KOBELCO WELDING TODAY

VOL.13 NO.2 2010

Faster, Cleaner and Greener Welding: the Excellence of the KOBELCO Arc

Superior Welding Consumables for Super Duplex Stainless Steels

PREMIARC™ NC-2594 (AWS E2594-16)
PREMIARC™ DW-2594 (AWS E2594T-1/4)
PREMIARC™ TG-S2594 (AWS ER2594)

Duplex stainless steel has a microstructure consisting virtually of 50% austenitic phase and 50% ferritic phase, and thus possess excellent ductility, notch toughness and resistance to stress corrosion cracking (SCC). Duplex stainless steel also offers higher tensile strength than normal single-phase stainless steels. The advantages obtained by combining the two phases enable this stainless steel to be applied in corrosive environments, like seawater, which contains the chloride ion (Cl^-). Such applications exist in chemical plants, drill pipes for crude oil and natural gas, line pipes, chemical tankers, and water gates.

The corrosion resistance of duplex stainless steel is determined through the Pitting Resistance Equivalent (PRE), which is calculated as: PRE = Cr + 3.3Mo + 16N. Applications in extremely corrosive environments require the materials to have superior corrosion resistance as indicated by a higher PRE. When the PRE is required to be 40 or higher, super duplex stainless steel and a matching filler metal are the correct choices.

PREMIARC™ NC-2594, DW-2594, and TG-S2594 are sophisticated filler metals developed for 25Cr-type duplex stainless steels (Table 1), especially for the super duplex grades (S32750, S32760). These filler metals are also suitable for 22Cr-type duplex stainless steels such as ASTM (UNS) S31803 and S32205. The typical chemical composition and mechanical properties of the filler metals are shown in Tables 2 and 3, respectively.

Table 1: Typical 25Cr-type duplex stainless steels

ASTM (UNS)	EN	JIS	Chemical composition
S32750	1.4410	-	25Cr-7Ni-4Mo-0.28N
S32760	1.4501	-	25Cr-7Ni-3.8Mo-0.7Cu-0.7W-0.25N
S32506	-	SUS329J4L	25Cr-7Ni-3Mo-0.15N-0.2W

Table 2: Typical chemical composition, PRE and FNW of NC-2594 and DW-2594 all weld metal and TG-S2594 filler wire

Trade desig.	**NC-2594** for SMAW		**DW-2594** for FCAW*1		**TG-S2594** for GTAW	
AWS	A5.4 E2594-16		A5.22 E2594T1-1/4		A5.9 ER2594	
C%	≤0.04	0.035	≤0.04	0.026	≤0.03	0.019
Si%	≤1.00	0.55	≤1.00	0.50	≤1.0	0.44
Mn%	0.5-2.0	0.66	0.5-2.5	1.18	≤2.5	0.57
P%	≤0.04	0.017	≤0.04	0.02	≤0.03	0.018
S%	≤0.03	0.001	≤0.03	0.005	≤0.02	0.0003
Cu%	≤0.75	0.04	≤1.5	0.031	≤1.5	0.10
Ni%	8.0-10.5	9.82	8.0-10.5	9.6	8.0-10.5	9.30
Cr%	24.0-27.0	26.61	24.0-27.0	25.7	24.0-27.0	24.96
Mo%	3.5-4.5	3.86	2.5-4.5	3.79	2.5-4.5	3.82
Nb%	-	0.016	-	0.016	-	0.02
W%	-	-	≤1.0	<0.1	≤1.0	0.01
N%	0.20-0.30	0.25	0.20-0.30	0.24	0.20-0.30	0.28
PRE	-	43.4	-	42.0	-	42.6
FNW*2	-	50	-	49	-	42

*1: With an 80%Ar-20%CO_2 shielding gas.
*2: Ferrite Number (FN) as per a WRC-1992 diagram.

Table 3: Typical mechanical properties of NC-2594, DW-2594 and TG-S2594 all weld metals

Trade desig.	0.2% PS (MPa)	TS (MPa)	El (%)	IV at –40°C (J)	IV at –20°C (J)
NC-2594	750	935	28	av. 40	av. 50
DW-2594*1	712	905	27	av. 39	av. 48
TG-S2594	721	870	31	av. 270	av. 291

*1: With an 80%Ar-20%CO_2 shielding gas.

As shown in Table 4, NC-2594, DW-2594 and TG-S2594 exhibit excellent pitting corrosion resistance.

Table 4: Typical pitting corrosion test results of NC-2594, DW-2594 and TG-S2594 all weld metals

Trade desig.	Size of specimen	Test solution	Time of exposure	CPT *3 (°C)
NC-2594	3 x 20 x 30 mm	6%$FeCl_3$ + 1%HCl solution aq.	24 hours	40
DW-2594*1				40
TG-S2594*2				50

*1: With an 80%Ar-20%CO2 shielding gas.
*2: With a 98%Ar-2%N2 shielding gas
*3: Critical pitting temperature, determined by ASTM G48 Practice E.

Through butt joint tests using 25Cr-type duplex stainless steels, these filler metals have been proven sufficient in relation to bead appearance, radiographic soundness, macro- and micro-structure, side bend properties, tensile properties, notch toughness, hardness, and ferrite content. Figure 1 shows an example of the test results of DW-2594.

