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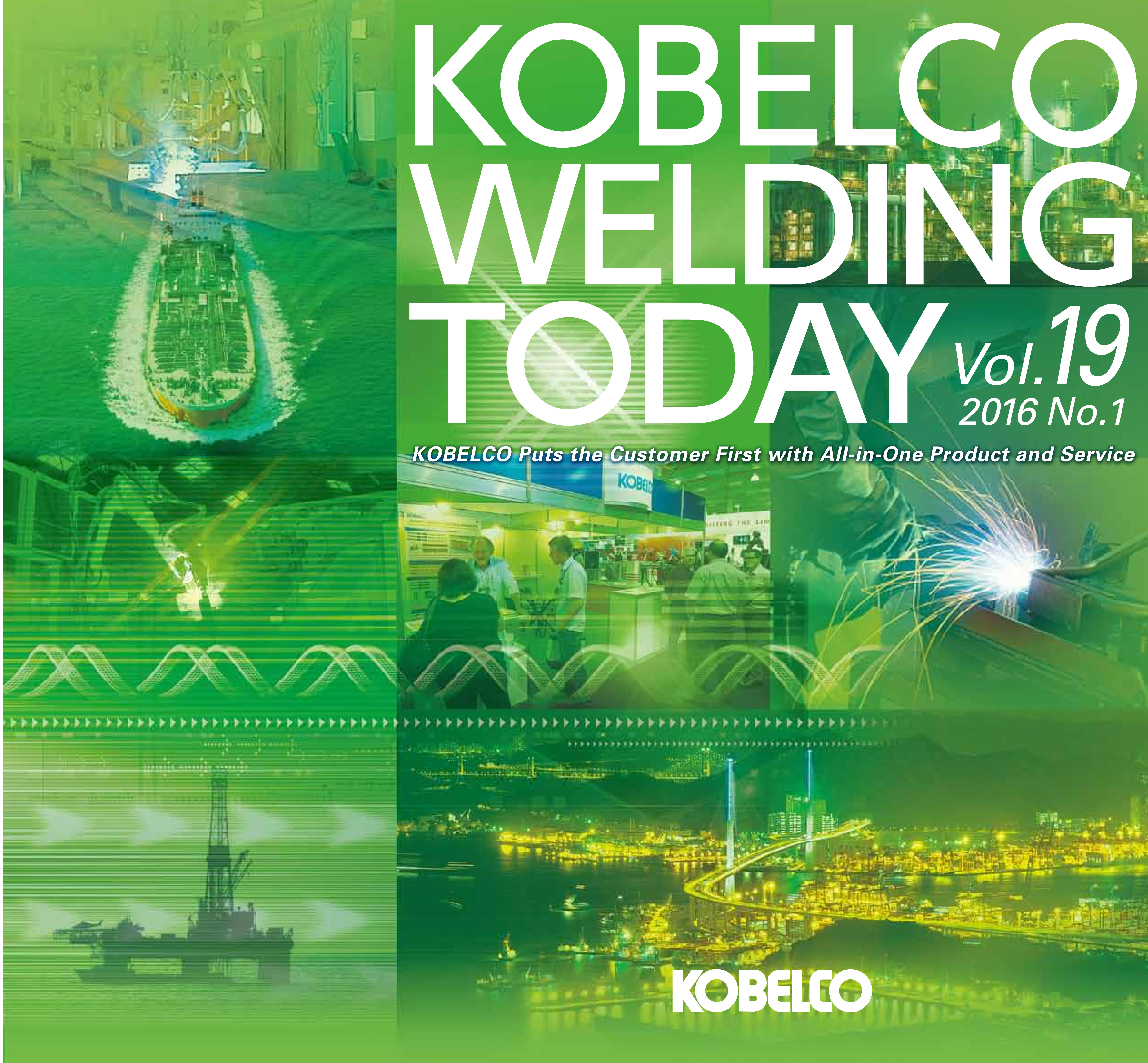

KOBELCO

Glossary

What is PWHT?

PWHT, short for Post Weld Heat Treatment, is the general term for heat treatment performed on the welds after welding. There is PWHT for stress relief (SR), normalizing, and quenching and tempering (QT).

SR reduces and redistributes the residual stresses in welds caused by welding by soaking them at a high temperature (500-700°C depending on the grade and composition of steel) for one hour for each 25mm of thickness in general and cooling them slowly.

The object of SR is to reduce the hardness by decreasing and equalizing the residual stresses in the welds and to raise the toughness by improving the quality of the welds. This will prevent the occurrence of cracks or even fractures in a welded structure that contains a crack.

It is, however, necessary to choose an appropriate temperature as well as soaking time, depending on the quality of the base materials, weld metals, steel plate thicknesses as well as structure sizes. Getting it wrong may cause temper embrittlement, SR cracking (Figure 1) and/or a decrease of whole structure strength. In particular, if the structure is too large to be put into a furnace for SR and local PWHT (on and around the weld metal) is performed, a temperature difference in the structure may result, which may generate new residual stresses. Detrimental effects of SR include distortion, temper embrittlement, over-softening, and SR cracking. Therefore, controlling the heating and cooling rates and holding the temperature tolerances and the times at temperature are extremely important. Careful planning in advance is essential.

