Transfer Press Paints a Pretty Productivity Picture at Wooster Brush

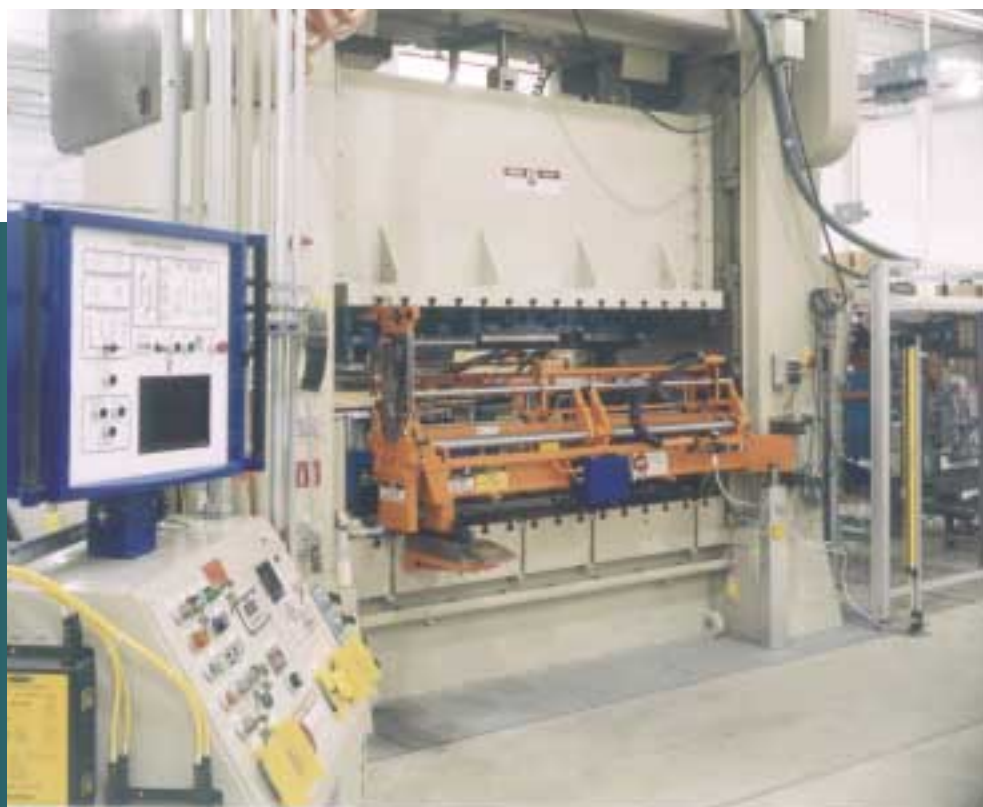
A new 300-ton three-station transfer press welcomes this 150-year-old company into the 21st century of deep-draw productivity, with a 250-percent increase in throughput.

BY BRAD F. KUVIN, EDITOR

In 2001, Wooster Brush Co., Wooster, OH, celebrated 150 years in business as an independent manufacturer of paint applicators and accessories. Last year also saw the firm build a new 30,000-sq.-ft. plant that now hosts a new 300-ton transfer press used to draw the firm's premium-style paint tray, one of its signature items.

Wooster Brush has expanded more than 20 times since it opened its doors back in 1851; its newest manufacturing building hosts metalworking operations that produce paint-roller frames and paint trays.

"We had to boost production to keep up with demand for the premium metal trays," says Jim Riggs, Wooster Brush purchasing manager, "and to improve productivity in order to hold prices and fend off competition from manufacturers of plastic paint trays." A boost in pro-



The new 300-ton Bliss press with HMS servo-mechanical transfer resides in a new 30,000-sq.-ft. addition on the grounds of Wooster Brush Co. The press replaced a three-press tandem line to produce drawn paint trays, boosting throughput by 250 percent.

ductivity, of 250 percent, is just what the firm got with its new transfer-press line.

Replacing a Three-Press Robotic Tandem Line

Wooster Brush fabricates its premium-grade paint trays from tin-coated 0.012-in.-thick steel sheet. Production of the trays began in 1962 on a manually fed three-press tandem line. The stamping process—in fact, many of the die components—developed in 1962 remain intact today. Paint trays develop in three forming stages: draw; trim and partial curl of the edges; and final flatten of the curled edges. Until the early 1980s, the firm used a 105-ton Verson press for drawing and a pair of 60-ton Warco presses for operations two and three.

"In the early '80s," recalls Steve Middlesworth, manufacturing engineer, "we increased throughput on the line by designing and building, in-house, a robotic transfer system to feed blanks through the presses. A couple of years ago, we realized that to remain competitive, and avoid problems we had with the availability of parts for our old presses, we needed to invest in a new line."

Wooster Brush turned to McAfee Tool & Die, Uniontown, OH, to produce the transfer tooling. The die designer and builder re-used much of the original tooling. "We had backup tooling for stations one and two," says Middlesworth, "so when we started building the new dies we shipped those spares to McAfee to repurpose the form tools. They built new draw rings, built new rails for the trim die and replaced the air cushion in the drawing station with a nitrogen system. But they were able to reuse the inserts and form pads from the backup tooling."

Due to the difference in draw depth from the front to back of the paint trays, from 2.75 in. down to 0.75 in., the firm went with a dual-zone nitrogen system, from Hyson Products. "The switch from air to nitrogen really improved our ability to set up faster and fine-tune the die to adjust for changes in steel properties," says Middlesworth. "Occasionally we'll get some cracking in the corners, particularly in the deep end of the trays, and, if we can't address the problem through die cleanup or lubrication, the ability to quickly and accurately reduce the nitrogen pressure in the pad solves those problems quickly."

