ador WELDING

e-Weldone

APRIL 2016 | Vol. 10

Pulsed Mig/Mag welding. Factors affecting welding performance.

Pulsed MIG/MAG welding, or pulsed arc MIG welding, is a method of welding that uses current pulses from the power source to control transfer of the droplets of molten filler material in the arc in such a way as to produce a stable and spatter free arc, even with low welding data.

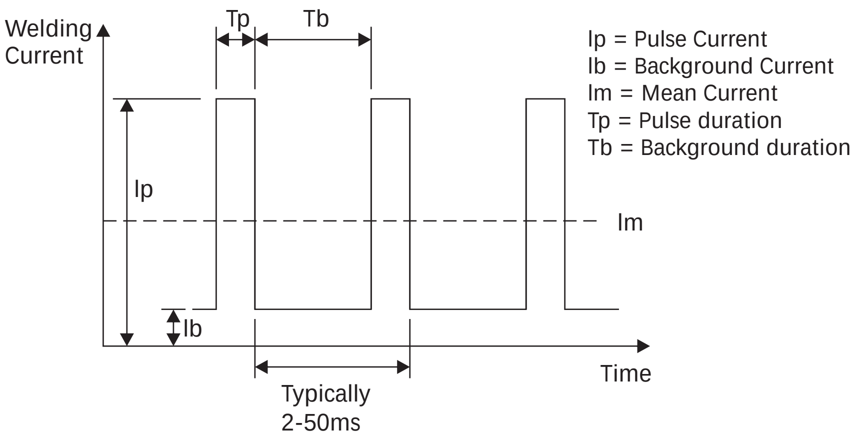
The technology used is referred to as 'synergic pulsed arc welding', with the word 'synergy' indicating a method of facilitating setting up the equipment by enabling the power source automatically to select appropriate pulse parameters. As the welder increases or decreases the wire feed speed, the other parameters are adjusted in order to maintain a suitable arc.

Pulsed arc welding

Pulsed arc welding is used mainly for welding aluminium and stainless steel, although it is also used for welding ordinary carbon steel. The method of controlling the transfer of the droplets by current pulses (30 - 300 Hz) from the power source makes it possible to extend the spray arc range down to low welding data. The process provides a stable and spatter-free arc as a welcome alternative to short arc welding. The pulses serve two purposes: supplying heat to melt the filler wire, and then also to pinch off just one molten droplet for each pulse. This means that, as the wire feed speed increases, the pulse frequency must also increase. This will have the result of maintaining the droplet volume constant at all times. a low background current contains the arc between the pulses. Although the current amplitude in each pulse is high, the average current - and thus the heat input to the joint - can be kept low.

With MIG welding, there is a connection between the welding current and the rate of melting the material. During ordinary non-pulsed welding, this relationship is utilised by setting the required wire feed speed and arc voltage. The arc voltage affects the arc length, so that a higher arc voltage results in a longer arc. The wire feed speed determines the welding current, i.e. the current must be such that the filler wire is melted away at the same rate as it is fed forward The values of the current in the pulses in pulsed arc welding lie above the critical current limit at which the droplets are easily released from the tip of the filler wire. The pulse duration is chosen such that exactly one droplet is pinched off by each pulse. The droplet diameter has to be equal to the wire diameter and is obtained by controlling both wire speed as well as pulse frequency on the condition that only one pulse is pinched of per one current pulse. To achieve synchronisation between pulse frequency and wire speed, a DC motor with pulse feedback is used.

Typical Pulse current waveform along with its associated parameters are shown in figure below:



An increase in wire speed can be achieved by following ways:

a) An increase in number of current pulsation

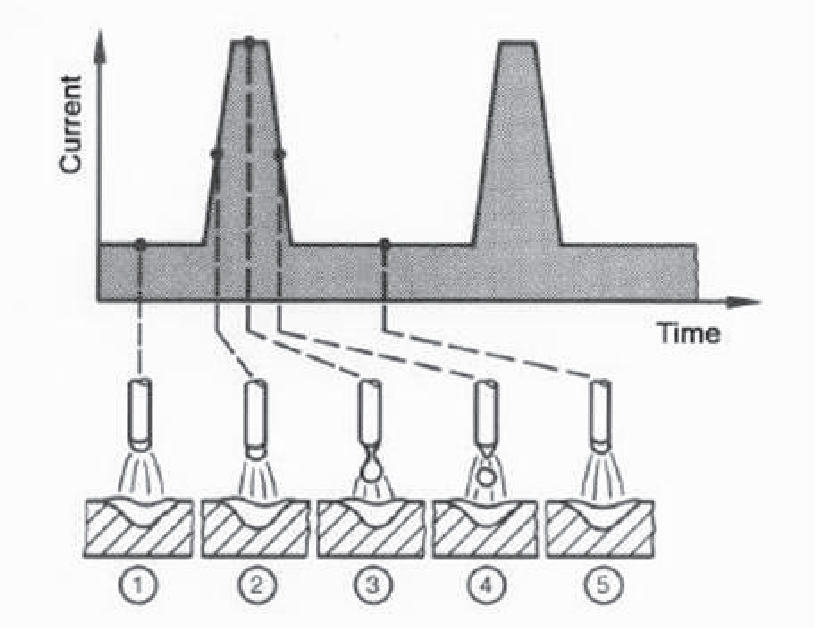
b) An increase of base current

However with variation with wire diameter the following parameters has to be updated in synergic way

a) An increase in pulse current

b) An increase in pulse duration

During the time between pulses, the current is low, so that the average current is low, and yet the droplets are transferred as in a spray arc.



Melting the filler wire

It has been explained above that, if the arc length is to regulate itself, the power source must have a constant voltage characteristic. However, this risks conflicting with the requirement of being able to control the pulse parameters at the same time. Ideally, we would like to be able to control both the pulse current and the background current, but this would then put self correction of the arc length at risk.

Different manufacturers of welding equipment have solved this problem in different ways. One way is to maintain constant voltage of the pulse and a constant value of background current, sometimes referred to as CVCC (Constant Voltage and Constant Current) control. The pulse current will then vary, depending on whether the arc length is long or short. Another alternative is to do the opposite, i.e. CCCV, which means that it is the background current that is varied. These operating principles restore control of the arc length, although to some extent at the cost of control of the pulse parameters.

ADOR has found an interesting solution to the problem, enabling both self correction and control of the pulse parameters to be used together. This involves current control during both the pulse and the background current period between pulses. The arc voltage is measured at every current pulse, thus providing a signal to indicate the arc length. Based on the arc length, the pulse frequency is increased or decreased along with control of base current simultaneously. Also to compensate the frequency correction, base current amplitude is also changed in order to get stable arc. Reducing the background current duration also reduces the amount of heat supplied by it. In order to be able still to melt a droplet of the same size, compensation is provided by increasing the value of the background current This method of control makes it possible to fulfil the conditions necessary to pinch off each droplet , while at the same time controlling the arc length.

It is important to have current control during the background current period, as this ensures that the arc will not extinguish at the lowest current settings.

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