

THE MECHANIZED PIPELINER AUTOSHIELD SOLUTION FROM LINCOLN ELECTRIC:

HIGH-STRENGTH PROCESS MAXIMIZES AFFORDABILITY AND PRODUCTIVITY FOR PIPELINE WELDING

For decades, pipeline welders have had a few different options in the field: stick welding, gas-shielded processes, or semiautomatic self-shielded flux-cored welding. Each have offered certain advantages, but also have come with drawbacks. Stick welding (shielded metal arc welding, or SMAW) can create reliable welds, but tends to be more time consuming and less efficient. The gas-shielded processes are more efficient, but their setup requirements can be more costly. The self-shielded flux-cored arc welding (FCAW-S) process is more efficient than SMAW and less costly than the gas welding processes, but its mechanical property results are highly dependent on operator skill.

Now Lincoln Electric is introducing a middle ground. The AutoShield® self-shielded mechanized pipeline welding solution is an “in-between option” that offers the best of both worlds, according to Sam Phillips, director of Lincoln Electric’s pipeline and pipe mill global industry segments.



Pipeliners AutoShield HW wire loaded into orbital welder

THE MECHANIZED PIPELINER AUTOSHIELD SOLUTION FROM LINCOLN ELECTRIC

FCAW-S: THE OPTIMAL PROCESS

FCAW-S is a variation of the flux-cored arc welding process in which atmospheric protection is obtained entirely from the flux within the tubular electrode. The typical setup includes a constant-voltage power source – either an engine drive or a traditional electric power source – a wire feeder, and a welding gun to pay out the wire.

FCAW-S is a well-established process commonly used in pipeline construction, shipbuilding, skyscraper construction and other industries where welding generally takes place in the field. Historically, FCAW-S has been the preferred process on sites where the terrain and weather-related factors can create challenges for the operator. It offers increased productivity compared to SMAW and at a lower cost than gas shielded wire processes.

“Stick has been an option with pipeline welding for a long time, but it’s not as efficient as the wire processes,” says Phillips. “With stick, you have to stop every so often, and there’s more waste. At the other end of the spectrum you have the gas-shielded processes, which are very efficient and very productive. But along with the gas-shielded processes come logistical challenges. You need the tanks of shielding gas to begin with, and also more equipment in order to lug a shack out into the field to protect the shielding gas from the elements.”

Despite the advantages of the self-shielded flux-cored process, some industries in certain parts of the world have refrained from adopting it, due to a perception that it doesn’t yield consistent mechanical properties from one weld to the next.

“What we have found in response to that perception – and Lincoln Electric has published a number of papers about this – is that how you weld makes all the difference,” says Phillips. “If you operate outside the parameters of a qualified welding procedure, you can’t necessarily predict the outcome – and the outcome may not be ideal. That’s true with any welding procedure, not just self-shielded flux-cored. So the process was probably misused in some instances, and that has been noticed in some regions of the world.”

The human element has also played a role, Phillips adds, noting that self-shielded flux-cored welding has been primarily a semiautomatic process up to this point.

“If you weld without following the procedures, you don’t necessarily know what mechanical properties you’re going to get,” he says. “Large variations in heat inputs could negatively affect mechanical properties, specifically toughness values in the weld metal and/or HAZ.”

THE MECHANIZED PIPELINER AUTOSHIELD SOLUTION FROM LINCOLN ELECTRIC

THE AUTOSHIELD ALTERNATIVE

Enter the Mechanized Pipeliner® AutoShield self-shielded pipeline welding solution from Lincoln Electric. It helps to deliver the quality, consistency, and productivity that will help contractors stay competitive. Designed to weld fill and cap passes without shielding gas on Lincoln Electric's APEX® orbital systems, AutoShield can improve productivity and lower heat input without the added costs associated with flux-cored gas-shielded welding on the right of way.

With AutoShield, "you can have higher productivity that comes with a wire process, but at the same time, you don't need the gas shielding," says Phillips. "You don't need as much heavy equipment to move from station to station, or from weld to weld. This gives the contractor a smaller and more affordable footprint compared to traditional mechanized processes utilized for pipeline construction."

The AutoShield solution consists of three primary components:

- Power source: Frontier® 400X Pipe engine drive, or the Power Wave® S500.
- Orbital welder (or "bug"): APEX controller and HELIX® M85 weld head.
- Wire: Pipeliner AutoShield HW

AutoShield is ideal for jobs where the terrain is rugged, and for tie-in applications where a contractor still wants to mechanize even when getting a shack to the weld can be challenging. The process is also well-suited to jobs that are not long enough to justify GMAW but increased productivity is required compared to SMAW.