Normalizing is the process by which a steel structure is hot-worked after being heated slightly above its upper critical temperature of 800 - 950°C and then air-cooled in order to improve ductility as well as toughness with a nominal tensile strength. If toughness has not improved after normalizing, a second PWHT can be performed. Normalizing is used at some plate mills, in the production of large forgings such as railroad wheels and axles and some bar products. Normalization can also eliminate dendritic segregation that may remain from the casting process.

QT is a PWHT process performed on high-quality heavy plates with requirements for high strength and toughness.

It consists of two stages: quenching and tempering. Quenching involves hardening, in which the steel plate is heated to approximately 800 to 950°C and then quickly cooled in water, oil, forced air or inert gases such as nitrogen (N). After the material is quenched in a quench unit to its hardest state, tempering is carried out to achieve greater toughness and ductility by decreasing hardness. The second stage, then, consists of tempering the material to obtain the desired material properties. Tempering involves heating the quenched material to below the critical point for a set period of time, then allowing it to cool in still air. Both the temperature and heating time depend on the composition of the material and will determine the amount of hardness removed. QT produces an extremely fine-grained and homogeneous microstructure. Quenched and tempered steel is characterized by high strength and good ductility.

PWHT has been regulated in Japanese Industrial Standard (JIS) Z-3700: 2009 as Methods of post weld heat treatment as well as in ASME Section I (Power Boilers), Section III (Nuclear Power Plant Components), Section VIII (Pressure Vessels), Section IX (Welding, Brazing, and Fusing Qualifications), B31.1 (Power Piping) and B31.3 (Process Piping).

Figure 1: Effect of PWHT, without stress relief (SR) (left) and with SR (right)

[Reference]

[1] Nondestructive Evaluation Center in JAPEIC (Japan Power Engineering and Inspection Corporation), Technical Review, Vol. 9 (2013)

Preface

New Year greeting from the Head of the Welding Business

Dear KWT readers! Wishing all of you and your families a happy and prosperous New Year! My name is Fusaki Koshiishi, the Head of the Welding Business. It is my great honor to convey my message to all of you at the beginning of 2016, and I'd like to express my heartfelt gratitude for your continuous patronage of Kobe Steel and KOBELCO products. Last year, both Kobe Welding of Korea Co., Ltd. (KWK) and Kobelco Welding of Europe B.V (KWE) in the Netherlands could mark their 20th anniversaries, thanks to your full support. Thank you very much indeed.

The new five-year mid-term management plans for all Kobe Steel groups will start from this year. At heart, our aim remains to pursue our business vision, which is **"to continue being the world's most reliable welding solutions company."** This is true even though our plan will also reckon with such issues as the deteriorating demand for welding consumables caused by the fall in crude oil prices and the subsequent stagnation in offshore drilling rig construction as well as by the economic slowdowns in China and other Asian countries.

In order for us to continue offering the most reliable welding solutions, we will focus our research and development on satisfying your welding needs; that is, on developing efficient and excellent welding products and highly functional robotic welding systems. At the same time, we promise to innovate through **monodzukuri** (production system innovation) as the best way to supply reliable products on time and to provide appropriate technical service, including recommending welding consumables and welding conditions that best match the structures and/or the components our users have under construction.

As in every year, I and other KOBELCO team members will be paying frequent visits to your countries or areas and are looking forward to engaging in direct communication with you. We'll be most interested in learning about your problems or difficulties or what concerns you may have with welding on these occasions.

By the way, 2016 is an Olympic Year, and the games will be held in Rio de Janeiro. I look forward, with a beer in hand, to cheering the athletes all over the world.

Lastly, I wish you all the best and a year filled with peace and good health.

Fusaki Koshiishi

The Head of the Welding Business and the Managing Director, Kobe Steel, Ltd.

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Welding duplex stainless steels

1 Preface

Duplex stainless steel, which has a dual-phase microstructure consisting of ferritic and austenitic grains, as shown in Photo 1, overcomes the weaknesses associated with two types of steel by offering higher resistance to stress corrosion cracking than austenitic stainless steel and better notch toughness than ferritic stainless steel. Duplex stainless steel plays an important role in such diverse applications as petro-chemical plants, chemical carriers, offshore structures and bridges as shown in Photos 2 and 3. This article will discuss the features of duplex stainless steels as well as their most suitable welding consumables.

Photo 1: Microstructure of duplex stainless steel

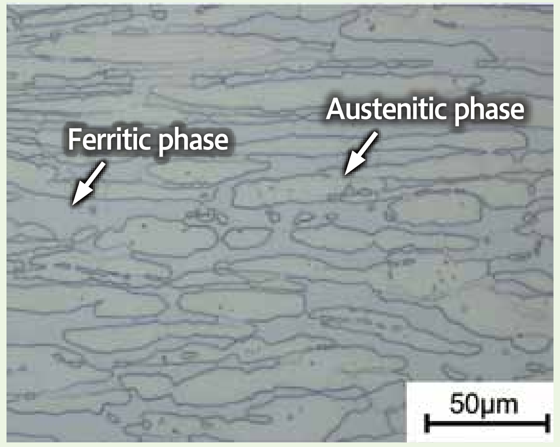

Photo 2:Chemical Tanker Bulkhead

Photo 3: Stonecutters Bridge main tower, rising over 175 m above sea level (Hong Kong)

2 Features of duplex stainless steels

The microstructure of duplex stainless steel shows that the austenitic grains have precipitated on a completely ferritic phase with a phase balance of approximately 50% ferrite and 50% austenite. As this condition is the most stable of microstructures, the features of duplex stainless steel can be highlighted.

