



Eliminating slag time in plasma cutting

A grinding machine helps Vac-Con improve production efficiency

By Dan Davis, Editor-in-Chief

A sewer cleaning truck will never be described as dainty. These are large vehicles that come equipped with heavy-duty industrial vacuums and high-powered water systems to tackle the grungiest of cleaning jobs. The machines are designed to stand up to the wear and tear associated with the dirty job (see **Figure 1**). In this case, the dirt don't hurt.

Bob Graden sees to it that these vehicles and related equipment stand up to the job. He's the plant manager for Vac-Con®, a leader in the manufacture of sewer cleaning vehicles, as well as industrial vacuum loaders and trucks and hydraulic excavators. He has spent 24 years with these vehicles, in the beginning as the company's only sheet metal mechanic, and he understands the high-quality standards that need to be met.

Vac-Con manufactures these vehicles to resist the rigors of the job. For instance, the debris tanks on the company's vehicles are made of COR-TEN® steel, a high-strength, low-alloy steel that is designed to be difficult to mar. Additionally, the vehicles contain several hundred pounds of plate to support options such as telescoping booms, large-capacity debris tanks, and an electromagnetic lift capable of lifting a manhole cover weighing as much as 500 lbs.

Graden also understands that you can't manufacture products the same way as you did 20 years ago. Fabricating by hand is admirable, but even the most skilled craftsman can't match present-day CNC equipment's speed and repeatability. The company also is looking for any type of savings it can wring out of its production processes.

For four years now Vac-Con has been involved in continuous improvement programs, seeking out those cost-saving opportunities on the shop floor. One such exercise led it to focus on its deburring activities related to plasma-cut parts. The subsequent investigation resulted in an automatic slag removal machine investment and changed the way the company processes its plate. Vac-Con realized immediate labor savings and enjoyed improved part quality at the same time.

Cleaning the Plate

Nearly three years ago Vac-Con's plate cutting process was not the most progressive. The company operated two plasma cutting machines, the largest of which had a 200-amp power source, two cutting heads, and a 12- by 32-foot table. The company used the table to cut carbon steel from 0.25 to 2.5 inch thick. The table was large enough to accommodate four sheets of plate.

Two employees were needed in the plate cutting area for each of the 10-hour shifts: one to operate and load/unload both plasma cutting machines and another to deburr the parts. Because the plasma cutting produced plenty of slag (see **Figure 2**), the employee responsible for removing it with a hand grinder had a very taxing job each shift.

That production predicament jumped out as an opportunity to reduce labor cost and effort while simultaneously improving efficiency, according to Graden. That led them to take a look at automated slag removal machines and ended with the purchase of a slag grinder from Timesavers Inc., Maple Grove, Minn.

"Pretty much from the get-go we realized how we could set it up," Graden said. "We set it up right next to the plasma cutting machine, so as the operator unloads the machine, he pretty much just runs the parts through the deslagger, which cleans them up, and he stacks them up on a pallet on the other side."

The operator has enough time to run both machines because of the plasma cutting machine's huge table. As the plasma cutter's two heads slice up sheets of plate at one end of the table, the operator has time to unload the parts and load up two new sheets with assistance from a magnetic or vacuum lifting device. The operator still has enough time to feed the cut parts through the slag grinder because it takes the plasma cutter typically about 45 minutes to cut a nest of parts from one sheet of plate, Graden said. The operator feeds the parts through the Timesavers grinder; retrieves them from the other end after the slag has been removed; and stacks the parts on a pallet, which will travel to the warehouse or directly to the shop floor in kits for assembly.

Figure 1 Sewer cleaning trucks are fabricated with plate to stand up to the rigors of heavy-duty use. For example, the Public Works Department of Rockford, Ill., has used the same Vac-Con truck for almost 13 years.

