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## Rotary transfer machines provide high-volume flexibility.

**W**hen it comes to high-volume, extended-length production runs of complex parts or families of parts, eliminating secondary operations is highly advantageous. It prevents tolerance build-up, reduces parts handling and maximizes machine efficiency and profit. For this type of production, rotary transfer machines excel. The flexibility of this type of machine also makes it appropriate for smaller parts quantities.

Brown Manufacturing Co. Inc., Plainville, Conn., is a case in point. "We were one of the first to use a CNC rotary transfer machine in a job shop environment for smaller quantities rather than dedicated to a certain job," said Douglas Brown, company president. In 1993, the company purchased its first CNC rotary transfer machine from St. Louis-based Hydromat Inc. (The 12-station machine was the second CNC RTM the machine tool builder produced.) Brown Mfg. currently has three Hydromats.

Started almost a half a century ago making precision parts with traditional screw machines and centerless grinders, Brown Mfg. turned to rotary transfer technology to finish a part completely with a single machine. "We first tried mini-workcells on wheels, but there was still parts handling and parts damage," recalled Brown.

In addition to reducing parts handling, the company was able to downsize its cam-driven screw-machine department from 38 to 12 machines. Brown said those machines still play an important role, because some parts are not complex enough for RTMs.

"The Brown & Sharpes are for simple parts that we don't want to tie up the high-cost equipment with," he said.

For parts whose complexity and size fell between the two types of machines, the company acquired two CNC live-tooling indexing machines with back-working capability.

But when it comes to running a family of parts, Brown said there's no better way than a rotary transfer machine. "The machines don't like to cool down," he said. "They like to run and cut metal."



**ROTARY  
AHEAD**

Brown noted that the company's machines need oil coolers for some demanding runs.

### Setting Up

The setup requirements for a rotary transfer machine depend on the workpiece material, part complexity and the type of part the machine was previously running. Brown said setup takes 2 to 3 hours when switching a part within the same family and two to three shifts when changing outside a family of parts.

Since an RTM can be an alternative to a high-volume production run on a multispindle screw machine, it makes sense that screw-machine shops are some of the biggest consumers of RTMs. But screw machinists often don't have the proper mindset when it comes to rotary transfer technology, Brown said.

"Initially, the screw-machine guys were skeptical of a rotary transfer machine's ability to produce parts," he said.

Brown said the company worked around the skeptics by choosing people who weren't familiar with screw machines for the initial RTM training. "With rotary transfer, there's a different philosophy about machining parts," he said. "We didn't want people with preconceived notions about what would and wouldn't work."

To become proficient, Brown indicated that it takes 6 to 12 months of training.

### From the Get Go

With two generations of family involvement in the screw-machine business, Troy Pohlman seemed destined to become a manufacturer of precision parts. In 1989, he founded Component Bar Products Inc. in a shop a short stretch down the road from Hydromat. CBP began producing parts using two Hydromats. Familiar with equipment from his father's experience with the technology, Pohlman figured it was ideal for making consistent, high-quality parts cost-effectively.

“The Hydromat rotary transfer machine is an alternative to running a screw machine and two or three secondaries. Anytime you have multiple people handling a part, variation is introduced into the product,” Pohlman explained.

By plowing profits back into the operation, the company grew to occupy its current 60,000-sq.-ft. facility in St. Charles, Mo. The building houses 30 RTMs: 24 Hydromat horizontals, 2 Hydromat VM-16 verticals, three Mikron rotary jaw/chuck machines plus a one-of-a-kind miniature model of a Hydromat—complete with moving parts.

Another machine tool the company has is a Walter CNC tool and cutter grinder. CBP uses it to make all of its carbide and HSS cutting tools. The company also designs its tools in-house, while outsourcing the coating work.

Although designed to accept a maximum diameter of 1¾", Pohlman said CBP is able to push the capabilities so one RTM model can accept 2"-dia. bar stock.

The company can produce parts up to 6" long for a plethora of industries, from HVAC to automotive, made of any bar shape and a wide array of materials. “The machine provides infinite flexibility from one station to the next and is capable of running all flavors,” Pohlman said.

