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Round Robin Test: Analysis of trace components in 2.25Cr-1Mo steel weld metal IIW/C-II/SC-E

An overview of three round-robin tests (RRTs) at the International Institute of Welding (IIW) was discussed in KOBELCO WELDING TODAY Vol. 18, No. 3 issue (KWT18-3), 2015. Here, we detail the progress of the first round-robin test on the reproducibility of analysis of trace elements in 2.25Cr-1Mo-V heat resistant steel weld metal. It was originally proposed at the E-subcommittee (SC-E) of the second committee (C-II) of the IIW intermediate meeting in 2010.

Because 2.25Cr-1Mo-V weld metal easily suffers embrittlement, reheat cracking is a common problem. Several formulas, such as the Watanabe Factor (or J-Factor), Bruscato Factor (or X-bar) and K Factor, for estimating the possibility of embrittlement by using precisely analyzed trace elements have been proposed. These three factors consist of mainly As, Sb, Sn, Pb, P and Bi as trace components and hence, accurate analysis in parts per million (ppm) of these elements is extremely important. The three factors are shown as below:

Watanabe Factor (J)=(Si+Mn)×(P+Sn)×10^4 (in wt %)
Bruscato Factor (X)=(10×P+5×Sb+4×Sn+As)/100 (in ppm)
K Factor =Pb+Bi+0.03×Sb (in ppm)

If the J-Factor is less than 180 or the X-bar, less than 15 or 20, the risk of temper embrittlement of the weld metal is considered to be low. If the K Factor is less than 1.5, the risk of reheat cracking is also considered to be low.

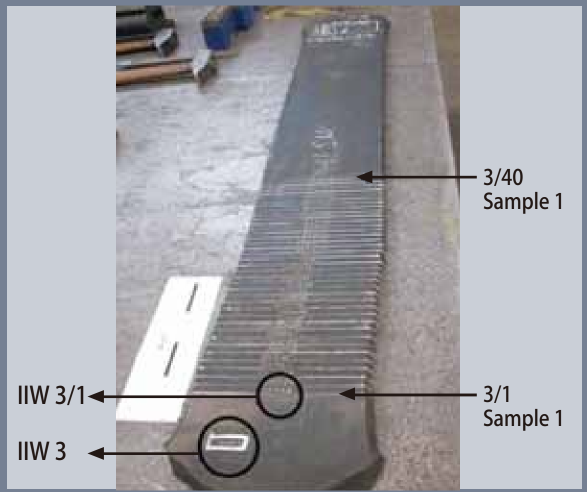
The RRTs found that both the Watanabe and Bruscato Factors are easily reproducible through conventional analysis methods. As for the K Factor, however, three RRTs failed, and a fourth RRT had to be carried out due to contamination caused during the cutting of test samples before collecting chips from them.

Kobe Steel has suggested an additional way to address the issue, namely, that Inductively Coupled Plasma Mass Spectrometry (IPC-MS) would serve as a better analytical tool due to its accuracy and excellent reproducibility in analyzing trace elements. With this method, pre-treatment of test samples with a sulfuric and phosphoric acid mixture is indispensable. In addition, the ICP-MS usually requires calibration with a standard material before analysis. For example, Kobe Steel utilized The National Institute of Standards and Technology (NIST) - Standard Reference Material (SRM) 361 - for its calibration before analysis.

Preparation of test samples is equally crucial because it was discovered that Pb contamination into test samples was caused by the electrical discharge machining (EDM) method.

From these results, Kobe Steel has concluded that ICP-MS should be used to reproduce Pb and Bi analysis at a level of 1 ppm or less.

We hope that in the near future, these findings will be published in the journal Welding in the World or as a Technical Report (TR) document with the International Organization for Standardization (ISO).



