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Signal processing approach on weld data for evaluation of arc welding electrodes using probability density distributions

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Abstract

Shielded Metal Arc Welding (SMAW) Process utilizes a constant current type power source with drooping characteristics. Due to complex nature of welding arc and metal transfer that occurs during welding, there is a lot of random variations in welding current and voltage which cannot be recorded directly by normal ammeter or voltmeter. However, acquisition of welding data while welding is in progress and subsequent analysis of this data can be very useful to evaluate various welding parameters (i.e. welding consumables etc.). For this purpose, high speed of data acquisition is essential. As noise level in the data will be high hence, before performing any meaningful analysis filtering of this data is also important. In the present study, a technique is proposed for the reliable acquisition of welding data to acquire all the possible variations in arc voltage while welding is in progress using a Digital Storage Oscilloscope (DSO). Various signal processing methods were used for selecting the appropriate filtering technique. Filtered data thus obtained were used to evaluate arc welding electrodes with different flux coating using probability density distributions. The results thus obtained were correlated with the images obtained using high speed camera setup. This clearly brings out the differences in the arc characteristics for welding consumables. They also indicate that the proposed technique can be developed as a tool to compare the performance of different welding electrodes.

Keywords: SMAW; Data processing; Consumables; Process Monitoring; sensors;

1. Introduction

Arc Welding is one of the most common and popular welding technique because of its simplicity in the operation, versatility and low cost. Due to its inherent merits, this process is extensively used in almost all type of industries. Random arc behavior and various modes of metal transfer in an arc welding process leads to dynamic variations in voltage and current while welding is in progress and hence, monitoring of this process is difficult and challenging. Welding process can be understood in a much better way than it is

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