From the time the bar stock is fed into the machine at the 12-o’clock po-



Photos: A. Richter

**Brown Mfg. Co.’s Douglas Brown (left), president, and Les Brown, vice president, continue the family-owned business founded by Howard Brown in 1955.**

sition and cut off at the appropriate length until the finished part is discharged through a chute at the 11:30 position, a virtually infinite combination of machining operations can be performed. Individual stations can be designed so that each independently controlled spindle performs its required operation vertically, horizontally or at any angle. In addition, the hydraulically controlled machine can have an inverting station to allow the workpiece to be taken out of its collet, inverted and placed back into the collet so the work-

piece’s backside can be machined.

A Hydromat 16-station RTM, for example, could perform 16 horizontal plus eight vertical operations, for a total of 24. Since the spindle units are modular, an individual operation can be switched from, say, tapping to boring. In addition, a worn drill can be switched for a new one in about 1 minute with the quick-change tooling attached to the end of the spindle. Without quick-change tooling, switching a worn tool takes 15 to 20 minutes.

Although Pohlman said CBP’s published minimum run is 50,000 parts, the contract manufacturer has gone down to 2,500-piece runs for select customers.

Being flexible helps justify the investment, since the machines are designed for “the long run,” with a 10- to 20-year outlook, Pohlman said. “There are not many jobs that will pay for the machine in 3 to 5 years,” he said. “Not many home runs like that.”

As previously stated, RTMs run long and hard, so preventive maintenance and machine reconditioning are essential ingredients for seeing an ROI. Pohlman said CBP performs teardowns and reconditioning work in-house on its RTMs after 100 million cycles. “We can recondition a machine in as little as 8 weeks.”

Depending on the job and the part’s cycle time, he noted that a single ma-



**Troy Pohlman, president of Component Bar Products, started the company in 1989 with two rotary transfer machines and is of the belief that CBP is the contract manufacturer with most Hydromat RTMs under one roof in the Western Hemisphere, with 26.**

chine can produce up to 5 million parts annually.

CBP also does all repairs and modifications in-house, Pohlman said. He estimated that maintenance costs less than \$10,000 annually for each machine.

### Variation on a Theme

Not all types of rotary transfer machines are an alternative to producing parts on screw machines. Larger RTMs, such as the Imasflex machines from the Italian machine tool builder Imas, substitute having a line of CNC vertical or horizontal machining centers for high-volume production of a part or family of parts.

This is the scenario for Duro-Life Corp., Algonquin, Ill. Timothy Heagney, general manager, said the company purchased two Imasflex eight-station RTMs about 6 years ago to make a family of manual transmission parts for a Tier 2 automotive supplier. Combined, the machines produce about a million parts annually.

"With this type of machine, you want to be in a higher production mode," Heagney said. "This is not the type of equipment that you would get when starting a machine shop. It's some of the fastest technology, but not for changing jobs from one day to the next."

Instead of the machine being fed bar stock, the operator loads ductile-iron, near-net-shape castings that remain stationary as the tools revolve to perform multiple operations at each station. Each station, or head, has four spindles that can apply different cutting tools. Therefore, with one station dedicated to part loading, an eight-station RTM can ac-

## A rotary transfer alternative to single-machine production

**A** rotary transfer machine's design makes it easily adaptable to a wide array of applications, but that flexibility doesn't come cheap. Depending on the number of stations on an RTM and the types of operations it performs, a new machine can cost well over \$1 million—and the sky's the limit.

Having the RTM perform the secondary operations after the workpieces have been turned on a separate machine is a lower-cost alternative to doing everything with a single machine, said Wolfgang Kesselring, vice president of Jamieson Mfg. Co. Inc., Torrington, Conn.

"Depending on the part quantities and type of part family, it's cheaper to have a standard turning center and combine it with a rotary transfer machine than to crowd everything into the rotary transfer machine," he said.

Kesselring added that the part can be automatically fed from the turning machine, such as a lathe or single-spindle screw machine, to the RTM. Some two-thirds of machines the company sells are automatically loaded.

Jamieson's SR line of RTMs is the

builder's main offering, he said, with prices ranging from \$200,000 to \$1 million. Jamieson also offers the Rotamat line of RTMs, which are smaller than the SR series machines. Shops with in-house machine-building capabilities can save money by choosing the components system instead of ordering a turnkey machine.

The company's RTMs are available with up to 15 stations, with horizontal and/or vertical units in each station. They can accept part sizes up to 4"x4"x8".