The AutoShield solution improves welding efficiency in a number of ways. Compared with FCAW-G, AutoShield requires no shielding gas or protective shacks, and it reduces heat input by as much as 50 percent. It is capable of running at 24kJ/in, thus minimizing the size of the heat affected zone (HAZ). In addition, the AutoShield solution can reduce weld starts and stops by as much as 80 percent when compared with low-hydrogen downhill stick electrodes such as E9045 AWS classifications. Starts and stops are typically where contractors see more risk of defects. The AutoShield solution can also reduce overall weld time by as much as 30 percent.



The AutoShield orbital welder in motion

THE MECHANIZED PIPELINER AUTOSHIELD SOLUTION FROM LINCOLN ELECTRIC

“We designed the AutoShield electrode to have a minimum tensile strength of 90ksi, making it capable of overmatching X65 and X70 pipe,” says Phillips. “But the process also runs vertical down, and since it’s mechanized, consistently lower heat inputs are possible.

Phillips adds: “We made a self-shielded flux-cored wire that’s designed specifically for mechanized welding on pipelines. We put it on an orbital bug, which improves efficiency in two ways: you’re not relying on a human arm from sunup until sundown, and you’re also going to get a consistent weld each time, because that bug is going to do what it’s specifically programmed to do. This results in consistent productivity and predictable heat inputs.”



Two AutoShield set-ups welding in the field



Two AutoShield set-ups welding in the field

THE MECHANIZED PIPELINER AUTOSHIELD SOLUTION FROM LINCOLN ELECTRIC

A BETTER OPTION FOR THE FUTURE

As of mid-2023, there are currently four pipeline projects in the ground – with a total of more than 2400 joints – using AutoShield. This number will increase in a relatively short time, as industry white papers continue to support mechanizing FCAW-S on pipeline to create welds with more robust mechanical properties.

AutoShield is the solution to meet that challenge without driving up costs or sacrificing productivity or efficiency, says Phillips. “For the pipeline contractor, it’s another tool in the toolbox,” he says. “And from the standpoint of the operator – the person in the field who’s actually using it – it’s going to be easier on them versus stick welding. There’s going to be less effort to make a weld.”

Phillips adds: “If a contractor wants to mechanize, or if they have to mechanize, AutoShield delivers a cost-effective solution to make it happen. Right now, if you want to mechanize, you have to use a gas-shielded process – which means you have to run shacks, you have to have heavier equipment to move those shacks, you have to have the gas. AutoShield gives that operator or that contractor a tool to do something different now.”

With the AutoShield system, Lincoln Electric offers an entire field-tested solution for pipeline welding – including a power source, orbital welding equipment and wire. It’s all backed by decades of expertise and our solid track record of efficient system deployment and effective training. In the end, AutoShield is capable of reliable welds at a higher level of efficiency and a lower cost.

CUSTOMER ASSISTANCE POLICY The business of Lincoln Electric is manufacturing and selling high quality welding equipment, automated welding systems, consumables, and cutting equipment. Our challenge is to meet the needs of our customers, who are experts in their fields, and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric for information or technical information about their use of our products. Our employees respond to inquiries to the best of their ability based on information and specifications provided to them by the customers and the knowledge they may have concerning the application. Our employees, however, are not in a position to verify the information provided or to evaluate the engineering requirements for the particular weldment, or to provide engineering advice in relation to a specific situation. Accordingly, Lincoln Electric does not warrant or guarantee or assume any liability with respect to such information or communications. Moreover, the provision of such information or technical information does not create, expand, or alter any warranty on our products. Any express or implied warranty that might arise from the information or technical information, including any implied warranty of merchantability or any warranty of fitness for any customers' particular purpose or any other equivalent or similar warranty is specifically disclaimed.

Lincoln Electric is a responsive manufacturer, but the definition of specifications, and the selection and use of specific products sold by Lincoln Electric is solely within the control of, and remains the sole responsibility of the customer. Many variables beyond the control of Lincoln Electric affect the results obtained in applying these types of fabrication methods and service requirements.

Subject to Change – This information is accurate to the best of our knowledge at the time of printing. Please refer to www.lincolnelectric.com for any updated information.

All trademarks and registered trademarks are the property of their respective owners.

