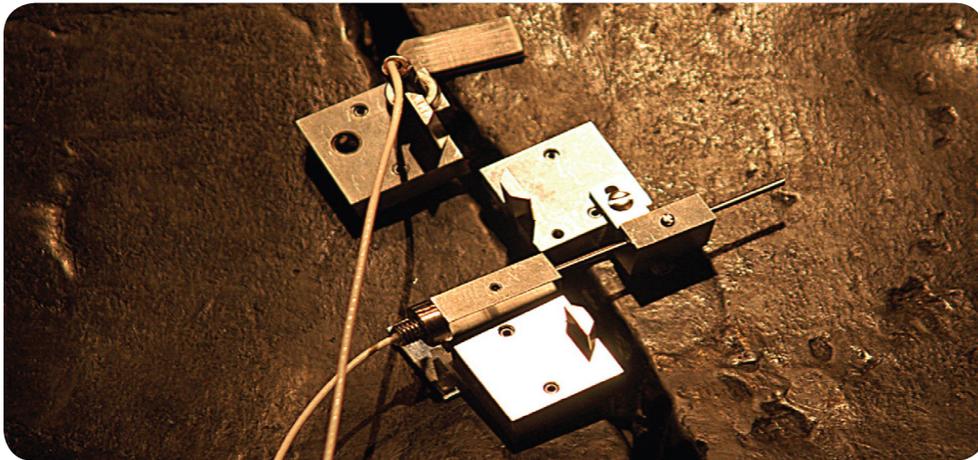# MicroStrain, Inc.
Made2Manage® ERP

Made2Manage ERP and Omnify PLM Help MicroStrain Reduce Leadtime

Smart Sensor Manufacturer Doubles Revenue Without Adding Production Staff

Measuring Loads in the Human Body

Scripps Institute researchers in La Jolla, CA, wanted to measure the joint loads experienced by patients receiving a total knee replacement. At the time, no one had ever built a knee replacement capable of transmitting the loads it was experiencing. The smart knee replacement needed to be built from scratch, and a critical part of the new system involved transmitting data from strain sensors located deep within an hermetically sealed titanium implant.

MicroStrain, Inc., a small company based in Williston, VT, met this challenge by developing digital sensor microelectronics that were powered by an electromagnetic field positioned outside the patient's body. Using these smart implants, the Scripps researchers were the first group ever to measure the three-dimensional forces and moments acting across the human knee. This information has led to improved implant designs.

These are just some of the many smart sensors developed by MicroStrain since its founding in 1987. Recent advances in wireless sensing networks enable an "internet of things," with literally billions of tiny wireless sensors used to monitor critical machines and structures, such as aircraft and bridges. But who will change all those batteries? MicroStrain has overcome this barrier by powering its wireless sensor nodes with energy harvested from the environment, such as light, thermal gradients, strain, and vibration.

ROI at a Glance:

The implementation of the Made2Manage ERP and Omnify PLM systems helped MicroStrain, Inc., a leader in design and manufacturer of smart sensors, manage extraordinary growth. Specifically, MicroStrain has:

- Doubled annual revenue in the past two years without having to add production staff.

- Reduced turnaround time on the average order from one week to two days.

- Reduced inbound shipping charges by approximately 35 percent due to better material planning.

MicroStrain is currently working on several major government contracts to develop wireless sensors that can track metal fatigue. Powered by vibration, these sensors enable aircraft to fly beyond their expected lifetime, saving the government billions of dollars, while enhancing safety and readiness levels. MicroStrain was recently awarded a Gold "Best of Sensors Expo" award in the sensor category, the company's ninth in the last seven years.

Manual Methods for Design and Production

MicroStrain sensors work by combining micro-electromechanical systems (MEMS) based sensor technology combined with microprocessors. The MEMS and microprocessors used in the sensor reside on printed circuit boards (PCBs). The company builds PCB prototypes in small runs and performs the critical packaging, calibration and testing functions internally. Most of the other parts used in the sensors are off-the-shelf items.