Test pieces used for RRTs

Reactor made of 2.25Cr-1Mo heat resistant steel

Upon starting the mid-term management plan KOBELCO VISION "G+"

Dear KWT readers! My name is Manabu Nagata, the Head of Technical Center. I'd like to express my heartfelt gratitude for your continuous patronage of Kobelco group products. In the Kobelco group, a new mid-term management plan called KOBELCO VISION "G+" just got started in April. Instead of being a three-year plan, it has been devised as a five year mid-term plan. Therefore, we expect that we can maintain a longer and wider scope than before, monitor the plan's progress and manage it with appropriate modifications along the way. Let me discuss the more detailed strategic points in the Welding Business, particularly with regard to the technical development plans.

In the new mid-term management plan, we will focus on developing never-before-performed technologies, especially welding automation. By "never-before-performed," we mean that the abilities and experiences of skilled technicians are to be installed in robotic systems and machines and reproduced through them. While such ideas as the Internet of Things (IoT), Information and Communication Technology (ICT) and Artificial Intelligence (AI) seem new, we have long been cultivating robotic technologies that are closely related. I believe that by activating these concepts and combining them with new sensor technologies, we will be able to realize automation with high applicability. Some immediate targets of these developments include shipbuilding and steel framed buildings, but they will be expanded to other industrial fields with technologies that enable highly efficient weld joints more simply. Not many welders with excellent skill can be found worldwide. Therefore, such newly developed products will surely prove helpful to a wide range of customers.

We will continue developing excellent, high quality welding consumables. The required functions and properties may vary, depending on what structures get built and where they are located. However, with our global networks and the excellent information they deliver, we can provide you with the best-suited products by utilizing the capabilities of our globally-established production bases to the maximum.

In April 2016, the Japan International Welding Show as well as international meetings were held in Japan. With these opportunities, we were able to exhibit new technologies and products; at the same time, Kobelco members would like to pay a direct visit to your country or region to discuss your needs and problems and how our technologies and products can improve your welding. Whether or not we can achieve our new mid-term management plan depends on whether we can appropriately respond to your needs. It is essential for us to keep the cycle "needs→response→improvement" rotating and accumulating your feedback. Thus, we can deepen our activities further, along with our business vision "to be the world's most reliable welding solution company."

Manabu Nagata
The Head of Technical Center
Welding Business
Kobe Steel, Ltd.

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Recent developments of AWS specifications

Traditionally, the American Welding Society (AWS) established its specifications for carbon steel welding consumables separately from those for low alloy steel. AWS specifications for welding consumables were also independent from those of the International Organization for Standardization (ISO). Recently, however, the AWS has changed direction and has begun developing unified specifications. In this article, the latest developments in AWS specifications are discussed.

1 Integration of AWS specifications

As mentioned, AWS specifications for carbon steel and low alloy steel welding consumables had been specified individually until recently. A new move to unify the specifications of the different kinds of welding consumables has been discussed and concrete actions to do so have started, as shown in Table 1.

Table 1: Move toward integrating AWS specifications

Kinds of welding consumables	Conventional specifications		New specifications to be integrated
	Carbon steel	Low alloy steel	
Covered electrode	A5.1	A5.5	Planning
Solid wire	A5.18	A5.28	In preparation
Flux cored wire	A5.20	A5.29	A5.36

In order to unify the specifications, it has been decided to adopt an open classification system in which a welding consumable should be classified by optional selection of such properties as tensile strength, notch toughness testing temperature and chemical composition. One drawback of the conventional system, for example, was that a new product with higher strength than and with the same chemical composition range as a conventional product but without a corresponding classification had to be classified as a grade "G" because of the fixed classification system where the above-mentioned properties were fixed in accordance with classifications.

AWS A5.36/A5.36M:2012 "Specification for Carbon and Low-Alloy Steel Flux Cored Arc Welding and Metal Cored Electrodes for Gas Metal Arc Welding" was published in 2012 as the first integration of two AWS specifications. The schedule to issue integrated specifications of solid wires as well as covered electrodes will be determined, judging from how A5.36 makes progress in becoming familiar.

