

InVision 3-D Printer Facilitates Smooth Communications at Smith International

In today's global manufacturing environment, the communication between engineering and manufacturing operations can result in an information technology Tower of Babel. When engineers try to convey complex part designs to manufacturers, the process can be difficult, time-consuming, and often perilous to the successful launch of a product. This is especially true when that communication takes place over long-distances, which is increasingly the case in the global economy. In the Smith Technology Business Unit of Smith Tools, a division of Smith International, Inc. (Smith) based in Houston, three-dimensional (3-D) modeling technology has been used to facilitate communications between engineering and manufacturing with impressive results since 1999.

"As we move into the engineering design process, it can be difficult to explain a three-dimensional concept to someone over the phone when they don't have the object in hand," says Layne Larson, senior project engineer in the Smith Technology Business Unit of Smith Tools. "CAD drawings are not the answer; they don't provide a sense of real feel or scale. On the other hand, if we send our manufacturing partners a three-dimensional prototype that they can hold and turn over in their hands, then communications are greatly improved. It also saves us the time, trouble, and expense of traveling overseas to present our ideas in person."

Recently, Larson's business division upgraded its 3-D modeling capabilities by installing the new InVision 3-D printers from 3D Systems (Valencia, Calif.). "We wanted to take advantage of the time and costs savings associated with the InVision printer's smooth surface finishes," says Larson. "InVision-built parts come out of the machine clean, so we no longer have to spend time re-touching them," says Larson. "We've eliminated the need to have a person dedicated to finishing 3-D parts."

The Shape of Communications

Smith International is a leading worldwide supplier of products and services to the oil and gas exploration and production industry, the petrochemical industry, and other industrial markets. The company provides a comprehensive line of technologically advanced products and engineering services. The company has manufacturing plants in the United States and Italy.

The company's diverse product line includes parts with a myriad of shapes, angles, and inserts. "There are a lot of different shapes associated with inserts, for instance," says Larson. "Due to the subtle nuances of these parts, it's difficult to view them on a CAD drawing. Instead, we rely on our InVision printer to facilitate changes during design review. With InVision, we've been able to make modifications during the design review process because we had the model in our hands. This helps us to get a product to market faster and more economically."

The company's complex parts can also present other challenges. The company's rock bits are a good example. Smith builds rock bits out of three 120V lags (each lag is one-third of a bit). The three lags are welded together to make one rock bit. "When designing our new rock bits, we encountered a problem with the weld grooves that held together the three sections of the rock bit," says Larson. "The way they are welded together is critical for manufacturing. To describe it over the phone was difficult. So we took the section of the weld groove and created a 3-D model, which we then sent to manufacturing. With the model in hand, they were able to determine the best way to gain access to the weld groove."

Before Larson acquired 3-D Systems printing technology, the company would go to the expense and trouble of outsourcing prototype creation. But the turnaround time for outsourced projects is long, and in many cases it is difficult for a third party to conceptualize the product. "Now that we have the systems in house," says Larson, "it's much more convenient. We selected 3D Systems because it doesn't require anyone to operate the machine. It is as easy to use as a paper printer. Any machine can give you a model, but this one is low maintenance and simple to use."

To make things even more convenient at Smith, Larson has the InVision machine on the company's computer network. When drawings are written, they are created in the InVision .ftl file format and sent directly to the machine from the engineer's desktop. From these computer files, the InVision printer creates models made from a durable acrylic photopolymer material, which provides a smooth, durable finish. The InVision 3-D printer combines 3D Systems' patented multi-jet modeling printing technology with an acrylic photopolymer model material, which results in a durable model able to withstand the stresses of shipping and handling. The InVision printer works much the same as a traditional network printer. It uses technology that is based on ink jet printing—but instead of using ink, the InVision machine sprays an acrylic photopolymer substance to create a solid model. Layer by layer, a three-dimensional object is formed that can be held and evaluated. The InVision's dual polymer system features a special wax that melts at low temperatures, thereby making it easy to remove from unwanted areas of the model.

"It is a seamless process," says Larson. "Once we send the file to the printer, we go to the machine and pull out our prototype and it's good to go."

In the Flow

Facilitating communications isn't the only application for InVision at Smith. The company also uses the InVision printer in their lab as they run down hole fluid tests. The InVision machine is used to create test fixtures. "It shaves off a lot of time if we can take a 3-D model and run water or air through it," says Larson. "It helps determine if everything fits. If we were to actually try to build those fixtures out of steel, our testing would be more time consuming and costly."

The company has also found a marketing application for InVision. "For customer presentations," says Larson, "the company uses the machine to present what we're doing from a research and development perspective. If you can show the history of the development of a product, that is something customers like to see. In terms of showing the technical side of the process to

customers, the InVision 3-D printer is a real positive for showcasing our capabilities.”

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