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KOBELCO WELDING TODAY

Vol.16
2013 No.3

KOBELCO Puts the Customer First with All-in-One Product and Service

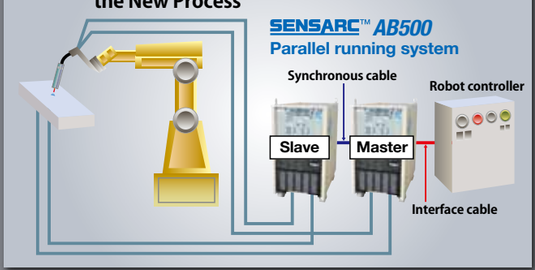
KOBELCO

A new Ultra High Current MAG welding process allows for highly efficient and extremely low spatter welding

In the field of mid-thick plate welding, robotic MAG welding has gradually been adopted to cope with the lack of skilled technicians and to pursue stable quality as well as high efficiency, high welding speed, low spattering, and reduced costs. A new robotic welding system (New Process) that utilizes Ultra High Current MAG welding has been developed to fulfill those requirements. It is exclusively combined with SENSARC™ AB500, the digitally-controlled welding power source that controls the output waveform by advanced control rules.

For robotic welding with a single electrode to be efficient, it is necessary to apply a high welding current over 500 ampere (A) and get high deposition rate. Two SENSARC™ AB500 units connected in parallel can achieve a maximum output of 700A with a 100% rating. Although the two power sources are connected in parallel, they function like a single power source because they are synchronized so that one, called the master, receiving a command from the robot controller, sends the command to the other, called the slave (see Figure 1).

Figure 1: Schematic drawing of a robotic system applying the New Process



A special welding torch has also been developed to treat power cable-resistant heat as well as radiant heat (see Figure 2).

Figure 2 :
Specially- made welding torch

In conventional solid wire MAG welding at high current, heavy spatter is unavoidable because of the rotating transfer of the molten droplet. Similarly, flux cored wire (FCW) offers a spray transfer mode but not a rotating transfer mode due to its cross-sectional structure. However, a new FCW, FAMILIARC™ MX-A100D, which was designed especially for the New Process, significantly reduces spatter by optimizing nitrogen resistance and slag formation. Table 1 shows the chemistry and the mechanical properties of MX-A100D all weld metal.

Table 1 : Chemistry and mechanical properties

Chemistry (mass%)					YS (MPa)	TS (MPa)	El (%)
C	Si	Mn	P	S			
0.06	0.81	1.61	0.01	0.01	482	604	25

Note : Welding conditions : 500A-39V-60cm/min ; 4 layers-8 passes

Figure 3 compares the amount of spatter generated in the conventional solid wire MAG process with the New Process with MX-A100D. In the conventional process, spatter rapidly increases at the wire melting rate of 150 g/min (welding current of 450 A) or more as the droplet transfer mode changes to rotating transfer, whereas the New Process maintains stable spray transfer at any welding current, resulting in very low spatter generation even in a high current area.

Figure 3 : Comparison of spatter generation

Note : Wire dia. : 1.4mm ; Wire extension : 28mm ; Shielding gas : 80%Ar-20%CO_2

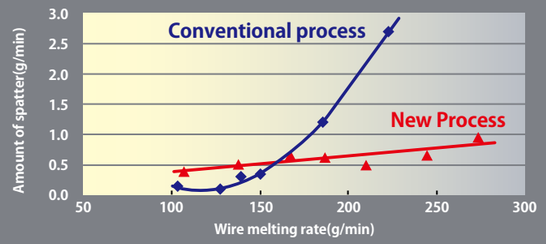


Table 2 shows the welding conditions of one pass, flat position fillet welding to get 15 mm leg length by the conventional process and New Process. The bead appearance and macrostructure produced by the New Process are shown in Figures 4 and 5, respectively.

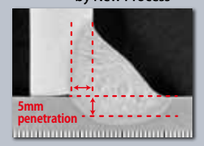
Table 2 : Welding conditions for flat position fillet welding

	Conventional MAG process		New Process
No. of passes	1st	2nd	1st
Welding current (A)	420	420	600
Deposition rate (g/min)	125	125	268
Welding speed (cm/min)	34.0	23.0	33.0
Efficiency comparison	1		2.4

Note : Conventional MAG process uses a solid wire of 1.4mm dia.

Figure 4 : Bead appearance by New Process

Figure 5 : Macrostructure by New Process



The conventional process needed two passes to achieve a 15 mm leg length whereas the New Process required one pass only, raising its welding efficiency to 2.4 times. The New Process also generated almost no sticking spatter and obtained penetration of 5 mm, results quite difficult to achieve by the conventional high deposition "tandem welding process."

Greetings from the new General Manager of the International Sales and Marketing Section

My heartfelt greetings to the dearest KWT readers! My name is Koichi (Jay) Sugiyama, the General Manager of the International Sales and Marketing Section in the Marketing Department, Welding Business.