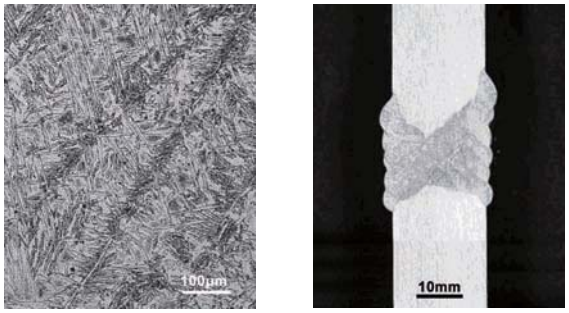

Figure 1: DW-2594 (1.2 mmø) weld metal exhibits an optimal austenite-ferrite phase (left) and good fusion in the multi-pass weld (right) — 20-mm thick S32760 base metal, horizontal position, 80%Ar-20%CO_2.

These filler metals are suitable for all position welding with DCEP current for NC-2594 and DW-2594, and DCEN for TG-S2594. An 80%Ar-20%CO_2 shielding gas is recommended for DW-2594, although a 100%CO_2 shielding gas can also be used. Heat input should be controlled in a range of 5-25 kJ/cm to obtain an optimized duplex microstructure with a well-balanced austenite-ferrite phase, thereby ensuring sufficient corrosion resistance and notch toughness of the weld metal and heat-affected zone. No preheat is required. Interpass temperature should be 150°C or lower.

Seeking out new business opportunities through multifaceted marketing

Toshiyuki Okuzumi
General Manager
ISMS
Marketing Dept.
Welding Business
Kobe Steel, Ltd.

Record-breaking hot days with temperatures over 35°C continued for weeks here in Tokyo last summer. Many people suffered heat strokes and agricultural products were damaged. What was the summer like in your country?

On the other hand, it was reported that this heat wave pushed up the sales of cold beverages like beer, electric air conditioners and refrigerators; hotter summers are not necessarily so bad for all business sectors!

This was true for Kobe Steel, too — copper tubes for air-conditioners and aluminum sheets for the beer cans did enjoy a rapid sales increase. To catch up with the unforeseen sales expansion, Kobelco's Aluminum & Copper Business had to maximize production.

We in the Kobelco Welding Business are also determined to expand sales by learning how to think in multiple ways to match changing business circumstances. This requires us to look at evolving customer needs and to determine what characteristics we should strengthen to fulfill those needs. Do they require consistent, high quality products? Cost competitiveness? Excellent technical service? Timely delivery or wider product ranges?

We must also react quickly to the diversified customer needs through multi-faced marketing. To strengthen our marketing power, the International Sales & Marketing Department was reorganized into the International Sales & Marketing Section (ISMS) of the Marketing Department in October 2010, which will help to harmonize overseas and domestic marketing through closer sharing of market information.

We will continue doing our best to deserve the reputation that leads customers around the world to "Ask KOBELCO for whatever is related to welding." In return we ask for your continued support and assistance.

Expansion of overseas business through mid- and long-term investments

Toshiyasu Nakamura
General Manager
IOS
Planning & Admin. Dept.
Welding Business
Kobe Steel, Ltd.

Dear KWT readers! My name is Toshiyas Nakamura, the general manager of the International Operations Section (IOS), in the Planning and Administration Department. It is my pleasure to have this first opportunity to write a greeting in the KWT magazine.

I joined Kobe Steel in 1983 and have mainly worked in accounting as well as planning and administration in the welding field. For three and a half years from 1998 till 2001, I worked for TKW and KMWT in Thailand, where I first experienced overseas business.

In April 2009, I had the second chance to work in overseas business in the International Operations Department (IOD), where I was in charge of overseas planning. In October last year when the IOD was reorganized into two departments, International Sales & Marketing Department (ISMD) and International Operations Department (the new IOD), I was assigned to be the general manager of the new IOD, specializing in overseas planning. Last October, the new IOD was again reorganized and renamed the IOS in order to execute overseas planning more efficiently, harmonizing it with domestic planning.

Kobelco's Welding Business is planning to put more management resources into several fields and areas for the mid-term and long-term in order to expand our overseas businesses. To carry out the planning, the IOS's largest task is to program and promote our various investments. We realize that our responsibility is so important that we have to do our utmost for these programs to succeed. We also hope that you will continuously support us.

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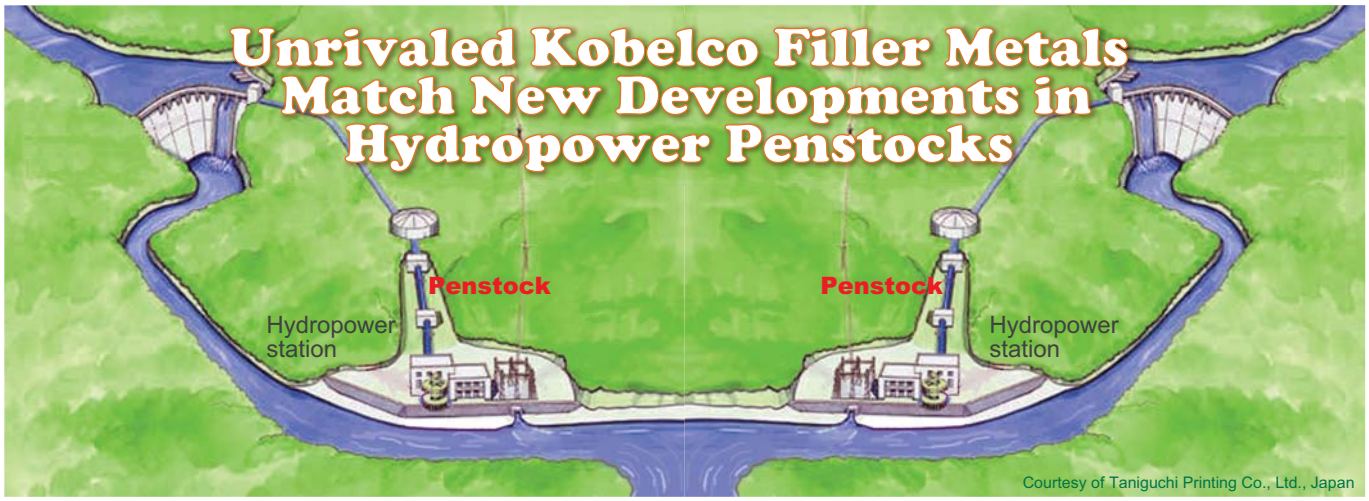
Unrivaled Kobelco Filler Metals Match New Developments in Hydropower Penstocks



