DePuy
companies of Johnson & Johnson

Facts

Challenge

Accelerated development of medical instruments according to the consulting doctors' requirements.

Solution

Speedy and flexible manufacturing of complex surgical tool prototypes using an EOSINT M 270.

Results

- Speedy: delivery times for surgical tool prototypes have shrunk from several months to less than a week
- Innovative: designing for functionality not for manufacturability
- Flexible: CAD design of instruments easy to adjust to the consulting doctors' requirements
- Economic: In-house production safes time and money

Prototype of a Plate Bender, used to contour plates for spinal surgery (Source: DePuy Spine)

EOS Technology Speeds Prototyping and Supports In-House Production Efforts at DePuy Spine

EOS

Additive Manufacturing effects paradigm shift in the process of designing tools

Short profile

DePuy Spine is one of the world's leading designers, manufacturers and suppliers of orthopaedic and neurosurgical devices and supplies. It is a division of DePuy, Inc., the world's leading orthopaedic company.

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Surgery on the human spine is one of the most exacting, delicate procedures in the operating room. While the skill of the doctor is of paramount importance to a good outcome, the precision and reliability of the instruments they use are also critical. As minimally invasive surgery (MIS) becomes one of the fastest-growing areas in spine treatment, orthopaedic surgeons are demanding increasingly sophisticated tools. These must be sized for greater access and control through smaller incisions, made strong enough to cut through cartilage and bone, and built from materials that are biocompatible.

Prototype of an Expedium SFX Cross Connector measuring device, which measures the distance between rods to indicate the size implant to use (Source: DePuy Spine)

Challenge

DePuy Spine has worked and partnered with leading clinicians and researchers for over 20 years to advance knowledge of both professionals and patients in addressing spinal pathologies and to develop products to treat spine disorders.

Getting the right instruments to a surgeon who needs them – and coming up with new or customized models as techniques advance and materials evolve – can be an arduous process. Prototyping, revisions, materials selection, cadaver testing and manufacturing can create total wait times of many months. DePuy Spine is cutting those lead times dramatically by employing the EOS technology.

Solution

The DePuy Spine development team starts with a basic design idea, often making a plastic prototype first on a different machine in their shop, and shows it to the surgeons for feedback. After modifying the design according to the doctors' input, DePuy Spine may turn to the EOSINT M 270 if the application is appropriate for creating a metal prototype. The Direct Metal-Laser-Sintering (DMLS) process begins with a CAD file of the product design, which defines each thin layer of a horizontal cross-sectioned model that is generated onto the work platform inside the machine. In this manner extremely complex geometries are created automatically directly from CAD data in just a few hours.

Once the consulting doctors are completely satisfied with an instrument design, DePuy Spine quickly makes a final metal prototype with the EOSINT M 270 and sets up a cadaver section so the surgeons can put the item through its paces. Cadaver testing of metal prototypes is the

last stage in product development before DePuy Spine sends the 3D model file for the approved piece to an outside vendor for manufacturing. The finished items undergo a last round of mechanical testing and verification before being used in actual surgeries.

Results

DePuy Spine makes over 70 brand-name products with more than 10,000 of product codes that are distributed globally. Using a single DMLS-machine from EOS in their own shop, DePuy Spine processed 2,000 prototype parts – benders, extractors, surgical screws, clamps, reduction devices and others – in the first year of use alone. Peter Ostiguy, Staff Team Leader at DePuy Spine, says: "The result of introducing laser sintering into our Development Centre has been a paradigm shift in the thought process for designing tools. We're not designing for manufacturability any more, we're designing for functionality. As designers, we were constantly thinking about how we were going to make something within process limits. With this machine, it really doesn't matter."

The consulting doctors can be very exacting about their requirements for tools such as blades, racks, tweezers, and callipers. "When they review the parts they may ask for different handle angles or different spring strengths" says Ostiguy. "It's very easy to adjust the CAD design and make another iteration of a tool to give our doctors more choice. Laser sintering lets us make virtually anything they ask for. In many instances we used to have to go with just one iteration, but now we have greater flexibility to present more options. There's just no substitute for actually holding an item in hand."

What's more, according to Ostiguy, delivery times for surgical tool prototypes have shrunk from several months to less than a week in some cases. "The EOS technology is very well-suited to our environment because of all the things we need to produce quickly," the Staff Team Leader adds. We've really impressed our surgeons with our ability to turn around what they're looking for in a short amount of time."

Due to their success in product development with DMLS technology the company DePuy Spine has purchased another machine of the type EOSINT M 270. "If we can make instruments on our own machine we can save time and money and be responsive to our doctors' requirements. The possibilities are endless for future product development with laser sintering," Ostiguy sums up.

"What has cut development time so dramatically lately is the capability of the EOSINT M 270 to build multiple iterations of a tool prototype in a matter of days."

"Thanks to EOS technology we're not designing for manufacturability any more, we're designing for functionality. As designers, we were constantly thinking about how we were going to make something within process limits. With this machine, it really doesn't matter."

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