By George Winton, P.E.

Reducing the costs of goods sold

Transfer machines help drive costs down, transfer work back to U.S.

DURING much of the 20th century, most U.S. manufacturers enjoyed a long ride immune to foreign competition. As the turn of the century approached, several industries witnessed the relocation of their manufacturing base. Two notable examples are furniture and garment manufacturing. Another is bicycle manufacturing. When is the last time you saw a child's new bicycle stamped "Made in the U.S.A."?

Figure 1
This stainless fuel line, used in an automotive application, has three bends, two flares, and two fittings. The fittings are installed before the last flare is made.

THE TRANSFER PROCESS

So the question is this: How can U.S. companies compete against foreign manufacturers, especially those with low labor costs? One way to stem the tide is to automate. Automation can reduce cost of goods sold and can help to keep or regain manufacturing ground.

The transfer process can help. The transfer process itself can take several forms. Linear or rotary, a transfer machine performs many operations within a defined cycle time. A tube used in an automotive brake line is a suitable candidate for a transfer process (see **Figure 1**).

It doesn't matter if the bent assembly has two bends or 20. One complete part is formed every time the transfer machine cycles. Typical cycle times are from three to eight seconds. The cycle time is the beauty of the transfer process—it can drop the product cost like a lead balloon.

TRANSFER IN ACTION

So how does the transfer process work? From a linear perspective, a transfer machine uses several discrete operations to make a finished part. Each operation is performed simultaneously on different parts every time the machine cycles. For example, while the first end form is being made on a tube at the beginning of the transfer process, the first bend is also being made at the same time on another tube elsewhere in the process. As each tube is transported from one forming station to the next, an additional operation is imparted on each tube. One completed part is ejected from the system every time the machine cycles.

The cycle time depends on the transfer machine's design, not the complexity of the part being formed. Within a given cycle, processes might include forming, assembly, bending, more forming, and so on. Although the sum of the individual operation times might equal 55 seconds, the machine ejects one complete part every time it cycles. This is the chief benefit of a transfer machine.

Another benefit of employing a transfer machine is it eliminates semifinished goods—big bins of parts between operations don't exist. This eliminates forklift requirements. Also, the transfer process doesn't require human intervention between operations. Reducing the number of workers—in some cases from 18 people to two—decreases the likelihood of injuries and workers' compensation claims.

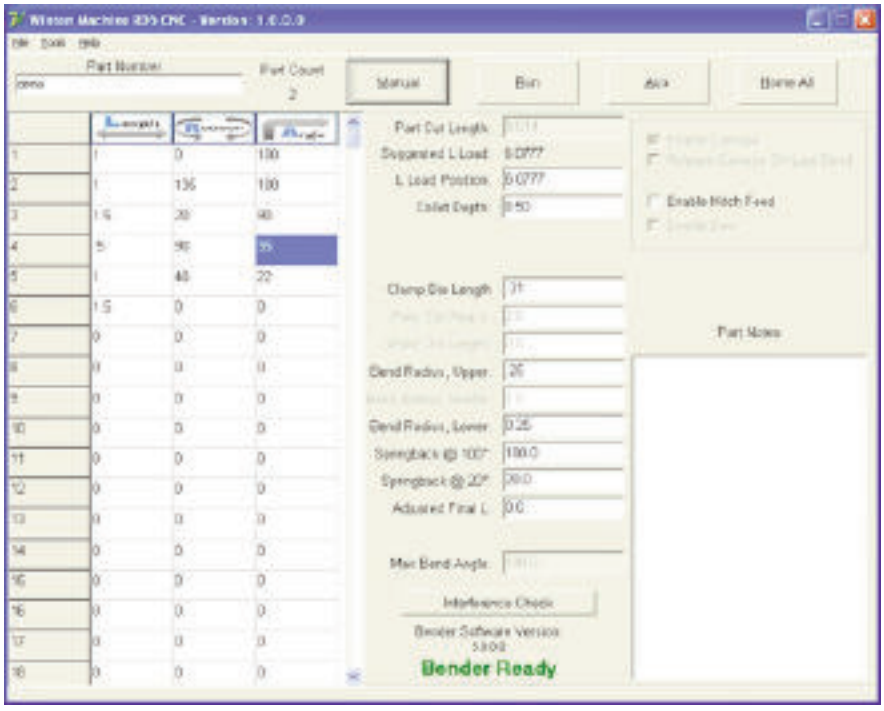

Figure 2

The transfer machines of yore manufactured a single component. Modern transfer machines are programmable; the operator uses an interface like this one to program it, making it essentially as versatile as any CNC machine.

CHARTING THE FUTURE

Historically, employing a transfer machine successfully hinged on a large dedicated volume. A return on an investment was impossible without one. This is changing. In the 21st century, tube fabricators will see a new type of transfer machine that is highly flexible. For example, a user interface now can be employed to program a CNC transfer machine to bend tubes (see **Figure 2**).

What's the benefit? Flexibility coupled with reduced cycle time. A typical six-bend part on a traditional CNC tube bending machine can take anywhere from 18 to 35 seconds to produce. On a programmable transfer machine, the same part would take about five to six seconds. Moreover, the five- to six-second cycle time includes load and unload.

CNC transfer machines do have drawbacks. However, they are no different from the limitations and restrictions associated with all CNC benders—each tooling set works on just one OD; each process requires some setup time; and machine interferences can prevent successfully bending some shapes.

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