

## *The fast and the curious*

**Greenheck Fan achieves faster production speeds with new press**

By Dan Davis, Executive Editor

In 1947 two brothers, Bob and Bernie Greenheck, opened a small sheet metal shop in Schofield, Wis. Fifty-six years later, Greenheck Fan Corp. has emerged as a world leader in the design and manufacture of commercial, institutional, and industrial air movement and control equipment.

With headquarters in Schofield, Greenheck is employee-owned with additional plant locations in Frankfort, Ky.; Rocklin, Calif.; and Kunshan, China. More than 1,500

Greenheck employees work to design, manufacture, and ship fans, ventilators, centrifugal and vane axial units, makeup air units, energy recovery ventilators, dampers, louvers, and kitchen ventilation systems.

### **Pressed for New Technology**

Greenheck officials attribute its ongoing growth to the implementation of lean manufacturing processes and the flexibility that has to co-exist

with those processes.

"Greenheck has made a significant investment in lean manufacturing practices that include one- and two-day quick builds for our custom products," said Lawrence Toboyek, manager of Greenheck's Tooling & Maintenance Division. "We have installed dedicated lines for a series of our products, and we have the capability to download work orders directly into our equipment controls for dedicated parts like our roll forming operations."



Greenheck also designs its own tooling that can be set up quickly. That quick-and-flexible mindset ultimately became prerequisites for a new stamping press that was needed in 2000. The press had to be quick to set up and be able to run small quantities.

"The type of equipment technology we use is an important component to our ability to maintain the level of service and product quality our customers expect," Toboyek said. "As another component of lean manufacturing, we wanted to enhance our production by running faster speeds and longer multiple-station progressive dies than we previously had the capacity for. We knew we needed a 300-ton press to accomplish that goal. Since we didn't own a press with that tonnage capacity, we knew we would need to make a capital equipment investment."

Greenheck visited area stamping houses and end users to look at a number of mechanical presses built by different manufacturers. Based on those visits, Greenheck officials selected AIDA's PMX stamping press technology.

### Stamp of Approval

"We knew the longer bed size would give us the opportunity to hard-tool parts with multiple operations, making it possible for us to produce parts that would come off the die complete," Toboyek said. "Quick setup and the ability to produce finished parts without the need for secondary operations are critical to our success in producing exactly what we need for each order."

The PMX was installed in July 2000 as a stand-alone work center for the Component Resource Center (CRC) in Greenheck's stamping department. Toboyek said riggers had the press installed in four to five days. The press was up and run-

ning, and operators were undergoing training by the second week, according to Toboyek.

Supporting all Greenheck operations, the press produces 350,000 parts a month. Some of these parts are bearing and motor plates, mounting brackets, blower wheel cones, wheel fins, and wheel backs. Materials used in the press include aluminum and galvanized, stainless, and cold-rolled steel in thicknesses of 0.030 to 0.187 inch.

Stamping a range of parts in smaller lots, the PMX runs 16 hours a day, five days a week.

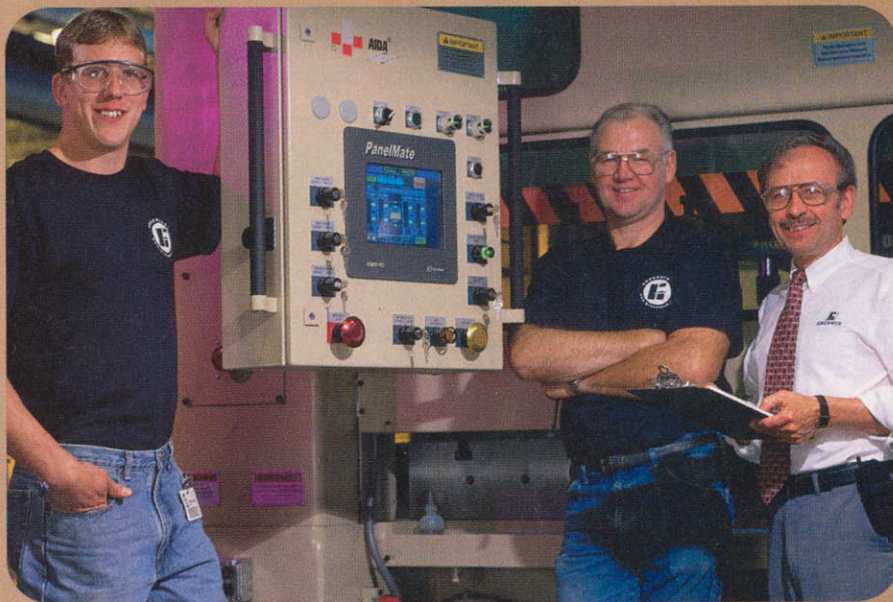
"To date we've experienced no breakdowns or related maintenance repairs," Toboyek said.