In comparison with austenitic stainless steel, duplex stainless steel offers the following advantages:

- smaller thermal expansion coefficient and larger thermal conductivity,
- higher room temperature strength,
- excellent resistance against pitting corrosion and stress corrosion cracking;

but also some disadvantages:

- higher nitrogen (N) content
- larger microstructure transformation caused by heat treatment and easier property deterioration including corrosion resistance

The effects of microstructure transformation are particularly noticeable at the heat affected zone (HAZ) and will be discussed later.

Duplex stainless steel is produced mainly in three grades in relation to chemical compositions: standard, super and lean.

A. Standard duplex stainless steel: Composed of 22%Cr-5%Ni-3%Mo-0.15%Ni, it is literally the standard.
B. Super duplex stainless steel: Amounts of Mo and N are added to the standard in order to increase room temperature strength and pitting corrosion resistance.
C. Lean duplex stainless steel: Amounts of Ni and Mo are reduced from the standard in order to lower the cost.

Table 1 shows the typical chemical compositions of the three grades of duplex stainless steels. Figure 1 shows a relative comparison between tensile strength and the pitting corrosion resistance index [PREW=Cr+3.3 (Mo+0.5W)+16N] of various stainless steels. A larger PREW means better pitting corrosion resistance.

Figure 1: Relative comparison between tensile strength and pitting corrosion resistance index (PREW) of various stainless steels

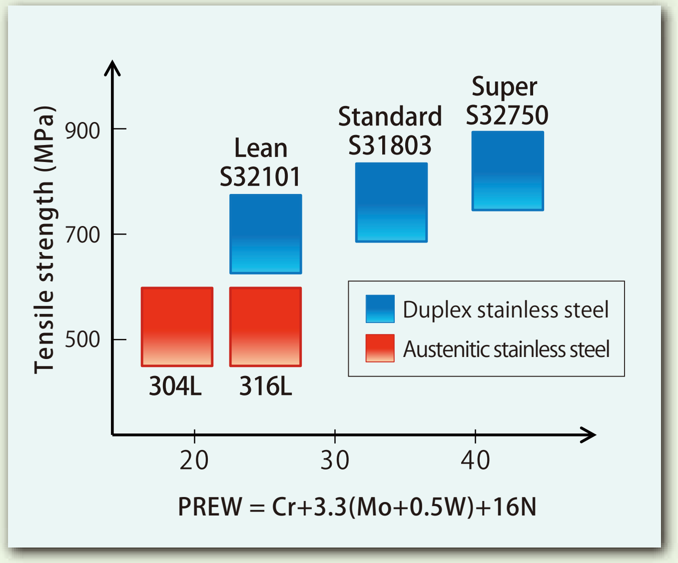

Table 1: Typical chemical compositions of duplex stainless steels(mass%)

Grade	UNS No.	C	Si	Mn	P	S	Cu	Cr	Ni	Mo	W	N	PREW※
Standard	S31803	0.02	0.5	1.5	0.02	0.001	0.4	22.1	6.0	3.0	-	0.12	33.9
	S32205	0.02	0.4	1.4	0.03	0.001	0.3	22.1	5.6	3.1	-	0.18	35.2
Super	S32750	0.02	0.4	0.7	0.02	0.001	0.1	25.6	7.0	3.8	0.1	0.28	42.8
	S32760	0.03	0.3	0.7	0.02	0.001	0.6	25.4	7.0	3.5	0.6	0.21	41.3
Lean	S32101	0.03	0.7	4.9	0.03	0.001	0.2	21.6	1.5	0.2	-	0.22	25.8
	S32304	0.02	0.5	1.5	0.02	0.001	0.2	22.7	4.7	0.3	-	0.10	25.3

※ PREW=Cr+3.3(Mo+0.5W)+16N

3 Features of the welded zone of duplex stainless steel

3.1 HAZ of duplex stainless steel

In duplex stainless steel, the dual phases of austenitic and ferritic grains are balanced in the heat treatment process. By contrast, at the HAZ of duplex stainless steel, pitting corrosion resistance and mechanical properties can deteriorate occasionally, because the phase balance and chemical compositions of the dual phases change in accordance with the cooling rate, which is influenced by welding heat input or plate thickness.

To be more precise, at the high temperature HAZ (HT-HAZ) close to the weld interface, the austenitic grains dissolve into the ferritic phase first and then precipitate as austenitic grains during the cooling process and create the dual microstructures at the end. However, when a high cooling rate occurs due to excessively low heat input, austenitic grain re-precipitation is delayed, and Cr carbides and/or Cr nitrides precipitate into the ferritic grains. As a result, a Cr-depleted layer will form around the HAZ, leading to a deterioration in corrosion resistance.

