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AWF News I

AWF Meeting in Xi’an, China
IMM, Malaysia Appointed as New Secretariat

The 22nd Asian Welding Federation (AWF) Governing Council, 15th Common Welder Certification Scheme (CWCS) Task Force Meeting, and 5th Standardization Meeting were held over a four-day period from October 22 to 25 at Xi’an Jiaotong University in Xi’an, China.

A total of 10 AWF member societies from 10 countries participated at the gathering, which marked the 10th anniversary of the AWF’s establishment, to review and discuss the organizational structure of the federation including the role of the AWF Secretariat. In attendance this time were the China Welding Association (CWA), representing the host country, the Indonesian Welding Society (IWS), the Korean Welding & Joining Society (KWJS), the Mongolian Material Science & Welding Society (MMSWS), the Institute of Materials Malaysia (IMM), the Philippines Welding Society (PWS), the Singapore Welding Society (SWS), the Thai Welding Society (TWS), the Myanmar Welding Society (MWS), and the Japan Welding Engineering Society (JWES).

On the opening day of October 22, an informal meeting was held to discuss the operation of the AWF Secretariat and the AWF Secretary-General. In view of the decision by Ang Chee Pheng, who had been serving as AWF Secretary-General in his capacity as SWS President, to withdraw his membership the from SWS, the JWES proposed and held an informal meeting to share the opinions of the member countries. It was agreed that the question of future responsibility for the AWF Secretariat would be decided at the Governing Council session after drawing together the opinions of member countries.

As a result of those discussions, it was agreed that the AWF would call on the association of another member country (other than the SWS) to take on the role of AWF Secretariat and Secretary-General, and that the role would be provisionally assumed by the IMM. Specifically, the IMM called on Ang...
Chee Pheng to serve as Secretary-General and head the operations of the AWF Secretariat. This arrangement will remain in effect for a period of two years, during which the future function of the AWF, including the operations of the AWF Secretariat, will be considered.

In subcommittee meetings later in the day, an Executive Committee was set up to review the AWF’s organizational structure. In addition, it was decided to register the AWF as a corporation in Singapore.

On October 23, the Specialized Technical Committee met to hear reports on issues concerning the current state of CWCS implementation in the member countries. IMM reported that, in Malaysia, leading petroleum company Petronas Nasional Berhad (PETRONAS) is recommending ISO 9606-01 skill examinations, whereas manufacturers are still implementing American Society of Mechanical Engineers (ASME)/AWS skill examinations. The TWS reported that although they have attempted to implement ISO 9606-01 skill examinations for electric power-related projects, end users have not adopted the examinations.

The MOS Internet Committee and CWCS Promotion Committee also held meetings at two separate venues.

The Standardization Committee made an appeal to encourage participation in the workings of the ISO, which is made up of 164 member countries, including 12 from Asia. In view of the fact that ISO standards are reviewed every five years and that each country has one vote, Asian countries need to participate in ISO voting in order to have their voice reflected in outcomes. The committee encouraged all AWF member countries to confirm their own representatives for ISO/TC44/SC3 and to apply to participate in ISO voting after returning to their own countries.

At the CWCS Task Force Meeting held in the morning of October 24, member countries approved two welding procedure specifications: OP-22 (Document Management Procedure) and OP-23 (Records Management Procedure).

At the opening of the AWF Governing Council session, CWA member Professor Li Xiaoyang of the Beijing University of Technology, speaking as the host country representative, gave a welcome speech to the representatives of the member countries during which he said, “Ten years have now passed since the AWF came into existence. Let us continue to take delight in developing projects in the future.”

Next, AWF President Na Suck-Joo (KWJS) expressed thanks to the CWA and announced the commencement of proceedings. The meeting featured reports on the progress of a ‘Terminological Dictionary of Welding’ that the JWES is creating. It was confirmed that the dictionary will be used abroad for welding engineer (WE) certification and that the copyright of the dictionary would be retained by the JWES.

The next AWF meeting is scheduled to be held in October 2015 in Surabaya, Indonesia.
The 2004 inaugural meeting of the Asian Welding Federation (AWF) was hosted by the Philippine Welding Society (PWS). In the 10 years that have passed since then, Asia-wide networks linking together the welding technologies and welding-related industries of AWF member countries have developed and are growing stronger. Herein, we report on a discussion with Eric Montes, the President of the PWS, which was a founding member of the AWF. He spoke to us about the activities and outlook of the PWS, as well as his future hopes for the AWF.

PWS started as a vision of various industry professionals whose aim was, and is, to promote the advancement of the science and practice of welding, and to advise and support government entities and national industries whenever possible on matters of training, qualification and certification, standardization, public safety, and health. The PWS is composed of six key officers (headed by the President) and five directors (with chairmanship roles) representing different industry players in the country. The day-to-day activities are being managed by the Executive Director and are assisted by a Secretariat.

On September 19, 1991, with encouragement from the government, the business sector, educators, and practitioners, 12 founding members from the construction, manufacturing, and inspection industries united together and established the PWS. On February 13, 1992, the Securities and Exchange Commission (SEC) of the Philippines registered the PWS as a non-stock and non-profit organization.

Philippine Welding Society membership:
Corporate members: 128 members (as of October 2014)
Individual Members: 8,273 members (as of October 2014)
Main business activities:
• Assessment and certification of welders (national certification), assessment and certification of welders (industry or code specific)
• Qualification and certification of welding personnel (local certification)
• Welding Inspection Course / Welding Personnel / Practitioner Course
• Welding Technology Upgrading or Refresher Course for industry workers
• Annual welding competition and convention
• Preparation and qualification of Welding Procedure Specification (WPS) and Welding Procedure Qualification (WPQ) testing for industry workers
• Technical consultancy (welding, corrosion, integrity, root cause failure analysis, audits)
• Accreditations of training, testing, and inspection institutions
• Research and development / technical bulletins
• Welding symposium / products exhibits / special reports

Speaking of his role as PWS President, Mr. Montes said, “My future view of PWS as its President will always be the same as that of the Society itself, which is to be an internationally recognized Society that provides information, knowledge, professionalism, best practices sharing, training, qualification and certification, and technical services in the fields of welding engineering and related technologies.”

When we asked, “What role do you think your society should play in AWF activities?” he answered, “the PWS has been in the forefront of AWF since its inception in 2004 and has contributed to the creation of processes and procedures that provide guidance and support for member-country welding societies that will help them to jumpstart their respective journeys towards compliance with the Welder Certification Scheme.

