

Detailed Meeting Notes for Commission XII:

July 2, 2007

Sub-Commission C Production Systems and Applications (Chairman, Mr S Asai)

IIW Doc No: XII-1926-07: T Ueyama, T Era, T Mita, M Ushio **Trends in Developments in Gas Shielded Arc Welding Equipment in Japan**

This paper describes the trends in the developments in gas shielded arc welding equipment in Japan. For welding power sources, a new output waveform control method combined with digital inverter control has been introduced to improve the performance of the arc welding process. Wire feeding control method has been innovated to boost high welding performance. Tandem GMA welding system and laser-arc hybrid welding system, have been introduced which have highly improved the weld quality and productivity.

IIW Doc No: XII-1921-07: J-M Fortain **Plasma Trends and Challenges**

Plasma arc welding is the highest density energy process available and is suitable for square butt joint application mainly for flat panel in shipyard, pressure vessel fabrication and piping. Also in comparison with TIG process, it is good for other applications using thick plates. This paper has introduced the possible technical challenges and how to overcome those challenges.

IIW Doc No: XII-1931-07: S Yamane, T Ishikawa, T Nakajima, H Yamamoto, Y Kaneko, K Oshima **Torch Weaving and Feed-Forward Control of Back Bead in One Side Backing Less V Groove Welding Using Switch Back Welding**

This paper describes a method to weld from oneside without backing using conventional welding robot. The relationship between current waveform and the torch weaving was observed and recommendations are made.

IIW Doc No: XII-1923-07: T Sato, T Kamei, K Wada **Effect of Shielding Gas on Weldability in YAG Laser - GMA Hybrid Welding of Galvanealed Steel**

Laser - arc hybrid welding process is good for high speed welding of steel sheets but seem to have problems in the application of galvanealed steel sheets for automobile industry. In this paper, a new shielding gas was developed for hybrid welding of galvanealed steel. It can eliminate possible defects such as pits or burn-through in fillet welding with large gap.

IIW Doc No: XII-1920-07: T Ogawa, S Asai, Y Makino, K Shiihara, K Okuno, N Koizumi, K Matsui
Laser Arc Hybrid Welding of Cover Plate for ITER TF Coil

This paper describes the investigation of the use of laser-arc hybrid welding for welding the TF coil cover plates and found that (1) Laser-TIG hybrid welding has superior joint gap tolerance than laser welding and the thermal input can be easily controlled, so it is suitable for CP welding. (2) With laser-arc hybrid welding, increasing the laser power and the TIG arc current are effective for increasing the penetration depth. (3) A twin spot laser-arc hybrid welding system was developed, the welding conditions were optimized, and the effectiveness for CP welding was verified. (4) For the actual shape model test, a 22-groove straight model and a 1/8 scale D-shape model were welded, and the workability and weldability of laser-arc hybrid welding was verified and the welding deformation amount was confirmed.

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Sub- Commission B Arc Welding Process (Chariman, Mr. H Hackl)

IIW Doc No: XII-1927-07: M Yamamoto, K Shinozaki, H Arashin, T Kanazawa, T Nagashima, T Myoga
Development of Ultra High Speed GTA Welding Process using Pulse-Heated Hot Wire

This paper describes the development of ultra-high-speed GTA welding process with the hot-wire system using pulsed current to heat filler wire. The advantages are: GTAW High Quality welds, economical advantages, ability to control heat input from the arc and the feeding rate of filler wire separately.

IIW Doc No: XII-1933-07: S Egerland
Improving Welding-Quality and Reducing Costs by Using the CMT-Welding-Process under Pure CO₂-Shielding Gas

This paper has made a study on the Cold Metal Transfer process and proves that using the right shielding gas CO₂ can significantly improved the welding conditions and thus improves the efficiency of the process.

IIW Doc No: XII-1917-07: M St Weglowski
Utilization of the Arc Light Emission Emitted During TIG Welding to Monitoring This Process

This paper presents the utilization of Arc light emission during TIG welding to monitor the process. The measuring system is based on a spectrophotometer, able to measure the arc light emission spectrum. This monitoring system will be beneficial to welded –structures manufacturing industry because it could significantly reduce the cost for post weld analysis and repairs.

