Multiple handles make it easier to pass feeders in tight quarters.

Technology advancements make now a good time to examine wire feeder effectiveness

By Arne Lagerkvist

Prepping for your wire feeder revamp

All wire welding processes depend on a smooth wire feed, ease of operation, the ability to control welding variables, and durability. In many situations, portability is also an important consideration.

Wire feeders often are overlooked when fabricators consider how to improve weld performance. Your current wire feeder may be getting the job done, but it also might be less efficient than you realize. Recent advancements in wire feeder technology have created a situation in which choosing the right wire feeder could contribute as much to your bottom line as choosing the right power source.

Portability Improvements

Whether on a shop floor, ship, or construction site, portable equipment that puts the feeder closer to the welding location helps operators complete work faster and with greater precision, such as by viewing a feeder's digital display to confirm settings or adjust parameters without long walks back to the power source. Previously, however, improved portability meant sacrificing one or more performance goals.

As a result, users were forced to choose between two basic feeder categories. Shop feeders offered excellent feeding performance and additional controls, but they had limited protection in extreme environments. A plastic case for the wire spool was about the limit.

Mobility mostly consisted of mounting the feeder on a trolley. Portable feeders with enclosed cases offered mobility and durability in harsh conditions, but they fell short on features and the ability to feed a broad spectrum of wire diameters.

Now these two categories have merged into a new, third category: the advanced portable wire feeder that combines performance, portability, and durability.

Wire Feeding Performance

The job of the wire feed mechanism is to deliver wire through the torch liner to the contact tip with a smooth, consistent wire feed speed during welding, as well as offer a controlled speed during arc starts and stops. The drive mechanism should not crush or scrub the wire, as that generates shavings which in turn clog the liner, hinder smooth feeding, and promote burnbacks.

When performance symptoms occur (such as arc instability caused by wire slipping), many operators apply additional pinch force to the wire by increasing the pressure on the adjusting screw. This usually does not fix the problem. In many cases, it creates additional problems, such as generating more wire shavings. The solution is to look for a well-engineered drive stand in the first place.

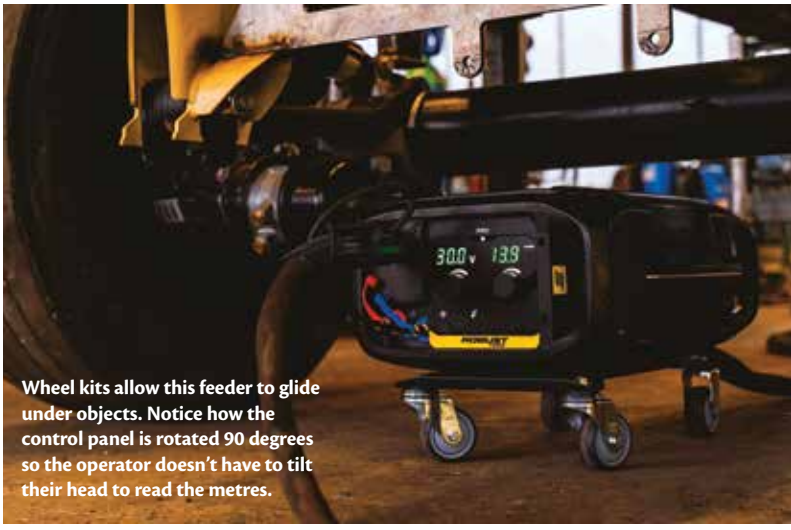
To start, consider that a four-roll system offers some inherent advantages over a two-roll system, as it doubles the amount of drive roll surface area in contact with the wire. Similarly, larger-diameter drive rolls also increase wire contact area, as does drive roll groove design. More gripping area enables feeding without deforming the wire through long torch cables and bends in the cable, even with softer cored and aluminum wires. A good four-roll system allows operators to run larger-diameter (up to 2.0-mm solid wires and 2.4-mm cored wires) and smaller-diameter (0.6- and 0.8-mm) hard wires. It also allows them to weld at speeds as low as 0.8 m/min. and as fast as 25 m/min.

The drive motor is also controlled differently in that it's not driven in one direction; instead, it is controlled in two directions. This provides improved feeding performance during starts and at lower speeds and enhances control of the wire speed overall. Combined with a precise feeding mechanism that has a lower level of backlash ("play") in the rolls, further precision can be achieved. This type of drive stand is actually suitable for a robotic system but is now available in portable units, which is a major development.

Control Upgrades

Quality issues occur most frequently at the start or end of the weld, so advanced portable feeders may offer a host of functions to improve results, including:

- **Run-in speed control (also called creep):** This reduces the speed at which the wire approaches the plate, then ramps up to full welding speed when the system senses the arc is established. The additional time preheats the electrode, promotes a more positive arc start, reduces spatter, and enhances fusion. Some feeders offer a hot-start function to increase total power for a few milliseconds during the start of the weld, which also helps prevent cold lap.



Wheel kits allow this feeder to glide under objects. Notice how the control panel is rotated 90 degrees so the operator doesn't have to tilt their head to read the metres.

