

Southwestern Laser Achieves Volumetric Accuracy Equal To Coordinate Measuring Machines With Its Two Laserdyne 790 BeamDirector Systems

July 2002 - Tucson, Arizona: Getting the most out of multi-axis laser machining systems has been a 30-year quest for job shop owner Ron Sanders. He's seen and done it all. His three-year-old company, Southwestern Laser, Inc., is the culmination of three decades of developing and applying laser technology to the most difficult aerospace, power generation, and automotive applications.

Sander's story is unique because he's built this success with one brand of multi-axis laser system – Laserdyne. Sanders contributed to developing many of the Laserdyne systems and software features since the early 80's the same systems he now uses on a day-to-day basis for customers like Pratt and Whitney and Solar Turbines.

Sanders grew up with Laserdyne systems by managing the company's application lab and contract services (job shop) for over 14 years. The job shop was a profit center designed to first develop then produce customer parts. It also served as a research and development facility where new machine designs and software were



PHOTO ONE CAPTION: Ron Sanders with one of his two Laserdyne 790 BeamDirector Systems. Because the laser moves at all angles to the part, tooling is much simpler and less costly than other types of lasers.

tested. Sanders had a hand in many of the new designs particularly in writing the critical operating software for the machines. When Laserdyne's job shop was sold in 1995, Sanders went out on his own and founded Northern Lights Laser in Minneapolis, Minnesota. But his upbringing in the Southwest and warm weather lured him back to Tucson, Arizona in 1999 where he and his wife set up Southwestern Laser.

The company is a well-run operation that belies its size by the volume and quality of the work it produces for its big-name customers which includes GE, Sundstrand, Rolls Royce, Allison, Turbo Tech and others. With 3 laser systems -- two Laserdyne 790 BeamDirectors, a Laserdyne 550 BeamDirector, six highly trained workers and more computers than you care to count -- Southwestern Laser reports annual volume in excess of \$2 million and is growing rapidly despite the economy.

"It's all about being able to do really difficult laser work that customers can't or don't want to do," reports Sanders. "We take a project in one day and begin shipping finished parts the next. We have customers through out North America and do work for virtually all of the aircraft engine and power generation manufacturers. We have complete in-house CAD capabilities, including conversion of .dxf files to CNC program files. Turnaround time is everything and we're able to do really difficult work quickly because of our ability to wring the most out of Laserdyne 790 BeamDirector systems."

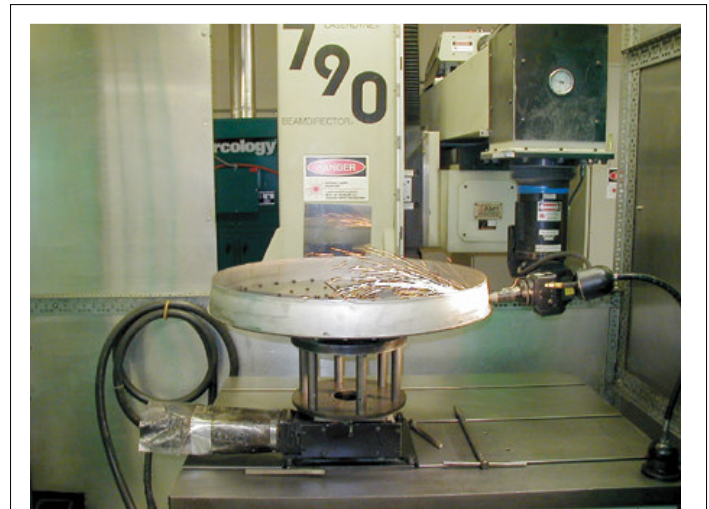


Southwestern Laser, Inc. processes all types of parts including combustion liners, exhaust and heat shields, and nozzle guide vanes and blades.

Laser Processed Parts Range From Tiny .005 Inch Rounds
To 4 ft X 4 ft X 3 ft .050 Inch Thick Stainless Steel Parts
With 11,000 Holes Per Square Inch

Wringing the most out of its laser systems is almost an understatement for Sanders. The company specializes in processing difficult materials such as super cobalt, exotic nickel alloys and stainless steel. Much of the work involves hole drilling from .003 inch to 24 inch diameters and material thickness from films to 1 inch. Hole angles range from 10° to 90°, rotary parts up to 48 inch diameter and preformed parts up to 24 inch and widths to 48 inch.

