TECHAPPLICATION

Laser Cutting of Metal

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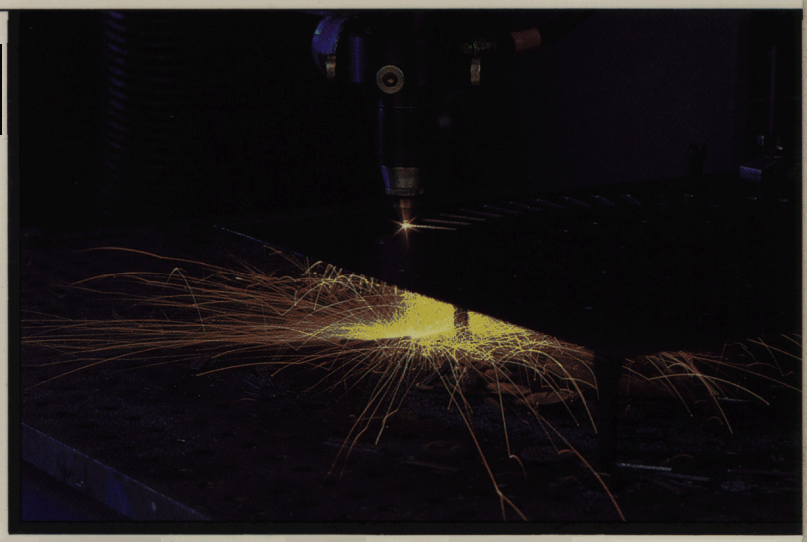


Laser cutting of motor end plates offers increased flexibility to meet changing customer demands.

The Challenge: More Custom Parts at Reduced Costs

By finding an innovative way to decrease manufacturing costs, Westinghouse Canada, Inc., is now supplying a wider variety of electric motors to its customers but without the extra cost usually inherent in manufacturing small orders. In the spring of 1986 Westinghouse Canada, Inc., accomplished this feat by taking advantage of the expertise of a high-quality job shop and the flexibility of laser cutting to manufacture the end plates, an important motor component. Now it supplies electric motors tailored to a variety of specifications while actually reducing the manufacturing cost of machining short runs of end plates.

Westinghouse Canada, Inc., builds 150-600 horsepower motors that are used for pumps, blowers, and conveyors in a variety of industrial and commercial applications. Each application has somewhat different requirements, in terms of motor efficiency, torque, and full load speed. Different requirements result in different end plate designs but only a few of each design will be manufactured.

Westinghouse Canada, Inc., knew that to continue offering design flexibility and control costs it had to find a new manufacturing method that would:

- Cut the cost of tooling—a costly portion of short run end plate manufacture
- Require little capital investment
- Permit the manufacture of a variety of motor end plates out of thicker materials.

The Old Way

The cores of electric motors are made from a series of laminations, tightly bolted together by an end plate on either end. Made from 0.125- to 0.25-inch thick mild steel, the end plates add structural stability and prevent flaring of the thin laminations from which the motor is made.

Until 1970, Westinghouse Canada, Inc., made its motor end plates in a 3-stage stamping process, using a special, high-tonnage punch press and purchased tooling. In the first press, sheets of 0.125-inch thick mild steel were cut into circular blanks from 14 to 22 inches in diameter. A second press formed the slots in the end plates, and the final press cut the shaft and vent holes.

While each pressing operation took less than a minute, the turnaround time for an end plate was about a week, partly because it took approximately 3 hours to set up the punch press for each operation resulting in a 1- or 2-day delay between operations. In addition, tooling for each end plate design cost around $4000.

From 1970 to 1986 Westinghouse Canada, Inc., looked at a variety of solutions before it decided to turn to laser cutting. It tried brazing standard laminations together to create the end plate. While this was fairly quick in elapsed time, the process was labor intensive and thus expensive. Gas cutting the end plates was tried, but it was not accurate enough.

Glass banding was used to hold the laminations together instead of end plates, but this restricted the motor's ventilation. However, this process is still being used for larger motors.

The New Way: Work Together with an Innovative Job Shop

In 1986 Westinghouse's Buffalo plant found its cost-effective solution by switching to an entirely different method for making end plates. Instead of stamped or gas cut, the end plates are now laser cut.