- **Crater fill function:** Wire feeders with a crater fill function ramp down parameters at the end of the weld to fill the crater at a lower wire feed speed and/or voltage level, which can prevent crater cracking and avoid melting the edges of the plate.
- **Gas pre-flow and post-flow controls:** These enable the operator to set the duration of gas flow times. These functions are especially helpful in applications where gas coverage is critical, notably stainless steel.
- **Short Circuit Termination (SCT) technology:** SCT sharpens the end of the solid GMAW wire at the termination of a weld to promote a positive next arc start. SCT technology also eliminates the need for the

With its four-wheel drive stand, large drive rolls, and unique drive mechanism, this portable feeder delivers feeding performance that surpasses that of premium shop feeders.

operator to clip the wire. In an operation with numerous weld stops and starts, the time savings quickly add up.

•**A burnback function:** This function controls the amount of wire that continues to feed after the operator releases the trigger, leaving an optimal wire stickout so they do not need to clip the wire to length.

•**Cruise control:** On feeders with 2T/4T control, the 2T mode is for standard on/off operation. The 4T (trigger hold) feature is like cruise control for the welder. After pressing and holding the trigger for a few seconds, the operator can release the trigger and the system continues to weld, reducing hand fatigue. To terminate the weld and initiate the downslope function (if enabled), the operator presses and releases the trigger again.

For those worried about operators wasting time adjusting settings for different jobs, do not worry. Advanced wire feeders offer memory settings that enable them to set, store, and recall parameters with the push of a few buttons.

Advanced Controls

Many of the functions described have been standard controls on shop feeders for years but have now migrated into portable feeders as managers want to improve welding results. Very advanced feeders also offer some additional functions that can immensely improve quality and consistency:

•A limit function prevents the operator from welding with parameters outside of weld specifications.

•A function called "quick set" (or "smart MIG" or something similar) automatically optimizes the short-circuit arc for the gas/wire combination installed. After a few seconds of welding, the system adapts parameters to match an operator's individual welding style, notably compensating for variations in contact-tip-to-work distance and torch angle. This lets the operator focus on torch mechanics instead of worrying about whether they have set proper parameters.

•Preprogrammed synergic lines have optimized parameters for the wire type, wire diameter, shielding gas, and process selected, speeding setup.

•Synergic lines for pulsing GMAW can save many hours of process development time. To begin pulsed welding, operators simply select the synergic line. The system then provides optimum dynamic arc control to maintain consistent penetration and weld bead appearance, automatically adjusting for variations in arc length and wire feed speed. If needed, operators can use the wire feed speed control to fine-tune the arc, and all pulsing parameters will automatically adjust.

Overall, advanced feeders help less experienced or moderately skilled welders produce better results and can transform good welders into great welders.

Many Facets of Portability

Weight is the first concern of portability. Most enclosed feeders that can hold a 300-mm wire spool weigh in the

New connection designs for the power cable and internal connections (see inset) prevent shearing off connections in tough environments.

neighbourhood of 17 to 19 kg when empty. However, after a spool of wire is added, minor weight differences between models become less important. For example, how does the feeder handle feel in the operator's hand, and how does the side of the feeder feel against the operator's leg when carried? Is it comfortable and smooth? Note that feeders with a longer centre handle let the operator adjust hand placement for balanced, one-hand carry. Next consider that feeders with handles on the front and back of the unit are significantly easier to lift with two hands, as well as pass through a manhole or small opening.

For lifting feeders with a crane, a standard procedure in shipyards and offshore operations, look for units that have crane-rated handles. Given the rugged nature of the welding industry, operators are also going to move the feeder by sliding it along the floor or dragging it by the cables, and feeder case designs with reinforced walls and built-up wear areas will last longer.

One of the more common feeder failures occurs when the power cable or gas connections shear off from the rear of the unit. To address this issue, some feeders now have a twist-lock design that secures the power cable to the rear of the unit, as well as have internal hose and cable connections. As a result, there is no strain or risk of shearing off when operators drag or lift the feeder, such as between levels of a job site or in the hull of a ship.

Lifting or dragging by the cable may not be recommended, but designs must accommodate reality. In a similar spirit, consider optional wheel kits that mount on the bottom or sides of a feeder. Putting the wheel kit on the side of the feeder creates a low, flat profile that is more stable. In applications such as trailer manufacturing and structural steel fabrication, the operator can easily move the feeder under objects and the low centre of gravity enables pulling the feeder past obstacles and across uneven floors without the risk of it tipping over.

Portability means nothing without durability, and wire feeders in heavy industrial environments take a beating. Case designs vary from metal to reinforced plastic to a combination of both. All can work well when designed properly to prevent transfer of shock, providing much greater protection for the electronics than shop units. Be cautious of units with exposed metal screws that could transfer the welding current if the feeder is on a metal surface, such as a ship deck plate.

Advanced feeders with icons, push buttons, and digital displays simplify use and eliminate language barriers (indeed, many have multiple language options).

Most portable feeders have an IP23 rating, which is defined as "protected from touch by fingers and objects greater than 12 mm" and "protected from water spray less than 60 degrees from vertical." The most robust systems available have an IP44 rating, meaning that all sensitive components are protected against solid objects that are bigger than 1 mm and water splashing from all directions. They are literally sealed against weather, dirt, metal shavings, and other contaminants. To protect against moisture that could promote hydrogen absorption in cored wires or oxidation of any carbon steel wire, note that IP44-rated feeders also have the option for an internal heater kit to drive off moisture.

If your current wire feeders do not have most of these features and benefits, it might be time to re-evaluate your equipment. Such feeders minimize maintenance headaches, promote both uptime and better weld quality, and help increase operator skill. FW

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