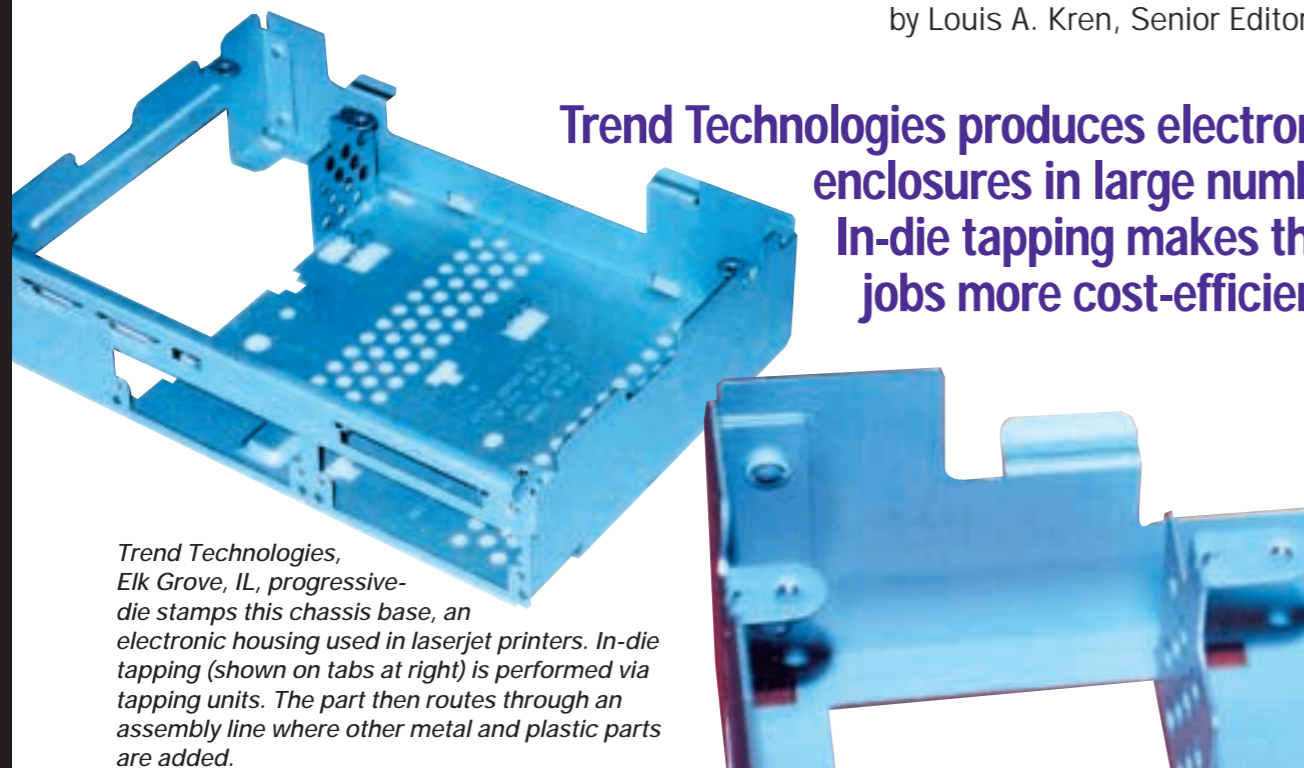




# In-Die Tapping Ideal for High-Volume Jobs

by Louis A. Kren, Senior Editor

**Trend Technologies produces electronic enclosures in large numbers. In-die tapping makes these jobs more cost-efficient.**



*Trend Technologies, Elk Grove, IL, progressive-die stamps this chassis base, an electronic housing used in laserjet printers. In-die tapping (shown on tabs at right) is performed via tapping units. The part then routes through an assembly line where other metal and plastic parts are added.*

In the Chicago suburb of Elk Grove, Trend Technologies churns out electronic enclosures for big-name computer-related companies. Part runs can top 100,000 per month. One part crossing this threshold is a chassis base, an electronic housing used in laserjet printers. Trend stamps the part then sends it through an assembly line where other metal and plastic parts are added. The

company refers to the shipped product as an engine.

The sheer volume of chassis bases produced necessitates unique methods to minimize costs and part-handling. With this in mind, Trend management decided to implement in-die tapping of screw housings during stamping. This eliminates a labor-intensive secondary operation.

Supplying in-die tapping technol-

ogy is Danly IEM, Cleveland, OH. Trend makes use of Danly ME 1024 in-die tapping units on a number of jobs. These units, known as internal lead-screw systems, are cam-driven. The units use a cam to drive a roller nut down the lead screw, forcing it to rotate. That rotation is transmitted through a pitch insert to the actual tap. Thus, the ram-driven cams adapt ram travel to tap a specific depth at a

suitable tapping rate. The lead screw and roller nut are placed inside the ME 1024 tapping unit because they require precise bearing and slide mounts, while the external cams fasten to the die.