I assumed this post in June this year after three year's service at Kobelco Welding of America Inc. (KWAI) in the USA. By taking this opportunity, I would like to express my warmest thanks to the wonderful distributors, end users and partners who extended their kind patronage and support throughout my stay there. I am confident that the entire KWAI team will continue to prvide you with the best service and support from North America all the way to Central and South America. I truly hope that you will continue doing business with them.

While economic prospects rise or fall in different parts of the world, the importance of welding never changes, which means we must continue to innovate in order to supply the most stable quality of welding. Such quality requirements as higher strength and lower hydrogen content will grow ever more severe, especially from those customers in the energy-related fields who must keep up with rising global energy demand. Likewise, higher efficiency, non-stop welding and other innovations are required by the transportation system industry, which includes manufacturers of ships, car and motorcycles, and construction machinery.

Our strengths in serving both the energy and transportation fields lie in how we deal with the total welding solution, which includes providing excellent welding consumables in a timely manner as well as developing procedures that combine welding equipment and robotic welding systems. Please consult our worldwide representatives on any issue that you may wish to discuss or ask about. We value the direct contact and comments from all of you who are working in the field.

You can check out Kobelco's new products and up-to-date technology at exhibitions around the world. As a matter of fact, we displayed our technology at the Shanghai Essen Fair in June 2013, and we will also participate in the world's largest Essen Fair, which is held once every four years, in Germany this September. We hope that you can visit us there and develop a closer connection with our products.

We truly look forward to seeing all of you in Germany, where we may discuss prospects for the global economy together.

Koichi (Jay) Sugiyama
General Manager
International Sales & Marketing Section
Marketing Department
Welding Business
Kobe Steel, Ltd.

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Leading a double life in Bangkok, Thailand and Bien Hoa, Vietnam is really exciting

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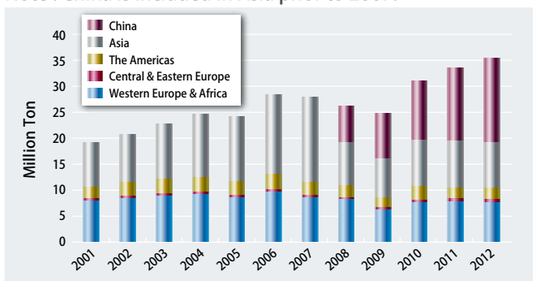
Technical Highlight

Kobelco flux cored wires for stainless steels : meeting diverse market needs with a wide range of products

1 Global demand for stainless steels and associated welding consumables

In the years since the financial crisis of 2008, global stainless steel production recovered smoothly due to large increases in consumption in China, reaching a level of 30 million tons in 2011 (see Figure 1). It is forecast to expand to 40 million tons in 2014 and 45 million tons in 2020 because a constant increase in worldwide demand is expected.

Figure 1 : Global stainless steel production
Note : China is included in Asia prior to 2007.



When worldwide demand is examined by country, China has accounted for the largest amount since 2008 and about 40 % in 2011, far outstripping demand from Japan (slightly more than 10 %) and the USA (just under 10 %). Forecasts of future demand suggest increasing consumption from emerging markets such as India and Turkey in addition to China.

As for what types of stainless steel will be in demand in 2020, austenitic steels are expected to slightly decrease from the current 60 % of total demand to about 50 % while ferritic as well as duplex steels will increase.

By contrast, while data on global demand for welding consumables for stainless steels is not available, it can be calculated from the data on stainless steels. Information on welding consumables for stainless steels in Japan is available from the Japan Welding Material Association, which reports that domestic consumption of welding consumables for stainless steels reached around 7,500 tons in 2011. Accordingly the ratio of welding consumables to stainless steels (unit ratio) is calculated as about 0.2 %. Hence, using the same unit ratio of 0.2 %, worldwide demand of welding consumables for stainless steels is forecast to be a little over 60,000 tons in 2011, increasing to 80,000 tons in 2014 and 90,000 tons in 2020.

2 Features of Kobelco flux cored wires for stainless steels

Flux cored wires (FCWs) provide high deposition rate as well as excellent weldability in general. The high deposition rate helps to decrease total welding time, to improve weldability, and to minimize the time spent on treatment-after-welding such as removing spatter and fume sticking to steel plates. Especially when used with austenitic stainless steels, FCWs provide welded portions with beautiful appearance and high corrosion resistance: important factors on austenitic stainless steel structures.

Figure 2 shows a schematic cross section of Kobe Steel FCW for austenitic stainless steels. The outer sheath is drawn to become as thin as possible so as to allow for high current density, which in turn, increases efficiency by raising the amount of welded metal per unit of time even if the same welding current is applied.