“We have also been engaged in the assessment of training bodies and testing centers. When I was elected Vice-President, the PWS had already been active in AWF proceedings and represented during AWF Conferences, as well as during Task Force and Governing Council Meetings.”

He continued, “When I assumed the Presidency, the PWS was even more active in participating with AWF works and activities. In fact the PWS sent seven of their Officers and Directors to participate in the just concluded AWF Conference and Meeting in Xi’an, China. This clearly shows how PWS has committed their time, efforts, and resources for the realization of AWF goals and aspirations.

As for his expectations regarding AWF activities, he said, “The PWS is currently in its initial stage for compliance with the National Welders Certification Scheme. Welding Training Regulations, and the Assessment of Training Body and Testing Centers—all in accordance with AWF guidance and procedures, and in close coordination with the Government’s Technical Education Skills and Development Authority (TESDA). The AWF’s guidance, support, and assistance will play a major role in PWS’s success.”

He concluded our discussion by saying, “The success of the Asian Welding Federation lies in the cooperation and common goal and understanding of each individual member country. It is PWS’s commitment (and we hope that of other member countries as well) that it will think and act as one with the Federation in ensuring the realization of its goals and missions. Each country serves as an individual link that connects the whole AWF chain together. It is important to ensure that these links do not break (or break away) from the chain, or the result will be a divided and loose organization with individual and conflicting objectives.”
The IMM is a nonprofit professional society that promotes honorable practices, professional ethics, and encourages education in material science, technology, and engineering. Its membership includes more than 4000 engineers, academicians, technicians, skilled workers, and other professionals. Beginning as the MMS (Malaysian Materials Science & Technology Society), the society was registered with the Registry of Societies of Singapore on November 6th, 1987. The MMS had been actively promoting the awareness of materials science in Malaysia since 1988. In 1996, with a newly-elected Council, a change of name to the Institute of Materials, Malaysia, was submitted to the Registry of Societies and approved on June 16th, 1997.

The IMM aims to become the authority on materials science, technology, and engineering in Malaysia by 2020.

Mission of the IMM

- To become the center for materials information in Malaysia
Members and the public will be able to research, source, and investigate information on materials.

- To provide materials specialists and professionals in Malaysia
IMM professional members will be able to attain recognized professional status awarded by local and international governing bodies on professional accreditation.

- To provide technical skills certification and educational programs in materials science, technology & engineering.
The IMM aims to provide career advancement opportunities for non-professional members through technical competency certification and educational training courses for skills such as blasting and coating, painting inspection, welding, welding inspection, cathodic protection technology, corrosion control technology, plastic technology, composites fabrication technology, rubber processing technology, ceramics technology, wood technology, concrete technology, metallurgy, and advanced materials technology.

Furthermore, in collaboration with MTE (Materials Technology Education Sdn Bhd), the IMM regularly conducts courses in material science, technology and engineering.

IMM certificates are particularly valuable as they are a means to a successful and enriching career in the oil and gas industry where skilled workers with the right knowledge are in high demand. For major Malaysian companies like the government-owned Petronas Corporation, IMM certificates are a requirement. They are used as a standardization method in order to achieve maximum technical and economic benefits and to achieve good technical practice in oil and gas production facilities, refineries, and gas processing plants.

In addition, the IMM is the ACB (Authorized Certification Body) of Malaysia for the AWF-CWCS (Asian Welding Federation-Common Welder Certification Scheme). The ACB qualifies and certifies welders in the Malaysian oil and gas industry in accordance to the ISO-9606-1 standard. Such welders are certified as AWF certified welders and must be registered in the MOS (Manpower Optimization System) in order to maintain their certification.

MTE (Materials Technology Education) was also founded to operate the various educational activities of the IMM. MTE offers technical certificates and diplomas in courses such as metallurgy, welding, and corrosion and coatings. IMM-accredited courses, recognized in the oil and gas, shipbuilding, and construction industries, are endorsed by Petronas. Graduates of these courses receive supplementary knowledge in materials technology and engineering, and usually obtain better employment opportunities and salaries.

MISSION OF THE IMM
The Japan Proton Accelerator Research Complex (J-PARC, Photo 1) is a world-leading research facility in Tokaimura, Ibaraki Prefecture, constructed and operated jointly by the Japan Atomic Energy Agency (JAEA) and the High Energy Accelerator Research Organization (KEK).

Work at J-PARC involves accelerating high-intensity proton beams close to the speed of light and colliding them with a target of metal or other material, in order to generate secondary particles such as neutrons, mesons, or neutrinos to be used as tools in visualizing and investigating atomic-scale objects. In particular, the pulsed neutron beams produced at J-PARC have the highest intensity in the world, thereby paving the way for a new age of pulsed neutron science. With the ability to observe and examine objects that were not visible before, and generate new objects, industrial use of J-PARC is expected to propel major technological advances and revolutionary industrial innovations.

The facilities and equipment at J-PARC are available for general-purpose work and research and development (R&D), with J-PARC providing systematic support to facility users. Researchers interested in conducting studies can apply to J-PARC for technical consultations on planning experiments, via http://j-parc.jp/researcher/MatLife/ja/index.html#riyou. Procedures for use of J-PARC facilities are outlined at the website, http://j-parc.jp/researcher/MatLife/ja/applying/index3.html. J-PARC invites researchers to make active use of its facilities for technological advances and revolutionary industrial innovations.

In this article, we take a look at the industrial use of J-PARC. In addition, following a visit to J-PARC, we report on its R&D facilities for substances and materials, and on the Tokai to Kamioka (T2K) Long Baseline Neutrino Oscillation Experiment.

Substances and Materials Research

When a high-intensity proton beam is accelerated close to the speed of light and made to collide with a target metal, the nuclei of the metal atoms break up and scatter (“nuclear spallation reaction”), resulting in the formation of secondary particles such as neutrons, mesons, and neutrinos. These secondary particles are utilized for a wide range of leading-edge scientific research.

The potential of this kind of research can be seen through the following examples of R&D in the field of automobile-related technology.

- Development of sophisticated high-strength, materials

Neutrons are particles that also exhibit wave properties. Like X-rays, they are scattered by the atoms in a crystal, resulting in diffraction, thereby revealing the atomic structure and atomic arrangement of the crystals. Compared to X-rays, neutrons have greater penetrability through materials and they are more sensitive to light atoms such as hydrogen. As an example, neutrons can be used...
in R&D to make stronger and lighter sheet steel for automobile use, by enabling detailed observations of material characteristics such as internal strain and residual stress diffraction, fine structure, atomic arrangement, crystal structure changes, and nano deposits related to hydrogen embrittlement.