On the other hand, at the low temperature HAZ (LT-HAZ), away from the weld interface, a low cooling rate due to high heat input can cause ferritic grain coarsening and precipitation of the σ (sigma) phase, Cr-carbides, and Cr-nitrides, thereby decreasing corrosion resistance and notch toughness.

To conclude, the HT-HAZ requires relatively slow cooling so as to enable the austenitic grains to precipitate sufficiently, while the LT-HAZ needs much faster cooling so as to suppress the harmful precipitates from precipitating. Accordingly it is necessary to control the cooling rate to satisfy the requirements of both the HT-HAZ and LT-HAZ through appropriate weld heat input, pre-heating and interpass temperatures. (1)

3.2 Weld metal of duplex stainless steel

The weld metal of duplex stainless steel is adjusted to obtain the required properties in the as-welded condition as shown in Photo 4; in contrast to the stable distribution of the ferritic and austenitic phases in duplex stainless steel, in weld metal they are distributed much more haphazardly.

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Photo 4: Microstructure of duplex stainless steel weld metal

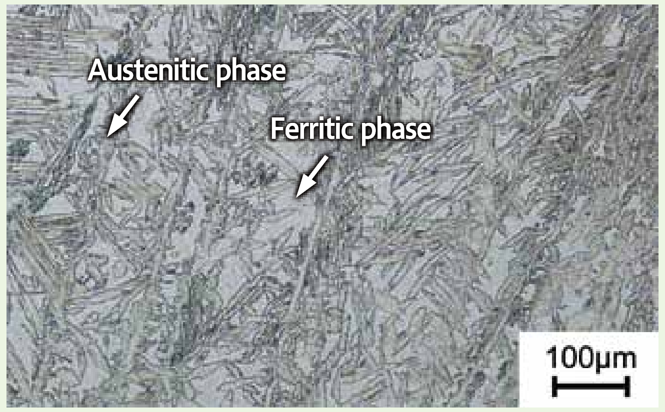
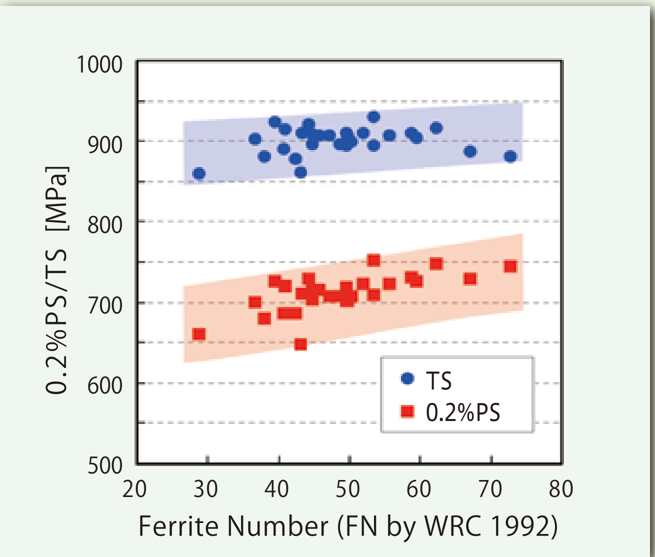


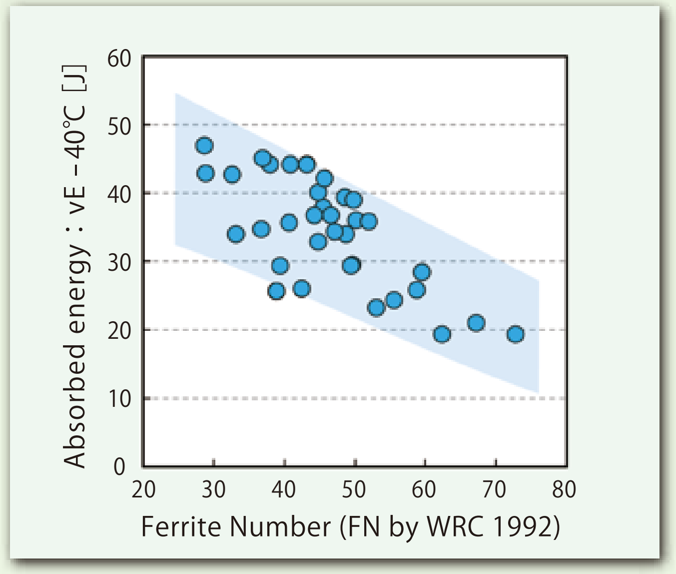
Figure 2: Correlation between FN and tensile strength/0.2% proof stress of E2594 type FCW weld metal



Figures 2 and 3 show the correlations between the ferrite number (FN), i.e. the ferrite content, and tensile strength/proof stress, and between the FN and notch toughness on the weld metal by the AWS E2594 type flux cored wire (FCW), respectively.