Figure 2 : Schematic cross section of Kobe Steel FCW for stainless steel

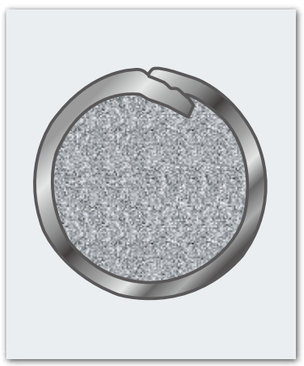


Table 1 : Wide range of FCWs for stainless steels

Steel type or Application	Feature and key note for application	Product name	AWS Classification	Main Chemistry	Applied position*1
304	General	DW-308	E308T0-1/-4	20Cr-10Ni	F, HF
		DW-308P	E308T1-1/-4	20Cr-10Ni	F, HF, VU, OH
304H	Bismuth free ; High temperature operation	DW-308H	E308HT1-1/-4	19Cr-10Ni-0.06C	F, HF, VU
304, 304L	Low carbon (0.04% max.) ; General	DW-308L	E308LT0-1/-4	20Cr-10Ni	F, HF
		DW-308LP	E308LT1-1/-4	20Cr-10Ni	F, HF, VU, OH
	304, 304L Gauge plate	DW-T308L	E308LT0-1/-4	20Cr-10Ni	F, HF
	Low Cr(VI) in fume	DW-308L-XR	E308LT0-1/-4	20Cr-10Ni	F, HF
	Low Cr(VI) in fume	DW-308LP-XR	E308LT1-1/-4	20Cr-10Ni	F, HF, VU, OH
	Cryogenic temperature (≥27J/-196℃)	DW-308LTP	E308LT1-1/-4	20Cr-10Ni	F, HF, VU, OH
		DW-308LT	E308LT0-1/-4	20Cr-10Ni	F, HF
	Bismuth free ; Solution treatment	DW-308LH	E308LT1-1/-4	19Cr-10Ni	F, HF, VU
	TIG rod for root pass welding without back purging gas	TG-X308L	R308LT1-5	20Cr-10Ni	F, HF, VU, OH
316, 316L	General	DW-316L	E316LT0-1/-4	19Cr-12Ni-2.3Mo	F, HF
		DW-316LP	E316LT1-1/-4	18Cr-12Ni-2.8Mo	F, HF, VU, OH
	Gauge plate	DW-T316L	E316LT0-1/-4	19Cr-12Ni-2.3Mo	F, HF
	Low Cr(VI) in fume	DW-316L-XR	E316LT0-1/-4	18Cr-12Ni-2.3Mo	F, HF
	Low Cr(VI) in fume	DW-316LP-XR	E316LT1-1/-4	18Cr-12Ni-2.3Mo	F, HF, VU, OH
	Bismuth free ; Solution treatment	DW-316LH	E316LT1-1/-4	19Cr-12Ni-2.3Mo	F, HF, VU
	Bismuth free ; High temperature operation	DW-316H	E316T1-1/-4	19Cr-12Ni-2.3Mo-0.06C	F, HF, VU
	Cryogenic temperature (≥27J/-196℃) (316L)	DW-316LT	E316LT1-1/-4	18Cr-13Ni-2.3Mo	F, HF, VU, OH
	TIG rod for root pass welding without back purging gas	TG-X316L	R316LT1-5	19Cr-12Ni-2.3Mo	F, HF, VU, OH
Dissimilar metal and overlay welding	General	DW-309L	E309LT0-1/-4	24Cr-13Ni	F, HF
		DW-309LP	E309LT1-1/-4	24Cr-13Ni	F, HF, VU, OH
	Gauge plate	DW-T309L	E309LT0-1/-4	24Cr-13Ni	F, HF
	Low Cr(VI) in fume	DW-309L-XR	E309LT0-1/-4	24Cr-13Ni	F, HF
	Bismuth free ; Overlay welding on low alloy steel	DW-309LH	E309LT1-1/-4	24Cr-13Ni	F, HF, VU
	TIG rod for root pass welding without back purging gas	TG-X309L	R309LT1-5	24Cr-13Ni	F, HF, VU, OH
	General	DW-309MoL	E309LMoT0-1/-4	23Cr-13Ni-2.3Mo	F, HF
		DW-309MoLP	E309LMoT1-1/-4	23Cr-13Ni-2.3Mo	F, HF, VU, OH
	General (310S)	DW-310	E310T0-1/-4	26Cr-21Ni-0.18C	F, HF
	High ferrite content	DW-312	E312T0-1/-4	29Cr-10Ni-0.12C	F, HF
321, 347	General	DW-347	E347T0-1/-4	19Cr-11Ni-0.6Nb	F, HF
	Bismuth free ; High temperature operation	DW-347H	E347T1-1/-4	19Cr-10Ni-0.6Nb-0.06C	F, HF, VU
	Bismuth free ; Low carbon	DW-347LH	E347T1-1/-4	19Cr-10Ni-0.6Nb	F, HF, VU
	TIG rod for root pass welding without back purging gas	TG-X347	R347T1-5	19Cr-10Ni-0.6Nb	F, HF, VU, OH
317L	General	DW-317L	E317LT0-1/-4	19Cr-13Ni-3.3Mo	F, HF, VU
		DW-317LP	E317LT1-1/-4	19Cr-13Ni-3.3Mo	F, HF, VU, OH
	Bismuth free ; Solution treatment	DW-317LH	E317LT1-1/-4	19Cr-14Ni-3.4Mo	F, HF, VU
Duplex stainless steel	Lean duplex (ASTM S32101, S32304)	DW-2307	E2307T1-1/-4	25Cr-8Ni-0.13N	F, HF, VU
	Standard duplex (ASTM S31803, S32205)	DW-2209	E2209T1-1/-4	23Cr-9Ni-3.3Mo-0.14N	F, HF, VU
	TIG rod for root pass welding without back purging gas	TG-X2209	---	23Cr-9Ni-3.3Mo-0.14N	F, HF, VU, OH
	Super duplex (ASTM S32750, S32760)	DW-2594	E2594T1-1/-4	26Cr-10Ni-3.8Mo-0.24N	F, HF, VU
Martensitic stainless steel for hydro turbine	All position type	DW-410NiMo	E410NiMoT1-4	12Cr-4Ni-0.6Mo	F, HF, VU, OH
	Metal type FCW	MX-A410NiMo	EC410NiMo	12Cr-4Ni-0.6Mo	F, HF
405, 409	Ferritic 13Cr-Nb	DW-410Cb	E409NbT0-1	13Cr-0.6Nb-0.06C	F, HF
	Buffer layer for 13Cr overlay welding	DW-430CbS	E430NbT0-1	17Cr-0.9Nb	F, HF
For car exhaust system	17Cr-Nb ferritic metal type FCW	MX-A430M	---	17Cr-0.7Nb	F, HF
Ni alloy	Alloy 625 and 825; Overlay welding ; Dissimilar joint	DW-N625	ENiCrMo3T1-4	Ni-21Cr-8.5Mo-3.5Nb	F, HF, VU
	Cladding and girth welding of clad pipe (5G, 6G)	DW-N625P	ENiCrMo3T1-4	Ni-21Cr-8.5Mo-3.3Nb	Pipe 5G, 6G
	Alloy 600 and 800 ; Dissimilar joint	DW-N82	ENiCr3T0-4	Ni-21Cr-3.0Mn-2.5Nb	F, HF
	Alloy C276	DW-NC276	ENiCrMo4T1-4	Ni-16Mo-15Cr-3.3W	F, HF, VU