“Our ‘through the lens’ viewing (amplification is 45 times) produces unsurpassed feature location placement on these parts,” reports Sanders. “Laserdyne’s automatic focus control (AFC™) follows the contour of the part regardless of surface irregularities. And it’s the speed that we’re able to operate at that really gives us an advantage. We employ percussion, trepanning and ‘fire on the fly’ techniques for drilling effusion holes in the preformed parts. Our 790 BeamDirectors with their 5-axis of moving beam motion are extremely precise and versatile. From one hole to thousands in a single part, we have the equipment and know-how to do it cost-effectively.”



Moving in, under and around the part, Sanders’ 790 BeamDirector drills holes in these aerospace components with repeatability to 0.0008 inch (0.02 mm) within 15 arc seconds.

Produced at the rate of one part per second, Southwestern Laser cuts tiny .050 inch rounds from 6 foot long stainless steel wire. Used in a confidential military application, these parts have smooth, square surfaces part-to-part and are accurate to $\pm .0002$ inch. Produced in quantities of 3000, a part run barely fills a thimble because of the parts’ small size.

In contrast to these minute parts are 4 ft x 4 ft x .050 inch stainless steel panels drilled with 11,000 holes per square inch. Each hole is .005 inch in diameter and percussion drilled on .010 (Please Check) inch centers. Each hole is drilled twice (the second pass cleans out debris from the first pass) with each finished hole completed in less than a second.

“Repeatability of the machine really comes into play on work like this,” Sanders reports. “These 790 BeamDirectors are designed so you get extremely good accuracy throughout the entire work envelope, not just in a sweet spot of the envelope.”

Laser Accuracy, Speed and Flexibility Is A Must At Southwestern Laser

Sanders says his two 790 BeamDirectors achieve volumetric accuracy equivalent to coordinate measuring machines. Like coordinate measuring machines, the 790's accuracy is achieved in the system's axis straightness, squareness and rigidity. Typically, conventional laser machining systems have a “sweet spot” where the system accuracy is at its best. But in the 790, the cantilever system achieves its accuracy from side to side and corner to corner, not just in the sweet spot.

“Positioning accuracy is a cumulative result of many factors working together that effect the overall system's accuracy and the quality of the parts produced,” says Sanders. “The straight, rigid and square granite base of the Laserdyne 790 is the ideal foundation on which the accuracy is built. Most laser machining systems are not rigid enough to isolate and eliminate the vibrations induced by continuous back and forth movement of a few thousandths of an inch necessary in many aerospace applications such as drilling combustor liners.”

Laserdyne's specially designed three-axis positioning module addresses these requirements for rigidity, straightness and squareness. Built and tested in accordance with ASME B 5.54 and ISO 230 standards, the system is designed for very high speed operation without compromising accuracy. By using DC brushless motors and digital motor amplifiers,

high acceleration and speed are achieved with negligible deflection or vibration due to the unitized assembly and excellent system rigidity.

Operating at speeds up to 800 in/min in the X,Y,Z axis (0-20 m/min), the 790 BeamDirector is accurate to ± 0.0004 inches (0.01 mm) per 20 inches (500 mm). Sanders says his company pushes the limits with these machines with only normal maintenance required. Annual certification is routinely done using laser interferometers and ball bar devices.

Southwestern Laser is a fully-equipped operation with conventional support machine tools and complete flow measurement capabilities used to check air flow through combustor liners and similar components. One system made by Super Flow tests subsonic flow rates while a second made by Cincinnati Dynamics tests super sonic flow rates.



Southwestern Laser's laser operators are cross trained to handle part programming, machine operation and part testing, including air flow measurement of combustor liners.

What They Say About Ron Sanders' Laser Knowledge

"Ron Sanders is what multi-axis laser processing is all about," comments Terry VanderWert, general manager of APA Optics, Inc., a manufacturer of fiber optic products and former associate. "Sanders helped design those BeamDirector systems, so he knows them from the ground up. He brings to the table broad technical training in materials and processes. He thinks in terms of multi-dimensions and defines the tooling and software to do the job. Besides being totally confident of his knowledge, he'll work all day and all night to do a good job on a project because he has so much pride in what he does."

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