- **Observations of the dynamic state inside engines**
The high penetrability of neutrons allows direct observation of the movement of internal automobile engine components, such as valves, pistons, and crankshafts, while they are in operation. Neutrons also enable observations of water, oil and other substances composed of light atoms, making it possible to visualize the flow of lubricants and cooling water in real time.

- **Development of magnetic materials**
By virtue of their rotation, neutrons possess spin, which means they behave as tiny magnets. Since neutrons are scattered by the magnetic field within a substance, they can be used to determine the magnetic structure and magnetic field distribution of materials. One potential application is the powerful neodymium magnets that are used in hybrid vehicle motors. These magnets suffer from a reduction in field strength at high temperatures, and one solution to this problem may be the use of a magnetic material in the form of nanoparticles. The key to this approach is using neutrons to investigate the magnetic structure of metal nanoparticles, and R&D work is currently underway to create powerful, highly heat-resistant magnets. Neutrons are also expected to be applied to the development of nano-magnetic devices.

- **Development of lithium-ion batteries**
There is an increasing demand for high-capacity lithium-ion batteries that can be rapidly charged and discharged, for use in electric and hybrid vehicles. Neutrons serve as an excellent tool for observing lithium, since it is a light element. Research is also being conducted on the development of high-performance, inexpensive batteries using alternative elements to cobalt and manganese, which are difficult to distinguish using X-rays. Furthermore, the high penetrability of neutrons can be utilized for direct observation of changes in the crystal structure that occur during the battery charging and discharging processes.

Neutrons are being used in a variety of other applications too, such as analysis of residual stresses in superconducting cables, nondestructive analysis of elements, observation of changes in the state of crystals due to processing, and measurement of the state of coexistence of heavy elements and light elements.

At J-PARC there are three high-intensity proton accelerator facilities located below the ground. In the linear accelerator (LINAC) protons can be accelerated to 71% of the speed of light, in the 3 GeV synchrotron they can be accelerated to 97% of the speed of light, and in the 50 GeV synchrotron they can be accelerated to 99.95% of the speed of light.

**Materials and Life Science Experimental Facility**
At J-PARC’s Materials and Life Science Experimental Facility (Photo 2), the proton beams generated by one of the most advanced high-intensity proton accelerators in the world are used to produce the most powerful pulsed neutron and muon beams in the world. The aim of the facility is to utilize these pulsed particles to drive advances in the fields of materials and life sciences. The research facility allows researchers to obtain knowledge about the atomic-level structure and dynamics of materials, allowing the mysteries of materials and life to be unraveled. Some of the features of the facility are:

- **High-intensity proton accelerator**
This produces beam intensities as large as any other in the world, and it boasts high stability and a high utilization rate.
Multipurpose research facility

This facility generates a wide variety of secondary particles in abundant quantities using high-intensity proton beams, helping to produce a steady stream of findings in areas such as particle physics, nuclear physics, physical science, life sciences, industrial applications and technology development.

On entering J-PARC, the first thing you see is a display of an actual mercury target container used for generating neutrons (Photo 3). This is the target for generating neutrals, and is precisely the heart of the setup for producing neutrons and muons. The mercury, which circulates within an enclosure, also serves to discharge heat. The three-layered structure made of SUS316L stainless steel was fabricated by Metal Technology Co., Ltd. using a hot isostatic pressing (HIP) process and partial-penetration electron beam welding. Metal Technology Co., Ltd. is the only place in Japan capable of making such a structure.

In Experiment Hall #2 there is a variety of experimental equipment spread out radially around a neutron source station (Photo 4). A wide range of experiments are conducted here at the Materials and Life Science Experimental Facility using particles such as neutrons and muons generated by protons that collide with a target material within the station. These proton beams are conveyed from 300 m away via a proton beam transport line that runs through an underground tunnel from the 3 GeV proton synchrotron, which is also located underground and consists of a series of electromagnets, arranged in a ring shape, to accelerate and circulate the protons supplied by a LINAC.

T2K Long Baseline Neutrino Oscillation Experiment

The T2K Long Baseline Neutrino Oscillation Experiment is an experiment aimed at elucidating the mysteries of neutrinos. This involves colliding high-intensity neutrino beams generated by the main ring (MR) synchrotron at the high-intensity proton accelerator facility and also by the Neutrino Experimental Facility at Tokaimura, Ibaraki Prefecture, and observing the collisions in the Super-Kamiokande neutrino observatory, a 50,000-ton water Cherenkov detector belonging to the Institute for Cosmic Ray Research, the University of Tokyo, that is located 1.000 m below the ground, 295 km away in Kamioka-cho in Hida-shi, Gifu Prefecture.

Neutrinos are electrically neutral elementary particles that have a mass less than or equal to one-millionth that of electrons and the lightest quarks. There are known to be three kinds of neutrinos—electron-neutrinos, mu-neutrinos, and tau-neutrinos. Trillions of neutrinos produced by the sun pass through our bodies every second. In the course of their motion neutrinos can transform from one of these three types to another, in a behavior known as neutrino oscillations. For example, if an accelerator generates 100% pure mu-neutrinos, after a certain distance some proportion of them changes into tau-neutrinos, and further along they revert to the former mu-
neutrinos. This process repeats itself, hence the term “neutrino oscillations”. This phenomenon can only occur if neutrinos have mass and exist in a mix of different types, and currently neutrino oscillations offer the only approach to investigating the infinitesimal mass of neutrinos and their mix of different types.

A zenith angle distribution of atmospheric neutrinos published by the Super-Kamiokande research group in June 1998 showed that the number of mu-neutrinos arriving from the other side of the earth was lower than that coming from the sky above. The transformation of mu-neutrinos by means of neutrino oscillations into tau-neutrinos, which cannot be observed, represented the first ever empirical evidence that neutrinos possess a finite mass.

Japan is a pioneer in the field of neutrino research, and researchers all over the world look to the neutrino investigations in the T2K Neutrino Oscillation Experiment as a driving force and important contributor to the field of fundamental science.

In fact, on July 19, 2013, the T2K Experiment International Joint Research Group announced that they had made measurements that definitively confirmed that mu-neutrinos transform into electron neutrinos during flight, which was a groundbreaking international discovery.