Note: *1: Applied position : F : flat ; HF : horizontal fillet ; VU : vertical upward ; OH: overhead ;

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Kobelco FCWs for stainless steels are also highly reputed for a stable arc with both 100 % CO_2 and Ar-CO_2 mixed shielding gasses, leading to very little spatter generation as shown in Figure 3. This feature is obtained not only by the appropriate flux design (and excellent quality control in Kobelco's manufacturing plants in Japan and the Netherlands) but also the special wire surface treatment that enables stable wire feedability. Another feature of FCWs for stainless steels such as PREMIARC™ DW-308L, PREMIARC™ DW-316L (for flat position and fillet welding), is how they are designed to handle slag formation : slag can be easily peeled off at the optimum time after welding, which prevents the formation of temper color on the bead surface (see Figure 4).

When temper color forms on welds that require aesthetic appearance and cleanliness, pickling treatment, an acid treatment to remove color from a weld metal surface, is called for as a countermeasure. By avoiding the formation of temper color, the time spent on acid treatment is reduced, boosting productivity.

Figure 3 : Comparison of spatter generation

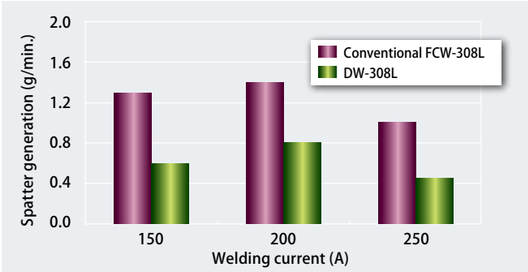


Figure 4 : Slag removability and bead appearance right after welding (DW-308L)

3 Up-to-date Kobelco FCWs for stainless steels

Kobelco's technologically advanced FCWs for stainless steels are singular products developed exclusively by Kobe Steel; they are trusted and preferred by users around the world. Table 1 (on page 4) lists the wide range of FCWs available for stainless steels.

3-1. Low Cr(VI) FCWs for stainless steels : "XR series"

FCWs can generate a higher amount of fumes than other conventional welding processes do, increasing safety risks.