A penstock is a steel pipe or conduit used to carry water to a water wheel or turbine. The penstock takes water from the water gate of a reservoir and carries it to the hydropower generator that is installed in a hydropower station (Figure 1). Hydropower stations have seen increases in capacity to meet growing demand for electricity. Consequently, the steels used for penstocks have been required to have higher tensile strengths and thicker walls to withstand higher water pressures. This article discusses high tensile strength steels and filler metals used for the welding of penstocks.

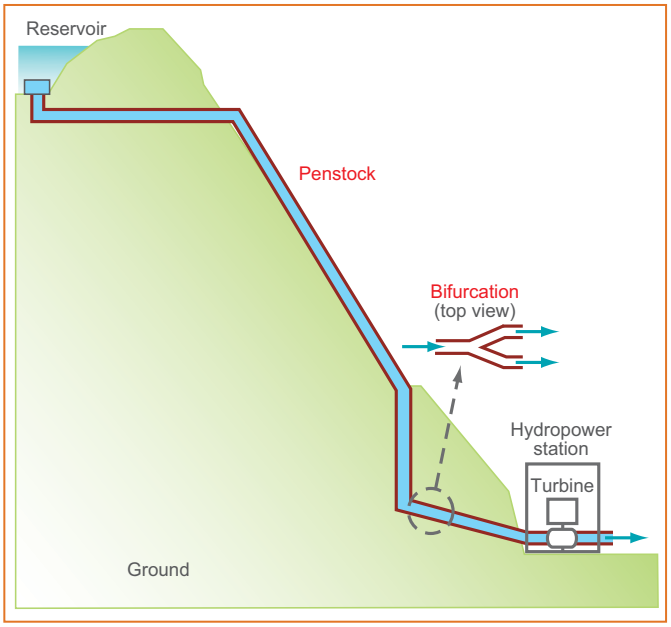


Figure 1: A cutaway view of hydropower penstock.

Larger and stronger penstocks

Penstock scale is generally determined by the product of the water head and the inner diameter ([H] x [D]) for which the penstock is designed. As shown in Figure 2, the scale of penstocks in Japan has continually increased since 1955 as a result of the scaling-up of pumped storage hydropower stations. Accordingly, the tensile strength of steels used in penstocks has increased to reduce construction terms and costs. Whereas 780 MPa class (HT780) high tensile strength steel was used extensively in many penstocks in Japan in the 1970s, by 2001, high tensile strength steel of the 950 MPa class (HT950) was adopted in the construction of Tokyo Electric Power's Kannagawa Power Station in Japan.

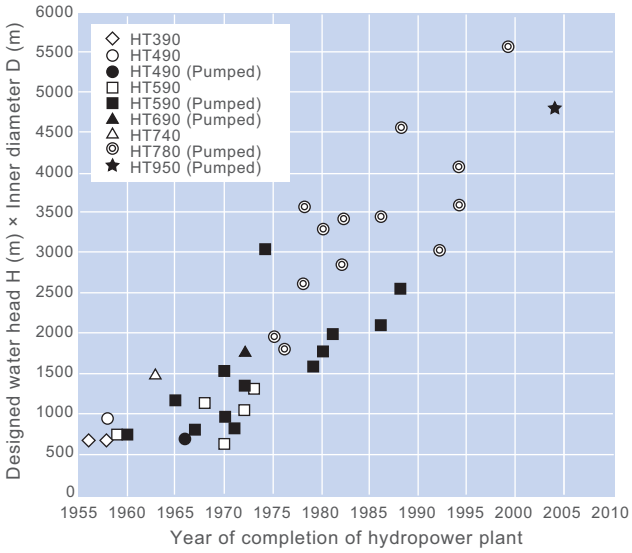


Figure 2: Transition of the scale of penstock in Japan.

In addition to the HT780 and HT950 steels mentioned above, high tensile strength steels of the 490 and 570 MPa classes (HT490 and HT570) are used where water pressure is lower or in the upper part of a penstock. The requirements of the Japanese Industrial Standard (JIS) for the chemical and mechanical properties of HT490, HT570 and HT780 steel plates are shown in

Table 1. HT950 steel is specified by The Japan Electrotechnical Standards and Codes Committee (JESC) as in JESC H0001: Technical Guide for Applications of 950 MPa Class High Tensile Strength Steels in Penstocks, which is enacted by The Japan Hydraulic Gate and Penstock Association. The typical chemical composition and mechanical properties of and the requirements for HT950 steel plate are shown in Table 2.