Rather than investing in its own laser equipment, Westinghouse Buffalo chose to contract with Diversified Manufacturing, Inc., of Lockport, New York, a job shop experienced in laser cutting a variety of materials. This arrangement was so efficient that the technology has been transferred to the Westinghouse Canada, Inc., location. Now, Westinghouse Canada, Inc., engineers simply send Diversified a part drawing. From the drawing, Diversified takes about 4 hours to produce a CNC (Computer Numerical Control) tape for its 1.5 kW metal-cutting laser; it then cuts the parts.

Results: Lower Costs and a Diverse Product Line

Lower tooling costs. Instead of paying about $4000 for hard tooling for the punch press, Westinghouse Canada, Inc., now pays about $250 for the CNC tape.

Lower labor costs. Rather than punch press operators spending 5-6 hours setting up the presses, the laser cutter operators simply load the CNC tape, insert the end plate blank and start the machine. The actual cutting time is about 15 minutes per part.

Faster turnaround time. Diversified usually cuts the parts within a day of receiving the drawing because set up is minimal. For stamping, turnaround time was about a week, not including the time to build tooling.

Reduced capital investment. Westinghouse Canada, Inc., reduced the need for its high-tonnage punch presses. This also made floor space available for other uses.

Lower cost per part. A run of 25 end plates of 20-in. diameter are considerably cheaper using laser cutting:

	Cutting Cost Per Part	25 Parts	Fixed Cost	Total Cost
Old Way	$12	$300	$4000 tooling	$4300
New Way	$32	$800	$ 250 CNC tape	$1050

The total cost per part has thus been reduced from $172 to $42.

Energy costs. Now that no tooling is required, the energy used to manufacture the tooling is conserved. In addition, the power to drive the punch press is also conserved. The total savings offsets the laser's energy use. By finding ways to decrease cost and increase quality, Westinghouse Canada, Inc., has improved its industrial competitiveness.

Fast design changes. Laser cutting enables Diversified to readily change designs for smaller runs. A new job is started by simply changing the CNC tape and inserting another workpiece. Minor design changes are easily made without additional charge to Westinghouse Canada, Inc. When Westinghouse Canada, Inc., calls with a rush job, it can be shipped within 48 hours.

What Did it All Cost?

Westinghouse Canada, Inc., would have had to spend about $250,000 for a laser and computer control if it had decided to buy one. The services of a job shop were much more economical, especially since Westinghouse Canada, Inc., had no other use for the laser. Westinghouse Canada, Inc., has avoided capital costs and has allowed production costs to be fully expensed as incurred.

The Bottom Line: A More Competitive Company, Better Able to Meet its Customers' Needs

Switching to laser cut end plates has put Westinghouse Canada, Inc., in a more flexible position to design motors which meet exactly its customers' specifications. For example, Westinghouse Canada, Inc., recently accepted an order for a new motor design, even though the customer wanted only 4 motors. Without laser cutting, each motor would have over $1000 in end plate costs alone.

Other Laser Applications

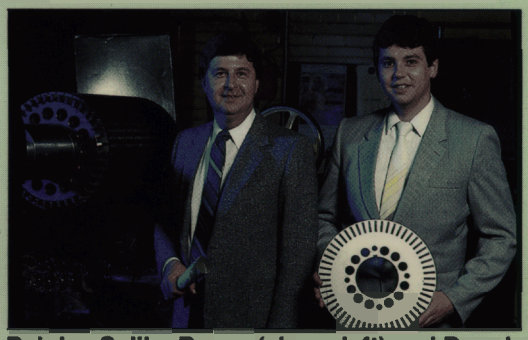
Lasers can cut a variety of thin materials. Laser cutting lends itself well to producing instantly-available prototypes, small production runs of precise parts, and rapid delivery of many different kinds of parts. For more information about laser cutting, see TechCommentary Vol. 3, No. 9.

Company Profile

Westinghouse Canada, Inc., Hamilton, Ontari

320 employees at site; 5500 in Westinghouse Canada

Company philosophy: Industrial achievements are made to happen by committed resourceful people who match vision and talent with the needs of the day.



Bohdan Solilo, Buyer, (above left) and Douglas Stafford, Product Specialist, of Westinghouse Canada, Inc., work together with Gary Brockman, Laser Operations Manager, (below left) and David Few, Sales Manager, of Diversified to supply quality electric motors.

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