On our current visit to J-PARC, we observed the front neutrino detector in Utility Building #1 (Photo 5). The front detector is located 280 m downstream of the target, in an experiment hall with a depth of 33.5 m and a diameter of 17.5 m. The front detector is composed of an on-axis detector, Interactive Neutrino GRID (INGRID), located at the center of the beam, and an off-axis detector located in the direction of Kamioka.

The stability of the neutrino beam center is monitored and measurements are made of the beam energy distribution and the quantity of electron-neutrinos in the beam.

▲ Photo 5: Front neutrino detector
3. Melting and Bead Formation Phenomenon in GMA Welding

Compared to the modeling of the arc phenomenon in stationary TIG welding discussed in the previous section, the weld pools in GMA welding are a more complex phenomenon; the applied forces are not constant due to droplet transfer, short circuiting, or the weaving of the torch, for example. In view of this, studies in this area have focused mainly on assessing the impact of various factors. Nevertheless, for achieving a high-quality weld joint, it is extremely important that the influence of welding parameters are identified for certain, and their interactions are understood and controlled, even if only qualitatively. An example of a study on the effects of welding parameters in GMA welding is outlined below.

3.1 Effect of Welding Current on Melting

Melting in GMA welding is substantially influenced by electromagnetic forces due to the penetration of arc plasma current down into weld pools. For this reason, a greater welding current corresponds to a more centrally concentrated shape of melting. As an example of a relationship between melting depth and welding current, Equation (1) shows an empirical formula derived from actual bead-on-plate welding results.

\[ P = 0.104 I^3 \sqrt{\frac{V^2}{WS}} - 1.66 \]  

\[ \text{(1)} \]

Here, P is the melting depth (mm), I is the welding current (A), V is the arc voltage (V), and WS is the welding speed (cm/min).

3.2 Control of Melting by Welding Power Source

Here we present an example of a commercial welding power source based on the concept of controlling melting by controlling output current, since the melting depth is dependent on welding current.

First, in the welding of thin sheet for automobiles, the occurrence of welding defects such as melt-through due to groove gaps or slight misses of the welding target are serious problems in terms of ensuring the quality of welding and productivity improvement. The welding power sources increasingly used for welding this type of thin sheet enable the welding depth to be freely varied by switching the polarities of the electrodes, the welding wire, and the parent metal alternately, by using alternating current (AC) for the power source output and by controlling the time rates of the polarities and also their current rates.

As described in the previous section, GMA welding utilizes a constant wire feed rate control and a power source with constant voltage characteristic, and the parent metal is configured as the cathode (with wire as the anode, direct current electrode positive: DCEP). Under these conditions, melting is the deepest and the bead width becomes flat. Conversely, if the parent metal is set up as the anode (with wire as the cathode, direct current electrode negative: DCEN), the melting is shallower. This difference in melting is related to the melting characteristics of consumable electrodes, which can be explained as follows.

If the parent metal is the anode (DCEN), the melting speed of the welding wire increases, as described. However, since the power source uses constant wire feed speed control (in other words, the welding wire is fed at a constant speed in accordance with the desired value of volume throughput by using remote control of the power source) the welding current decreases. For this reason, the amount of heat input penetrating into the parent metal also decreases, and the melting becomes shallower. In addition, because the arc stability with DCEN is inferior to that with DCEP, the arc is not as concentrated at one point of the weld pool and thus causes shallower melting.
By using such a difference in parent metal melting due to polarity, it is possible to control melting depth and bead width by controlling the proportions of the polarities, as shown in Fig. 7. (The figure plots the DCEN time rate.) This method is particularly effective for welding thin sheet that has groove gaps.

On the other hand, when the groove is relatively narrow or when welding the initial layer of thick sheet, as when welding steel frame joints, the welding wire extension length can easily become long. That is, when welding the initial layer, which requires deep melting, the welding current decreases and thereby increases the tendency for melting defects or other melting imperfections to occur. To prevent this, some recent welding power sources control the wire feed speed so that the welding current remains constant even if the wire extension length changes.

Figure 8 compares the melt volume for this kind of welding power source, which controls the wire feed speed, with that of a conventional welding power source. With the conventional power source, the wire extension length and welding current are initially set at 25 mm and 330 A, respectively. At this setting, sufficient melting is achieved, but when the extension length increases to 40 mm, the welding current falls to approximately 270 A and causes the melting to become shallower. In contrast, with a constant current control power source, the volume of deposited welding wire increases and results in a slight decrease in melting because the arc has more difficulty reaching the base of the groove. Still, compared to a conventional power source, more sufficient melting is ensured.

3.3 Impact of Welding Material on Melting

One of the factors that influence the melting of the parent metal is its precedence relative to the arc point of the molten metal. The flow of molten metal occurs ahead of the arc point, and the arc itself obstructs the melting of the groove. This precedence of molten metal is a problem in terms of welding conditions, in that the welding speed is too slow relative to the weld pool, but it is also a phenomenon influenced by the physical properties (viscosities) of the molten metal. Weld pools for which the so-called fluidity is considered good, have this problem of precedence easily. This problem is more likely to occur when the groove width is narrow and the welding current is high.

This precedence phenomenon of molten metal is not much influenced by the type of solid wire or its composition, but in the case of FCW, the flux composition alters the physical properties of the weld pool and also the melting may differ. Figure 9, which shows the influence of flux on the melting depth for metallic FCW, reveals that the melting depth varies with the quantity of fluoride, a flux ingredient. The cause of this effect is reportedly connected to the vapor pressure at high temperature of the fluoride, but the mechanism is not well understood. Furthermore, if there is high level of deoxidizing agent in the flux, the viscosity of the molten metal increases, and thereby inhibits the precedence of the molten metal. Figure 10 shows the effect of metallic FCW, whose flux composition is controlled to achieve deep melting.
In semi-automated GMA welding, the welding speed is low and the range of welding conditions that enable a suitable bead appearance is relatively wide. However, when considering high-efficiency welding with a robot or other device, if the welding current, voltage, and welding speed are not set in balance with other conditions, undercut, humping, or other forms of irregular beads will occur. Figure 11 is a schematic diagram of the relationship between welding current and welding speed for appropriate welding bead formation. At high welding current and high welding speed, the range of conditions that can be used is quite limited because of irregular bead formation. The precise number values of the limits vary according to the welding material, the shield gas, and the groove shape, but generally if the groove is wide (as an extreme example, bead-on-plate welding) humping beads form easily.

