Real time capturing welding parameters with tracking module

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Abstract: *It is presented real time capturing voltage and current in welding process with module Lincoln Arc Tracker.*
Keywords*: WELDING PROCESS, CURRENT CAPTURING, VOLTAGE CAPTURING, REAL time*

1. Introduction

According to the modern requirements for low energy intensity and environmental protection and in the context of declining natural resources, scientists, the business, and the society are looking for ways to meet the growing needs of various industries, from optimizing and improving welding methods to adding additional alloying elements for better weldability.

The welding process is used in almost every area of human activity, and the need products of this process is constantly increasing. With the increase of the responsibility of the welded joints, the requirement for welding quality is also increased.

The welding process is performed according to a pre-approved and validated Welding Procedure. This welding procedure sets the welding technology, welding mode, current, voltage, welding speed, wire feed rate, flux used, type, diameter and tip pre-forming of the welding wire, welding and break time, and other parameters on which the quality and reliability of the welded joint depends. Deviating from them, with a high probability, leads to a decrease in the properties of the welded joint, and hence to defects and damage that increases the risk of injuries and endangering human life and negative environmental consequences.

When welding by an operator, due to a number of factors that cannot be avoided, the welder can deviate from the welding procedure, with the welding process being carried out at welding parameters that differ from the procedure. This leads to the presence of defects - gas and slag inclusions, welding cracks, unexpected change of the main metal properties in the surrounding area, etc. The presence of such defects directly affects the exploitation properties of the manufactured parts and elements by reducing their strength, lifetime, reliability, etc. When applied conscientious control, this leads to wastage, cost increases and waste of resources - metal, welding wire, welding gases and energy. In case of unconscious control - to the direct danger of traumatism, accidents, ecological catastrophes, etc., which directly or indirectly affects the society.

Improving the welding process by the real time control of welding parameters compared to those set in the welding procedure reduces drastically the possibility of defects and thus gives economic and environmental advantages by reducing wastage and consequently consumption of metal, gas, electricity and water to reducing emissions.

The results of the research show that there are numerous studies on the methods and technologies for monitoring and control of the welding parameters, the influence of the parameters on the exploitation properties of the welded elements, the quality determination of the welded joints.

It is studied the influence of the welding parameters in various welding processes and their impact on the quality and performance of the welded joints [1,2,3].

One of the current problems of modern material science is methods for increasing the life cycle of parts with welded joints, which must have both high hardness and strength and low internal stress. It is studied the impact of welding parameters on the morbidity of welded joints [4,5].

There are known studies on welding process optimization methods by control of welding parameters [6,7,8].

There are studies on welding parameters control and welding optimization [9,10] as well as methodologies for determining the parameters in welding processes [11].

There are developed welding parameters parameter control systems [12,13,14].

The analysis of our well-known sources does not give enough clarity to the question: what impact the welding parameters have on the performance of the welded joints and what methodologies should be used to improve the quality of the process.

This leads to the need to acquire new fundamental knowledge about the possibilities, means and rate of improving the quality of the welding processes by real time control of parameters.

A thorough study and determination of the influence of welding parameters on the quality of the process and analysis of the possibilities for quality improvement through real time control is also needed.

2. Capturing welding parameters – voltage and current

As a capturing module is chosen Lincoln Arc Tracker. With this module we can capture in real time welding current up to 1000A and voltage up to 44V. This module has an ethernet connector to easily connect it in to a local network. The module is combined with software product Power wave manager which captures tracked welding parameters. With this capturing process can be monitored in real time on remote computer.[15]

The set up consists of welding torch, which is mounted on mechanical grip. The mechanical grip fixes the torch in one position and removes fluctuations from welder's movements. The mechanical grip is mounted on welding tractor, which moves along and over the welded elements with constant speed. Welded elements are placed on welding table. Next to the welding table are placed the power source that feeds the torch and gas bottle that protects the joint. Capturing module Lincoln Arc Tracker. Arc tracker captures welding current and voltage. It is connected to WiFi Router that transmits the data to laptop. Connection of the Arc tracker module is shown on Fig. 1.