Table 1: Chemical composition and mechanical properties of HT490, HT570 and HT780 steel plates

Class	HT490	HT570	HT780
JIS	G3106		G3128
Grade	SM490B	SM570	SHY685NS
Thick. (mm)	$t \leq 200$	$t \leq 100$	$t \leq 100$
C% max.	0.18-0.20 as per t	0.18	0.14
Si% max.	0.55	0.55	0.55
Mn% max.	1.65	1.70	1.50
P% max.	0.035	0.035	0.015
S% max.	0.035	0.035	0.015
Ni%	-	-	0.30-1.50
Others % max.	-	-	Cu:0.50, Cr:0.80, Mo:0.60, V:0.05, B: 0.005
Ceq*1 % max.	-	0.44-0.47 as per t (QT)	0.53-0.57 as per t*2
YS, min. (MPa)	275-325 as per t	420-460 as per t	665-685 as per t
TS (MPa)	490-610	570-720	780-930, 760-910 as per t
IV, av. min. (J)	27 at 0°C	47 at –5°C	47 (each 27) at –40°C

*1: Ceq = C + Mn/6 + Si/24 + Ni/40 + Cr/5 + Mo/4 + V/14
*2: Supplier and purchaser shall agree for 75 < t ≤ 100 mm.

Table 2: Typical chemical and mechanical properties of HT950 steel plate and requirements per JESC H0001

	Typical [Ref. 3]	Requirement	
Thick. (mm)	50	≤ 50	50 < t ≤ 75
C%	0.10	0.14 max.	0.14 max.
Si%	0.25	-	-
Mn%	0.92	-	-
P%	0.003	0.010 max.	0.010 max.
S%	0.004	0.005 max.	0.005 max.
Cu%	0.17	-	-
Cr%	0.53	-	-
Ni%	1.39	-	-
Mo%	0.48	-	-
V%	0.040	-	-
B%	0.0011	-	-
Ceq	0.52	0.59 max.	0.62 max.
Pcm *1	0.25	0.29 max.	0.33 max.
YS (MPa)	994	885 min.	885 min.
TS (MPa)	1,033	950-1130	950-1130
IV (J)	219 at –50°C	47 min. at –55°C	47 min. at –60°C

*1: Pcm=C+Si/30+Mn/20+Cu/20+Ni/60+Cr/20+Mo/15+V/10+5B

Filler metals for HT490, HT570 and HT780 steels

High strength filler metals for SMAW, FCAW, GMAW, GTAW, and SAW are available from Kobe Steel, as shown in Tables 3 through 5 for the respective tensile strength level of 490, 570 and 780 MPa.

Table 3: Typical chemical composition and mechanical properties of KOBELCO filler metals for HT490 steels

Process	SMAW		FCAW	GMAW	SAW	
Trade desig.	**LB-52**	**LB-52A**	**DW-100**	**MG-S50**	**MF-38/ US-36**	**PF-H55AS/ US-36J**
AWS	A5.1 E7016	A5.1 E7016	A5.20 E71T-1C	A5.18 ER70S-G	A5.17 F7A6-EH14	A5.17 F7A8-EH14
Polarity	AC*1, DCEP	AC*1, DCEP	DCEP	DCEP	AC	DCEP
C%	0.08	0.08	0.05	0.08	0.09	0.07
Si%	0.60	0.57	0.45	0.62	0.23	0.23
Mn%	0.94	1.12	1.35	1.12	1.62	1.42
P%	0.011	0.012	0.013	0.010	0.014	0.009
S%	0.006	0.005	0.009	0.008	0.007	0.004
Ti%	-	-	-	-	-	0.021
B%	-	-	-	-	-	0.004
YS (MPa)	500	500	510	450	470	485
TS (MPa)	570	580	570	570	570	555
El (%)	32	31	30	28	30	33
IV, av. (J)	210 at 0°C	230 at 0°C	110 at 0°C	180 at –20°C	125 at 0°C	180 at –45°C

*1: Chemical and mechanical properties given here are for AC.

Table 4: Typical chemical composition and mechanical properties of KOBELCO filler metals for HT570 steels

Process	SMAW	GMAW	Auto GTAW	SAW	
Trade desig.	**LB-62UL**	**MG-S63B**	**TG-S60A**	**MF-38/ US-49**	**PF-H80AK/ US-56B**
AWS	A5.5 E9016-G	A5.28 ER90S-G	A5.28 ER80S-G	A5.23 F8A4-EG-A4	A5.23 F9A6-EG-G
Polarity	AC,DCEP*1	DCEP	DCEN	AC	AC,DCEP*1
C%	0.05	0.08	0.06	0.07	0.06
Si%	0.59	0.50	0.04	0.27	0.36
Mn%	1.20	1.09	1.23	1.35	1.36
P%	0.009	0.007	0.007	0.015	0.010
S%	0.005	0.008	0.009	0.010	0.006
Ni%	0.59	-	0.92	-	0.81
Cr%	-	0.42	-	-	-
Mo%	0.26	0.29	0.62	0.42	0.45
YS (MPa)	551	601	590	530	611
TS (MPa)	645	662	670	630	668
El (%)	28	28	27	25	25
IV, av. (J)	188 at –20°C	161 at –20°C	270 at –60°C	97 at –5°C	123 at –40°C

*1: Chemical and mechanical properties given here are for DCEP.