### The Link Not Missing

For Greenheck, the press has helped it to pick up the pace of its manufacturing processes.

"When we began running production on the PMX, we achieved the faster speeds we were looking for," Toboyek said. "But we were also able to run our tooling velocity slower because of AIDA's link motion. That meant we got the speed we needed without tearing our dies apart by running the slide velocity too fast."

According to Toboyek, the press's link motion and bed deflection delivered significant advantages that complemented Greenheck's lean manufacturing practices.



### Controlled launch

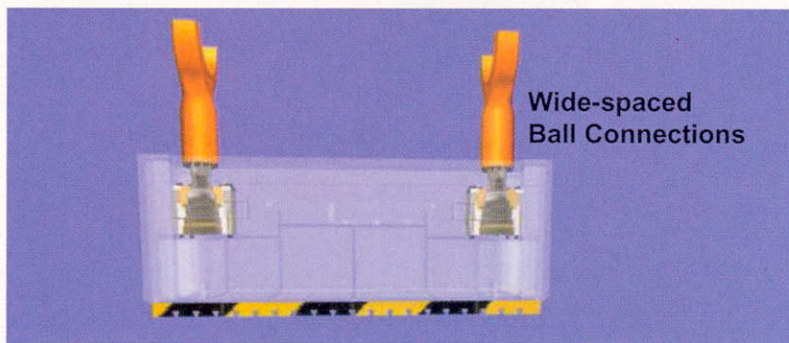
AIDA also provided Greenheck Fan Corp. with the flexibility it needed for its press layout.

"We selected AIDA's Access control to work with the PMX," Toboyek said. "AIDA customized our control layout to meet the special needs we had in the pressroom."

Control functions critical to the operator are placed in a small enclosure and suspended from a mobile arm, allowing the operator to move the control to the right spot. Access's large enclosure was removed from the press area to free space for forklift drivers.

Gary Jakubek, punch press operator; Thomas Maltbey, punch press operator; and Lawrence Toboyek, manager, tooling and maintenance stand with the Access control panel that AIDA customized for Greenheck's needs.





**Figure 1**

The connection points of the press's wide-spaced connections are positioned toward the outside of the slide. According to the press manufacturer, the greater distance between the connection points increases the stability of the slide and enables the system to resist the effects of tipping under off-center loads.

"We didn't have a true understanding of what AIDA's link motion could do until we saw it demonstrated at some of the companies we visited," Toboyek said. "We had a preconceived notion of older, conventional link motion with knuckles and pivot points."

AIDA's link motion is designed to enhance metal forming operations

in progressive-die work by maintaining the press slide near the bottom of the stroke for an extended period of time. Its ability to reduce punch velocity holds pressure on the workpiece longer. Metal has more time to flow because the material is in the work portion of the stroke 30 to 40 percent longer than with conventional technology,

according to AIDA officials. The press's link motion uses this additional time to allow the part to "set" into its ultimate and final dimensions, helping to reduce springback. The link drive's modified slide motion allows the slide to regain the extra time spent at the bottom of the stroke as it travels over the top.