When MicroStrain was first founded, it used an entry-level financial accounting system and managed scheduling and job costing on spreadsheets. "Our production managers walked around the shop collecting parts and checking them off a paper bill of materials," said Mike Jewett, Project Manager for MicroStrain. "Using this approach, it was often difficult to meet the increasing demand for our products using the parts we had immediately available. We found ourselves ordering parts at the last minute and paying for overnight deliveries in order to meet ever-tightening production schedules."

The company's engineers stored their design information in various folders and it was often difficult for production staff to verify that they had the latest versions of PCB designs, mechanical designs, bill of materials (BOMs) and other critical information. The engineering change order (ECO) process was managed using relatively inefficient paper forms with handwritten notations and approvals for custom requirements.

Jewett joined MicroStrain soon after the decision had been made to move to Made2Manage, ERP, and he was assigned to head up the implementation. After it was completed, an interface between Made2Manage ERP and the Omnify Product Lifecycle Management (PLM) system was announced. "We looked at Omnify and liked what we saw," Jewett said. "We liked the potential for further improvements by automating engineering change orders and integrating our product development and production management processes."

Automating the ECO Approval Process

The implementation of Omnify has resulted in a completely-integrated product development and production process that begins when MicroStrain engineers store their files in the Omnify vault. "Only the engineer that owns the design can make changes to it, which eliminates the problems with having multiple conflicting versions of a design," Jewett said. "Any authorized user can find a design document in seconds by executing a simple query."

Omnify also reduces the time required to process ECOs by automatically distributing them through the company e-mail system in parallel or series. The person who submitted the ECR can determine the status of each approval in a few seconds on the computer, making it easy to determine when a personal follow-up is required.

"Omnify enforces our business rules much more consistently than was possible with the previous manual process," Jewett said. "For example, correcting a simple BOM error just requires the approval of the Production Manager, while a more complex design change must go through three layers of approval." As soon as it is approved, the BOM moves into Made2Manage ERP. A key advantage is that any Made2Manage user can see the latest copy of the BOM and selected users can also access Omnify to see whether or not change orders are being processed that will affect the BOM in the near future.

Enabling Users to see Aggregated Demand

When a sales order comes in, the sales team enters it into Made2Manage ERP. The system then explores the order to calculate what parts are required to build it and generates the work order. The ERP software makes it possible for users to see the aggregated demand from all customers along with deadlines and the availability of parts. Right now, MicroStrain production staff manually determines which orders to release into production. The company is planning to use Made2Manage Shop Floor Manager to automate the scheduling process.

The purchasing queue in Made2Manage ERP shows how many of each part needs to be ordered and identifies any deadlines. This information enables purchase orders to be issued on a timely fashion so that express shipping is rarely required anymore. Consolidating demand enables purchasing to make fewer orders for larger volumes of components, which in turn makes it possible to obtain larger quantity discounts. Raw material is back-flushed from inventory based on production volume. Meanwhile, information from Made2Manage ERP that is required by the engineering team is fed back to Omnify, including the cost, quantity on hand, and ordering lead time.

High Level of Integration Saves Time

"Made2Manage ERP makes it very easy to determine what our customers are asking for, what we have built, what materials we have used and what materials we have left," Jewett said. "The high level of integration offered by the system means each area of the company is able to access and use data that was already entered by other functions, saving a considerable amount of data entry time, as well as preventing errors." Jewett added that MicroStrain is now able to close its books on a timely basis because information flows automatically from sales orders, work orders, and inventory into the accounting system.

"Without this solution," Jewett concluded, "we would need one or two more people to manage our ECO process and another full-time person to create BOMs. As it is, we have been able to approximately double our sales volume over the last two years without having to increase the size of our production staff. The average turnaround time from when we receive an order to when it ships has been reduced from one week to just two days. Automating these critical business processes has positioned us to continue our rapid growth, while maintaining control of our critical business processes."