Table 5: Typical chemical composition and mechanical properties of KOBELCO filler metals for HT780 steels

Process	SMAW		GMAW	Auto GTAW	SAW	
Trade desig.	**LB-80UL**	**LB-80L**	**MG-S80**	**TG-S80AM**	**PF-H80AK/ US-80LT**	**PF-H80AS/ US-80LT**
AWS	A5.5 E11016-G	A5.5 E11018-G H4	A5.28 E110S-G	A5.28 E110S-G	A5.23 F12A10-EG-G	A5.23 F11A10-EG-G
Polarity	AC	DCEP	DCEP	DCEN	AC	DCEP
C	0.08	0.04	0.06	0.08	0.08	0.07
Si	0.52	0.60	0.40	0.09	0.28	0.44
Mn	1.50	1.39	1.15	1.12	1.65	1.60
P	0.009	0.009	0.010	0.006	0.009	0.011
S	0.006	0.006	0.001	0.003	0.004	0.004
Ni	1.90	2.88	2.67	2.85	2.45	2.43
Cr	0.28	-	0.19	0.36	0.07	0.08
Mo	0.43	0.70	0.51	0.68	0.74	0.73
YS (MPa)	710	770	764	760	836	773
TS (MPa)	820	830	827	880	908	871
El (%)	25	24	22	23	20	21
IV, av. (J)	99 at –20°C	100 at –60°C	109 at –20°C	240 at –60°C	103 at –60°C	79 at –60°C

Strong and tough filler metals for HT950 steel

HT950 steel penstocks are constructed in accordance with the Technical Guide JESC H0001, which requires the following to prevent penstock fracture in operation at a minimal service temperature of 0°C: (1) a base metal to arrest propagation of a brittle crack; and (2) welds (weld metal and base-metal heat-affected zone) that will not initiate a brittle fracture. Since it is inherently difficult for a weld to secure an equivalent level of toughness as the base metal, the Technical Guide aims primarily to have brittle cracks arrested by the base metal.

The mechanical properties required by the Technical Guide for welds are shown in Table 6. The tensile strength given in the table is the minimum tensile strength of a plate-type transversal test specimen removed across a butt weld joint (as per JIS Z 3121-1993) but not of an all-weld metal specimen. Thus, the weld metal can be lower in tensile strength than the base metal. Known as an undermatching weld joint, it is designed to minimize the cold crack susceptibility of the weld while keeping the joint strong enough to sustain the tensile stress that may arise during operation.

Table 6: Requirements of mechanical properties for weld joints in HT950 steel penstocks

Base metal thick. (mm)	$t \leq 100$	$100 < t \leq 200$
Joint tensile strength (MPa)	950 min.	930 min.
Transition temp., vTrs (°C)	–10 or lower	–15 or lower
Absorbed energy, min. vE (J)	47 at –10°C	47 at –15°C

When tensile strength increases, the impact toughness of high tensile strength weld metals tends to decrease. To address this issue, Kobe Steel has developed tough filler metals for HT950 steel by reducing oxygen in the weld metal (Figure 3) to refine the microstructure and improve the resistance to ductile cracking, by adding nickel in the weld metal to toughen the matrix of the microstructure, and by adjusting the chemistry of the weld metal to create a fine acicular ferrite structure.

As the tensile strength of weld metal increases, the weld metal also becomes more susceptible to diffusible hydrogen, which may cause cold cracking. To improve crack resistance, Kobe Steel has devised how to reduce the source of hydrogen in filler metals that maintain good welding usability. For the SMAW electrode covering and the SAW flux, the production process was innovated and the raw material composition was elaborated to decrease the water content and the hydrogen partial pressure in the arc atmosphere. For GMAW and GTAW wires, the lubricant has been improved.

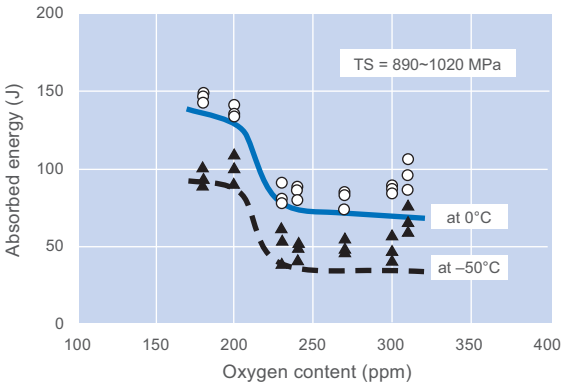


Figure 3: Effect of oxygen content in SMAW weld metal of HT950 on Charpy impact absorbed energy.

These advances have enabled Kobe Steel to develop the exceptional filler metals for HT950 steel penstocks. Table 7 shows the chemical and mechanical properties of the Kobelco filler metals. With these HT950 filler metals, the welding procedure can be comparable to that for conventional HT780 filler metals. With the unsurpassed properties shown in the table, these filler metals have successfully been applied in the construction of penstocks for two hydropower stations in Japan.

Table 7: Weld metal and butt weld joint properties of Kobelco filler metals for HT950 steel*1

Filler metal and process	Covered electrode for SMAW		Solid wire for GMAW*2	Solid wire for auto GTAW	Flux and wire for SAW	
C%	0.05		0.06	0.06	0.09	
Si%	0.39		0.34	0.30	0.53	
Mn%	1.35		1.34	1.43	1.79	
P%	0.004		0.005	0.004	0.011	
S%	0.003		0.003	0.006	0.002	
Ni%	3.37		2.60	3.18	2.60	
Cr%	0.58		0.46	0.81	0.07	
Mo%	0.46		0.75	0.96	0.75	
O%	0.016		0.016	0.001	0.019	
TS(MPa)	965	960	1019	1002	959	962
IV, av. (J) at –20°C	137	138	111	224	120	152
vTrs (°C)	< –60	< –60	< –60	< –60	< –60	< –60
CTOD, δm*3 (mm) at 0°C	0.26 0.27	0.22 0.23	0.17 0.18	0.66 0.64	0.26 0.25	0.27 0.26
Welding position	Flat	Vertical	Flat	Flat	Flat	Flat
Heat input (kJ/mm)	2.5	3.5	1.3	5.0	3.3	4.5

*1: Tensile strengths are those of butt weld joints for SMAW and SAW; the other properties are those of weld metals.
*2: 95%Ar-5%CO_2 shielding gas was used.
*3: Tested as per WES 1108-1995, with B=W=50 mm specimen.

