

# C&S MACHINE PRODUCTS, INC.

## The Reasons Why C&S Uses Charmilles...



Dominick Saratore, C&S Vice President and Joseph Saratore, C&S President with one of their ROBOFIL 310's.

Buchanan, MI – With 32 years of experience, C&S Machine Products, Inc. excels in helping customers improve their product designs by finding better ways to meet their engineering and manufacturing requirements. By providing customers with the support of an engineering staff for start-up and refinement, C&S offers a wide range of CNC machining services. Such services include turning, grinding (OD, face and ID), four-axis milling, wire EDM, and deep-hole gundrilling in exotic materials and materials up to 56 Rockwell. C&S has systems in place, including Charmilles wire EDMs, that hold extremely tight tolerances, even when annual volumes soar as high as 30,000 pieces.

### What Prompted C&S to Call Charmilles...

In 1995, a customer asked C&S to quote a part which required high accuracy and would yield an annual volume of 10,000 pieces. The part was a sophisticated rotor for high precision, high speed vacuum pumps used by the medical, microprocessor, and instrumentation industries. The customer initially asked that the cast iron rotor assemblies be quoted and produced as designed – in 20 manufacturing steps that create 12-component, segmented assemblies held together with bolts, washers and nuts. The components needed to be lined-up perfectly and tightened together to a highly precise Newton-meter torque specification.

So C&S President Joseph Saratore and C&S Vice President Dominick Saratore and their staff went to work to devise a way to make the rotor assembly. "We saw the current manufacturing process to be a tedious and highly difficult job," explains Dominick. "As a result, we collectively began the re-engineering of the potential rotor project."

C&S approached the rotor challenge with the idea that the part could be improved by manufacturing it as one piece. This idea of a one-piece rotor would – all at once – improve the reliability, save production time, and reduce the cost to the customer. Since the original assembly consisted of two segment halves bolted together, the potential for slipping and twisting as the rotors spin always existed. At the heart of the vacuum pump, the critically important (and historically cumbersome to manufacture) rotor assembly spins at up to

15,000 rpm. If the rotor were to fail at this speed, the assembly could break apart, thereby destroying the rotor and the user's laboratory, as well as possibly inflicting even greater damage.

Among the specific machining and redesign concerns for C&S was the fact that the rectangular through-slot in the rotor assembly's center had width tolerances of just  $\pm 0.0007$  in. (0.017mm). Also, the slot needed to be parallel to the outside assembly diameter within another  $\pm 0.0007$  in. (0.017mm). Also, the slot needed to be parallel to the outside assembly diameter within another  $\pm 0.0007$  in. and symmetrical within 0.002 in. (0.05mm). The rotor's outside diameters needed to be ground within  $\pm 0.0002$  in. (0.005mm), and depending on the rotor configuration, there might have been as many as five different diameters, all needing to be ground to the same specifications.

"The more we studied the rotor assembly," Dominick explains, "the more we felt it just did not make very much sense for us to manufacture this part as a multi-step operation. So we began to look at different options as to how we could make the part less cumbersome to manufacture and at the same time lower our costs. One definite possibility was the unattended wire EDM machine. We felt that with wire EDM technology, the rotor could be redesigned, simplified, and improved."

C&S had been sending out wire EDM work for some time prior to acquiring its own machines. To make the move to EDM, they began by asking associates at other shops and by asking questions at IMTS. As a result of several referrals, C&S contacted Charmilles.