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Shielding Gases



Cover Story

A Stronger Start Yields a Smoother Finish

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Ferris Industries, a Munnsville, NY, producer of landscaping equipment, found that a return to welding basics, especially with respect to welder training and shielding gas, helped them improve their mower products. Changing their shielding gas improved the cosmetics of their parts, increased wire feed rates, and improved productivity and quality.



Ferris Industries had some serious problems with spatter, and it was gumming up the works. The Munnsville, NY, company builds a complete line of riding and walk-behind mowers used by commercial landscapers. The mowers' frames and decks are fixtured, jigged, and welded by hand at 18 MIG welding stations on the shop floor. The welds are primarily structural, but appearance and integrity are just as important — if not more so — than strength.

Because paint highlights spatter rather than hides it, any spatter on the part has to be removed before painting. Due to large amounts of spatter, however, an inordinate amount of time was being spent on the rework required to prepare parts for painting.

When Simplicity Manufacturing purchased Ferris Industries in 1999, Simplicity's management made a commitment to build Ferris' leadership position in the market. As part of that commitment, management decided to improve the "fit and finish" of the mower decks. That is, make cleaner welds with little spatter, thereby reducing the amount of grinding, wire brushing and other rework required before painting.

So Ferris set out to reduce the amount of spatter while looking at the welding shop as a whole to determine what other improvements could be made and how to make them.

Training as the Basis for Improvement

Most of Ferris' welders have lit-

tle formal training. They're either self-taught or they learned welding from a relative or friend. So it appeared that some problems arose because the welders didn't fully understand the equipment or processes they were using. For instance, the welders believed that more was better when it came to gas flows and flow meters.

Upon further inspection, it turned out that many rework problems could be attributed to improper machine settings because the welders didn't appreciate the effect that voltage, amperage, and wire feed controls had on the process. Consequently, Ferris developed a training program to teach its welders what happens during the weld and why, so they know how to adjust the machines.

The shop-floor training covered the MIG welding process, the operation of the equipment, the power source and the wire feeders, as well as the characteristics of various shielding gases. Also covered were maintenance topics such as how to set drive rolls, how to keep them clean, and what to look for when something isn't



Ferris sought to improve the "fit and finish" of its mower decks, using cleaner welds with little spatter, thereby reducing the amount of grinding and other rework required before painting. Shown is a deck lift pivot, as welded, and another freshly painted with no rework.

going quite right. The entire workforce, including management, received the overview.

Finding the Proper Shielding Gas

Then the company looked at its welding methods and procedures, as well as the general operation of the welding shop. Management wanted to upgrade the workers' skills and give them better tools and methods. Aware that the welders have to be comfortable with what they were using, the company sought tools and methods the welders would embrace, and took the time to demonstrate the advantages.

Because most of the rework was necessitated by spatter and cosmetic concerns, we decided to prevent the problem as much as possible by finding a shielding gas better suited for the job.

The welding shop had been using a 15 percent CO₂ shielding gas, but that made the puddle too unstable. The welders had little control over the puddle, and that contributed to the large amount of spatter. So Ferris decided to find a shielding gas that



Close-up shows corner of the mower deck as welded (left), and another as painted (right).



Many welds on Ferris' products require integrity and appearance. Focusing on the basics has allowed the company to improve productivity of their capital and their labor, and also improve their products.

would offer greater control through the formation of a puddle that's less erratic and more manageable.

An Internet search was conducted to identify suppliers that had developed gases aimed at spatter-free welding. One gas in particular — Airgas Gold Gas SteelMIX Extra — seemed to fill the bill. A unique combination of helium, argon, and CO₂, the gas is commonly used for robotic sheet metal welding in the automotive industry because it offers good appearance and spatter-free performance.

Several other products were also considered, but SteelMIX Extra stood out because it creates less smoke, thereby helping maintain a cleaner environment in the shop. Ozone emissions with SteelMIX Extra are lower, and the gas also provided the desired arc characteristics for the job. Consequently, Ferris asked Airgas to provide a sample for testing.

Welding Specialist Lends a Hand

Pleased with the gas' performance

during various trial runs, Ferris asked Airgas to recommend specific procedures and techniques for the work being done. That's when Dave Schaffer, process welding specialist for Airgas, got involved.

Schaffer is a Certified Welding Inspector (CWI) and a Certified Welding Educator (CWE) who joined Airgas when the company purchased Air Products & Chemical Inc.'s U.S. packaged gas business. He's one of a nationwide team of process welding specialists who tested various shielding gases and added the SteelMIX Extra product to the Gold Gas line-up.

Schaffer agreed that a change in shielding gas could decrease the amount of spatter and help increase wire feed rates to provide faster welding. With Schaffer's help, Ferris did some sample runs and tried a variety of techniques.