It is also well known that bead formation is strongly influenced by welding torch holding conditions. Photo 1 shows the influence of the torch angle for a fillet weld. If we take the torch to be the push angle, flat surface beads will result, but if the push angle becomes too large, undercut occurs. If we take the angle to be the drag angle, the melting is deep, but on the other hand the bead surface becomes convex. This kind of phenomenon cannot be explained by any theory or modeling; it can only be understood qualitatively so far. Therefore, it is necessary to correctly understand how the various factors influence welding performance and results, and to select the appropriate welding conditions.
Globalization in Joining Technology and Materials Science-Collaboration Networking in Asia", an international symposium organized by the Joining and Welding Research Institute (JWRI) Osaka University in cooperation with Thailand’s National Science and Technology Development Agency-National Metal and Materials Technology Center (NSTDA-MTEC), was held at the Miracle Grand Convention Hotel on Nov. 5 in Bangkok, Thailand.

More than 70 participant-related parties and students from Asian universities and parties from companies in Asia—took advantage of this excellent opportunity to exchange valuable information and build networks.

The symposium was conducted as part of JWRI’s "Project to Create Research and Educational Hubs for Innovative Manufacturing in Asia", a Special Budget Project of Japan’s Ministry of Education, Culture, Sports, Science and Technology (MEXT) that began in 2013. The aims of the project are (1) to construct a global network relating to welding sciences, linking researchers and universities across Asia, (2) to construct a global platform of welding technology that can be adapted to extreme environments, and (3) to implement Coupling Internship (CIS) programs hosted at Japanese-affiliated companies abroad.

With particular regards to (1), in addition to constructing a global network relating to welding sciences as a platform for concluding academic exchange agreements with leading local universities and setting up local JWRI offices, efforts to implement international joint research projects and to internationalize joint research centers through the global network will be accelerated.

In his opening address at the symposium, JWRI Director Seiji Katayama welcomed the participants and expressed "good wishes for the success of this symposium in advancing further toward constructing a network between researchers across the Association of South-East Asian Nations (ASEAN) region."

A keynote speaker was Dr. Tamon Ueda, Chief Adviser of the Japan International Cooperation Agency (JICA) ASEAN University Network / Southeast Asian Engineering Education Development – Network (AUN/SEED-Net) project, who outlined the activities of AUN/SEED-Net and its efforts to foster engineering-related professionals in the ASEAN region through those activities.

Dr. Panadda Sheppard, head of the Materials Reliability Research Unit at NSTDA-MTEC, then gave an introduction to the research work of MTEC and discussed the organization’s evolution and international networking activities. Finally, Prof. Katsuyoshi Kondoh of JWRI gave a presentation on Osaka University’s activities aimed at constructing an Asia-wide network for academic collaboration.

The symposium also featured 10 research presentations on research activities in the field of welding and was joining by speakers from the Indian Institute of Technology Hyderabad and Indian Institute of Technology Kharagpur in India; the University of Malaya in Malaysia; De La Salle University in the Philippines; NSTDA-MTEC, Kasetsart University, King Mongkut’s University of Technology North Bangkok, and King Mongkut’s University of Technology Thonburi in Thailand; and Osaka University in Japan. There were lively question-and-answer sessions at the presentations.

The symposium also enjoyed the support of the industrial sector, with exhibitions by the following companies: Thai-Kobe Welding Co., Ltd.; OTC Daihen Asia Co., Ltd.; Yamamoto Metal Technos Co., Ltd.; and Sanpo Publications, Inc.

After the symposium, a social gathering was also held. As well as allowing the participants from the different countries to develop and deepen their friendships, this symposium proved valuable in accelerating the construction of a global network relating to welding sciences, the implementation of international joint research projects, and the internationalization of joint research centers.
ISO/TC 44 Plenary and Parallel Meetings
Back in Asia after 10 Years at the Welding Hall of the Japan Welding Engineering Society

The ISO/TC 44 (Welding) gathered in Tokyo over five days, from July 21 to 25, at the Welding Hall in Chiyoda-ku, Tokyo. The Welding Hall was completed two years ago, so this presented an opportunity to host the meeting in Japan. It has been 10 years since this TC was held in Asia.

From the opening day through the third day, each of the TC 44 subcommittees (SC) met for parallel meetings: SC 5 (Testing and inspection of welds), SC 7 (Representation and terms), SC 9 (Health and safety), SC 10 (Unification of requirements in the field of metal welding), and SC 12 (Soldering materials). On the fourth and fifth days of the gathering, reports of the parallel meetings were presented at the TC 44 plenary meeting.

There were approximately 80 registered participants from 13 countries: Finland, France, Germany, Italy, U.K., Japan, Malaysia, Singapore, Canada, Kenya, China, and South Korea. The plenary meeting began with a greeting by Walter Sperko, the chair of the meeting. This was followed by a greeting by the Japan Welding Engineering Society (JWES) Managing Director Wataru Mizunuma: “Welcome to the Welding Hall. This hall was constructed two years ago with state-of-the-art construction and welding technology. It is also located in Akihabara, known as the electric district and famous as the outlet for new trends and fashionable subcultures.” He then proceeded to introduce JWES history and activities.

The next speaker was Yasukazu Fukuda, Director for International Standards at the Industrial Science and Technology Policy and Environment Bureau of the Ministry of Economy, Trade and Industry. He introduced the Tokyo Skytree, which is the world’s tallest (634 m) self-supporting broadcast tower, as an example of a welded structure. “Its basic structure is a fusion of Japan’s old-time building technology with leading-edge building technology,” said Mr. Fukuda. He went on to point out, “Welding technology, along with its associated processes, is a very important fundamental manufacturing technology, and it has made a large contribution to the development of social infrastructure.” He added, “The activities of TC 44 have greatly advanced the quality and safety of welding technology. I hope that the present meeting proves to be fruitful.”

Next, Taro Abe and Masataka Muramatsu, two group leaders from the Architectural Design Division of Kajima Corporation, introduced the Welding Hall. They explained that their concept for the building was to “show the steel structure.” Although welding technology is indispensable in construction, it usually remains unseen, covered by finishing materials and fireproof coverings, but in this case they made the steel structures visible to express the identity of the hall. The ISO/TCO 44 participants who had come from abroad were fascinated by the designers’ presentation because it concerned the hall in which the plenary meeting was being held. Here are some of the comments made by the participants. “This building is very well equipped.” “The view through the windows is very nice. You can see Tokyo Skytree.” “I would like to take home a copy of the PowerPoint file that Kajima Corporation used for their presentation.”

