

Simplifying success with ESAB's latest Aristo MIG system

Jannie Bronkhorst, ESAB South Africa's product manager for welding and automation, talks about the advantages of using the latest Aristo MIG 4004i coupled with the best possible consumable wire for the application.

In medium- and heavy-duty industrial welding applications, enhanced weld quality, reduced operating costs and welding productivity reign supreme. Manufacturers in heavy equipment are seeking every welding advantage they can find. Compounding this is the chronic shortage of skilled welders. That said, even the most skilled workforces benefit from the functionalities incorporated into today's advanced welding systems.

Take, as an example, the new Aristo MIG 4004i Pulse power source from ESAB, which pairs with the Aristo Feed 3004 wire feeder and the user-friendly U6 or more advanced U82 control panel to form a complete welding system, together with the correct filler metal.

Inverter advantage

The Aristo MIG 4004i Pulse is an inverter-based, multi-process welding power source that can be used for various processes. These include gas metal arc welding (GMAW), pulsed spray transfer (including modified pulsed spray processes such as ESAB's Super-Pulse process), gas tungsten arc welding (GTAW) and shielded metal arc welding (SMAW).

In addition to its versatility, the Aristo MIG has a footprint that is 80% smaller and weighs 70% less than conventional technology power sources with a similar

output. The Aristo MIG has an output range of 4 to 400 A; a 60% duty cycle at 400 A/36 V and a 100% duty cycle at 300 A/32 V; and the machine operates from a 380 to 460 V ($\pm 10\%$), three-phase supply at 50/60 Hz.

Its compact size and light weight help fabricators who want to move their welding system around a large weldment, especially if they have limited space in their welding cells or want to mount the power sources on a mezzanine or pedestal to get them off the factory floor. Inverter technology also means that the Aristo MIG can help lower utility bills, as it has energy efficiency of 88% and a power factor rating of 0.94 (with a 1.0 power factor being the best possible).

Built-in intelligence

The real benefits, however, come from the system's advanced capabilities, many of which are controlled from the U6 or U82 panel. For example, they offer up to 250 pre-programmed synergic lines. Operators start by selecting the welding process, followed by wire type by AWS classification, shielding gas type and wire diameter.

Once the selections are made, the system sets the optimum welding parameters for those variables using its synergic lines. It then displays the data on the panel interface. The ESAB-designed synergic lines also help the operator avoid globular regions between short arc

and spray arc where the arc becomes unstable and generates excess spatter.

With each synergic line, there are start and stop routines set as default. Some of these functions (creep start, hot start and crater fill) can be activated by using the keys on the interface. To further fine-tune the weld settings, the start and stop data can be customised and sub-



The AristoU82 control panel enables users to create customised synergic routines specific to their application, further optimising performance.

sequently stored – the U6 has a memory to store up to 10 welding schedules, while the U82 can store up to 255.

In addition, the U82 enables users to create customised synergic routines specific to their application, further optimising performance. Activating the trigger switch enables users to switch between pre-set welding programs during welding by quickly double clicking the torch trigger.

With the U82 panel, users can set limits on voltage and amperage, ensuring that operators cannot step outside of a set welding procedure. Further, once the weld data has been set, the control box can be locked, preventing unauthorised personnel from changing the data. Additional quality functions include storing data on the last 99 welds; monitoring production statistics, such as arc-on time and quantity of wire consumed; and exporting statistics and procedures using a USB connection.

Some of these functions are mandatory for users of this type of equipment, which also run such ESAB filler metals as OK AristoRod 12.50 solid wire.

Quick-set functionality

In a fabrication facility with 10 operators all using the short-circuit GMAW process on the same component, there is a reasonable chance of finding 10 different opinions on the settings that constitute a perfect arc. On top of that, operators new to the production line might have trouble consistently setting parameters.

To harmonise parameters between workstations, using one of the provided synergic programs in combination with the limit and lock functions is a good

place to start. However, there is another way that might have more operator appeal: Q-Set.

Q-Set artificial intelligence is an innovation that improves the efficiency of short arc welding. To use Q-Set, operators push a single button and then weld for eight seconds on a sample of the joint they plan to weld. Q-Set then automatically selects the optimal short-circuit frequency for the gas/wire combination installed.

By varying the number of short circuits per second and the duration of the short, along with other variables, the machine provides ideal weld pool conditions and consistent weld quality. It can also lower spatter levels for reduced post-weld cleaning. Q-Set even adjusts for variations in electrode stick-out, such as when operators are welding in a deep corner or groove.

Q-Set, as with all of the Aristo MIG's synergic programs, provides for easy weld pool heat adjustment. To weld 'hotter and faster' or 'colder and slower' when shifting from the flat to vertical position, for example, operators simply adjust the wire feed speed up or down. The system automatically adjusts all other welding parameters to maintain optimum performance. By eliminating the technical adjustments, Q-Set allows newer operators to focus on gun manipulation and technique.

