Overlaying with the AFTek Demand Pulse WELDING SYSTEM

The heart of the **AFTEK DEMAND PULSE SYSTEM** is one of the oldest welding technologies still in use today - the resistor controlled arc. BUT, it's BRAIN is as modem as tomorrow! **AFTEK** uses EDGE-WOUND resistors made with an alloy specially selected to *CONTROL CURRENT,* And Power MOSFETs to switch between the peak and background amps. **Demand Pulse**, while similar in appearance and sound to Short-Arc, is nevertheless, very different.

"SHORT CIRCUIT TRANSFER encompasses the lowest range of welding currents and electrode diameters associated with Gas Metal Arc Welding. This type of transfer produces a small, fast freezing weld pool that is generally suited for joining thin sections, for out-of-position welding, and for bridging large root openings. Metal is transferred from the electrode to the workpiece only during a period when the wire is in contact with the workpiece (short-circuited). No metal is transferred across the arc gap...As the wire touches the work the current increases...".the molten tip is pinched off by the magnetic flux created by the high current, and the arc is reinitiated...The wire contacts the workpiece in the range of 20-200 times per second."

You can find more details from many sources, but the main points made in the above description, largely excerpted from the **American Welding Society Handbook©**, infer several points: the arc is extinguished 20-200 times per second, metal transfer can only occur while the arc is extinguished, the transfer is violent, causing spatter.

While not mentioned in the above, research shows that the arc is out approximately 60 percent of the time. This is the principal reason cold laps occur.

With **DEMAND PULSE TRANSFER** the arc is rarely extinguished. Never in perfect conditions... Metal transfers through the arc, although a much shorter arc than Pulse Spray...The transfer occurs above the molten pool, so spatter doesn't explode from the puddle...It is a "constant current" process. Now, constant current in this sense does NOT mean the current does not change during welding. It is simply to distinguish **Demand Pulse** from Short Arc, which is constant voltage. The operator selects a base current, similar to some Pulse Spray applications (GMAW-P), adjusts the wire feed speed to give the correct voltage, and begins to weld. The **Demand Pulse** control will deliver two 100-ampere pulses as DEMANDED by the arc. The **Demand Pulse** control has a dial to allow the operator to set the voltage at which transfer will occur. This is adjustable from 6 to 15 volts. Lower voltage will cause the puddle to freeze faster, higher voltage will cause the puddle to he more fluid.

In short arc, a current PULSE is triggered by the short-circuit condition caused by the wire driving into the workpiece. **Demand Pulse** FORCES the transfer to occur BEFORE short-circuit, at a voltage selected by the operator, above the weld pool. This has two important effects: the arc does NOT extinguish and the spatter level is greatly reduced because the molten tip of the wire does NOT contact the weld pool. Because the arc is not extinguished, cold laps are virtually eliminated.

Demand Pulse works particularly well with “Inconel©” type materials – because the arc does not extinguish between pulses, fusion is much better, and heat input can be controlled. Unlike GMAW-P (Gas Metal Arc Welding-Pulsed), the actual welding current is quite low, similar to short-arc. A typical GMAW-P when showing an “average” of 100 amps and 22 volts is switching between possibly 400+ amps to 50 or so, and the voltage is switching between 35 and 12 or so. The 400 ampere peak current means a water-cooled torch is necessary unless you can live with extremely short parts life. A **DPM** system, with the same operating “average” would have around 50 amps “background”, and 175 or so peak, with the voltage running between 12 and 22.

Many surfacing materials are available only in a tubular wire form, sometimes called metal-cored wire. .045 diameter is very common, and **Demand Pulse** allows sound deposits with lower dilution rates than conventional machines, at lower current and voltage. In a recent test with .045 Cobalt 6M, 115 – 120 amperes at 18-19 volts yielded excellent results with very little spatter loss, and very smooth deposits. The client was extremely pleased, and entered an order for a system for delivery as soon as possible.

The Tennessee Valley Authority contracts out thousands of square feet of overlay work each year in their hydroelectric plants. They have found that overlays done using the **AFTEK Demand Pulse System** are sounder, and have lower dilution rates than those done with conventional machines. Their quote form specifies that **Demand Pulse** or equivalent be used. Since there is no equivalent, all overlay work for the past several years has used **Demand Pulse**.

On the reverse is a testimonial from an experience in Georgia. Since this demo, the utility has purchased 3 MV445DPM-III Power Supplies, and 5 MO-80- 395DPM-III GRIDS for overlay and joining on boiler work. They are still amazed at the quality of the deposited overlay, and the ease of adjusting to weld open butt pipe joints.

If your work includes overlay of “alloy” material on carbon steel, or if you join high nickel alloys, give Demand Pulse a try. Of course it also works extremely well on EASY jobs, too!

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