Stud Arc Welding – Changes of the main welding parameters due to welding on unclean surface

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Index Terms: Stud Arc Welding, On-line monitoring, Process stability.

The main purpose of welding parameters monitoring systems is to monitor the welding voltage and current in real time (on-line). This relies on experiences that useful information about welding process quality can be gained by analysis of welding voltage and current dynamics. However, some of the systems for welding process monitoring include, besides of welding current and voltage gauges, welding velocity and wire feed speed gauges (MAIG/MAG welding process) as well as temperature and gas flow gauges [1]. Systems for monitoring of main welding parameters are used for on-line monitoring of welding processes in manufacturing quality control, as a support in development of new filler metals, shielding gasses, and welding equipment, optimization of welding technology, adjusting of parameters and welding equipment characteristics as well as adaptive control of the welding process [2]. It is important to discover the welding parameters irregularities in real welding conditions so they can be eliminated in order to achieve acceptable weld quality. In this paper, the applicability of methods for stability evaluation usually used in MAG welding process [2, 3] for application on stud arc welding is analyzed.

During experimental stud welding with ceramic ferrule (semiautomatic equipment Nelson Stud Welding, Inc., Oh, USA; power source ALPHA 850; stud welding gun NS 40 B) welding current and voltage were recorded with developed on-line monitoring system (sampling frequency from welding process was 5 kHz). Welding was performed on studs "Nelson KS 10,0×50" with ceramic ferrule "Nelson KW 10/5.5". Stud was made from X10CrAl18 (EN 10095), and base metal was steel type 16 Mo 3 (EN 10028-2). The setup of selected welding parameters is shown in table 1. Validation of the welding process stability was performed by off-line analysis of collected data. The welding process starts and stops disturbances are excluded – the moment when the welding current value exceeds a value selected on the welding power source is the starting point of the analysis, and the voltage short circuit drop, due to submerging the stud into the base metal, marks the end of the analysis. The resulting diagrams of arc voltage versus welding current, for the process with clean and oiled base metal surfaces, is shown on figure 1.

Table 1. Stud welding parameters

Trial No.	Welding current *I*, A	Welding time *t*, s	Plunge *P*, mm	Lift *H*, mm	Welding condition
1	600	0,4	2,9	2,5	Clean surface
2	600	0,4	2,9	2,5	Oil on surface

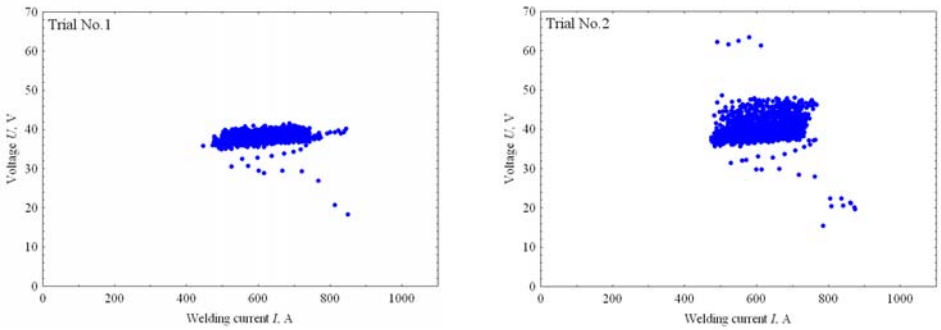

Fig. 1. Dependence of the arc voltage on the welding current for the welding parameters shown in table 1

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