It can be seen in both figures that when the FN increases, room temperature strength improves while notch toughness declines. As the FN also influences pitting corrosion resistance, good mechanical properties as well as pitting corrosion resistance can be obtained by selecting the most suitable welding consumables and controlling welding procedures, including base metal dilution and/or the cooling rate, to put the weld metal FN within a range from 30 to 65. In addition, because the weld metal is less corrosion resistant than the base metal, which is produced through a process of thermal refining, it is designed to hold slightly higher amounts of alloying elements (higher PREW) than the base metal. The Ni content of the weld metal is also designed to be higher than that of the base metal in order to optimize the ratio of austenitic and ferritic grains under as-welded conditions in many cases. (2), (3)

Figure 3: Correlation between FN and notch toughness of E2594 type FCW weld metal



Because the weld metal FN influences mechanical properties as well as pitting corrosion resistance, it is important to check and control it. But how does one measure FN? Three methods are available: point counting, which utilizes microstructures; referring to the Welding Research Council's (WRC)-1992 diagram composed of chemical compositions; or using a Feritscope, which applies eddy current and magnetic induction. At welding sites, the point counting method is seldom applied as it is difficult to handle. When FN control is necessary for butt joint welding, the Feritscope is preferred to determine pass/fail.

Figure 4: Correlation of FN by Feritscope and WRC diagram

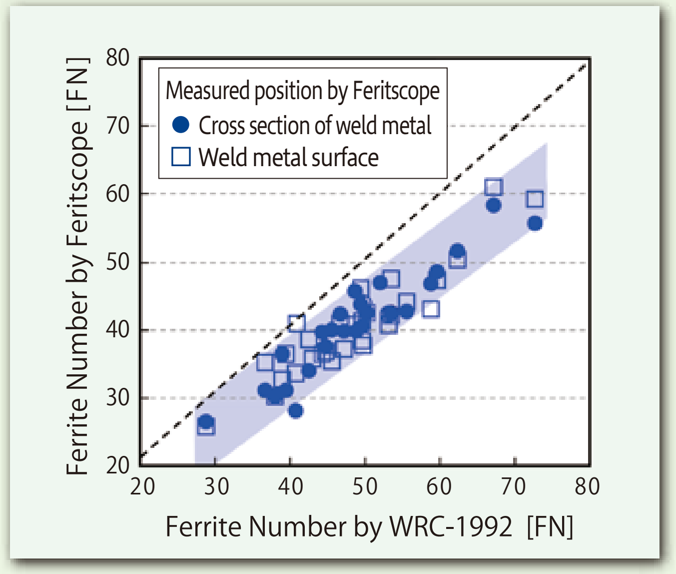


Figure 4 shows the correlation of measuring FN by Feritscope or by WRC diagram. It can be seen that FN by Feritscope is not exactly equal to that by WRC diagram. Therefore, special attention has to be paid, depending on what method is adopted.

4 Kobelco's duplex stainless steel welding consumables

Kobelco's duplex stainless steel welding consumables are available for all grades of duplex stainless steel and are listed in Table 2 together with their chemical compositions and mechanical properties.

A key factor in the design of welding consumables for duplex stainless steel is how to control for the relatively high amount of nitrogen (N), which frequently causes porosity problems such as blowholes, pits and elongated porosity as well as poor slag removal. It can also cause the radiographic property (X-ray property) in flux cored arc welding (FCAW) or shielded metal arc welding (SMAW) to fail in the horizontal or overhead positions. In order to counter the porosity problems, Kobelco's welding consumables are designed to increase N solubility by

Table 2: Typical properties of Kobelco's duplex stainless steel welding consumables

Grade	Welding process	Product name	AWS classification	Chemical compositions [mass%]									Mechanical properties				Remarks
				C	Si	Mn	Ni	Cr	Mo	N	PREW*1	FNW*2 (FN)	0.2%PS (MPa)	TS (MPa)	El (%)	vE0°C (J)	
Standard duplex stainless steel	GTAW	[P] TG-S2209	A5.9/A5.9M ER2209	0.008	0.39	1.67	8.7	22.7	3.10	0.16	35.5	51	598	773	39	270	DCEN, 100% Ar
	SMAW	[P] NC-2209	A5.4/A5.4M E2209-16	0.028	0.54	1.14	8.8	23.1	3.34	0.15	36.5	51	667	845	30	97	DCEP
	FCAW	[P] DW-329AP	A5.22/A5.22M E2209T1-1/-4	0.023	0.57	0.66	9.4	23.0	3.40	0.14	36.4	49	605	823	30	55	DCEP, 100% CO_2
	FCAW	[P] DW-2209	A5.22/A5.22M E2209T1-1/-4	0.028	0.61	0.74	9.1	22.7	3.30	0.13	35.6	46	639	820	28	73	DCEP, 80% Ar+20% CO_2
	SAW	[P] US-2209 / [P] PF-S1D	A5.9/A5.9M ER2209 (Wire)	0.021	0.31	1.56	8.9	23.0	3.28	0.15	35.9	57	618	798	29	69	DCEP
Super duplex stainless steel	GTAW	[P] TG-S2594	A5.9/A5.9M ER2594	0.019	0.44	0.57	9.3	25.0	3.82	0.28	42.0	42	721	870	31	286	DCEN, 98% Ar+2% N_2
	SMAW	[P] NC-2594	A5.4/A5.4M E2594-16	0.035	0.55	0.66	9.8	26.6	3.86	0.25	43.3	50	750	935	28	55	DCEP
	FCAW	[P] DW-2594	A5.22/A5.22M E2594T1-1/-4	0.026	0.50	1.18	9.6	25.7	3.79	0.24	42.0	49	712	905	27	55	DCEP, 80% Ar+20% CO_2
Lean duplex stainless steel	FCAW	[P] DW-2307	A5.22/A5.22M E2307T1-1/-4	0.026	0.45	1.26	7.9	24.6	0.03	0.15	27.1	41	571	750	29	58	DCEP, 80% Ar+20% CO_2

