The Application of Television Systems for Process Control of Adaptive Arc Welding of Metal Parts

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Abstract - **In this paper the principles of the use of special television system to manage the Adaptive Pulse - arc welding of metals are considered. Considered, too, the basic processes that occur during welding between the electrode gap.**

Keywords - **Adaptive welding, TV control system, Dosed supply of electricity, Electrical and timing parameters.**

I. Introduction

Pulse adaptive welding and surfacing provides greater opportunities to ensure the quality and operational parameters of the responsible welding. The essence of this approach is the adaptive control for changes in the energy parameters of the process according to their instantaneous values: the arc current, voltage, energy spent on melting and transfer of each drop of the electrode metal. Due to the presence of feedback in such an electrodynamic system provides complete control over the stability of heat and energy parameters of the process, as well as the characteristics of mass transfer of electrode metal, the required performance indicators may be provided.

II. The Main Principles of Control System Functioning

Functional diagram of the control system dosed supply of electricity when arc welding of metals containing semiconductor energy converter (SEC), a control system of converter parameters (CS), welding arc setting (WAS), television sensor (TS), pulse shaper (PS), controled converter (CC), the filter low-pass (LPF) and processor of technology parameters (PTP) [1].

The implementation method dosed supply of electricity in the process of arc welding of metals involves optic filtering of arc discharge image, processing video image TV sensor by using intra- and interframe processing. After signal processing by processor technological parameters, the output of a signal is sent to control system parameters of energy source.

As noted in [2], transport processes of molten metal from the electrode to the surface has a somewhat different character compared to how it is taken to explain the technology of STT. Throughout the interval short-circuit critical to accelerating the destruction of bridges has electrodynamic force that seeks to "pinched" electrode through the melting, tear off the drop of electrode metal and give it a booster-shot to move in the direction of the weld pool. And only on the last stage of destruction bridge (approximately 10^{-4} sec until the re-excitation of the arc) is accompanied by the prevailing value of the surface tension relatively for other forces. However, due to the short time of existence of this range, its contribution to the destruction of the liquid bridge is negligible.

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Jumper is destroyed by a small electric current during pause time. Pause duration can be set either parametrically, or depending on the arc gap at this stage. At the end of the pause current increases and the melting of the electrode is carried out during the time of the current pulse. The above mechanism of controlled transfer of electrode metal into the weld pool is preserved also in the implementation of other adaptive algorithms of impulse control power parameters of the process. The only difference is that the disturbances caused by the transfer of electrode metal droplets and causes by the features of formation of the weld metal in different spatial positions, are processed at different stages of the welding microcycle depending on the duration of the pause before the short-circuit, indicating the mobility of the weld pool when you change the spatial position.

The use of television monitoring systems on the process of metal droplet formation at the electrode tip and the formation of the weld gives the ability of quickly adjustment the electrical and timing parameters of the welding process, as well as to support the value of the interelectrode gap to achieve a homogeneous quality of the weld.

At the same time due to the electrical current during pause is maintained average power mode that enables the formation of defect-free welds, regardless of its spatial position. At the same welding speed reaches 20-30 m/h, while welding the bottom up - no more than 5-7 m/h [2]. This fact indicates a good reserve for increasing the productivity of electric arc welding in CO2, which can significantly affect the rate of increase in the welding and assembly work highly responsible structures, while ensuring the required quality and strength characteristics of welded joints.

Welding in CO2 with electrode metal transfer during forced closures of the arc gap provides good results in the formation of the root and facing layers of the seam, as well as welding of thin sheet metal parts and surface cladding of metal.

III. Conclusion

At present, research is underway on the development of application technology television system process control of arc welding under stationary conditions. The successful solution of the tasks will significantly improve the quality parameters of welded products for different purposes**.**

References

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