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## Putting the Rapid in Prototyping.

ETCO Incorporated was founded in 1947 as Electric Terminal Corporation. The original company produced wall plug blades in strip form for attachment by the customer on a patented air-operated machine. ETCO still produces wall plug blades (although the production speeds have increased from 175 parts per minute to as fast as 3,000 parts per minute). Last year, ETCO produced approximately half of all wall plug blades made in the USA. Nonetheless, ETCO's "tried-and-true" product line is constantly added to and augmented and their offering is now comprised of thousands of different products — including catalog and custom designed products tooled to their customer's individual needs. Through rigorous R&D, ETCO's patented and proprietary products represent approximately half their annual sales.



So, while plug blades remain big business for ETCO, chairman, David Dunn, looks to future — insisting that innovation and patented, cutting-edge technology will ensure his company's place there. To that end, ETCO INC is virtually a think tank dedicated to continuous R&D. Two of the key players in Florida are Ralph Jacques, Director Of Research & Development and his brother Edward Jacques, Manager Of Research & Development. With Ralph's strength in Manufacturing and Production Management and Ed's years of experience as a tool and die maker, and process automation, they represent a great R&D one-two punch for ETCO.



Several years ago, the R&D team identified some problems that impacted overall R&D efficiency and time-to-market. Specifically, the prototyping process often required subcontractors and, at times, up to 20 rounds of modifications to their initial designs. With a two- to three- week turn around from some of their specialty vendors and a common policy for minimum quantity orders, this was simply too time consuming and expensive. So, in 2005, they set out to make some changes — focused on bringing subcontracted work in house via the installation of a precision CNC machining center capable of producing small intricate electronics parts ... in short order.

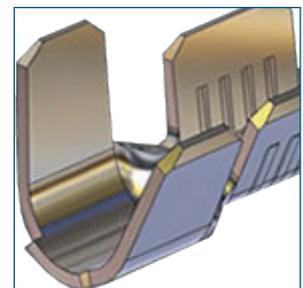
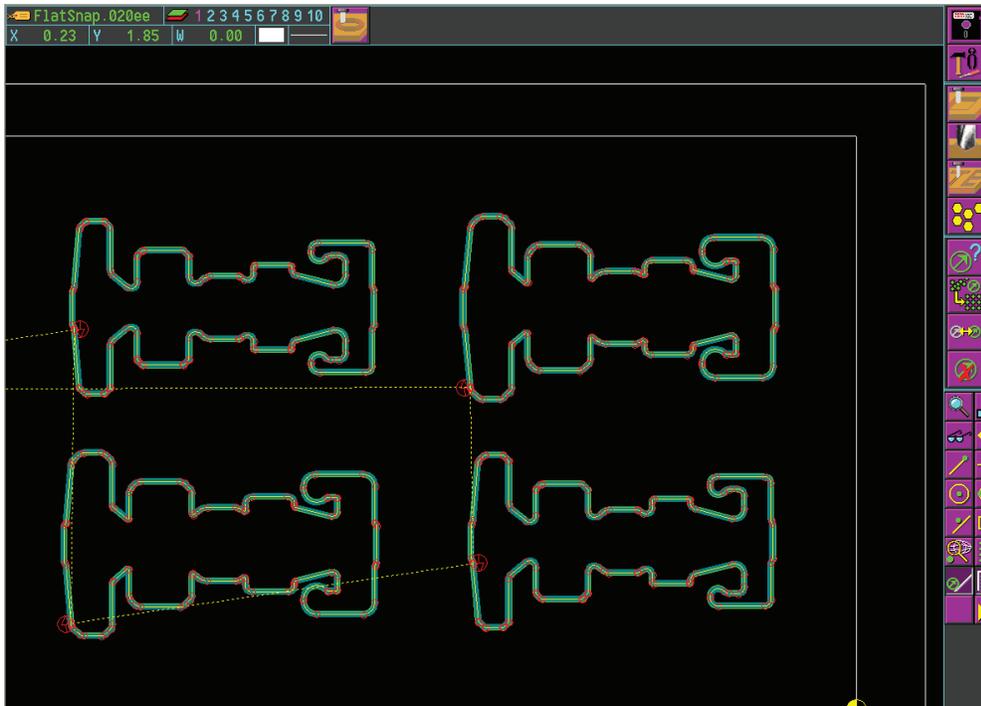