Sub-Commission E Quality and Safety in Welding (Chairman, Professor D Rehfeldt)

IIW Doc No: XII-1925-07: M Mochizuki, S Okano, H Shirai, Y Hirata, M Toyoda
Appropriate Molten Pool Configuration from a Viewpoint of Weld Distortion Control

This paper presents numerical analysis with the thermal elastic-plastic finite-element method and experimental approach to evaluate precise weld distortion. This will allow proper selection of welding conditions. This will allow increase efficiency during fabrication.

IIW Doc No: XII-1922-07: K Yamazaki, E Yamamoto, K Suzuki, F Koshiishi, K Ono, S Tashiro, M Tanaka, K Nakata
Effects of Welding Process Parameters on Fume Emission in Gas Metal Arc Welding

This paper presents the effects of arc voltage, welding current, and shielding gas composition on the fume emission rate. Also it has measured the droplet temperature in several welding processes. It has concluded that metal droplet transfer mode and short-circuiting mode have significant effects on the fume emission rate. The source of fumes is mainly the high temperature vapor diffused from the surface of droplets hence the temperature and the size of droplets, which will be changed by the metal droplet transfer mode, are the major factors of the fume emission.

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VIII-2042-07: L Costa, P Montenovi
European Limits on the EMF Exposure and Welding Electromagnetic field

This paper explains the European limits on the EMF Exposure and Welding Electromagnetic field. Welder exposure depends on: current intensity, waveform and type of power source, workshop design, position of welding cables with respect to the body and its relevant parts. Adverse effects on health include Adult & childhood leukemia, brain cancer, EMP as a broad spectrum carcinogen for all cancer, miscarriage, other reproductive and developmental conditions, Amyotrophic lateral sclerosis etc. And the biological effects are summarized with relation to EMF.

14:45 XII-1930-07: S Yamane, Y Yamamoto, K Oshima
Measurement and Numerical Simulation of Electromagnetic Field in Arc Welding

In this paper, numerical simulations and measurements are used to evaluate the effect on a magnetic field due to welding current and metal plates. It was found that there was no evidence between magnetic exposure and the affection to human health. The conclusion was that as the working V is low, in the welding field, the magnetic field is important than the electric field. Since the frequency of the welding I is low, the fundamental wavelength is long. The steady state analysis was applied to the numerical simulation of the magnetic flux. The magnetic flux was under the influence of the metal plate near the welding. It is important to consider the arrangement welding cables in the work environment.

III-1449-07: J N Boyer

Exposure Electromagnetic Fields during Resistance Welding Operations

This paper gives an overview of physical laws, coupling mechanism with human body, limit values for workers exposure, measurements performed on RW equipment, guidelines for products and process improvement and the scope was to establish an evaluation method to show conformity of resistance welding equipment with the council directive 2004/40/EC

XII-1929-07: P Mair

EMF Assessment Results and Protection Measure at Workplaces Utilizing Electric Welding Processes

This paper gives attention to aspects like interpretation of the Directive 2004/40/EC on the minimum health and safety requirements related to exposure of workers to the risks arising from physical agents (EMF), practicable procedures for exposure evaluation, examples for assessment results and measures that can be taken.

It is the responsibility of the employer to evaluate workplaces includes overall exposure assessment, avoiding risks, work information and training, participation of workers and health surveillance.

XII-1932-07 Modeling and simulation of gas flows in Arc Welding – Implications for Shielding Efficiency and Fume Extraction

The paper describes the approach and its application to the understanding of shielding effectiveness and local fume extraction efficiency. The secondary effects of poor shielding seen in practice are consistent with the numerical modeling results.

XII-1924-07: U Dilthey, K Holzinger

Health and Safety in Welding - Actual Research Projects at ISF Aachen

ISF

This paper gives comparative studies about the characterization of ultra fine particles in welding fume during welding and related process – from cutting brazing and welding methods.

General discussion on Health and Safety issues

Recommendation ?/2007

IIW will require to CENELEC and IEC/TC26 to reconsider the limit values of human exposure to electromagnetic fields specified in the new draft standard prEN 50445 to harmonize the social costs.