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TUBE PRODUCTION

RAPID-CUT SAW, FLEXIBLE TOOLING MAKE MILL A HIT

Small tubing manufacturer sees big possibilities with FCF tube mill

By Lincoln Brunner

If investing in a machine can help increase your business, you might want to look into it. But if investing in that machine stands to double your current capacity, by itself, you don't just look. You leap.

That's exactly what Jeff Mason and his son, Sam—the team that heads Major Metals Company—did just a few months ago with their purchase of a Flexible Cold Forming mill from SEUTHE, a member of ASMAG Group.

Major Metals has five mills running round, square, rectangular, and custom-shaped tubing from a variety of materials, including hot- and cold-rolled, hot-rolled pickled and oiled, galvanized, galvanized, and aluminumized steel. On the new mill, however, the company runs mainly A500 and A513 low-carbon steel.

Since the spring, the FCF mill has given the company a whole new set of capabilities. It creates square and rectangular tubing that is directly shaped from the ID rather than from a traditional round mother tube that is shaped from the OD. The mill uses universal tooling that can be positioned to create virtually any metric or imperial size up to 5 in. square at speeds up to 330 FPM. Major Metals President Sam Mason said that for now, the company is using the mill for tubing weighing up to 15.5 lbs./ft. and up to 0.25-in. wall thickness.

Faster Cuts = More Production

One feature, in particular, that has helped Major Metals—a third-generation, family-owned tube manufacturer in Mansfield, Ohio—is the machine's high-speed MonoCut saw that provides low-burr and dimple-free cutoffs at speeds that stand up nicely next to the cutoff methods used on the shop's other four tube mills.

The MonoCut saw on SEUTHE's Flexible Cold Forming tube mill offers ultrafast carriage speeds and nearly burr-free cuts on tubing coming off the mill. Images: Major Metals Company

The circular saw is housed in a lightweight aluminum carriage and driven by a linear electric motor. Combined with a speed measurement device mounted on the front of the saw, the unit enables users to cut even short lengths of tube with tolerances of 0.020 in. over a 20-ft. length at high production speeds, ASMAG reports.

"From a functionality standpoint, it's going to do the same job—but what it does particularly well is the acceleration," Sam Mason said. "Since it's accelerated with a linear motor instead of a mechanical device like a belt or a rack and pinion, its acceleration is way faster. When you see the carriage either accelerate up to line speed or return back to its home position, it does that crazy-fast.

"It lets us run shorter lengths at higher speed," Sam added. "We can run 10- or 12-ft.-length pieces pretty much at the same speed that we can run long-length stuff now. It has a lot to do with the parameters and the material that you're cutting."

Klaus Heinzl, senior area sales manager for ASMAG GmbH in Scharnstein, Austria, noted that while the company does offer rack and pinion drives for its cutoff systems, when a shop is producing short lengths of tube, the MonoCut saw has been proven to increase productivity in the FCF by up to 15%.

"I can say from experience that the productivity of the system is increased by at least 5% even with longer lengths," Heinzl said.

In addition, Heinzl pointed out, the saw features two improvements that help increase saw blade life through reduced vibration. First, a form-fit clamping system clamps the tubing coming out of the mill close to the saw blade. Second, the saw is driven by a gearbox that has increased distance between bearings, which eliminates backlash upon return, even at return speeds up to 1,200 FPM. Based on feedback from customers, ASMAG said both of these features have helped double the service life of the MonoCut saw blades compared to conventional saws while producing low-burr cuts.

"Vibrations are not good for the lifetime of the saw blade," Heinzl said matter-of-factly. "The more vibration you have in the tube or in the whole piece of equipment, the shorter the lifetime."

Smooth, Clean Cuts

Smooth travel of the saw blade carriage is aided by the complete lack of contact between the linear motor and the magnets that are responsible for the drive, Heinzl noted.

"There is hardly any wear," Heinzl said. "Furthermore, the guides and the drive are mounted in such a way that they are protected from flying chips and other dirt."



The FCF mill forms square and rectangular tubing directly from strip and from the ID rather than the OD.

Sam said one thing he has noticed is the FCF's ability to handle even the fastest line speeds smoothly. That attribute helps his company maintain its market share as customers' quality expectations naturally increase along with the technology they're using to serve their customers.

"The customer expectation has gotten higher," he said. "More people are using tube lasers. They're using higher-precision machines, and as a result, that end condition [of our tubes] has to be better. Where a traditional cutoff might blow the end out a little bit, a saw is not going to do that. Where a traditional cutoff might leave a dimple or a rough end cut, the saw is generally going to be burr-free. So, in terms of cut quality, it's been great.

"In terms of speed compared to our other mills, when they're running at 225 FPM, it looks like they're running fast," Sam continued. "It looks like they're doing all they can to keep the tube moving with the way the cutoff moves. When the new mill runs at 250, 260, 270, close to that 300 mark, it still doesn't look like it's really even trying that hard. Everything is smooth. The cutoff is moving smooth, and it's got plenty of time to make the cut. It's not jerky. In terms of top end speed, that's really where you see it. It's doing it in a much more controlled and smooth fashion."