Pulsed spray and SuperPulse

Traditionally, manufacturers and fabricators selected the short arc process for reduced heat input, especially on thinner sections of stainless steel and aluminium (from 5.0 mm to 15 mm thick). With stainless steel, thermal conductivity is poor, which means that it is highly prone to warping. Excess heat also 'burns out' the

alloying elements, which can severely degrade mechanical properties and reduce the material's ability to inhibit corrosion.

Conversely, aluminium, because of its excellent conductivity, is highly prone to burn through and – in what may seem a contradiction – incomplete fusion. The potential for poor fusion occurs because the weld pool solidifies too quickly and because the short arc process does not have sufficient heat to penetrate through the root of the weld. This is especially notable on square butt joints and fillet welds.

Pulsed spray and Super-Pulse (technically a modified pulsed spray transfer process) overcome the limitations inherent in both the short-circuit GMAW and conventional spray transfer processes. With the pulsing processes, the Aristo MIG 4004i pulses the arc between a high peak current that promotes metal transfer and a low background current where no metal transfer occurs but the arc does not become extinguished.

By varying the amplitude, duration and frequency of the peak and background current, the system can more efficiently control heat input while ensuring excellent fusion.

Not only does the process reduce spatter with little to no post-weld clean-up required, it also promotes faster travel speeds and enables all-position welding and using larger diameter wires across a broad range of metal thicknesses.

When using Super-Pulse, a GTAW-like bead appearance is produced. In short, the process can increase productivity and quality while reducing weld costs in many operations.

When first introduced, pulsed spray

systems offered a handful of 'canned' programs. If one of those programs did not work well, it took an expert to modify them. Today, the Aristo MIG 4004i system with the U82 control panel features 18 synergic programs or lines dedicated to pulsed spray, including those for carbon steel, duplex steel, GMAW brazing, nickel-chromium-molybdenum and five each for stainless steel and aluminium.

These synergic lines provide out-of-the-box functionality for about 95% of all stainless and aluminium applications. In addition, the system enables experts to program and store custom synergic lines, such as those for welding other alloys.

As previously mentioned, Super-Pulse provides a GTAW-like bead appearance. Traditionally, many operators enhanced this appearance by manipulating the gun with a whipping motion, directing the wire from the leading edge of the puddle back to the middle of the puddle and back again to the leading edge. It is important to know, though, that this type of manipulation can add unintended variables.

To produce the classic 'stacked dime' bead appearance without any gun manipulation, ESAB developed the Super-Pulse process. Even better, Super-Pulse enables operators to easily adjust the distance between 'stacks'. By combining excellent, customisable bead aesthetics with a consistent travel speed, the Aristo MIG satisfies the needs of welding operators, supervisors and quality control personnel alike.

Coupled with other features that appeal to operators, supervisors and owners, ESAB believes that more fabricators and manufacturers should examine the benefits of advanced systems such as the Aristo MIG 4004i Pulse units. ■



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Extra low-slag welding wire from Hyundai Welding

Hyundai Welding Japan has developed an extra low-slag solid wire, SM-70MT, for joining galvanised steel.

During winter, calcium chloride sprayed on roads adheres to the undersides of cars, causing corrosion. Galvanised steel sheets with electro-deposition coatings are applied to car frames to prevent corrosion.

When welding a galvanised steel plate there is a possibility that corrosion may occur on the slag of the weld, since it is not electro-deposition coated. Another problem is that pores are generated in the weld of galvanised steel sheets, despite the fact that they have excellent corrosion resistance.

In cooperation with major Japanese automakers, Hyundai Welding has re-

searched and developed welding materials and methods that allow electro-deposition coating and low porosity. They have now succeeded in developing and commercialising SM-70MT, a solid wire capable of producing welds on galvanised steel sheet that can be electro-deposition coated while maintaining low porosity.

The product has gone through various performance evaluations in cooperation with major car makers since 2017, and took part in the International Welding Show held in Tokyo in April of 2018. Having completed the performance evaluation for the past two years, the consumable is currently being applied to a production line of an automobile company that has been participating

in the development process since the first half of 2019.

The main features of SM-70MT are that it is applicable to any welding equipment currently in use, and that it minimises porosity and spatter generated during welding when using optimised welding parameters.

The consumable's electro-deposition coating performance excels on conventional steel sheets as well. This is due to the decreased slag production that is not only present on galvanised steel sheets – and the corrosion performance of the finished weld excels even in briny environments.

Hyundai Welding products are distributed in South Africa by Argon Arc Welding. www.argonarcwelding.co.za