Ralph Jacques recalls, *"We knew that our proprietary designs were advancing the company in leaps and bounds and also understood that having R&D agility called for equipment that could quickly leverage the full power of our design concepts."* So, ETCO began to research five or six different machine tool manufacturers and ultimately decided to pay a visit to DATRON Dynamics, Inc. in Milford, NH. This North American distributor for DATRON AG in Germany offers a line of high-speed machining centers designed around 60,000 RPM high-frequency spindles. During that visit, Ralph conveyed his equipment criteria as follows:

### R&D PROCESS REQUIREMENTS:

1. To design, manufacture and test a prototype concept the same day in-house at ETCO
2. Reduce costs and have quick pay back on equipment investment
3. A user-friendly machine and software that does not require extensive cost and training
4. A turn-key solution which includes tooling and workholding for very difficult small parts
5. More in-house control of design, testing and initial production runs ... in short time

During that same trip to Datron, the machine tool builder was able to demonstrate something to Ralph that none of the other CNC vendors could — namely a turnkey solution. This included software for design, CAM to generate tool path, CNC Machine to mill the part, work holding to hold the part and micro tooling to cut the part. Ed says, *“When Ralph came back from New Hampshire, it was a done deal. He was convinced that this was the most impressive technology and said that the German engineering was rock-solid quality through and through.”*



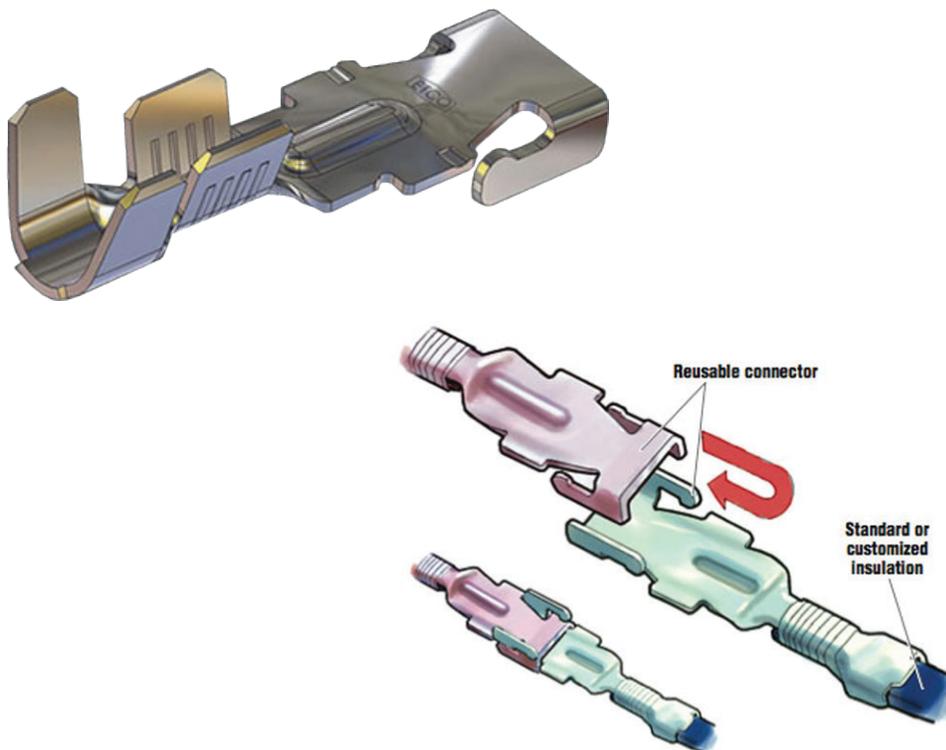
**ETCO'S NEW R&D PROCESS WITH DATRON:**

1. Concept meeting in morning where Engineering department outlines requirements for new or modified connector
2. A CAD/CAM program is generated based on the part geometry, metal thickness and material of the part
3. A blank sheet or brass is secured to vice using Mitee adhesive
4. Datron machining center automatically measures the length of the micro tools and uses Z-probe to map the surface
5. The Datron machine cuts the connector form which is placed into a jig die that bends the part into the appropriate shape
6. The prototype connector is sent to ETCO's Engineering department where it undergoes stress test, optical testing, and UL testing to see if improvement or modification need to be made
7. Once a connector design has passed all the tests, a progressive die is made for limited production run at the Bradenton location. If the quality inspection on this run is acceptable, the progressive die is sent to ETCO's RI manufacturing facility