1.1 Flux cored wires

A5.36 published in 2012 is currently under modification in order to prepare for the second edition. It contains not only A5.20 (Specification for Carbon Steel Electrodes for Flux Cored Arc Welding) and A5.29 (Specification for Low-Alloy Steel Electrodes for Flux Cored Arc Welding) but also metal cored wires that were contained in A5.18 (Specification for Carbon Steel Electrodes and Rods for Gas Shielded Arc Welding) and A5.28 (Specification for Low-Alloy Steel Electrodes and Rods for Gas Shielded Arc Welding). Figure 1 shows the integration scheme of flux cored wires (FCWs) including metal cored wires and solid wires (or bare wires).

Figure 1: Integration scheme of FCWs and solid wires

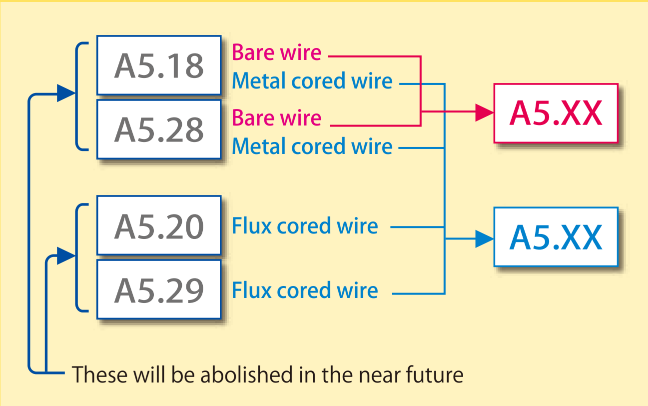

Figure 2 shows classification and designation according to A5.36. They are to be classified by choosing appropriate properties in each category. However, some classifications and designations, such as E71T-1C, that have widely been used and may cause inconveniences if suddenly abolished, may continue to apply the conventional fixed classification system (see Table 2).

It was planned at the beginning that A5.20 and A5.29 would be abolished and transferred to A5.28 in 2015; however, that was changed so that both A5.20 and A5.29 as well as A5.28 may continue to exist because of the delay in the transfer.

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Figure 2: Classification symbols and designators (Excerpt from AWS A5.36)

E X X T X - X X X - X - X H X

Designates an electrode.

Tensile Strength Designator. For A5.36 one or two digits indicate the minimum tensile strength (when multiplied by 10 000 psi) of weld metal deposited with the electrode under the welding conditions specified in this specification. For A5.36M two digits are used to indicate the minimum tensile strength (when multiplied by 10 Megapascals [MPa]). See Table 2.

Position Designator. This designator is either "0" or "1." A "0" is for flat and horizontal positions only. "1" is for all positions (flat, horizontal, vertical with downward progression, and/or vertical with upward progression and overhead).

Usability Designator. This letter is the letter "T" followed by some number from 1 through 17 or the letter "G." The letter "T" identifies the electrode as a flux cored electrode or metal cored electrode. This designator refers to the usability of the electrode with requirements for polarity and general operating characteristics (see Table 4). The letter "G" indicates that the polarity and general operating characteristics are not specified. An "S" appears at the end of this designator when the electrode being classified is intended for single pass welding only.

Shielding Gas Designator. Indicates the type of shielding gas, if any, used for classification (see Table 5). The letter "Z" in this position indicates that the shielding gas composition is as agreed upon between supplier and purchaser. When no designator appears in this position, it indicates that the electrode is self shielded and that no external shielding gas is used.

Designates the condition of heat treatment in which the tests were conducted. "A" is for as-welded and "P" is for postweld heat treated. The time and temperature of the PWHT is specified in 9.2.1.2 and Table 8. The letter "G" in this position indicates that the PWHT procedure is as agreed upon between supplier and purchaser. This designator omitted when the electrode being classified is intended for single pass welding only.

Impact Designator. For A5.36 this designator indicates the temperature in °F at or above which the impact strength of the weld metal referred to above meets or exceeds 20 ft·lbf. For A5.36M this designator indicates the temperature in °C at or above which the impact strength of the weld metal meets or exceeds 27 J. The impact designator may be either one or two digits (see Table 3). A "Z" in this position indicates that there are no impact requirements for the electrode classification. This designator is omitted when the electrode being classified is intended for single pass welding only. A "G" in this position indicates the impact requirements are not specified but are as agreed upon between purchaser and supplier.