High-tech welding procedures are required in the construction of penstocks

In many cases, a hydropower penstock is fabricated first at a workshop that is temporarily built near the

penstock construction site. At the workshop, two or three rolled sections of steel are seam welded mainly by SAW to fabricate a single pipe with a length of about 3 meters. Next, three or four single pipes are butt-joined mainly by SAW to produce a unit pipe of 9-12 meters long. The unit pipes are delivered to the site — many cases into the inclined tunnel — where the penstock is to be installed. Then the unit pipes are joined by SMAW, automatic GMAW, or automatic GTAW to construct the penstock. Figure 4 shows a unit pipe being delivered into the inclined tunnel. Figure 5 shows the automatic one-sided GMAW process setup inside the unit pipe to butt weld two unit pipes.

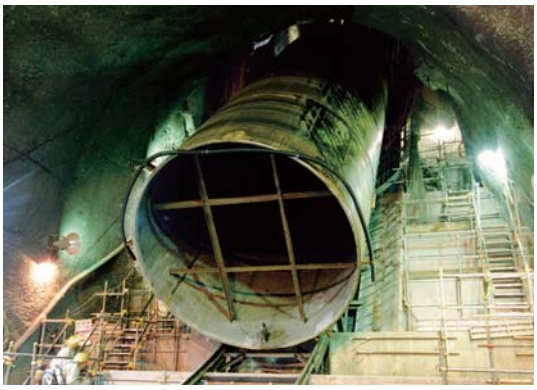


Figure 4: A unit pipe is joined to another unit pipe one by one in the inclined tunnel to construct the penstock (Courtesy of Mitsubishi Heavy Industries, Ltd., Japan).

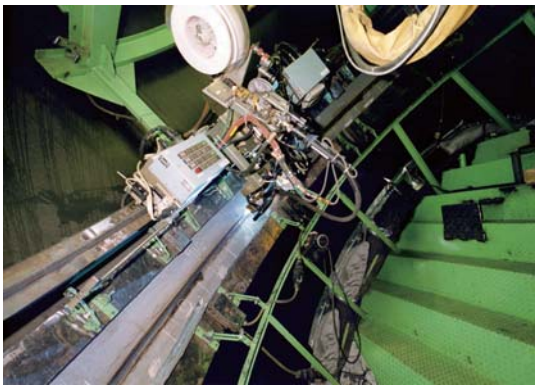


Figure 5: An automatic one-sided GMAW process setup on the butt joint of two unit pipes inside the inclined tunnel (Courtesy of Mitsubishi Heavy Industries, Ltd., Japan).

As shown in Figure 1, when a single penstock feeds several hydropower generators with pressurized water, the penstock branches to separate the water. When the penstock separates the water into two lines, penstock branching is more commonly referred to as bifurcation. Figure 6 illustrates how bifurcation is typically carried out at a fabrication plant. Generally a penstock is bifurcated at its lowest part where the water pressure is highest. To bear the burden of high water pressure, the bifurcation will be a heavy-duty structure composed of HT780 or HT950 steel pipes with heavy-thick stiffeners.

In the underground tunnel, the unit pipes are placed in ambient air of around 15°C and of almost saturated humidity. During welding, the joints have to be maintained at the required preheating and interpass temperatures (e.g. 100-125°C or higher for 50 or thicker HT780 steel pipe) to prevent cold cracking in the weld. Therefore, the welding operation has to be carried out in a high-temperature high-humidity atmosphere.

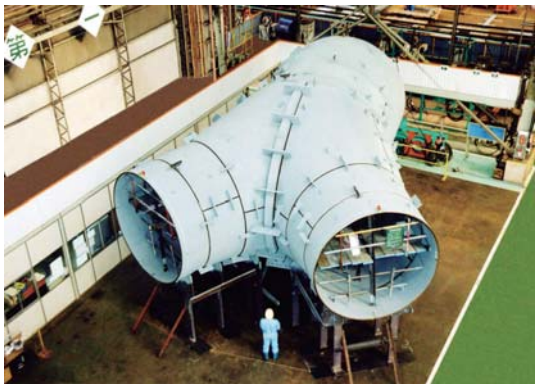


Figure 6: A penstock bifurcation under production at a fabrication plant (Courtesy of Mitsubishi Heavy Industries, Ltd., Japan).

Manual welding under these high-temp/high-humidity conditions is harsh on welders. Tunnel diameter must also be wide enough to secure a large enough working space. To address the human safety and the economic issues, the welding process has been automated by employing one-sided automatic GMAW and GTAW processes.

Because high humidity (a source of water, and thus hydrogen) can promote cold cracking and delayed cracking in the weld, controlling preheat and interpass temperatures, postweld heating, and keeping filler metal dry are essential to prevent these effects. In addition, heat input must be controlled to ensure sufficient tensile strength and notch toughness of the weld. The exact requirements for these procedure control parameters depend on the type of steel, plate thickness, and type of filler metal.

References:

[1] Quarterly Journal of the Japan Welding Society, Vol. 21 (2003) No 1.
[2] Journal of the Japan Welding Society, Vol. 78 (2009) No 6.
[3] Hitachi Shipbuilding Engineering Reports, Vol. 58 (1998) No. 4.
[4] Kobe Steel, Welding technical guide, (1997) No. 331.