The success of these tapping units relies on the use of cams. The progressive die we saw, producing the chassis base, had cams installed on the upper die with the tapping units fastened to the lower die. Here, on the press downstroke, the cams contact the tapping unit, ramping the tap to the required tapping speed and overcoming the acceleration of the press ram. This extends tap life and the life of the tapping unit by providing optimal rotational speed to the tap during the tapping cycle. Heat buildup is reduced on the lead-in threads by slowing the tap speed on initial penetration and then bringing the tap to full speed. Because the cams completely disengage from the tapping units during strip feed, the system can work with any press open height or strip width. A standard tapping unit can be used in a variety of dies, a feature utilized by Trend. Customized cams rest in each die and a suitable pitch insert is used for each specific job.

For our visit, Trend laid out a 10-station progressive die with electro-galvanized steel strip indicating what each station accomplishes in producing the chassis base. The part is produced on one of two 600-ton Minster mechanical presses complete with automated coil feed. The first two die stations pierce and extrude while the next three perform tapping. This is followed by cutting of the part perimeter as well as coining and additional forming. Hole location is critical for successful in-die tapping, and is accomplished through pilots placed along the die set.

Tap lubrication is accomplished



*This 10-station progressive die, with the strip showing what functions are performed at what station, incorporates tapping units, the black boxes in the center of the lower die.*

## Capabilities to Die For

Trend Technologies' Elk Grove, IL, 460-employee operation encompasses 300,000 sq. ft. and is responsible for \$100 million in annual revenue, making it the second largest facility under the Trend umbrella, according to Edward Walter, vice president of sales.

Trend, headquartered in San Jose, CA, is a primary electromechanical enclosure supplier to major OEMs such as Dell Computer, Sun Microsystems, Cisco Systems, Nortel Networks, Hewlett-Packard, Alcatel and Nokia as well as CEMs such as Solectron, SCI, Jabil Circuits and Celestica. The 5000-employee company manufactures in 16 facilities worldwide including 11 in North America, two in Southeast Asia and three in Europe. Overall, the company operates more than 600 metal-stamping and plastic-molding machines and is projected, with pending acquisitions, to reach \$1 billion in sales in 2001, according to Walter. At one time, automotive contracts represented 75 to 80 percent of the Elk Grove business. But the volatility and low margins led Trend

to build its electronics customer base.

Walter refers to Trend as an integrator, that is, the company produces enclosures containing metal and plastic.

"Integration sets us apart," he says. "We want to be everything for customers, having them come to us for plastic molding and metal stamping and for assembling those pieces. Because of our facilities worldwide, we can build a product here and place it anywhere."

Elk Grove runs stamping presses to capacities of 600 tons and molding presses with capacities of 1000 tons. To keep those presses humming, Elk Grove houses a full toolroom with a staff of about 70 employees who design, build and repair dies. Equipment includes wire-EDM machines, CNC machining centers, grinders and all manner of die-building and repair equipment. Overhead cranes cover the entire operation. The toolroom features a large tooling-assembly area and a 300-ton Minster tryout press with coil-handling equipment.

"We can achieve extremely close to production-quality die performance in our tryout press," says Curtis Pilson, tooling coordinator. "The tryout-press line mimics the actions of the two 600-ton Minster press lines on the production floor."

The toolroom manufactures dies for use by Trend at any of its facilities, and stays busy, since production is running three shifts and Elk Grove frequently picks up jobs from other Trend operations.

"The people who built up our toolroom have done an excellent job," says Walter, "and this operation owes about 90 percent of its success to the toolroom and its capabilities."



via an in-die manifold with tubes running directly to the taps. Lubrication is fed directly to the hole to be tapped and timed to the tapping process. "When we run the tool, we only have to lubricate the tap itself," explains Precour. "We lube the tapping unit during die maintenance."

### Customer-Driven

Trend had been aware of in-die tapping technology, especially pertaining to automotive applications, but was hesitant to use it. In mid-1998, a customer prodded Trend to dive into it.

"Initially, the comfort level wasn't there," recalls Dan Precour, general manager of tooling at Trend. "We tended to use secondary tapping operations, but a customer pushed us into tapping as a cost-saving measure. The part required several tools and several tapped holes, and the high volume justified using in-die tapping."

Danly supplied in-die tapping units with construction more robust than traditional open-lead-screw types, according to Precour.

"The unit gave us the ability to place the tapping unit anywhere in the die," he says. "Because the unit is relatively large, it uses some room in the tool but we can place it anywhere and tap at any angle, so it offers a tremendous amount of flexibility."

Typically, Trend designs new dies to incorporate the in-die tapping units, using Danly IEM-supplied Campro software for cam design. While existing progressive dies can be reworked to hold the units, in some cases, necessitate extensive machining. However, some existing progressive dies have the room to incorporate the units rather easily as added stations.

Because Trend builds dies in-house (see sidebar), all in-die tapping information is at the ready, from engineering to the toolroom to the production floor. If stampers do contract out tooling work, Danly

stresses the need for tool-and-die shops to provide all tapping-unit-related drawings and information to the stamper.