Deposit Composition Designator. One, two or three characters are used to designate the composition of the deposited weld metal (see Table 6). The letter "G" indicates that the chemical composition is not specified. No designator used in this position when the electrode being classified is a single pass electrode.

Optional Supplemental Designators[b]

Optional, supplemental diffusible hydrogen designator (see Table 13).

For flux cored electrodes, the letter "D" or "Q" when present in this position indicates the weld metal will meet supplemental mechanical property requirements with welding done using low heat input, fast cooling rate procedures and using high heat input, slow cooling rate procedures as prescribed in Clause 16 (see Tables 9 and 10).

[a] The combination of these designators constitutes the flux cored electrode classification.
[b] These designators are optional and do not constitute a part of the flux cored or metal cored electrode classification, as applicable.

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Table 2：Fixed classification (Excerpt from AWS A5.36)

Source Specification for Electrode Classification & Requirements	Classification Designation[b,c]	Electrode Type	Shielding Gas[d]	Weld Deposit Requirements: Wechanical Properties[e]	Weld Deposit[f]
AWS A5.20/A5.20M	E7XT-1C[g]	Flux Cored	C1	Tensile Strength: 70 ksi-95 ksi Minimum Yield Strength: 58 ksi[i] Min. Charpy Impact: 20ft-lbf @ 0°F Minimum % Elongation: 22%[j]	CS1
	E7XT-1M[g]		M21		
	E7XT-5C[g]		C1	Tensile Strength: 70 ksi-95 ksi Minimum Yield Strength: 58 ksi[i] Min. Charpy Impact: 20 ft-lbf @ -20°F Minimum % Elongation: 22%[j]	CS1
	E7XT-5M[g]		M21		
	E7XT-6[g]		None		GS3
	E7XT-8[g]				
	E7XT-9C[g]		C1		CS1
	E7XT-9M[g]		M21		
	E7XT-12C[g]		C1	Tensile Strength: 70 ksi-90 ksi Minimum Yield Strength: 58 ksi[i] Min. Charpy Impact: 20 ft-lbf @ -20°F Minimum % Elongation: 22%[j]	CS2
	E7XT-12M[g]		M21		
	E70T-4[g]		None	Tensile Strength: 70 ksi-95 ksi Minimum Yield Strength: 58 ksi[i] Min. Charpy Impact: Not Specified Minimum % Elongation: 22%[j]	GS3
	E7XT-7[g]				
AWS A5.18/A5.18M	E70C-6M[h]	Metal Cored	M21	Tensile Strength: 70 ksi minimum Minimum Yield Strength: 58 ksi[i] Min. Charpy Impact: 20 ft-lbf @ -20°F Minimum % Elongation: 22%[j]	CS1

[a] These multiple pass electrodes are classified according to the fixed classification system utilized in AWS A5.20/A5.20M or A5.18/A5.18M, as applicable, which has been carried over for these specific electrodes as a part of AWS A5.36/A5.36M. The mechanical property and weld deposit requirements are as defined in this table. These same electrodes may also be classified to the same requirements or to different requirements using the open classification system introduced in this specification. In this case, the classification designations are as prescribed in Figure 1. See Table A.1 or Table A.3, as applicable, in Annex A for comparisons of the "fixed classification" designations and equivalent "open classification" designations for the above electrodes when both are classified to the requirements listed in this table.

[b] Under AWS A5.20/A5.20M, the "E" at the beginning of the classification designates an electrode. The "7" is the tensile strength designator. The "X" indicates the electrode's position of welding capability. A "0" is used to indicate flat and horizontal only. A "1" is used to indicate all position capability. The "T" identifies the electrode as a flux cored electrode The one or two digit number after the dash indicates the electrode's usability characteristics as defined in AWS A5.20/A5.20M. For the open classification system introduced in this A5.36/A5.36M specification, the "T" identifies the electrode as either a flux cored or a metal cored electrode. The "T" is combined with a one or two digit number as a part of the alpha-numeric designator for usability. See Table 4. Under AWS A5.18/A5.18M for classification E70C-6M, the "E" designates an electrode. The "70" indicates that the weld deposit will have a minimum tensile strength of 70 ksi. The "C" indicates that the electrode is a composite (metal cored) electrode. The "6" indicates the composition of the weld deposit produced with this electrode. The "M" indicates the type of shielding gas used.