Kesselring said most of the machines are pneumatically/hydraulically actuated but can also be actuated by cam, hydraulics or servomotor, which is becoming more popular.

Kesselring estimated that a company needs to make a part or family of parts in a quantity of 500,000 annually to justify the investment. He added that the RTMs are built to handle round-the-clock use and abuse, since end users can't afford machine downtime.

"Most run them until all goes to hell and then they fix the machine," Kesselring said.

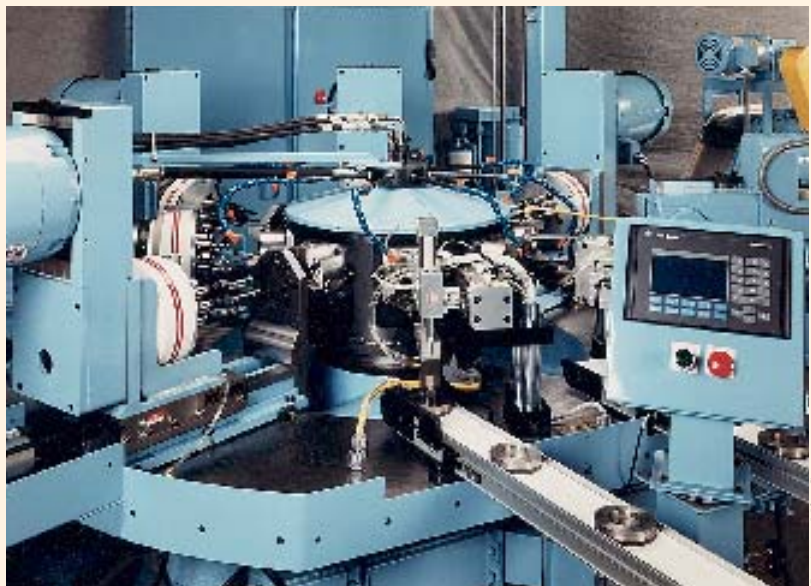
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### The following companies contributed to this article:

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Jamieson's RTMs can be ordered as turnkey machines with all systems installed or as component systems that the customer assembles with the machine builder's support.





A single station in an Imasflex rotary transfer machine can have up to four spindles.



At Component Bar Products, two machines are grouped together to allow one machinist to operate both.

cept up to 28 tools. However, Heagney noted that Duro-Life upgraded a station that performs heavy milling from the standard head to a “beefier” dedicated milling head.

“The builder tailors the machine to the product you need to produce,” he said.

Heagney said another significant difference between the Imasflex and Hydromat design is that the Imasflex does not perform turning operations. Even so, the parts Duro-Life produces on the Imasflex can be produced completely in a single fixturing since they don’t require turning, but he said a counter-sinking operation is performed after the part comes off the RTM to reduce

cycle time.

Like workholding on other types of machine tools, fixturing is critical for this style of RTM, Heagney said. He noted that the fixtures are mounted on a faceplate and are not chucked.

“That’s not to say that chucks could not be mounted on these machines,” he said. “The holding fixtures are not as universal as a chuck would be, where the chuck jaws are changed to hold a different shape. But the configuration of the part we’re running doesn’t lend itself to being held by a chuck.”

Heagney said the machines receive a complete preventive-maintenance check after every 1,500 to 2,000 pro-

duction hours. This involves inspecting components such as ballscrews, slides, spindle bearings and electrical apparatus.

“In an environment where there’s coolant all over the place, limit switches, for instance, get gummy and sticky. Good preventive maintenance is demanded,” Heagney said.

In addition, daily maintenance by the operator is important to keep production flowing. “Good machining practice says you should always keep the machine as clean as you can,” he explained. “My opinion is that the cleaner the machine is, the better and longer it will run. This is especially so when machining abrasive materials, with cast iron being one.”

Whether to invest in this type of rotary transfer technology depends on having an appropriate family of parts and enough quantity of them to run on the machine. The level of commitment from the customer is also a critical factor.

“The major consideration is having a customer base or customer within your base that has a need and a willingness to commit to you for a period of time that the part-production program will be staying with you,” Heagney said. “When the machine is purchased, it’s purchased with a specific program in mind. Typically, by the end of that program, the machine is pretty well spent.”



Setting up a horizontal Hydromat rotary transfer machine.