The modified slide motion also minimizes heat and vibration. As a result, Toboyek estimates that the time and dollars spent on die maintenance have decreased by as much as 25 percent.

### **A Multitasking Tool**

AIDA's link motion also makes it possible for Greenheck to perform nontraditional jobs on the press.

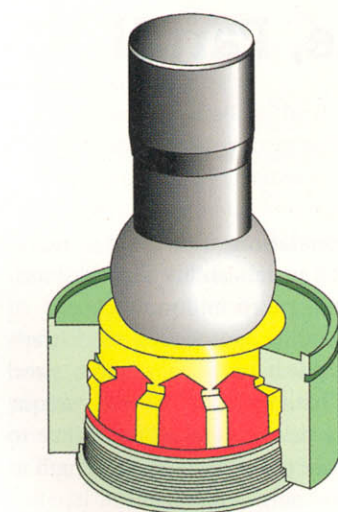
"We were able to draw our 10-inch-diameter wheel cone and eliminate a costly spinning operation," Toboyek

said. "Prior to our installation of the PMX, certain parts could be produced only with a spinning process. Spinning generates much higher labor costs than stamping operations."

A significant portion of Greenheck's stamping operations is also devoted to cutting and blanking. Greenheck found that the press's low bed deflection allows operators to increase cutting operations—almost double the strokes per minute when compared to Greenheck's previous press operations—while reducing the amount of reverse tonnage. The press is engineered to have a deflection rating at 0.0008 in. per foot.

The press's mass, which AIDA estimates to be 25 to 35 percent heavier than other progressive-die presses, helps minimize deflection. Its stack-up tolerance and low bearing clearance also help reduce the amount of breakthrough shock associated with cutting and piercing, according to AIDA officials.

The press also assists Greenheck in overcoming the challenges associ-



**Figure 2**

A hydraulic overload protector is provided on the suspension point. The HOLP is designed to operate in response to an overload, relieving oil pressure to zero in  $\frac{1}{100}$  second and stopping the press.

increasing demand for complex parts that require longer dies with more operating stations. The combi-

**Greenheck and other metal stampers are responding to the industry's increasing demand for complex parts that require longer dies with more operating stations.**

ated with the use of longer dies.

"The PMX's long left-to-right bed lengths made it possible for us to use larger, multiple-station progressive dies, but we also knew bigger dies would make it harder for us to center loads within the die," Toboyek said. "The PMX's higher resistance to off-center loading provided the solution we needed to effectively overcome that challenge."

Greenheck and other metal stampers are responding to the industry's

nation of complexity and length makes it difficult for stampers to center loads within the die without increasing die costs.

Greenheck found the wide-spaced connections in its new press reduce the effects of off-center loading on part quality and die life. AIDA officials estimate the press's wide-spaced connections are at least 30 percent farther apart than conventional progressive-die presses' (see Figure 1).


## HOLP Needed

Greenheck also achieved a higher level of die and press protection with the press's hydraulic overload protection (HOLP).

"Die protection became especially important to us with the implementation of the larger progressive dies," Toboyek said.

Greenheck press operators can adjust the press's HOLP from 110 percent down to 60 percent of press capacity to provide protection that matches the capacity of the tool being run. The HOLP can release when a tool is improperly set or gets too dull, helping to prevent production of bad parts. The HOLP also can be released at any time using an "unstick" switch. This feature quickly frees a slide stuck on the bottom. Recovery time to reset the overload takes only seconds, according to AIDA officials.

When an overload occurs, an oil-filled chamber trips, triggering the oil escape system. The slide connection itself is configured to operate as a high-speed valve, eliminating pressure valves and large hydraulic flow systems found on older-design presses with wrist pin and saddle bushing connections (see Figure 2).

"The steps we continually take to enhance quality and service is one of the reasons Greenheck continues to grow," Toboyek said. "Flexibility is another. We try to look for the same characteristics in our equipment. With the PMX we have the ability to run different types of material in the same machine. We can also run a wide variety of parts using different stamping processes. In today's lean economy, that kind of flexibility is important." 

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