Finally, each of the SCs gave their reports. Of particular note, SC 10 reported on the progress of the International Institute of Welding (IIW)’s Route 2 project, and there was also a report on the results of a discussion from ISO/TC 8/SC 8 relating to design standards for shipbuilding. There was concentrated discussion on a wide range of topics, and it seemed to be a fruitful meeting for the participants.
## World Shipbuilding Statistics — WORLD NEW ORDERS

<table>
<thead>
<tr>
<th>Country name</th>
<th>Calendar year</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014 (January to June)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of ships 1,000 GT</td>
<td>Share (%)</td>
<td>No. of ships 1,000 GT</td>
<td>Share (%)</td>
<td>No. of ships 1,000 GT</td>
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<tr>
<td>Japan</td>
<td>332 7,689</td>
<td>13.5</td>
<td>387 8,851</td>
<td>23.0</td>
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<td>South Korea</td>
<td>359 25,125</td>
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<td>31.2</td>
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<td>China</td>
<td>731 19,112</td>
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<td>France</td>
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<td>11 422</td>
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<td>11 535</td>
</tr>
<tr>
<td>Germany</td>
<td>12 281</td>
<td>0.5</td>
<td>35 90</td>
<td>0.2</td>
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</tr>
<tr>
<td>Greece</td>
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<td>0.2</td>
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<td>101 1,141</td>
<td>3.0</td>
<td>113 1,311</td>
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<tr>
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<td>42 556</td>
<td>1.0</td>
<td>59 582</td>
<td>1.5</td>
<td>29 193</td>
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<td>33 90</td>
<td>0.2</td>
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<tr>
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<td>0.2</td>
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<tr>
<td>United States</td>
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<td>0.5</td>
<td>35 212</td>
<td>0.6</td>
<td>72 721</td>
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<tr>
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<td>0.2</td>
<td>7 44</td>
<td>0.1</td>
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<td>India</td>
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<td>0.0</td>
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<td>0.4</td>
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<td>Philippines</td>
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<td>1.1</td>
<td>8 405</td>
<td>1.1</td>
<td>67 3,474</td>
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<tr>
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<td>41 558</td>
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<td>42 230</td>
<td>0.6</td>
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<tr>
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<td>58 117</td>
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<td>104 1,144</td>
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<tr>
<td>Others</td>
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<td>372 640</td>
<td>1.7</td>
<td>354 307</td>
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<td>Other countries total</td>
<td>721 4,061</td>
<td>7.1</td>
<td>728 2,680</td>
<td>7.0</td>
<td>880 8,708</td>
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<tr>
<td>World total</td>
<td>2,252 56,800</td>
<td>100.0</td>
<td>2,152 38,400</td>
<td>100.0</td>
<td>3,532 103,200</td>
</tr>
</tbody>
</table>

**Note:**
1. Based on IHS (formerly Lloyd’s Register) materials (World Shipbuilding Statistics). Year 2014 figures are preliminary.
2. Includes only ships having a gross tonnage (GT) of 100 GT or more.
3. The European countries listed are members of the former AWES (now known as SEA Europe). Poland joined the organization in 1995, Romania in 2000, Croatia in 2002, and Lithuania and Bulgaria both in 2009. However, Lithuania and Bulgaria are included under Other countries in the above chart.
4. Source: The Shipbuilders’ Association of Japan
Product Reviews

**RealWeld Trainer™ System**

The RealWeld Trainer is the first and only welding training solution that uses motion capture technology to objectively analyze and score welding technique while performing real arc-on welds, or while practicing arc-off welds. Unlike virtual reality training solutions designed for classroom use and limited to simulated welding, the RealWeld Trainer is designed for in-situ use in an actual welding booth. Sweet spot parameters associated with proper welding technique are configured by the instructor in each Welding Procedure Specification (WPS) with lenient, moderate, or stringent tolerances. The system analyzes and scores every weld trial attempted by a trainee. In this weld trial, the trainee is a novice and has not yet developed a steady hand or muscle memory as evidenced by all five torch motion parameters associated with proper welding technique varying inside and outside the sweet spot (the light blue band).

Real Weld Systems Inc. (http://www.realweldsystems.com)

**“PC150B-MP Series” Semiautomatic Switching Gas Delivery System**

This semiautomatic switching gas delivery system enables continuous gas supply, supplying gas without interruption even when one tank is exhausted or a tank is being replaced. Its main features are the following: 1) Suitability for CO2 and argon supply systems for welding, hydrogen supply systems for hydrogen furnaces, and carrier gas supply systems for analysis; 2) Restriction of intermediate pressure (P2) to less than 1.0 MPa, even though gas can be supplied at a pressure of up to 0.7 MPa; 3) Teflon diaphragm covering that maintains gas purity; 4) Availability of various options, such as attachable pressure gauges and alarm board; 5) Operating temperature range of –5 to 40 °C; and 6) Weight of 7.2 kg.

Nissan Tanaka Corporation. (http://nissantanaka.com/english/)

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This is the eighth issue of a newsletter launched by the American Welding Society. This newsletter, which will be sent out to readers, contains information on the activities of the American Welding Society and other topics condensed into a single page.

BY DAN KAY

BRAZING Q&A

Q: What should we do when a customer has a critical "hot job" that he wants brazed immediately and cannot wait for us to properly clean the furnace and run the necessary leak checks? How can we make a good braze when the furnace isn’t ready?

A: Most brazing shops will occasionally be given rush jobs by their good customers and they do the best they can to comply; however, no brazer wants to risk losing a good customer by delivering a poor-quality product.

Let’s suppose your vacuum brazing furnace has just completed a series of cycles that has left it contaminated. You were preparing to take the furnace out of service for the next day or two for maintenance including hand cleaning, vacuuming, a high-temperature burn-out cycle, etc. Then a customer shows up with a hot job that must be done right away.

The customer’s assembly consists of some components made from 316L stainless steel and others from a titanium alloy. These base metals should be brazed in a thoroughly clean and leak-tight furnace. What to do?

Should you attempt to braze the assembly in the dirty furnace and risk an unsatisfactory braze or just tell the customer you cannot do the rush job that day? I propose you enclose the assembly inside of a protective "box" before placing it into the dirty furnace to ensure it will braze well.

Boxing an assembly prior to the brazing run is a simple technique that more shops should use. Here’s how to do it. Prior to brazing, place the parts inside of a foil box that is easily constructed by hand specifically for those parts. The foil box shields the parts so they effectively braze inside their own pristine mini-furnace chamber. The foil box is usually used only once, for a particular assembly for one furnace run.