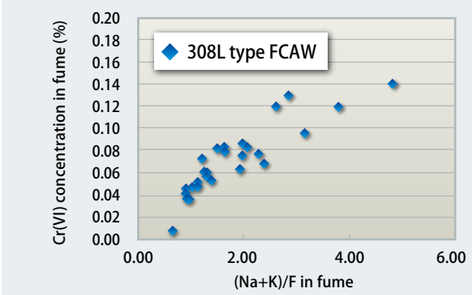
The welding fume is an oxide that forms when metal vapor generated by the arc cools and solidifies in the air. In the case of stainless steel welding, the fume contains 5 to 20 % Cr oxide, a portion of which exists as harmful Cr^{6+}, notated as Cr(VI).

The toxicity of Cr(VI) has recently been re-evaluated in accordance with moves toward regulating it more strictly in the workplace. For example in 2010 the American Occupational Safety and Health Administration (OSHA) cut the amount of airborne Cr(VI) allowed in workplace by 90 %. It goes without saying that the most effective method to reducing Cr(VI) associated with stainless steel welding is to install more powerful ventilation systems to remove fumes. On the other hand, if welding fumes contained less Cr(VI) to begin with, less effort would be required removing it via better ventilation like a local ventilation.

To reduce Cr(VI) in welding fume itself is also effective. Kobe Steel has developed a new FCW series, "XR series" for flat position/horizontal fillet welding as well as for all position welding that drastically reduce the Cr(VI) content in the welding fume. The highly versatile XR series FCWs target three types of stainless steels, namely 308L, 316L and 309L.

As shown in Figure 5, controlling the content of Na and K, added to flux as arc stabilizers, can reduce Cr(VI) content in the welding fume. In order to maintain stable weldability, however, the content of other additives, such as fluorides as well as Na and K, may have to be adjusted.

Figure 5 : Relationship between flux components and Cr(VI) in welding fume



One of the new XR series FCWs is the all-position PREMIARC™ DW-308LP-XR. It is designed to apply both 100% CO_2 and Ar-CO_2 mixed shielding gas. Figure 6 shows the recommended range of welding parameters and Figure 7, the Cr(VI) emission rate (as measured by ISO 15011-1 and ISO 16740), respectively. It shows that the XR series emits Cr(VI) at a rate of just 1/6th that of the conventional DW-308LP. For more information on PREMIARC™ DW-308L-XR and PREMIARC™ DW-316L-XR, please refer to the Product Spotlight column of KOBELCO WELDING TODAY, Vol. 14, No. 3 issued in 2011.

Figure 6 : Recommended range of welding parameters of DW-308LP-XR

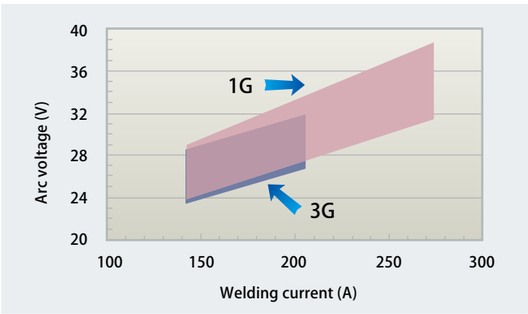
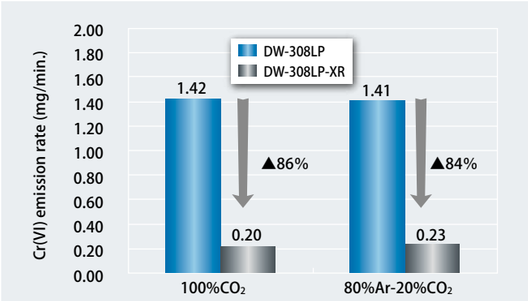


Figure 7 : Cr(VI) emission rate of DW-308LP-XR



A butt joint was welded in the vertical upward (3G) position with DW-308LP-XR under the conditions listed in Table 2; Figure 8 shows the bead appearance and macrostructure, respectively.

Table 2 : Welding conditions of butt joint in 3G position

Groove shape and pass sequence	Location	Welding current (A)	Arc voltage (V)	Interpass temperature (℃)
Plate thickness : 15mm Groove shape : Single V Groove angle : 60℃ Back side : 3 passes Final side : 1 pass	Back	160	28	<300
	Final	160	28	<300

Figure 8 : Bead appearance and macrostructure of butt joint, 3G position welding with DW-308LP-XR

3-2. FCWs for duplex stainless steels

Duplex stainless steels have a two-phase microstructure that is 50 % ferritic and 50 % austenitic. Advantages include high strength, superb resistance against pitting corrosion, crevice corrosion as well as stress corrosion cracking (SCC).