KOBELCO Asserts Support for Our Customer's Production Technologies at the Japan Int'l Welding Show 2010

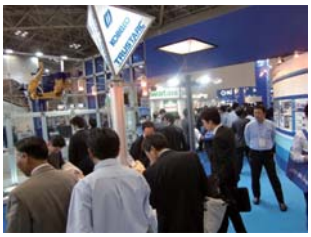
The 21st Japan International Welding Show 2010 opened at the event complex, Tokyo Big Sight, in Tokyo on April 21 (Wed) and continued through April 24 (Sat), 2010. The Show was organized under the theme of "Gateway to the Successful Business Matching in the Welding & Joining Fields." Visitors could not only see cutting-edge products, technologies and services on display, but take part in technical seminars, too. The show floors and conference venues were busy with nearly 94,000 visitors in total during the four days even though the middle two days were rainy.

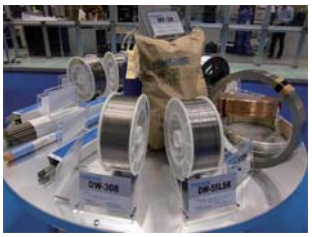
The ribbon-cutting ceremony to open the show, held in front of the door to the main hall on the first day.

Kobe Steel (KSL) emphasized a business slogan of "Supporting the Customer's Production." KSL's booth stood out at the front center of the No. 2 pavilion, featuring a sophisticated design of lights and glass, and illuminated in bluish colors. Along with displays that emphasized the advanced welding processes, robotic welding systems and welding consumables, KSL's booth put on lively demonstrations on the "High-current MAG process," "REGARC™ process," and "PREMIARC™ DWN series Ni-based FCW."

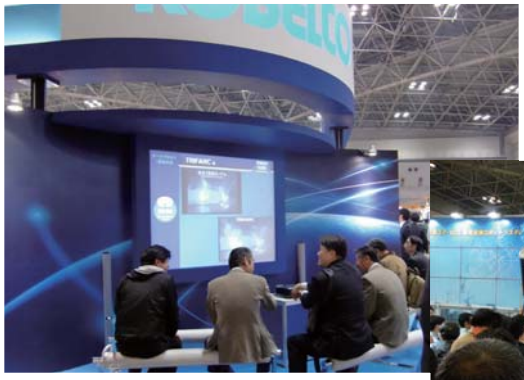
The booth's wide video screen presented KSL's advanced technologies. At the friendly corner of the Shin-Yo-Kai (Kobe Steel's distribution network) and welding supporters, welders demonstrated the making of handicrafts (such as a miniature motorcycle and golf player) by semiautomatic gas metal arc welding using leftover scrap metals in front of bemused and impressed visitors.

We are very much grateful for the customers and potential customers who, by visiting the KSL booth during the Show, demonstrated they are all "pro-Kobelco!"

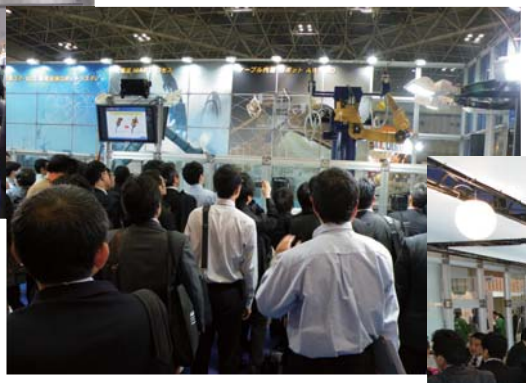




At the welding consumables corner, the up-to-date products and information panels were displayed for better understanding.



The big video screen displayed prominently at KSL's booth drew many visitors' eyes.



ARCMAN™ welding robots attracted many visitors to the KSL booth with hourly live welding demonstrations.

The Kobelco meeting corner was always full of visitors, not only for commercial talks but also for renewing old friendships.

KOBELCO Enhances Its Presence in China through Participation at the Beijing Essen Fair

The 15th Beijing Essen Welding & Cutting Fair was held in the New China International Exhibition Center Beijing over four days from May 27-30, 2010. The Beijing Essen Fair, one of Asia's world-class exhibitions for the welding and cutting industries, is an annual event that alternates each year between Beijing and Shanghai.

At the fair, it was clear that the world economy has been recovering from the global financial crisis that was triggered by the bankruptcy of Lehman Brothers in September 2008; China's economic growth in particular has been outstanding. In order to enhance our presence in the growing Chinese welding market, Kobe Steel (KSL) has been taking part annually in the Beijing Essen fair.

KSL displayed the highly efficient, overhead beam-mounted welding robot, "ARCMAN MP™" at the center of the booth and offered live welding demonstrations of the DW-stainless-series flux-cored wires at the demo corner. A variety of welding consumables were presented on electronic panels that focused on individual welding fields. In addition, we provided visitors with welding seminars to explain KSL's advanced technologies.

Many visitors, including KSL's major customers in China, visited our booth and the welding seminars during the fair over the four days. These efforts enabled us to highlight KSL's position as an all-round producer that can supply customers with the totality of welding solutions.

In the closely-watched Chinese market, KSL must be recognized as a reliable on-site supplier, the partner who can suggest and supply the welding systems, processes and consumables that Chinese users need most.

We conducted our activities during the welding fair so that the Kobelco brand may grow in the Chinese welding market and so that KSL will be quickly and firmly recognized, in China as in Japan, as "the leading welding company."

The Kobelco booth attracted many visitors with the overhead beam-mounted welding robot, ARCMAN MP™ displayed at the booth center.

KOBELCO conveyed to visitors its capabilities as an all-round producer and provider of welding solutions.