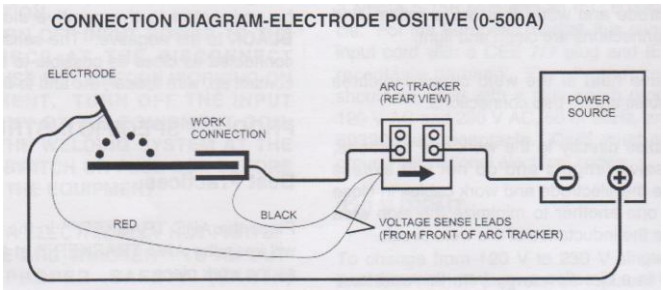

Fig. 1 *Connection diagram of Arc Tracker in the experimental set up.[15]*

The set up functionality is verified with experiment with the following parameters:

- welding current – 210A
- welding volatage – 25V;

- η of the welding source – 0,8;
- welding power – 4200J/s;
- welding speed – 50cm/min;
- welding steel plates 50x5x200mm.

On Fig.2 are shown values of set and measure welding current.

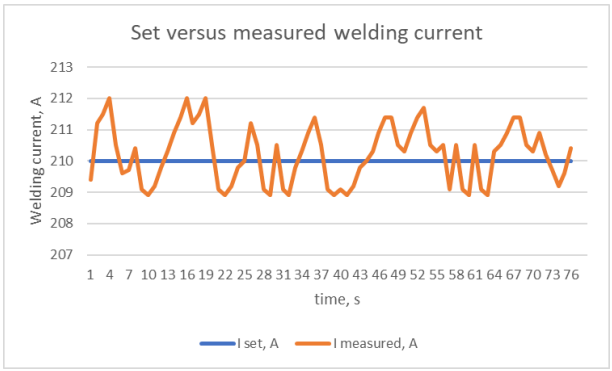

Fig. 2 *Set versus measured welding current curves.*

On Fig.3 are shown values of set and measure welding voltage.

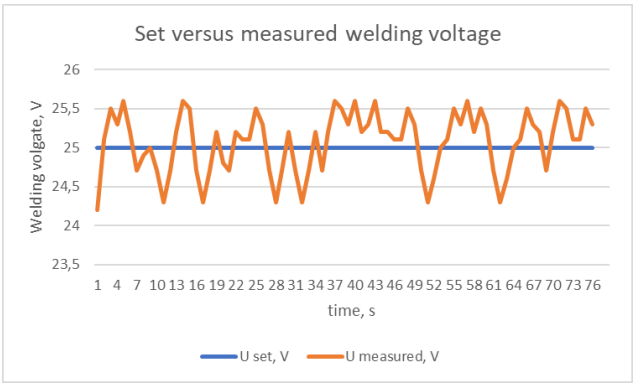

Fig. 3 *Set versus measured welding voltage curves.*

On Fig.4 are shown values of set and measure welding power.

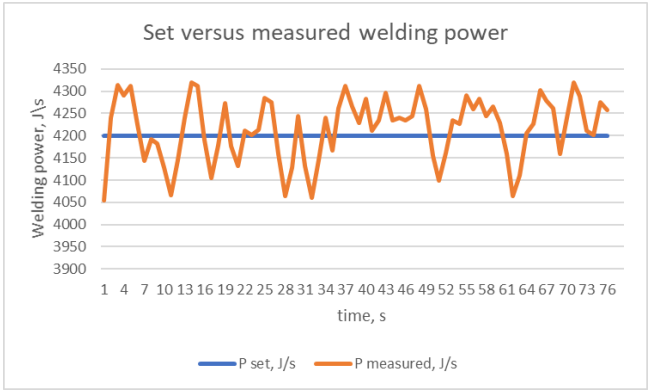

Fig. 4 *Set versus measured welding current power.*

On Fig.5 are shown set versus measured welding current, voltage and power differences.

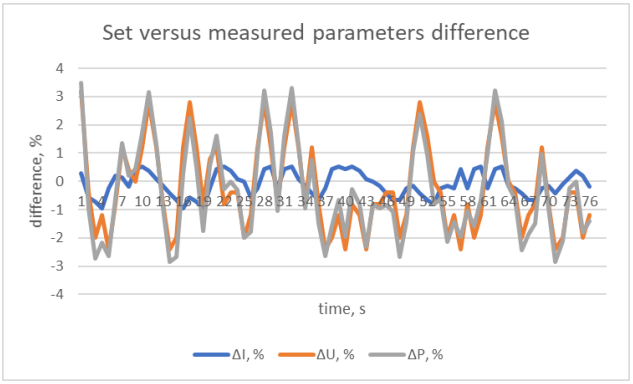

Fig. 5 *Set versus measured welding parameters.*

Measured welding current and voltage don't deviate much from set values. This gives the expectation that the welded joint would be of good quality.

3. Conclusions

It is presented tracking module for real time capturing welding current and voltage during a welding process. Parameters are shown graphically on remote laptop and a warning signal value limitation can be triggered if measured values goes off.

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4. *References*

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