We introduced the new gas to the welders on the shop floor by explaining the differences between the gases and why the new gas should offer better results. As part of the introduc-

tion to the new gas, Schaffer explained the relationship between gas mix and performance.

"Many customers only want to know the price of the gas and the price of the wire," he said, "when in reality those costs have very little effect on the total cost of the product. For instance, if you can double your wire speed feeds, you'll cut your shielding gas costs in half because you're depositing twice the amount of material with the same amount of gas."

In Ferris' case, wire feed rates were improved as a result of the change to SteelMIX Extra. Overall rates increased approximately 20 percent, with some welders able to run the wire feeders almost 100 in./min. more. A 19 percent increase in travel speed was achieved by the increase in wire feed speed, which also improved capacity, reduced the need for additional welders, and reduced overtime. The increased speeds were applied to weld times of a sample group of weldments being considered for a semi-automatic welding system. The annual labor savings for this sample group of parts totaled \$4,300.

The amount of spatter was reduced by 50 percent, even though the welders were running at higher speeds. What's more, they are comfortable running at those higher speeds, particularly since they're getting better-looking welds because of spatter reduction.

Of course, less spatter and better-looking welds translate directly to less cleanup and rework time. Before Ferris switched shielding gas, it took approximately six minutes to grind the spatter from each mower deck in preparation for painting. Because there's now less spatter, clean-up and grinding time has been reduced by approximately two minutes per deck. That's a 33-percent improvement, which translates into annual savings of \$6,500 in labor costs.

Even though Ferris now pays about 20 percent a cylinder more for its shielding gas, the increase in wire

feed rates and the spatter decrease have reduced labor costs. (The savings will vary because the welders perform other tasks, such as fixturing and hand fitting, in addition to welding.) What's more, lack of spatter means the nozzle stays cleaner longer, and a clean nozzle helps prevent wire feed problems.

"I credit Tim and Ferris welding supervisor John Szkotak and the Ferris welders with being proactive in wanting to improve their process, and for being open minded in seeking solutions," Schaffer says.

Lowering the Flow

Ferris also has reduced the amount of gas it uses by adjusting its welders' flow meters. As noted earlier, most of the welders believed that higher gas flow was better, when in truth the company was wasting gas and losing money because the meters were set too high.

Having welders reduce the flow to 35 ft./hr. allowed them to still get good results, yet use much less gas. Indeed, when the improvement program began, the company was consuming about 18 cylinders of gas every two days. Adjusting the flow meters has reduced that number to 10 to 12 cylinders.

Even though the cost of each cylinder has increased, adjusting the flow meters to the proper setting has saved the company approximately \$6,500 per year. In fact, that step alone offset the higher cost of the new gas.

Before Simplicity acquired the company, Ferris faced financial constraints and was operating without an experienced welding engineer. Now that Ferris has the financial backing and other resources of its parent, its welders can take advantage of the formal operating procedures and welding techniques that were brought to the company.

For example, they've begun paying greater attention to torch maintenance, which includes ensuring that the tip is clean and in the right place. And, the welders are encouraged to change tips when they become worn

rather than try to extend the life of used ones.

They've also been cleaning the drive rolls when they become clogged and replacing them when they're worn. Previously, they'd run drive rolls until they could barely push the wire anymore, but they've come to learn that that was counter-productive.

Additional Improvements Expected

Many of the improvements we've made in spatter reduction, wire feed rates, and gas conservation would not have been possible without the cooperation of those who do the job day in and day out. Their willingness to listen to new ideas and try new ways was instrumental in the successes seen so far.

It's an ongoing process. As new welders come into the shop they're given several hours of orientation on the equipment and the type of welding they'll be doing. They're shown a process that's proven to be nearly spatter free and will give them results that will make their jobs easier and more productive. If they need additional training their supervisors work with them to give them the confidence and comfort level they need to work with their equipment

and read drawings and prints.

The shop also conducts monthly "open forum" meetings in which the welders discuss their successes and concerns. That enables us to continue to improve the working environment in the shop and the quality of our product.

Along with productivity improvements and cost savings, Ferris Industries has gained an understanding that sometimes even small changes can make a big difference in the long run. Focusing on the basics has helped us improve productivity, save time, and cut costs — all while improving quality.

The underlying message is, "If you think there's a better way to do something, there probably is. If you're not sure, don't hesitate to invite a specialist in to observe your process. Sometimes you just need another set of eyes to help you see more clearly." ☺

Author Tim Andrecheck, welding engineer for Ferris, has been in the welding field for nearly 30 years, having learned the process through military and vocational schools, as well as on-the-job training and other programs. He also holds a bachelor's degree in mechanical engineering technologies.

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