Three different duplex stainless steels are available in the market: (1) standard duplex stainless steels, typically ASTM S31803, S32205 and JIS SUS329J3L; (2) lean duplex stainless steels, which, while inferior to other duplex stainless steels, are nearly equivalent to 304L and 316L in corrosion resistance and lower in cost due to reduced Ni and Mo contents, and (3) super duplex stainless steels, which contain higher amounts of Cr, Mo and N in order to withstand more highly corrosive environments. Because of their excellent pitting corrosion resistance, they are widely applied in desalination plants, oil and natural gas drilling and refining, flue gas desulfurization systems, and corrugated partitions in chemical tankers (Figure 9). Duplex stainless steels are even spreading to more general structures such as the Stonecutters Bridge in Hong Kong (Figure 10) and the roof of New Doha International Airport in Qatar.

Figure 9 : Corrugated partition members in a chemical tanker

Figure 10 : Stonecutters Bridge in Hong Kong

FCWs for duplex stainless steels include the newly-developed PREMIARC™ DW-2209 for standard duplex stainless steel, PREMIARC™ DW-2307 for lean duplex stainless steel and PREMIARC™ DW-2594 for super duplex stainless steel. Table 3 shows the chemistries of all weld metals and Table 4, the mechanical properties of DW-2307 and DW-2594, respectively.

Table 3 : Chemistries of all weld metals of FCWs for duplex stainless steels (mass%; 80%Ar-20%CO_2)

	C	Si	Mn	P	S	Cu	Ni	Cr	Mo	N	PRE
DW-2307	0.03	0.5	1.3	0.02	0.003	0.06	7.9	24.6	0.03	0.15	27.1
AWS A5.22 E2307TX-Y	≤0.04	≤1.0	0.5-2.5	≤0.04	≤0.03	≤0.75	6.5-10.0	22.5-25.5	≤0.8	0.10-0.20	-
DW-2594	0.03	0.5	1.2	0.02	0.004	0.03	9.6	25.8	3.8	0.24	42.2
AWS A5.22 E2594TX-Y	≤0.04	≤1.0	0.5-2.5	≤0.04	≤0.03	≤0.75	8.0-11.0	23.0-27.0	2.5-4.0	0.08-0.30	-

Note : PRE : Pitting Resistance Equivalent=Cr+3.3Mo+16N

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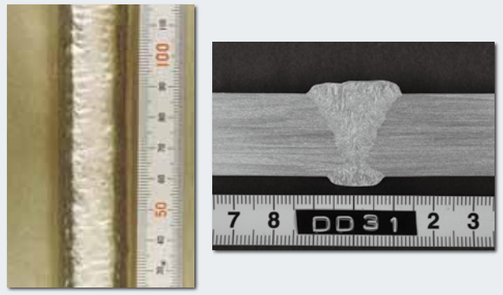
Table 4 : Mechanical properties of all weld metals of FCWs for duplex stainless steels

	Tensile properties			Notch toughness at 20℃(J)
	0.2%PS (MPa)	TS (MPa)	El (%)	
DW-2307	571	750	29	58
AWS A5.22 E2307TX-Y	-	≥690	≥20	-
DW-2594	712	900	25	60
AWS A5.22 E2594TX-Y	-	≥690	≥20	-

One feature of both duplex stainless steels and their associated welding consumables is the high N content, which may cause blow holes in weld metals, or pits and worm holes on weld metal surfaces when the high N dissolved in a molten metal does not remain within the solidifying weld metal in solid solution state. In Kobelco FCWs for duplex stainless steels, the flux components are optimized so as to resist gas cavities in spite of the high N content. Figure 11 shows the bead appearance and macrostructure of a butt joint by DW-2594 in the 3G position. No defect such as a worm hole or pit is visible.

Figure 11 : Bead appearance and macrostructure by DW-2594 in 3G position. (80%Ar-20%CO_2 shielding, 160A-26V)



3-3. Flux cored TIG rod “TGX series”

In root pass welding of stainless steel pipes by TIG rod, a back shield of pure Ar gas is usually required to prevent oxidation in the back bead, which could render it unsound. There are two common back shielding methods: whole pipe shielding and local weld zone shielding. However, with either method, the amount of time and Ar gas required for shielding is enormous and expensive.

In another example of Kobe Steel’s leading FCW design technology, the TGX series of FCW filler rods for TIG root pass welding eliminate the need for expensive back shielding. Another highlight is how they allow operators to work safely inside pipes without the danger of oxygen deficiency.

The flux inside the TGX filler rod produces an appropriate amount of slag that completely covers both the back and surface sides of the bead, protecting them from exposure to air and preventing oxidation even without a back shield. The slag covering both sides of the bead is easily removed with a light tap and leaves a beautiful bead as shown in Figures 12 and 13.

Figure 12 : Back bead of pipe back-bead welding by TGX wire

Figure 13 : Back bead (left) and surface bead (right)

Because the TGX series FCWs are seamless, they are handled in almost the same way as solid TIG rods.