[c] The electrodes shown in the shaded panels are self shielded.

[d] See Table 5.

[e] Mechanical properties are obtained by testing weld metal from the groove weld shown in Figure 2. Welding and testing shall be done as prescribed in this specification. The requirements for welding and testing are the same as those given in A5.20/A5.20M. All mechanical property testing for the classifications listed in this table shall be done in the as-welded condition.

[f] See Table 6.

[g] The "D," "Q," and "H" optional designators, which are not part of the electrode classification designation, may be added to the end of the designation as established in AWS A5.20/A5.20M, i.e., E7XT-XXD, E7XT-XXQ, E7XT-XXHX, E7XT-XXDHX, or E7XT-XXQHX, as applicable. The "J" optional, supplemental designator listed in A5.20/A5.20M is no longer required. The open classification system introduced in this A5.36/A5.36M specification eliminates the need for this designator.

[h] The "H" optional, supplemental designator, which is not part of the electrode classification designation, may be added to the end of the designation as established in AWS A5.18/A5.18M, i.e., E70C-6MHZ. Provisions for the "D" and "Q" optional, supplemental designators have not been established in A5.18/A5.18M and, as a result, may not be used with the E70C-6M designation. However, that does not preclude their use with metal core electrodes classified utilizing the open classification system under the A5.36/A5.36M specification.

[i] Yield strength at 0.2% offset.

[j] Percent elongation is in 2 in [50 mm] gage length when a 0.500 in [12 mm] nominal diameter tensile specimen and nominal gage length to diameter ratio of 4:1 is used.

1.2 Solid wires

As shown in Figure 1, a new standard that would allow solid wires specified in both A5.18 and A5.28 to be integrated into one standard is under preparation. As in the case of FCWs, a strategy in which major parts are in open classification but some, in fixed classification, is planned to be approved. It is expected that the newly established standard may be published after 2020.

1.3 Covered electrodes

Although it has not been started yet, there are plans to establish an integrated standard.

2 Harmonization (or Matching) with ISO standards

The ISO standards are renowned worldwide as international standards of welding consumables. Table 3 shows ISO standards for welding consumables established by September 2015. Because AWS participated in establishing these ISO standards, the content of some AWS specifications matches with corresponding ISO standards. This trend whereby a product conforming to an AWS specification can be accepted as one that also conforms to an ISO standard will enable welding consumables to be utilized across borders and may lead to more effective and convenient distribution.

Matching domestic standards/specifications with international ones was one of the aims of the Technical Barriers to Trade (TBT) Agreement that was established and made effective in January 1995 by the World Trade Organization (WTO).

2.1 Aluminum

AWS A5.10/A5.10M:2012 "Welding Consumables — Wire Electrodes, Wires and Rods for Welding of Aluminum and Aluminum-Alloys — Classification" has already been established as one that matches with ISO 18273:2004 (the same title).

2.2 Stainless steel

AWS A5.9 is under modification as an AWS specification that matches with ISO 14343:2009 "Welding consumables--Wire electrodes, strip electrodes, wires and rods for arc welding of stainless and heat resisting steels--Classification."

2.3 Ni alloy

AWS A5.14 is under modification as an AWS specification that matches with ISO 18274:2010 "Welding consumables--Solid wire electrodes, solid strip electrodes, solid wires and solid rods for fusion welding of nickel and nickel alloys--Classification."

2.4 Cases in which mechanical properties are listed in the requirements

Although the above-mentioned three specifications (Al, stainless steel and Ni alloy) require chemical compositions only, many other specifications for welding consumables list the requirements of mechanical properties. Two cases follow in which the AWS and ISO specifications remain different and unification has not yet been carried out.