In my brazing shops, we kept rolls of titanium foil and stainless foil on hand just for this purpose. The titanium foil may be either pure titanium or a titanium alloy — both types work well. Similarly, the stainless steel foil may be made from any one of a number of different alloys. A regular grade stainless steel foil works well. Using a low-carbon L-grade foil is not necessary.

When a customer gave us a very sensitive part that needed to be brazed right away, we did not delay brazing that component until after the furnace was cleaned. Instead, we placed the component on some thin, clean aluminia-ceramic sheet, which we then placed on top of some thin titanium or stainless steel foil. We then cut some short slits in the foil to allow the foil to be folded up to form a box around the component — taking care the component did not touch any of the foil. Figure 1 illustrates how this is done.

Once two walls are folded up, then the side walls can be folded up into place and the extra foil length folded around the box to ensure there are no open seams to the outside. Everything is merely bent over, cramped, etc., using pliers, metal shears, and other standard tools, so the box can be made quickly and easily by hand right there in the shop.

The walls of the box formed in this manner should be tall enough so that the sides of the box are higher than the top of the part to be brazed. Then, take another piece of the metal foil to make a loosely fitting cover which is simply laid on top of the box. Fold the edges of the cover down so that there is absolutely no "line-of-sight" into the box. Figure 2 illustrates how this is done. Note: use thinner foils to make these boxes, they are much easier to work with. Keep the foils clean and stored where they will stay clean and not oxidize. Always handle the foils with clean gloves and use clean tools to construct the box and for placing the components inside it.

During the brazing cycle, the outside of the box serves as a getter. It catches the outgases products in the larger furnace chamber atmosphere that would normally condense onto or coat the parts being brazed. But the foil box can quite effectively prevent these contaminants from reaching the assembly protected inside. When the cycle is over and the box is removed from the furnace, the outside of the box may appear very dark and discolored. However, when the lid is carefully removed, the components inside the box should be pristine clean and nicely brazed.
The American Welding Society (AWS) was founded in 1919 as a multifaceted, nonprofit organization with a goal to advance the science, technology and application of welding and related joining disciplines worldwide.

From factory floor to high-rise construction, from military weaponry to home products, AWS continues to lead the way in supporting welding education and technology development to ensure a strong competitive and exciting way of life for people worldwide.

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- Quarterly digital edition of Welding Marketplace keeps you current on welding's newest products and services.
- Access to members-only web site at www.aws.org and access to country-specific AWS microsites
- This Week in Welding e-Newsletter
- Access to career information and job postings at www.careersinwelding.com

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American Welding Society
6010 NW 24 St., #250, Miami, FL 33126-6072
(305) 443-9353
www.aws.org/membership
Advertising

Commercial Ad Rates

General Advertising
- Cover 3, 4 col, 1/2 page
  size: 12.5 cm × 18 cm
- Cover 4, 4 col, 1/2 page
  size: 12.5 cm × 18 cm
- Main text, 1 col, 1/3 page
  size: 8.5 cm × 17.4 cm
- Main text, 1 col, 1/6 page
  size: 8.5 cm × 8.5 cm
- Main text, 1 col, 1/12 page
  size: 4 cm × 8.5 cm

Advertising

Electronic Documents for Viewing on a PC are in PDF format.

* Payments can be made conveniently by credit card.

Subscription

Subscription form on web site: www.sanpo-pub.co.jp/welpro.html

Subscription ORDER FORM
Please send me Welding Promenade for a period of ___ year(s) beginning with issue No. ____, for which I agree to pay the sum of ___ USD in advance.

Name: ____________________________

Address: ____________________________________________

Avg: ____________________________________________

E-mail: ____________________________

Vol. 17  December 2014 19

Guide to New Digital Version of Welding Promenade for Smartphones and Tablets (fee-based)

Welding Promenade (WP) has been available in an electronic version for PCs since Vol. 10 (March 2013). Now, in response to the demands of our subscribers, we are set to launch a new digital version of the magazine for a wide range of devices including smartphones and tablets. The first issue of WP to be released in the new format will be Vol. 18 (March 2015).

We are aiming to make use of all the features and convenience of the latest mobile computing devices to give you a better reading and viewing experience than ever.

Main features of the new digital version:
- Viewable by subscription on a wide range of devices including smartphones and tablets (Android/iOS) and PCs
- Color graphics (enjoy exhibitions, product photos, etc. in full color)
- Enlarged views (zoom in to check out detailed statistics, graphs, etc. of interest)
  * Only PC
- Links (click for easy access to detailed information) user
- Easy to view back issues (with search function)* Only available in PDF format
- Easy to print (to circulate content to colleagues, clients, etc.)

Notes:
* Since WP is a quarterly, the subscription period is 1 year (4 issues per year: approx. March, June, Sept., Dec.)
* To subscribe on a smartphone or tablet (Android/iOS) it is necessary to download the app from Google Play (Android) or the Apple App Store (iOS).
* Electronic documents for viewing on a PC are in PDF format.
* Payments can be made conveniently by credit card.

Preliminary announcement of Vol. 18

Area Spotlight: Vietnam, Thailand, Korea


Vol. 17  December 2014 19
News from the Editors

Request for information and article submissions

Welding Promenade is published by Sanpo Publications Incorporated four times a year (approx. March, June, September, and December). The editors are currently inviting submissions of information and articles from readers for the following sections of the magazine: Editor’s Choice/Product Reviews, Asian Voice, Hot News, Note, and Guide to International Events. Please note that received information and articles will be edited by the editors to adjust the text to the appropriate length and to make necessary corrections.

E-mail submissions or inquiries to:
Welding Promenade Editors
<wp@sanpo-pub.co.jp>

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www.daihen.co.jp
KOBE STEEL GROUP

http://www.kobelco.co.jp/english/welding/weldingtoday/index.html

The Japan International Welding Show 2016

DATE April 13–16, 2016
10:00-17:00 = Final day (16) 10:00-16:00
VENUE INTEX OSAKA

Information on Exhibit
Space Fee Excluding consumption tax
Early Bird Rates (Before June 19, 2015) ¥ 270,000
Standard Rates (After June 20, 2015) ¥ 300,000
Space Spec.: 3 m (w) ×3 m (d) ×2.7 m (h)

Contact Information
Phone: +81-3-3258-6411
Fax: +81-3-3258-6430
E-mail: info@weldingshow.jp
For further information, please visit:
www.weldingshow.jp

Organized by The Japan Welding Engineering Society / Sanpo Publications Incorporated

Think Future, Act Now!
Gateway to Great Success in Asia
Guide to Banner Advertising with Welding Promenade Online Site
A Compelling Business Tool for the Asian-Pacific Market

**Intent of Ad Plan**

As manufacturing industries in developed countries face declining domestic demand due to economic globalization, the manufacturing industry as a whole continues to become increasingly globalized. Simultaneously, as markets in emerging countries expand as a result of, for example, continued high levels of economic growth, local production and investment by foreign companies continues to increase in an effort to capture this demand.