Station one, deep drawing, of the three-station transfer is the trickiest of them all. Wooster Brush, die builder McAfee Tool and transfer-system supplier HMS worked together to fine-tune the knockout process from the top die in order to minimize the freefall distance of the drawn trays down onto the draw pad. They changed knockout-spring length and diameter so that the trays fall gently and smoothly from the die onto the pad, without bouncing, enabling the transfer fingers to positively and repeatably locate the trays to carry them to the next die station.

Feeding Coil Stock Rather than Blanks

With its tandem line, Wooster fed precut blanks. "We were purchasing double-width blanks from the service center and shearing and restacking them here," recalls Riggs. "The automatic feeder on the lead press was somewhat sensitive, hence the need to shear and restack. One of our goals in implementing the new transfer system was to move to coil feeding and to look at how we positioned the dies on the press bed to maximize coil-stock yield. Steve Middlesworth decided to go with narrow-width coils that are slit at the service center."

Adds Middlesworth: "How we would purchase our steel dictated the press-bed size we needed. Originally we looked at turning the trays 90 deg. to run through the press, to minimize transfer pitch. However, that would have complicated the feeding operation and diminished coil yield."

Ultimately, Wooster Brush settled on a Bliss SC2-300 straightside press with a 96-in. bed—the die master plate measures 90 in. long. Blanks sheared and formed at station one feed via an HMS servo-transfer system; a dual-loop servo-feed setup from P/A industries feeds the transfer press. The line consumes as much as 1.5 coils per day: "That's double what we ran 10 years ago," says Riggs.

Fine-Tuning the Transfer Process

Station one posed the biggest transfer challenge to Wooster Brush, HMS and McAffee Tool & Die. "HMS needed a ¾-in. clearance to grab the part with the transfer fingers," says Middlesworth. "McAfee needed to machine the die and add lifter pins to raise the drawn blanks off of the draw pad and allow the transfer fingers to come in and pick the blanks up to move them to station two."

Initially, mechanical springs loaded these lifting pins, yielding some 10,000 to 15,000 hits per spring. The firm switched to Raymond nitrogen gas springs (from Associated Spring) and enjoys a boost in spring life to as many as 500,000 hits per spring.

Next the firm had to fine-tune the die at station one to maximize press speed, yet be careful that the top die accurately ejected the blanks back onto the draw lifter pins so that the fingers could positively locate them.

"Initially, we had as much as a ½-in. freefall back onto the lifter pins," says Middlesworth, "which caused the trays to bounce and led to unpredictable locating. And if we reduced spring pressure too much, the trays tended to hang up at one end. So we worked hard to minimize the length of the fall, and to positively locate the trays for the transfer fingers."

As a result of this engineering effort, which focused on the ejector knockout pins on the top of the station-one die, Wooster changed the springs. It went with a longer spring, to gain more leverage on the trays as the dies lift after drawing. It uses two round knockouts in the deep end of the trays, and one rectangular knockout at the shallow end.

"Now we get no bounce at all, and the trays drop only ¼ in. or so to lay neatly on the lifter pins," says Middlesworth. "Lengthening the springs also allowed us to reduce spring pressure and avoid dents in the top of the trays."

A pair of proximity sensors on top of the form pad at station two, one sensor at the deep end of the tray and another at the shallow end, make sure that the tray has settled properly after feeding from the drawing station. The sensors tie in to the die-protection system through the press control, and are flush with the surface of the pad. They gauge whether the tray is within ⅛ in. of sitting down completely on the form pad. Sensors also reside in the transfer fingers.

While not a Class A draw, the paint trays do need smooth corners, crack-free of course (unless you like dripping paint). While some sidewall rippling is tolerated, if corner cracking occurs all that's usually required is to clear flaked tin coating from the dies.

The Drive for Clean Corners

While surely not Class A drawing, Wooster Brush does strive for wrinkle-free corners in the trays, while tolerating some wrinkling in the sidewalls. Should cracking appear in the corners, the troubleshooting begins with die cleanup.

"We'll see some flaking of the steel coating and occasionally need to buff out the corners of the die," says Middlesworth. "That maintenance procedure nearly always solves any cracking occurrences. If not, then we'll look at the lubrication setup and make sure the nozzles at station one are accurately pinpoint spraying into the corners, top and bottom. We do have to be careful with the amount of lubrication we apply, since we rely on the water-based lube to evaporate before the trays ride the conveyor out of the press to the welding station, where the tray legs are welded on."

After checking the lubrication system, a die-setup person might have to turn his attention to the nitrogen cushion. "He'll evaluate the stress pattern in the scrap flashing around the formed part, and either shim the standoffs to adjust clearances, or decrease nitrogen pressure by 10 or 20 percent," explains Middlesworth.

This troubleshooting procedure has allowed the metalforming operation to rarely, if ever, send back a coil of steel that it couldn't form, due to inconsistencies in material properties.

"Some 20 to 25 years ago," recalls Riggs, "we couldn't purchase a consistent supply of tin-coated stock from domestic suppliers, so we purchased from a Japanese source. We purchase American products when we can, and 12 years ago we switched to National Steel as our supplier of tin-coated steel, to the tune of more than 2 million lbs. per year just for the premium-tray line alone. We've never looked back." **MF**