Table 3: Current status of ISO standards

	Mild & fine-grained steel	High tensile strength steel	Heat resistant steel	Stainless steel	Ni & Ni-alloy	Cast iron	Al & Al alloy	Cu & Cu alloy	Ti & Ti alloy
Covered electrode	ISO 2560	ISO 18275	ISO 3580	ISO 3581	ISO 14172	ISO 1671	—	ISO 17777	—
FCW	ISO 17632	ISO 18276	ISO 17634	ISO 17633	ISO 12153		—	—	—
TIG welding consumable	ISO 636	ISO 16834	ISO 21952	ISO 14343	ISO 18274		ISO 18273	ISO 24373	ISO 24034
Solid wire	ISO 14341								
Combination of SAW wire and flux	ISO 14171	ISO 26304	ISO 24598			—	—	—	—
SAW flux	ISO 14174					—	—	—	—
Shielding gas	ISO 14175								
Filler rod for gas welding	—	—	—	—	—	ISO 1071	—	—	—

2.4.1 Groove configuration for all deposited metal on FCWs and solid wires

Figure 3 shows the groove configuration for all deposited metal on FCWs and solid wires and Table 4, the differences in AWS and ISO specifications.

However, as the difference in groove configurations, as shown in Table 4, is small and has only minor influence on mechanical properties, it is likely that AWS will accept the same groove shape as that of the ISO in the future.

Figure 3: Groove configuration

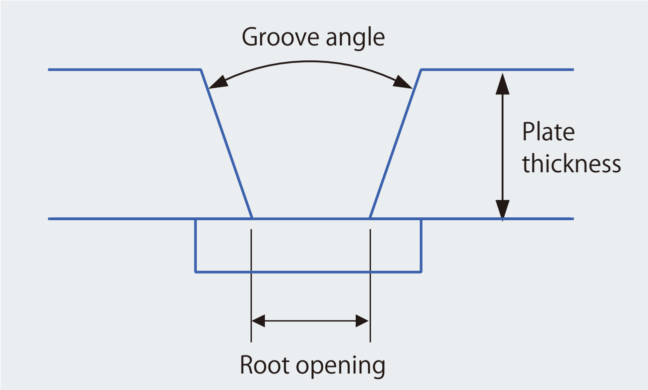


Table 4: Difference in groove configuration specifications

	AWS		ISO	
Plate thickness (mm) (Example)	20	12	20	12
Groove angle	45°		20°	
Root opening (mm) (Example)	12	6	16	12

2.4.2 Shape of tensile test specimen for all welding consumables

Figure 4 shows the shape of a tensile test specimen and Table 5, the difference in specifications.

Figure 4: Shape of tensile test specimen

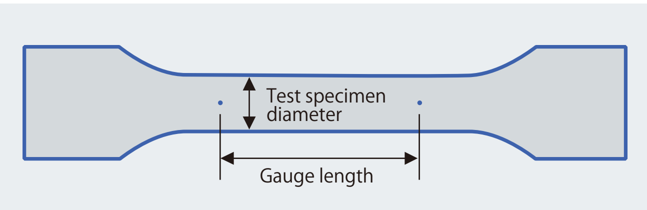
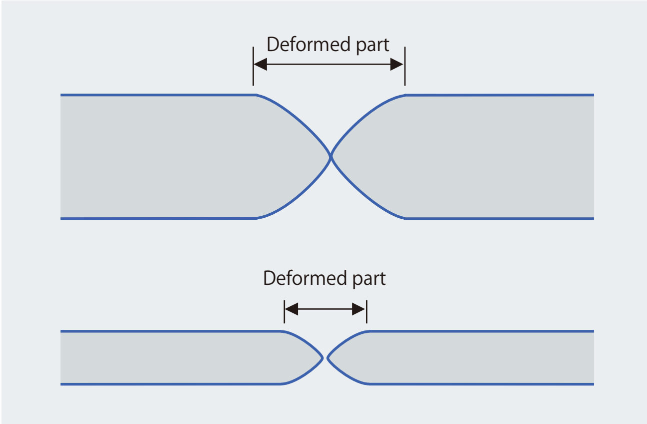


Table 5: Difference in tensile test specimen specifications

	AWS		ISO	
Specimen diameter (mm)	12.5	6	10	8
Gauge length (mm)	50	24	50	40
Ratio of Gauge length/ Specimen diameter	4		5	

As seen in Figure 5, if the ratio of gauge length to specimen diameter is different, elongation (%) also changes. Because the deformed part of a small diameter specimen becomes shorter than that of large diameter specimen, the calculated elongation of a small diameter specimen becomes smaller.