*1: PREW=Cr+3.3(Mo+0.5W)+16N *2: FNW=Ferrite Number by WRC 1992 Diagram [P] stand for PREMIARC™

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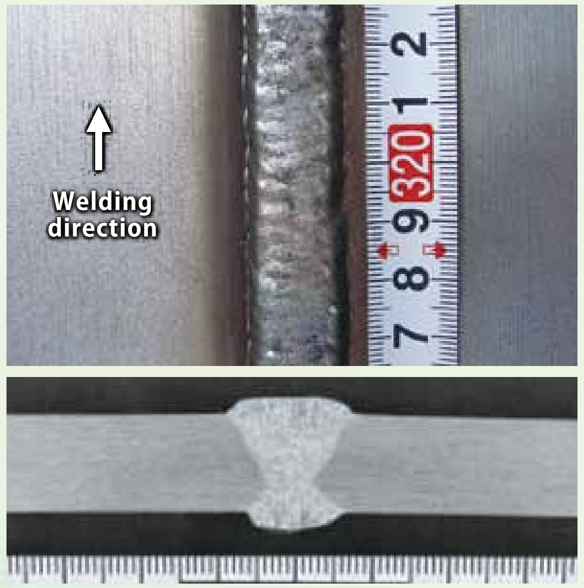
adjusting the weld metal chemical compositions and to optimize the slag solidification temperature and viscosity. Improving slag removability is necessary since N in the weld metal makes that difficult even though the slag generated from the slag forming components in the coating flux (on SMAW) or in the flux (on FCAW or SAW) covers the weld metal during welding. Poor slag removal may cause slag to remain here and there on the bead surface and may prevent smooth welding and/or cause slag inclusions. Kobelco welding consumables are therefore designed to optimize the slag forming components in the coating of covered electrodes and in the flux of FCWs and SAW fluxes for easy slag removal.

Photo 5 shows the bead appearance and macro-structure of a butt joint welded by FCAW with PREMIARC™ DW-2594. Photo 6 shows the same by SAW with PREMIARC™ US-2209 wire / PREMIARC™ PF-S1D flux.

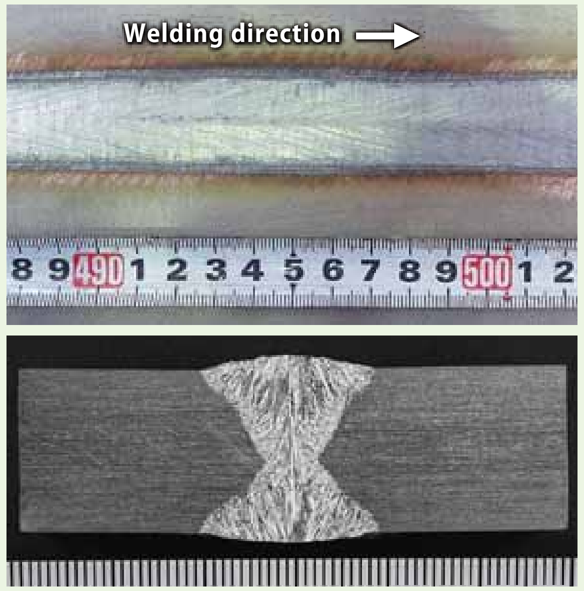
Kobelco duplex stainless steel welding consumables provide excellent mechanical properties (refer to Table 2), high pitting corrosion resistance and porous defect resistance as well as superb slag removability.

Photo 5: Bead appearance and macro-structure of DW-2594 butt joint (3G)



Note: 1. Welding position: Vertical upward (3G) 2. Current: 160A (DCEP)
3. Voltage: 26V 4. Shielding gas: 80%Ar-20%CO_2
5. Travel speed: 15cpm
6. Pass sequence: 2 passes/1st layer and 1 pass/2nd layer
7. Wire size: 1.2 ㎜ dia

Photo 6: Bead appearance and macro-structure of US-2209 / PF-S1D butt joint (1G)



Note: 1. Welding position: Flat (1G) 2. Current: 450A (DCEP)
3. Voltage: 32V 4. Travel speed: 35cpm
5. Pass sequence: 1 pass each/1st and 2nd layer
6. Wire size: 2.4 ㎜ dia

Table 3: Selection of duplex stainless steel welding consumables

	Welding consumable grade		2307type	2209type	2594type
Duplex stainless steel grade	Product name / Base metal	GTAW	—	TG-S2209	TG-S2594
		SMAW	—	NC-2209	NC-2594
		FCAW	DW-2307	DW-329AP DW-2209	DW-2594
		SAW	—	US-2209/PF-S1D	—
Lean	UNS S32101 UNS S32304		◎	○	○
Standard	UNS S31803 UNS S32205		×	◎	○
Super	UNS S32750 UNS S32760		×	×	◎