Greg Larson, president of Timesavers Inc., said its grinders can be configured in different ways for specific applications, but the typical approach to removing slag is fairly consistent for all of the company's products. The deslagging process (see **Figure 3**) begins with the operator placing parts on the conveyor belt of the slag grinder, which is equipped with three heads. The first head has a hard contact drum and a coarse-grit abrasive belt. That head is set so that it grinds off the slag but does not remove the mill scale. After all the slag is removed by the first head, the part continues under the second head, which has a soft rubber drum set just below the material surface. This soft drum is not aggressive on the flat surface, so it also leaves the mill scale. However, the second head is aggressive on the edges and cuts a small radius to remove all sharpness. The third head is a wire brush that rotates in the opposite direction of the first two heads. This action removes lateral burrs and any sharpness that often remain.

Vac-Con's slag grinder can accommodate parts ranging from thin-gauge sheet metal to the 2.5-in. plate thrown on the plasma cutting table. The speed of the table can be adjusted so that one operator can load parts on one end and retrieve them on the other end.

Graden said the Timesavers grinder not only delivered the quality results (see **Figure 4**) the continuous improvement team was looking for, but also resulted in an unexpected benefit: another secondary process was eliminated.

Because the plasma cutting produced plenty of slag, the employee responsible for removing it with a hand grinder had a very taxing job each shift.



Figure 2 Any fabricating shop that works with older plasma cutting equipment is familiar with the slag left over from a cut.



Figure 3 With its new slag grinder, Vac-Con no longer has to worry about manual grinding to remove slag, only manually feeding parts into the new equipment. Moving from right to left, plasma-cut parts progress underneath two abrasive rollers and then to a wire brush that rotates in the direction opposite of the material flow.



Figure 4 Vac-Con's slag grinder proved effective in removing slag from plasma-cut parts.

A Way Better Way to Weld

"By using the Timesavers [grinder], we found out that we could deslag and also take off some of the mill scale, which in turn helped the welding process," Graden said.

The presence of mill scale had been giving the welding shop fits. Another person was spending most of his shift grinding edges on the plate parts that were to be welded. If any of the mill scale was present after the grinding, pinholes would show up in the area around the gas metal arc weld.

Larson said that as the grinder is rounding off the edges, it also is removing about 0.1875 in. of mill scale, just enough to make a difference for Vac-Con's welders. That still leaves just enough mill scale on the plate parts to protect them from rust and not affect welding. Graden said rust isn't a problem, however, because most parts are pretreated aggressively and finished before finding their way onto Vac-Con vehicles.

A Proper Finish

Since the slag grinder was installed, Vac-Con has gotten rid of one of its plasma cutting tables and added a Prima laser cutting machine and a material storage tower. Graden said the grinder has helped extend the life of the plasma table because the company is satisfied with the efficiencies it has discovered with one operator working both the cutting and grinding machine. High-definition plasma

cutting technology or another cutting process may be able to cut plate without as much slag as Vac-Con's current plasma technology, but a sizable investment would be required to move in that direction. Vac-Con is comfortable with its daily grind.

"It's been one of the successes that we've seen," Graden said. "I guess if you are putting it on a scale of one to 10, it would be a six or a seven in the successes that we've seen as part of our continuous improvement program."

He added that such successes energize the work force because they had input in the purchase of the slag grinder and other equipment. When it works, they want to work and create other successful opportunities.

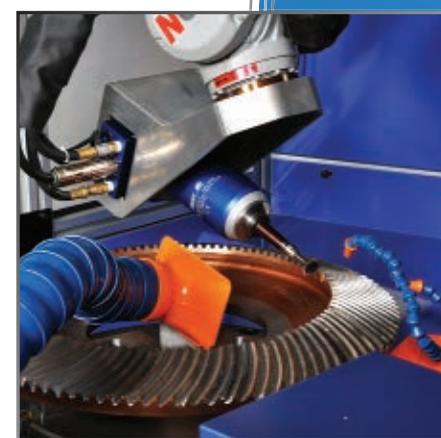
"It creates a snowball effect in regard to what we are trying to do out there," Graden said. **FAB**

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