In order to secure a sound back bead with TGX filler rod, it is essential to form a key hole during welding, so that a sufficient amount of molten slag will flow to the back side of the groove and cover the back side of the bead (Figure 14).

Figure 14 : How to maintain proper key hole

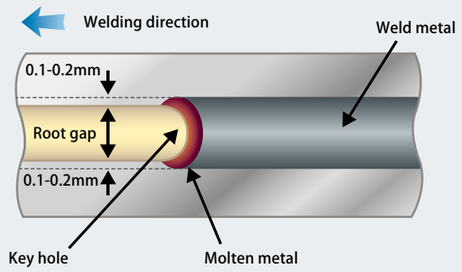


Table 5 shows the recommended groove shapes, based on the wall thickness and root gap.

Table 5 : Recommended groove shape for root pass welding by TGX filler rod

Groove shape	Single V (70℃) 1.0mm shoulder		
Wall thickness (mm)	4	6	10
Root gap (mm)	2.0	2.5	3.0

The feeding speed of TGX filler rod differs slightly from that of conventional TIG filler rod. It has to be fed at a high pace and little by little, with attention paid to not feeding too much at one time.

Since the TGX series were launched in the mid 1980s, they have been reputed as one of Kobelco’s benchmark products due to their reliability and for what they’ve achieved. To meet new market needs, the series has been expanded with PREMIARC™ TG-X2209 for duplex stainless steel as well as PREMIARC™ TG-X308L, TG-X316L, TG-X309L and TG-X347.

3-4. DW-T series, suitable for thin stainless steel sheet

Because the thickness ratio of thin sheets applied to stainless steel structures is much higher than to carbon steel structures, low current welding is more important in stainless steels than in carbon steels. In the past, 0.9 mm dia. FCWs or solid wires were mainly used. However 1.2 mm dia. FCWs have long been desired due to their reasonable cost and better availability. The DW-T series has been developed under these circumstances and is highly evaluated in the markets now.

The DW-T series, 1.2 mm dia. offers the following :

(1)Suitability for small leg length as shown in Figure 15 as well as low current welding as shown in Figure 16. Even 100A welding is possible.

(2)Thin sheet welding from 1.0 or 2.0 mm in thickness is possible whereas it was difficult with conventional 1.2mm dia. wires.

(3)Excellent arc re-start, eliminating the need for a wire edge cut at arc re-start during tack welding.

Figure 15 : Relationship between welding speed and leg length by DW-T series

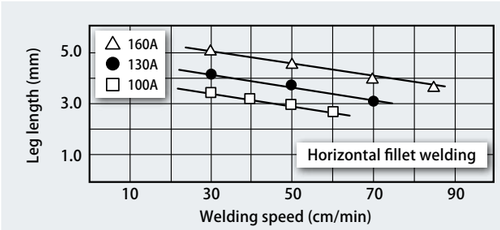
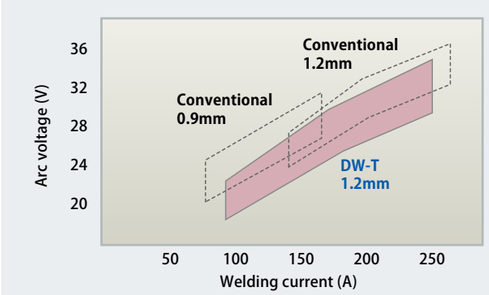


Figure 16 : Optimum welding parameter range of DW-T series



4 Postscript

As one of the most efficient welding processes, FCWs are forecast to spread further into ever more applicable fields; accordingly, new types of FCWs will have to be developed to meet future needs.

Kobe Steel’s FCWs for stainless steel are some of the most reliable welding consumables in the world and has been highly evaluated and supported from the markets as well. The designing and manufacturing technologies cultivated so far have been utilized for developing not only FCWs for stainless steels but also for nickel alloys as shown in Table 1.

The quite recently developed welding process of FCWs for stainless steels exploits pure Ar shielding gas. The extremely low spatter and low carbon content featured in this newly-developed process will be introduced in the next issue of KOBELCO WELDING TODAY.

References

【1】International Stainless Steel Forum (ISSF), Home Page

Strengthening the power of our staff members at three bases in China

Dear KWT readers, Ni-hao (Hello) from China! My name is Hideaki Osa, Sales General Manager of Kobe Welding of Tangshan Co., Ltd. (KWT) in Tangshan City, northeastern Hebei Province, China. Tangshan is located 180 km east of Beijing, the renowned capital of China and 150 km northeast of Tianjin, one of four direct-controlled municipalities of China. The city is quite famous for its iron and steel industry as well as for producing the famous "Tianjin" sweet roasted chestnuts. Although the sweet roasted chestnuts come from Tangshan, they are named for the city that exports them-Tianjin.

