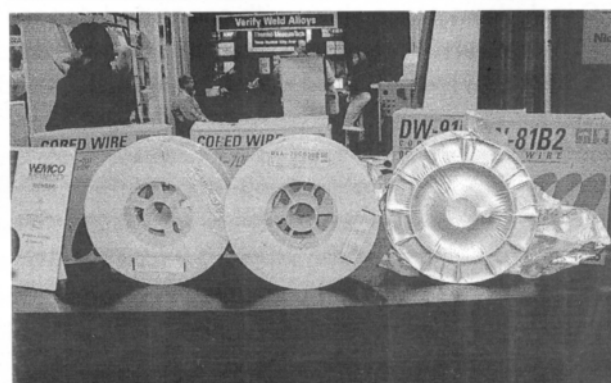
A FCW for all-position welding of 1.25Cr-0.5Mo steel

- **DW-91B3** (AWS A5.29 E91T1-B3/-B3M):

A FCW for all-position welding of 2.25Cr-1Mo steel

At the Kobelco Evening Party that has become a custom now, more than 100 users and dealers attended. They all had a good time, strengthening their ties while enjoying live music and the announcement of luxurious door prizes.

The next MAX International will be held at McCormick Place in Chicago, Illinois from March 4 through 7, 2002. See you again at Kobelco's booth.



Reported by
T. Ikeda,
KWAI

My Impressions of Singapore

Singapore is not just one island but a main island with over 60 surrounding islets. The main island has a total land area of about 640 square km, the size of which reminds me my hometown, Awaji Island, in Japan. Singapore, however, is a big city with a population of more than three million. While its nature has been well-preserved, the overall profile of Singapore seems artificial, which reminds me the man-made island, Port Island, in Kobe City in Japan. Still, tropical plants bloom all the year round pleasing the eyes of viewers.

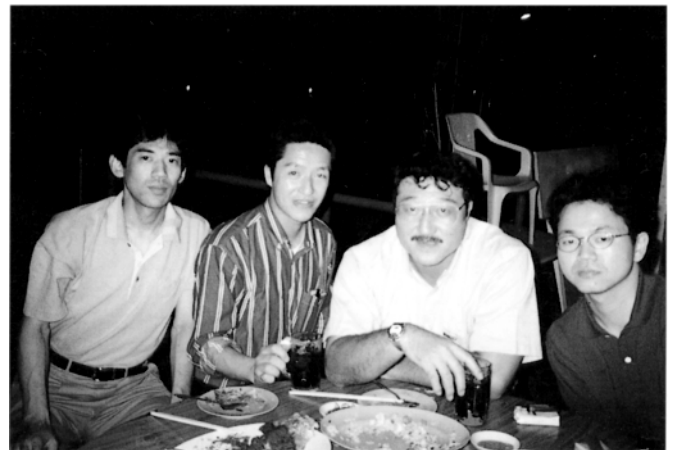
Singapore is one of the smallest but most economically successful countries. Singapore has grown into a thriving center of commerce and industry in just 150 years. It is also well known that Singapore is the busiest port in the world with over 600 shipping lines sending super tankers, container ships and passenger liners to share the busy waters with coastal fishing vessels and wooden lighters.

Singapore can be perplexing in that seemingly trivial aspects of life are often controlled by laws and regulations. It is a well known that smoking is banned in most air-conditioned buildings and restaurants. As for chewing gum, you cannot even see it sold anywhere in order to, they say, prevent public annoyance. However, it seems not to be banned to chew gum.

Traffic regulations are also very strict. In order to prevent illegal parking, you must place a pie-paid parking coupon at the windscreen of your car indicating the starting time of parking so that it can be

seen from outside. It will cost you a lot later if you try to cheat by just a few minutes. Furthermore, when you enter the city area (main business zone) during the daytime, you must insert a pre-paid area license card into the slot of the gadget installed at the driver's seat of your car. If you enter the city area without using this card, you will end up in paying a large fine.

On the other hand, there are many good places to shop in Singapore. Internationally famous brands are available in many stylish stores on that famous Orchard Road. When it comes to sightseeing, however, I have found only a few places so far. Among those few, Sentosa Island on the southern side of Singapore Island is highly recommended. It used to be a big fortress. When it was decided to turn it into a tourist resort, the island was named "Sentosa" meaning "peace and tranquility" in Malay.



Hawker Centers are where you will find a veritable feast of Chinese, Malay and Indian treats

Reported by F. Morimoto, KSL

Editorial Postscript

A quadrennial world trade fair. Essen Fair, for welding engineering including joining, cutting, and surfacing technology will be held at Messe-Essen in Germany from the 12th through 18th of September 2001. Kobe Steel and Kobelco Welding of Europe will be there as a cooperate exhibitor. We will welcome you to our booth.

FABTECH International is North America's largest annual metal forming and fabricating exposition and conference, which is scheduled to be held at McCormick Place South, Chicago, Illinois, USA from November 11-14, 2001. Kobelco Welding of America, as an exhibitor, hopes to have a chance to see you there.

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