"We will quote a part, if it is of sufficient volume, with in-die tapping or with secondary tapping," explains Precour. "At high volumes, in-die tapping is the low-cost alternative."

Trend usually stamps electrogalvanized steel and some tin plate and other materials. In-die tapping maintains its performance through all these materials and with a variety of coatings.

### Riding the Learning Curve

Incorporating in-die tapping did present a learning curve for Trend in terms of matching the tapping to the press stroke and press speed, but most of that learning curve dealt with lubrication.

"The lubricant initially used evaporated on the tooling, eating away

grease and leaving a powder residue on the tooling," Precour explains. "But Danly helped us out by providing a maintenance schedule."

According to this schedule, all tapping units are installed in the dies for job runs, then removed when the run ends. Then, each unit's pitch insert is removed, cleaned, regreased and shelved until the next run. Often, Trend will transfer tapping units between dies, install the correct pitch insert and ensure the correct height between the insert and the tap, which can differ from job to job. Precour says the process is simple and tapping units can be installed with only two screws.

"We have work instructions that specify where all the pitch inserts are placed and how to arrange the units in the dies," he says.

Because the cams are dedicated to specific tooling, Trend uses Campro software to produce optimal cam de-

signs based on the type of press used, tapping requirements and tapping locations. For stampers without in-house tooling design/build capability, Danly IEM can design and manufacture custom cams. In addition, the company provides regional customer-service capability as well as staff engineers, which aided Trend during implementation of in-die tapping. **MF**

### Benefits of In-Die Tapping

Choosing in-die tapping units has cut costs for high-volume jobs at Trend Technologies. Such units offer other benefits as well, according to Danly officials, including:

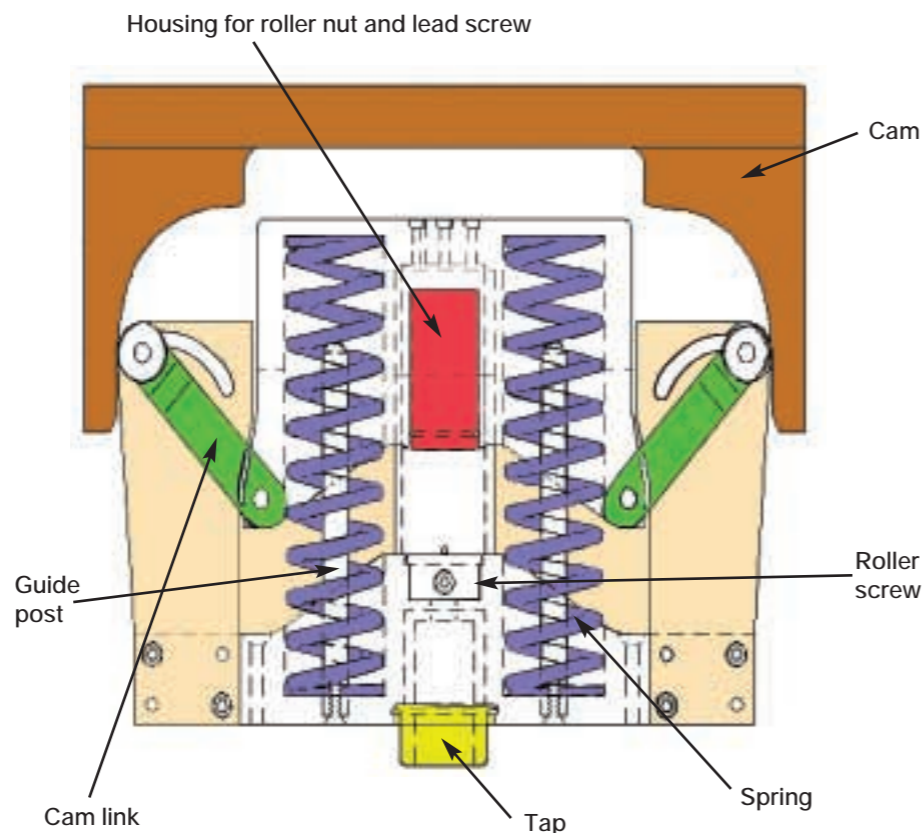
- Elimination of secondary operations
- No strip-width limitation
- Multiple-hole tapping in the same press
- Simple pitch-insert replacement for changing thread pitch
- Forming of taps, resulting in high-quality threads without chip production
- Simple transfer of tapping unit to another dieset
- No limitation on the open height of the dieset.

Besides the units in use at Trends, other types of tapping-tool styles are available for various applications. An example is Danly's Pronic electromechanical unit, which operates independent of press power.



These in-die-tapping units can be removed and installed on other dies, making the technology more cost-efficient. Note the tubes in the back of the die. These supply lubrication to the tap holes during the tapping process.

### ME 1024 Tapping Unit



This diagram shows the in-die tapping unit used at Trend Technologies.