Figure 5: Influence of different gauge length



3 Postscript

As has been discussed, the AWS has been making progress toward integrating specifications for welding consumables. The details and properties of welding consumables with the same classifications will be easier to recognize under a system of unified specifications.

At the same time, the operation of matching AWS specifications with ISO standards has also been moving forward. It is expected that in the future all welding related specifications will contain the same contents worldwide, and welding consumables of the same quality with the same descriptions will become available from anywhere in the world.

AWS specifications are changing in order to be more useful and utilized more widely in the ways described above.

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AWF meeting in Osaka, Japan

Dear KWT readers! I am honored to be able to discuss the activities of the Asian Welding Federation (AWF) for a second time after introducing them in the previous issue (KWT Vol. 19, No. 1, 2016). The latest AWF meeting was held in Osaka, Japan from April 13 to 15, in parallel with the 2016 Japan International Welding Show.

Established in 2004, the AWF is composed of welding societies, institutes and associations in 13 countries, and Japan is represented by two organizations: the Japan Welding Engineering Society (JWES) and the Japan Welding Society (JWS). I took part in two task forces, the Common Welder Certification Scheme (CWCS) and Standardization, as one of representatives of JWES.

1. CWCS Task Force

Welder certification remains one of the biggest concerns of all AWF members and is considered an effective measure toward solving the shortage of skilled welders and experienced and able technicians which is an important issue that all member countries currently share.

In this task force meeting, the status and progress of preparation in starting the CWCS operation was reported on, and potential problems as well as measures to solve them were discussed.

2. Standardization Task Force

The goals of this task force include examining trends and sharing information and on the establishment and modification of national standards in member countries, maintaining consistency between them and other international standards, and for communicating the opinions of Asian members to the ISO. In the task force meeting that I chaired, presentations on the two following subjects were given.

2-1. Standardization activities related to ISO standards

Representing JWES, I presented the results of an investigation related to test completion conditions on the "Measurement method by hot carrier gas extraction," which is regulated in ISO 3690-2012 Chapter: 4.3.2.3, and on "Welding and allied processes – Determination of hydrogen content in arc weld metal." The results of this investigation have already been reported and approved at the IIW intermediate meeting held on Feb. 29, 2016 as an example of activities related to ISO standards as well as standardization. They have also been studied in the Welding Consumable Division, Co-research Subcommittee-3 in JWES.

I believe that my presentation helped AWF members to understand the involvement of the JWES in establishing and revising ISO standards, and at the same time, encouraged task force members to be more conscious of ISO standards.

2-2. National standards in Vietnam

In response to an invitation from the Standardization Task Force, Ngoc Hoa, Vice President and Secretary General of the Vietnam Welding Society, visited Japan and gave a presentation on the organization, history and activities of both the Vietnam Welding Society and the Vietnam Register (of Shipping), as well as on welding consumable market trends and standards in Vietnam. The presentation was both useful and significant because he not only illuminated the situation related to standardization of welding consumables in Vietnam but also announced that Vietnam would officially join the AWF as a member country. Positive contributions from Vietnam to the AWF are therefore expected in the near future.

3. For the future of AWF

Taking part in the AWF meeting in Osaka, I got the impression that because not all attendants are directly involved in standardization, the topic may not be at the top of their minds. On the other hand, I realized that patient promotion of standardization without giving up is important, as well as that Japanese members must continue taking leadership without hesitation.

The next AWF meeting will be held in Manila, the Philippines from Oct. 5 to 7, 2016.