◎: Applicable welding consumables of similar composition metals
○: Applicable welding consumables
×: Not applicable

Table 4: Selection of dissimilar welding consumables

Duplex stainless steel grade	Carbon steel / Low alloy steel	Austenitic stainless steel	
		304L type	316L type
Lean	Types of 309L, 309MoL, 2307	Types of 309L, 309MoL, 2307	Types of 309MoL, 2307
Standard	Types of 309L, 309MoL, 2209	Types of 309L, 309MoL, 2209	Types of 309MoL, 2209
Super	Types of 309L, 309MoL, 2594	Types of 309L, 309MoL, 2594	Types of 309MoL, 2594

5 Selection of welding consumables

When welding duplex stainless steels, it is recommended to select the welding consumables of the same grade or higher, depending on the cases. For example, when welding standard duplex stainless steel, a welding consumable equivalent to AWS E2209 or E2594 (a higher grade) can be chosen. The selection guide is shown in Table 3.

In cases of dissimilar welding between carbon steel or austenitic stainless steel and duplex stainless steel, 309L or 309MoL welding consumables or those for duplex stainless steels are applicable. The selection guide is shown in Table 4.

6 Notes on usage

The welding procedures for duplex stainless steels are similar to those of austenitic stainless steels in general but special care should be paid in order to maximize their strengths.

6.1 Heat input limitation

The heat input limitation is common in all welding processes. However, duplex stainless steel contains higher amounts of Cr and Mo than usual. If weld metal cools down extremely slowly due to excessive heat input and remains in a temperature range of 700-800°C for a long time, it forms the σ (sigma) phase, which deteriorates notch toughness. On the other hand, when the cooling rate of the weld metal is too high due to extremely low heat input, Cr nitride precipitates at the HAZ close to the weld interface and, as a result, forms a Cr-depleted layer. This will cause corrosion resistance to deteriorate. Because the cooling rate also influences the amount of weld metal FN, it is necessary to avoid heat input that is too high or too low. The American Petroleum Institute (API) recommends heat input of 5 to 25 kJ/cm as its guideline. (4)

6.2 Shielding gas composition on GTAW

TIG welding usually adopts 100% Ar as the shielding gas for circumferential root pass welding of stainless steel pipes. However, if 100% Ar shielding gas is used for TIG welding with a solid filler rod for duplex stainless steel, the amount of N in the weld metal may be less than that in the TIG filler rod. This results when the N in the TIG filler rod does not completely transfer to the weld metal; instead, some of the N is discharged as N_2 gas from the molten pool inside.

This will cause excessive ferrite in the weld metal and/or a PREW drop, resulting in the possible deterioration of notch toughness and pitting corrosion resistance. In order to avoid such problems, it is recommended to add about 2% N_2 gas into the shielding gas, depending on the N content in the weld metal and/or base metal.

6.3 Prevention of hot crack on SAW

It should also be noted that duplex stainless steel welding consumables are more susceptible to hot cracks than standard austenitic stainless steel welding consumables except for fully austenitic stainless steel welding consumables. In this sense, there is a high risk of hot cracks with SAW, which applies high heat input in general. As the susceptibility to hot cracks is influenced by bead shapes as well, it is recommended to avoid narrow gap welding, large welding currents and high welding speeds. Such welding conditions must be confirmed thoroughly before actual welding takes place.

7 Postscript

The duplex stainless steels and their welding consumables available from Kobe Steel were discussed herein. It is forecast that the application of duplex stainless steels will be further expanded at home and abroad. It is desired that this article will be of assistance for welding duplex stainless steels.

[Reference]

(1) Welding Consumables for Super Duplex Stainless Steel: Journal of the Japan Welding Society, Vol. 80 (2011), No. 2
(2) Welding of duplex stainless steel: Welding Technology, February, 2011
(3) Weldability of Stainless Steels: Journal of the Japan Welding Society, Vol. 79 (2010), No. 6
(4) API Technical Report 938-C: Use of Duplex Stainless Steels in the Oil Refining Industry: American Petroleum Institute

Introducing the Asian Welding Federation (AWF)

You have heard of the Asian Welding Federation (AWF), haven't you? Established in 2004, it was formed by drawing together welding societies, institutes and associations in 13 countries including China, India, Indonesia, Iran, Japan, Korea, Malaysia, Mongolia, Myanmar, Philippines, Singapore, Thailand and Vietnam. Two organizations, the Japan Welding Engineering Society (JWES) and the Japan Welding Society (JWS) have been representing Japan since it was established. The main objectives of the AWF are defined in its charter, as stated below:

1. Standardization of welding skill and qualification
2. Promoting more exchange of scientific and technical information in welding and transfer of welding knowledge and skills
3. Developing a formal structure to promote and guide AWF members towards a common welding standard
4. Defining common guidelines for the education, training, qualification and certification of personnel in welding and its related technology, etc.
5. Increasing welder qualification and efficiency
6. Serving as a common and united front in international welding affairs and standardization in welding practices
7. Increasing the strength of Asia in influencing international welding standards

The AWF meeting is held every half a year. I took part in the one held in Surabaya, Indonesia, from October 20 to 24, 2015. Surabaya is the capital of East Java Province, the second-largest city in Indonesia after Jakarta, and a major industrial center.