If we look at the changes in the proportion of production done abroad, we find that notwithstanding the upward and downward influences of the world economic climate, this figure is growing year by year, and we can expect to see it rising to even higher levels in the future.

Furthermore, in the face of this global shift, if we consider investment growth in plant and equipment, as well as local production by foreign companies in emerging countries, a key survival factor is their ability to disseminate information from around the world to the rest of the world ahead of their rivals and to apply this information effectively to their projects.

In view of this situation, in November 2010, Sanpo Publications, Inc. (Sanpo Publications) launched a quarterly journal focused on the Asia-Pacific region: “Welding Promenade - Journal of Welding for Asian-Pacific” – primarily to feature news about the Asian Welding Federation (AWF) and its member countries. Thanks to your support, we have reached four years in print, and as we put out our 17th issue, we have currently achieved a circulation of over 13,500 and have received responses from a reach that extends beyond Japan to all four corners of the world.

Since our 10th issue of March 2013, we have also published an online edition of the journal. By our previous 16th issue, the number of subscribers to this online edition reached 12,335 (as of November 2014) and boasts a readership that spans people from AWF member countries, visitors to welding-related international exhibitions, and Asian-Pacific members of the of the American Welding Society (AWS).

Starting with the 17th issue, our latest edition, Sanpo Publications is planning to offer banner ads for display on the exclusive online edition of the journal, thereby offering advertisers full access to our hitherto cultivated network of countries across Asia and around the world. By placing your company’s banner ad, which will appear on the login page or on the My Page, you will be able to lead our medium’s readers to the page your company designates. We have strived to make the Welding Promenade (WP) Online site an “interactive” medium of communication that offers not only information from Japan, but also a selection of information from around the world, and we strongly encourage you to take advantage of the WP Online site as part of your company’s promotion strategy.

We look forward to collaborating with companies whose intentions are aimed at tackling the international welding market, hope that you agree to our above-mentioned aims, and wholeheartedly invite you to consider the WP Online site for your advertising needs.

**Outline of Ad Plan**

- **Distribution system (format):** PDF files distributed to the web library
  - A4 × 20 pages, 1 to 4 tables: 4-color, Text: 1-color
- **Number of subscribers:** 12,335 (scheduled to be issued 4 times/year: March, June, September, and December) (as of November 2014)
- **Subscribers by country:** Japan: 7,142; other countries: 5,193 (as of November 2014)
- **Readership:** Users, distributors, and research institutions of welding-related products and technology, predominantly in Japan and the Asia-Pacific region
- **Subscribers:** Visitors to welding-related international exhibitions, Asian-Pacific members of the AWS, members of the AWF, members of welding societies from around the world, etc.
- **Date of distribution:** the 15th of each month of issue, every year (March, June, September, and December)
- **Ad submission deadline:** 5th of the month of issue
- **Ad prices**
  - Single banner ad frame on WP Online login page (1 of 4 randomly displayed advertisers):
    - Price: 100,000 yen (excl. tax) 3-month period
A Compelling Business Tool for the Asian-Pacific Market

Guide to Banner Advertising with Welding Promenade Online Site

Welding Promenade — Journal of welding for Asia Pacific — Quarterly English-language Journal Connecting Asia from Japan

Publications is planning to offer banner ads for display on starting with the 17th issue, our latest edition, Sanpo Society (AWS). Asian-Pacific members of the of the American Welding visitors to welding-related international exhibitions, and 16th issue, the number of subscribers to this online edition published an online edition of the journal. By our previous circulation of over 13,500 and have received responses your support, we have reached four years in print, and as a key survival factor is their ability to disseminate investment growth in plant and equipment, as well as local. Furthermore, in the face of this global shift, if we consider intentions are aimed at tackling the international welding market, hope that you agree to our above-mentioned aims, we look forward to collaborating with companies whose company's banner ad is displayed on the login page screen. That is, the ad is displayed when subscribers log in.

Price: 100,000 yen (excl. tax) 3-month period, with random ad rotation between 4 advertisers (scheduled) per banner ad frame.

[Ad size] 305 × 95 pixels, [File size] 200 KB, [No. of advertisers displayed] 4 companies

Ad Specifications
WP Online Login Page Banner Ad

WP Online My Page Banner Ad
Single banner ad frame at top of page:
Price: 70,000 yen (excl. tax) 3-month period,
[Ad size] 305 × 95 pixels
[File size] 200 KB, [No. of advertisers displayed] 3 companies (scheduled) random display

3 banner ad frames at bottom of WP Online My Page:
Price: 30,000 yen (excl. tax) 3-month period,
[Ad size] 210 × 65 pixels
[File size] 100 KB, [No. of advertisers displayed] 9 companies (scheduled) random display

Note
[Creation of ad artwork]
* If submitting an ad in SWF format, please provide an alternative version in GIF format as well. Additionally, please set the file to link.

[Deadline for submission of banner images]
Please submit banner images at least one week before commencement of ad display.

* Please submit banner images in both SWF and GIF format.
* In some cases, after inspecting the submitted files, we may request changes to the artwork.

[Payment of advertising charges]
Please make ad payments by bank transfer to our designated account at least one week prior to the day of commencement of ad display.

[Commencement of ad display]
Display of ads commences on the 15th of each month.

* Ads will start to display some time between 9 a.m. and 5 p.m. (Japan office hours) on the day of commencement of ad display.
* If the 15th falls on a Saturday, Sunday, or public holiday, then the ad will begin displaying on the next business day.

[End of ad display]
Ads will stop displaying on the 14th of each month.

* Ads will stop displaying some time between 9 a.m. and 5 p.m. (Japan office hours) on the day that display is scheduled to end.
* If the 14th falls on a Saturday, Sunday, or public holiday, then the ad will stop displaying on the next business day.