Effect of Welding Conditions on Thermal Factor Assosiated with Residual Diffusible Hydrogen Content in Heavy Thickness Steel Welds

by Toshio Terasaki, Hideaki Harasawa, Masaru Sakaguchi, Mikio Sakashita and Kunihiko Satoh

In order to avoid cold cracking in steel welds, a proper selection of welding conditions of heat input, preheat and interpass temperature is required corresponding with the interested plate, joint geometry and consumable.
Although cooling rate at 300°C or time to cool 100°C etc. have been considered as the parameters which may be used to estimate the avoidance of cracking, the thermal factor calculated by means of welding thermal cycle and diffusivity coefficient for hydrogen should be more directly concerned as a parameter.

From this point of view this paper firstly describes the estimation of the correlation between welding thermal cycles and welding conditions, and then, the effect of welding conditions on the thermal factors both for single root-pass weld by the y-slit test specimen and for the final pass of welds by large size multipass butt joint test specimen.

It is found from the investigation that the estimated welding thermal cycles show a coincidence with directly obtained ones and the value of heat transfer coefficient (α) of 7×10^{-4} cal/cm²·sec. °C is applicable to the temperature range of 300°C through 90°C for single root pass welding.
It is also found that the thermal factor is significantly influenced by heat transfer coefficient, and that the thermal factor in multipass butt welding shows the m·nimum value at the plate thickness of about 100 mm.

<P. 1171>

Study on Diffusion Welding of Stainless Steel to Mild Steel

by Isao Masumoto, Shigetomo Matzui and Takeshi Yamada

This paper describes the wledability for diffusion welding of stainless steel to mild steel. For this purpose, the joint tensile strength and microstructures were investigated. And the effect of insert materials was also examined.
The results obtained are as follows.

(1) The joint strength depends on the welding temperature and the surface roughness remarkably. The relation between the strength and the surface roughness for the dissimilar joint of stainless steel to mild steel has the same tendency as that of the similar joint between the mild steels.
(2) When the joint is welded at about 800°C, chromium carbide is formed at the stainless steel near the joint interface due to carbon migration. If the welding temperature is higher than the sensitizing temperature range, chromium carbide precipitated zone along the joint interface is not formed.
(3) To avoid the formation of chromium carbide precipitated zone and decarburized zone due to carbon migration, the insert material, nickel is effective.
(4) To increase the weldability of the joint, which surface has been roughly treated, the insert material, silver is useful, when the welding temperature is high.

<P. 1179>

Effects of Current Waveforms on TIG Welding Arc Sound (II)

—Investigation on Welding Arc Sound (Report 5)—

by Masami Futamata, Tetsuo Toh, Katsunori Inoue Hiroshi Maruo and Yoshiaki Arata

This paper describes the effects of the pulsation of welding current on the TIG welding arc sound by using a transistor-controlled power source. The arc behavior is observed by using a high-speed movie camera and an oscillograph. Based on the examinations, it is found that the contraction and expansion of arc form is synchronized with the change of welding current. Therefore, it is possible to estimate the welding arc sound source as a pulsating sphere for sine wave current.

<P. 1187>

Factors Affecting the Result of Electromagnetic Welding of Aluminum Tube

—Studies on Electromagnetic Welding (Report 2)—

by Koreaki Tamaki and Masatoshi Kojima

The important factors which affect the result of electromagnetic welding will be i) inductance of coil, ii) clearance between outer tube and core bar, iii) tapered angle of core bar, iv) thickness of core; if a tube is used as a core, v) hardness of outer tube. Each of those factors was examined on some joints made of industrial pure aluminum. The main part of the welding equipment was the capacitor of capacitance of 1,000 μF and proof voltage of 5 kV. The result of welding was expressed by the ratio of welded length to interfacial length along the circumferencial direction. The results could be summerized as follows

(1) The optimum result of welding was obtained by the coil inductance of about 3 μH.