Recently, one of the biggest concerns of the AWF is the start of a Common Welder Certification Scheme (CWCS) in order to realize the objectives 1, 4 and 5, mentioned above, and all member countries have been working on it. Hence, we discussed the current status of preparation as well as some issues raised by member countries.

I also took part in the Task Force on Standardization, which was chaired by Mr Suzuki, my colleague at Kobe Steel. In that meeting, trends related to Indonesian standards were discussed and Vietnamese standards were introduced even though the Vietnamese presenter could not attend. The discussion of trends in Vietnamese standards will be resumed next time, when a representative from Vietnam is present. The chairman presented a progress report on standardization between China and Japan called "A Report of Bilateral Meeting concerning Welding Materials Standards," which proceeded under approval of the AWF.

The next AWF meeting will be held in Osaka, Japan between April 13 and 16, 2016 in parallel with The Japan International Welding Show. At that meeting, the CWES operation will be discussed further, and the Task Force on Standardization will discuss trends in the standards of AWF members as well as progress in developing and/or revising International Organization for Standardization (ISO) standards. It will be important to develop a mutual consciousness that encourages AWF members to move towards a common welding standard.

During my first experience to participate in an AWF meeting, I noticed how difficult it was for every country to agree on a consensus, because each country's welding organization(s) has its own way of thinking that is quite different from others. It must be the reason that progress toward achieving the AWF's objectives over the past ten years has been in slow. Therefore, it is important that we adopt a patient approach with consistent leadership.

Reported by
Hiroshi Saito
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Group photo of the 24th AWF Governing Council Meeting in Majapahit Hotel Surabaya, Indonesia
(Mr Saito, standing 3rd row and 3rd from the right)

Bulletin

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Cheerful and friendly, Brazilians, think positively about their economic future

Brazil Welding Show 2015, the biggest welding show in Brazil, was held at Expo Center Norte in Sao Paulo from 20 - 23 October. Launched in 2011, this was the third time the show, held every other year, has been held.

Around 2000, when the booms in the BRIC (Brazil, Russia, India and China) nations broke out, foreign affiliated companies rapidly set up operations in Brazilian cities, especially Sao Paulo. The city had become major metropolis, with a population of 11 million. The greater metropolitan area of Sao Paulo, the largest in Brazil as well as the southern hemisphere, has a population of about 20 million. It is also now one of the world's biggest industrial areas. According to the Global Cities Index, a study that ranks cities in terms of business activity, human capital, information exchange, cultural experience and political engagement, Sao Paulo was ranked No. 34 in the world and No.1 in Brazil, surpassing Rio de Janeiro, Brazil's capital with a population of 6 million, which was ranked No. 56 in the world.

Because Brazil Welding Show is a joint-exhibition with Corte & Conformação, the largest exhibition of metal forming and fabricating in South America, welding products as well as machine tools were on display. In the Brazil Welding Show, about 60 companies had booths, including welding consumable manufacturers, power source makers, robotic welding machine producers and agents, while there were about 120 companies, including cutting machine makers, at the Corte & Conformação. Representing the Kobelco Group, Kobelco Welding of America Inc. (KWAI) took part in the Welding Show for the first time in four years since the 1st Brazil Welding Show, with the aim of helping the Kobelco brand penetrate the South American market. On display at the Kobelco booth were samples of products already exported to this market, such as stainless steel flux cored wires, as well as panels that attracted many visitors including those from the neighboring countries of Chili and Peru.

In general, the national character of Brazilians is recognized as being cheerful, open-minded and friendly; Brazil is also well-known as being pro-Japanese because the population includes about 1.5 million of Japanese descent. In my conversations with Brazilian visitors at our booth, I found them bright, friendly and also positive thinking. It seems to me that they were confident rather than worried about economic recovery even though the recent economic situation in Brazil is not as energetic as it was due to political issues and the fall in prices of natural resources.

Brazil is the largest nation in Central and South America with land area of about 8.51 million km^2. It is the fifth-largest country in the world, 22.5 times bigger than Japan, and its population of about 200 million is ranked fifth in the world. Rich in natural resources and one of the largest agricultural producers (particularly of grains and meat), the country now has the seventh-largest gross domestic product (GDP) in the world. It is widely accepted that Brazil possesses great potential power in spite of the recent economic slowdown.

In this large country, we wish to provide Kobelco's high quality welding consumables in order to satisfy customer requirements and enhance the country's technical infrastructure, under our vision that states: "We aim to continue being the world's most reliable welding solutions company."

We look forward to seeing KWT readers at the next Brazil Welding Show in two years. Please drop by the Kobelco booth then. Até breve, Obrigado! (See you again!)

Reported by
Ryusaku (Ray) Yanagimoto,
National Marketing Manager, KWAI


Entrance of Brazil Welding Show and Corte & Conformação


Posing in front of Kobelco booth are all attendants of KWAI
(Mr Yanagimoto, at the extreme left)