I was assigned to KWT in June, 2012, nearly a year ago. I felt bewildered at first as both my work and private life suddenly seemed unfamiliar. I'd had no experience of doing overseas business since joining Kobe Steel, Ltd. (KSL) and no experience of communicating in a foreign language. However after one year, I've been able to relax a bit because I understand a little more Chinese. And traveling to Beijing by myself from time to time and enjoying the delicious Japanese food there helps a lot as well.

KWT, which mainly manufactures and markets carbon steel solid wires for MAG welding, celebrated the tenth anniversary of its establishment last year. With 180 employees whose average age is 32 years old, it is still a young company. Rushing from place to place in this large country in order to increase sales as well as the market share, I've been visiting end-users together with regional agents in the daytime and strengthening our relationships by drinking Baijiu (distilled Chinese liquor) together at nighttime.

As part of our sales effort, KWT took part in the annual Beijing Essen Fair, held in Shanghai this year from June 18 to 21. Together with such other Kobe Group companies as the parent company KSL, Kobe Welding of Qindao Co., Ltd. (KWQ) and Kobe Welding of Shanghai Co., Ltd. (KWSH), we made a presentation of each company's core products. There were just under 1,000 exhibitors and well over 20,000 participants who gathered at the fair this year.

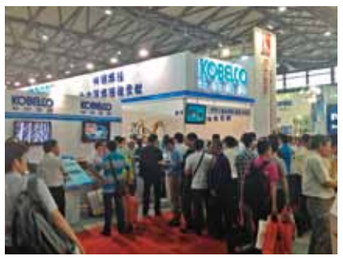
Mr Osa (front row and third from the left) and KWT staff members posing in front of the KWT entrance

All of the arrangements for the Kobe group's exhibitions, such as booth-lay out, display-panels, were prepared by the local three companies - KWT, KWQ and KWSH - unlike in previous years when everything had been prepared by KSL. Though time-consuming, it allowed the Chinese national staff members to experience the fulfillment of making plans and carrying them out. During the fair, the Kobelco Group held a meeting with all its agents and introduced the sales campaign for the coming July. At a small party afterwards, all attendants toasted with beer and wine and prayed for a successful campaign.

Although unfortunate news, such as last year's deteriorating China-Japan relationship and the PM2.5 air pollution problem, dominate headlines in China and elsewhere, our Chinese national as well as Japanese staff members at the three bases in China maintain close ties and help each other to build up a better production and sales organization. We aim to be called "the Kobelco Group, the first-class in China" by Chinese customers.

Zai Jian
(See you again)!

Posing in front of the Kobelco booth are Kobelco Group attendees at the 2013 Beijing Essen Fair in Shanghai



Many visitors showed interest in Kobelco's exhibits at the 2013 Beijing Essen Fair in Shanghai

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Leading a double life in Bangkok, Thailand and Bien Hoa, Vietnam is really exciting

Dear KWT readers! My name is Yohei Kakihara, Manager of Thai Kobe Welding (TKW) in Thailand. Since I was transferred to TKW last December, six months have already passed and I have come to enjoy my daily life at work as well as in private. As this is my first experience working abroad, I was puzzled at first by the differences in culture, life style and working.

I am also in charge of the Vietnamese market, and every month I spend half my time there and the other half in Bangkok.


The Ho Chi Minh Central Post Office is a representative building of the French colonial period.

TKW opened the TKW-Vietnam Office as a liaison office in Bien Hoa City last October. The capital of Dong Nai Province, the city has a population of about 800,000 and is located around 30 km east of Ho Chi Minh City. In the office, a total of six staff members (pictured at the top of the right side) are working hard to promote sales and increase market share of Kobelco welding consumables in Vietnam.

In our daily activities, "trial and error" is unavoidable to whatever we plan and do because we are still green at the job in Vietnam; however, we are sure to grow together as this old but young country develops under an atmosphere full of vigorous energy. Our goal is to contribute to the further growth of Vietnam through our activities as well as by providing useful products.


People's Committee Building-Ho Chi Minh City's prominent landmark


Mr Kakihara (far right), posing at the restaurant with all the staff members of Vietnam Office.

Let's take a look at Ho Chi Minh City, formerly called Saigon. It's only about an hour by car from the Bien Hoa office, but visiting that city, with its exotic atmosphere, makes my days off in Vietnam very attractive. On the streets of the city that used to be a French colony, quite a few buildings built in the colonial period still remain, and when I see them, I can feel like I'm in Europe. I can also see that the country is full of vitality wherever I go: roads are always full of motorcycles and pedestrians. I believe that it is the phenomenon peculiar to a developing country.

Dear readers, please join us for a visit to Vietnam and experience the energy of this country that is about to leap by large bounds. And it needs hardly be said that Vietnamese food is delicious, with many dishes a mix of Chinese, French and of course Vietnamese originals.