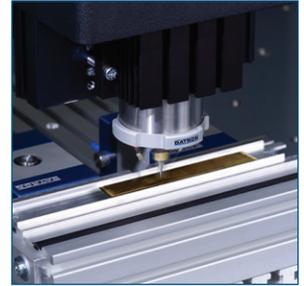
**REVOLUTIONARY INNOVATION.**

A revolutionary connector recently patented by ETCO perhaps best illustrates the value of keeping this proprietary work in house. While most connectors are comprised of male and female parts that fit together to make an electronic connection, this connector is classified as a hermaphroditic adapter where the design allows for the connection to be made with two units of the exact same part — thereby eliminating the need to maintain an inventory of both male and female connectors.



*Changing electronic components used to require cutting wires and re-crimping them. But, ETCO used a Datron high-speed machining center to produce the prototype for their patented FlatSnap connectors. The connectors are reusable and make a solid “pull-on/push-off” electrical connection that resists coming apart. They can be used on appliances, scientific and medical devices, stereo equipment, and automotive and marine electronics. The connectors can also be used to form a splice.*

It's such a logical and simple solution that it's hard to believe that it has never been done before. But, when you consider that it took ETCO ten design changes from the initial concept to the final prototype, it's understandable that companies without a Datron machine simply couldn't afford the time associated with this extensive R&D. Ed Jacques recalls, *"With the Datron, it was a very exciting process. We would test the design at the end of each day, make modifications the next day, form, crimp and test again that afternoon."* In the end, what would have been weeks of trial for ETCO (and perhaps months for companies with less efficient or skilled R&D groups) became hours because of the speed and agility of the Datron machine. One of the factors that makes Datron technology so agile is its user-friendly Microsoft® Windows®-based control software and its ability to interface with most CAD/CAM packages like the PrimCAM package used by ETCO for rapid prototyping. The Datron control delivers information in a familiar and intuitive Microsoft environment. Also, operators can view or edit programs during machining, run other software simultaneously as the machine is milling or download large files through a company network. Plus, they can remotely diagnose the machine or monitor the machine's activity through a standard Internet connection. Because it is user-friendly, easy to learn, robust and integrates with PrimCAM so nicely, it immediately empowered ETCO — providing them with a platform capable of transforming an idea on a napkin to a completed part quickly and cost-effectively. *"This Datron machine gives you the ability to see what you saw in your head, placed in your hand within six hours ... pretty cool!"* says Jacques.



While designing ETCO prototypes begins in the software, not all of ETCO's new-found prototyping efficiency is software related. Indeed, proof is in the pudding and new designs can't be tested until a physical part is produced. Where these small, intricate brass connectors are concerned, the high-speed technology of the Datron machine certainly fits the bill. With microtooling ( $\frac{1}{4}$ " and under) the 60,000 RPM spindle reduces the chip load to less than 0.005". Such a low chip load significantly reduces the forces between the tool and the material. This high-speed/low-force machining yields less heat, reduces tool deflection, and allows machining of thinner walled work pieces. This all results in cooler machining, superior surface and edge quality and better accuracy. Additionally, with the non-ferrous metals and plastics used by ETCO in prototyping, the ethanol-mist coolant system on this Datron model produces superior cooling and eliminates the secondary operation of degreasing. Here's how it works. A small tool with intricate geometry turning at an extremely high RPM calls for a cooling and lubricating agent with a lower viscosity than water. Lower viscosity is needed because the coolant needs to make it to the cutting edge of the tool despite the high spindle speeds involved. Emulsion-based coolants have a higher viscosity than water, and thus are ineffective as a lubricant for high-speed machining with micro tooling. But, ETCO's Datron system uses micro-volume ethanol spray. Ethanol is a form of alcohol which occurs naturally in the sugar fermentation process and exhibits a lower-than-water viscosity. The low evaporation point of ethanol makes it an extremely efficient cooling and lubricating agent for high-speed machining operations. Plus, while conventional flood coolant is petroleum based and needs to be properly disposed of, ethanol simply evaporates. This eliminates the costs associated with disposal. In addition, ethanol as a coolant does not leave any residue on the machined parts, thus eliminating the costly secondary operation of de-greasing parts. Marveling at the changes realized through the addition of the Datron, Ed Jacques says, *"When developing a prototype you may find you are a thousandth off and you have to do it again. This machine is small, fast and clean — in other words, it's perfect for a rapid prototyping environment."*