Part Quality and Tooling Life

That smooth operation has produced a side benefit that Jeff and Sam noticed pretty quickly: square and rectangular tubing without twists, which is a nice departure from the norm and is likely also a by-product of how the tube is formed on its ID rather than from the OD.

"On our round mills, where we shape out of the round, twist is always something that we fight," Sam said. "Just in the way that it's formed, we have no twist on any of these profiles. Straightness bow is something that we fight like normal, so it's not like the mill is making perfect-quality tube every time. But if you lay the tube down on a flat granite plate, it doesn't have any twist from end to end.

"You can see it in the bundle sometimes—we'll get a tube that's kind of more of a parallelogram than a true square, and that can look like twist at the end of the bundle. But true twist, we have seen almost no twist out of the mill, which is pretty surprising to us."

Amid all that production, tooling life on the FCF remains more robust than he would have anticipated.

"The tooling life has turned out to be pretty spectacular," Jeff said. "So far, we have to agree we haven't had enough tons to really tell, but they're saying 40 million ft. on a set of tools. A conventional mill on a particular size would be 2 to 3 million ft. Now, on a conventional mill, you have multiple tools, so it's not a direct comparison."

Cost Savings

On the subject of savings, because the FCF uses a set of universal tooling that can be fitted with shims to create various tubing sizes, small companies like Major Metals don't have to purchase multiple tooling sets that require hours of changeover time for each new part run.

"If we were buying a conventional mill and we wanted to tool up for, say, 10 sizes, you're at \$100,000 or \$125,000 a set. So you're at a million and a half dollars' worth of tooling. I don't know what a new set costs [on the FCF], but it sure isn't that much."

Another benefit of the FCF's net forming capability that other users have verified is savings on raw material. The mill forms square shapes directly; that eliminates the compressed material that's ubiquitous in the corners of square tubes shaped from round mother tubes. So far, the direct forming alone has saved the company about 2.9% on strip.

Major Metals is using the new mill to explore other markets—in particular, hollow structural sections—beyond what it supplied with its other mills. Because the company has had the mill in production mode for just a few months, it is still improving its acumen with it, dialing in the tooling changes from product to product.

"Most of our effort has been using the new mill to attack new markets that we weren't previously in—in growth mode more than in consolidation mode," Sam said. "As a result, we haven't gotten to really test a lot of different sizes that ran on the other mills to really see the strip widths and all of that. The savings can be significant on certain profiles."



The FCF mill doesn't use round mother tubes to create squares and rectangles, so no material is compressed in the corners, saving users anywhere from 2.5% to 8% on the width of strip used for the tubing.

New Machine Cracks New Markets

The big idea for Major Metals is to be more flexible than bigger competitors that rely on higher-volume tube runs at standard sizes rather than customized sizes and volumes. Jeff said if a customer calls in and orders, for example, custom tubing that is 85 by 125 mm, his crew can program that into the machine, create a recipe for it, and be rolling that tube within hours.

That creates the possibility of prototyping tubes for new customers or filling custom orders without having to spend \$50,000 to \$60,000 on tooling to create tube for which the customer merely might place an order. The FCF eliminates all of that.

"With this mill, you can set that up and run one tube," Jeff said. "That's a huge advantage for prototyping."

Sam said one customer, in fact, came in looking for a certain size tube that could accommodate a bolted-on insert.

"We said, 'Sure, you can use whatever size rectangle you want, and for the insert, we'll come up with the spec that we can hold on the ID, and then we'll just set up a recipe for the insert tube so that it fits in the over-tube,'" Sam said.

That kind of responsiveness and flexibility is precisely what drew the company to the FCF in the first place after reading about the mill's possibilities in a Tube and Pipe Journal article. For now, the company continues to ramp up and improve its expertise so that it can cut its changeover and programming times as much as possible. According to ASMAG, where a typical changeover on a conventional mill might take four to five hours, a changeover on an FCF mill can take as little 40 minutes with a trained team.

"We're learning and learning fast, and the changeover times are getting less and less," Sam said. "The mill speeds that we're running and the quality that we can hold on that mill is getting better every day.

"We're not sitting here saying, 'We're going to revolutionize the entire way the HSS market is working. But a lot of the big guys that are doing these larger structural sizes, they're going to do business the way they want to do business. We want to try to take a little different approach and offer customers some solutions that fit their needs and what they want. There's that mid-tier company that buys a lot of tube but also doesn't have really sophisticated forecasting methods. Sometimes they run into problems, and they don't want to try to source from 12 different structural mills so that they can catch the rolling that they need."

Major Metals hopes to increase its one-shift daily output on the FCF to 160 tons soon. And while the company currently is far from the 60,000 tons of tubing that the FCF could produce annually, adding the mill has given the Masons a whole new outlook on what is possible for their business.

"If we were to get there, that could potentially double our business, because we run 40,000 to 45,000 tons on four mills, and this adds another 60,000 tons on top of that," Jeff Mason said. "Are we going to get there? It's yet to be determined, but the potential is there. Our projections are that we should see, from a tonnage standpoint, potentially doubling our business in a period of three to five years." **TPJ**

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