At the customer service area in the booth, the Kobelco staff received many pro-Kobelco customers and would-be customers and listened to their welding-related needs and issues.

The Kobelco team, posing in front of ARCMAN MP™, satisfied at having done their best throughout the fair.

Reported by
Tsunehiro Ishihara
ISMS, MD, KSL

My Twentieth Year in the Welding Business starts with KWAI's Twentieth Year in Business

KWAI's functional complex consisting of an office, warehouse and welding laboratory in Stafford, Texas (above)

Jay Sugiyama, posing in KWAI's warehouse with a variety of flux-cored wires ready to supply.

To our dearest KWT readers!

It has been a pleasure to take up my new post of president, as the successor to Mr. Alan Egami, of Kobelco Welding of America Inc (KWAI) last May 2010.

KWAI is the sales subsidiary of Kobe Steel, Ltd. (KSL) in North America and has been supplying a range of high quality welding consumables to customers in the energy-related, shipbuilding and car industries. In recent years, KWAI has expanded the main product line of flux cored wires (FCWs) to respond to shifting customer needs by placing emphasis on specialized FCWs such as "Frontiarc™," "DW stainless steel series," "Nickel-based alloy FCWs," "Super duplex alloy FCW," and "Low temperature service FCWs." We have also been working to increase sales of excellent FCW products in Central and South American markets in the last few years.

Established in 1990, KWAI has turned 20 years old this year. We intend to keep running toward the next milestone of our thirtieth or even fortieth anniversaries, by continuing to enhance our sales and marketing, maintaining the trust of our customers, and proving the best technical service. As it happens, this year is my 20th year with KSL as well. On this unique occasion, I am determined to execute my best in the presidency of KWAI together with our excellent staff.

I try to remember everyone I have met in my welding business career in many countries around the world over the last 20 years. It would be wonderful to reconnect with anyone I've met before who may be in the USA at this time. Please drop me a line or give me a call if you ever happen to be nearby. I am looking forward to it.

Thank you very much.

All members with KWAI, including the ex-president Alan Egami (the seventh from the right)

Reported by
Jay Sugiyama
President
KWAI

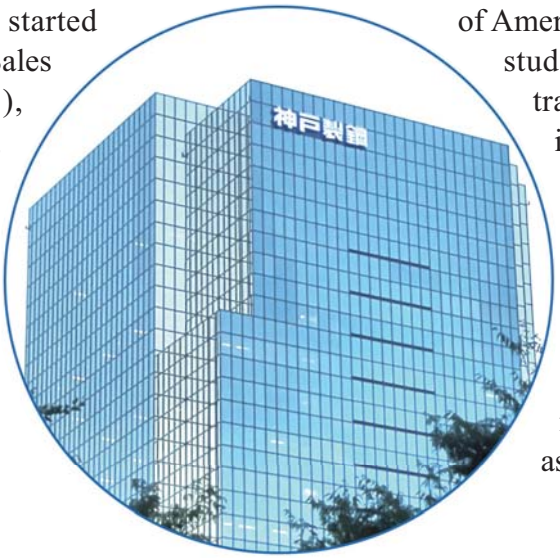
Heartfelt Greetings from International Sales & Marketing Section

Yukinobu Sara
Manager

My name is Yukinobu Sara. I joined Kobe Steel (KSL) in 1990 and mainly have been involved in domestic sales. Through my service in the domestic market, I have experienced how KOBELCO welding consumables are reliable to users and how highly reputed they are in the welding field. I know and appreciate that the overwhelming status of KOBELCO is the result of the efforts of predecessors. Since I started my duties in the International Sales & Marketing Section (ISMS), in the Marketing Department, I have been working hard to seek out potential customers in welding markets worldwide. I am sincerely looking forward to meeting our dear readers in the nearest future.

Akihisa Ushijima
in charge of
Indian Market

I am Akihisa Ushijima. I would like to express my sincere greetings to our dear readers. I have been engaged in the domestic sales for large customers. When I joined KSL, I was assigned to the Technical Department and was in charge of research and development of stainless steel flux-cored wires as well as strips and fluxes for overlay welding. And then I was assigned to Kobelco Welding of America for one year as a "company student abroad." After this, I was transferred to Thai-Kobe Welding in Thailand for a few years and then returned to domestic market sales in Japan. My job now is to promote sales through technical services to chemical plant fabricators in the Indian market. I will do my best in my duties. I humbly ask you to support my activities.



Mizuki Katayama
in charge of
Chinese & Philippine
Markets

Mizuki Katayama is my name. I am in charge of sales for the shipbuilding industries in both China and the Philippines. Before joining the ISMS, I gained experience in the domestic sales to distributors and large customers, mainly shipyards, in Japan. Based on my experiences, I will work on proposing up-to-date materials and processes that will benefit our clients in China. I will also do my best to contribute to shipbuilders in other countries where the shipbuilding industry is still under development, introducing the welding materials and processes as well as the know-how useful for shipbuilders.

Makoto Yamashita
in charge of
Chinese & Taiwanese
Markets

My name is Makoto Yamashita. I would like to express my warmest greetings to dear readers. Since I took this new post in the ISMS in June 2010, I have been in charge of the offshore drilling rig fabricators in China and the general market in Taiwan. My job includes the export of KSL products to Kobe Welding of Korea. I joined KSL in April 2008 and was at first engaged in the production process control for SAW and GTAW wires in Japan. My ambition is to become such a sales person as who can, in the proper and timely manner, catch the customer needs and respond to them. I will do my utmost to enhance the status of KOBELCO brands.

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