Reported by
Hiroshi Saito,
Manager, Quality Assurance Section, Technical Center

All of participants to the AWF meeting in Osaka (Mr Saito, 3rd from the right, in 3rd row)

2016 Japan International Welding Show, Osaka


Live demonstration of a robotic welding system

The 24th Japan International Welding Show (JIWS) was held at INTEX Osaka on April 13-16, 2016. Considered one of four renowned exhibitions worldwide, it is held every two years, alternating between Osaka and Tokyo. 2016 was Osaka's turn.

The event attracted as many as 216 exhibitors and 88,945 visitors, far exceeding the 66,697 who came to the last time JIWS, was held at the 18,577m² site in Osaka, 66,697. As a result, the 2016 JIWS buzzed with excitement every day. Kobe Steel took part in the JIWS Osaka in order to enhance its presence in welding markets.

Kobe Steel, located at the rear of B Hall, promoted its technological capabilities with the catch phrase "KOBELCO – Your Best Partner" as well as with live demonstrations and panel displays.

The system demonstration corner introduced new robotic welding systems to crowds of interested visitors. The Highly Efficient Horizontal Fillet Welding Procedure, targeted at construction machinery producers, enables high quality welding even at fast speeds of 700mm/min, while SMART TEACHING, aimed at shipbuilding, makes possible simple teaching with 3D-CAD data.

At the display corner, panels, bead samples and Q&A with our helpful staff allowed customers to acquire in-depth information about several of Kobelco's total welding solutions. Featured were the Ultra High Current MAG Welding Process that enables both high efficiency and low spatter and the SEGARC and TRIFARC processes that are already well-regarded by the shipbuilding industry for high quality and efficiency. Visitors could also learn about unique products, such as the new "1Z Series" welding consumables, exclusively developed for galvanized steel sheet; Cr-Mo heat resistant welding consumables for ASTM T91/P91, corresponding to the new specification for 9% Cr steel; and AMT-KS, which is a straightening machine for solid wires.

Visitors to the Kobelco stand came not only from Japan but also from many foreign countries like the USA, China, Korea, Russia and Southeast Asia. Members of the International Sales and Marketing Section (ISMS) of the Welding Business welcomed the agents, distributors and their guests from overseas to exchange information about welding consumables and systems. I am sure the experience has led them to acknowledge Kobelco's high technical capability as I heard such comments as "it was a very interesting exhibition" or "I'd surely study to introduce those into my country."

In order for us, Kobelco, to become our users' best welding partner, I, as a member of the Kobelco group, am resolved to continue learning about and appealing to the needs of our users worldwide with well-designed exhibitions, such as JIWS, that can lead our customers toward the best solutions for their welding tasks.

Reported by
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Posing in front of the Kobelco booth are Kobelco participants

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QC circle assembly in the Welding Business Group

The Welding Business Group's 111th QC circle assembly was held at Saijo Plant in Hiroshima Prefecture between April 7 and 8.

QC circles consist of groups of employees that actively work on trouble shooting and on improving quality and efficiency on their own at their production sites. The history of quality control activities in Japan is said to have started in August, 1950, when the American engineer, Dr. William E. Deming (1900-1993), lectured on "Quality Control for executive officers" at Mt. Hakone. While the Deming prize was established soon afterwards, it was in the 1970's, when the Japanese economy entered a stable growing period, that QC circle activities quickly spread into a great many factories and other workplaces. After getting started in Japan, they have also caught on in companies in many other countries. I believe KWT readers may have participated in QC circles at their work sites, too.

At the latest QC circle assembly, a total of 156 participants, from Japan as well as overseas, took part. Furthermore, employees from six overseas companies, namely KWE (the Netherlands), KWAP (Singapore), TKW & KMWT (Thailand) and KWQ & KWT (China) gave presentations.

After the presentations and a lively question and answer session, the gold prize was awarded to TKW and KMWT. TKW also received the Most Impressive Circle (MIC) prize that was started in 2014, and as a result was awarded a double prize.

In the evening of the first day, a get-together party was held, and participants enthusiastically exchanged information on market trends and production systems.


Lively question and answer session


Get-together party

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Award ceremony