

# SPIRAX SARCO INC.

## Steam expertise and enterprise 3D printing make powerful combination for Spirax Sarco Inc.

- **Spirax Sarco Inc** – a national leader in steam-related products and services
- **Challenge** – Reducing the time and cost required to obtain prototypes of parts for valves, traps and condensate recovery products
- **Solution** – Creating prototypes in house with a 3D printer from Z Corporation
- **Results** –
  - Spirax Sarco Inc. compressed its design cycle by 25 to 30 percent.
  - The company saved \$600 to \$800 and two weeks of waiting per 3D printed prototype.
  - Product quality soared because faster, more affordable prototyping enabled more iterations early in the design cycle.
  - 3D printing quickly evolved into a strategic solution with benefits beyond cost savings on printed prototypes.
  - SSI is using 3D printing for burnout patterns, reducing investment casting costs by \$5,000 per prototype part and speeding delivery by four weeks.
  - A 3D printed model of a custom valve helped seal a \$600,000 sale in Alaska, beating companies that could only present 2D drawings.
  - Scale models of 1,000-pound products reduce time, shipping and labor at tradeshows.



Spirax Sarco Inc. closed a \$600,000 job with this 3D printed scale model of the EasiHeat heat exchanger

Spirax Sarco Inc., a firm that helps companies harness the power of steam, is now leveraging a second powerful technology – 3D printing – this time to improve its own business performance. A \$100 million US subsidiary of UK-based Spirax Sarco Engineering, SSI is headquartered in Blythewood, S.C., and manufactures products for steam heating and process plants in a wide range of industries, from automotive to vegetable oil processing.

### Challenge

#### Costly prototypes

Prototyping products that are under development is a fundamental early step for any manufacturer, and in 2004, SSI was spending too much money on the process. For example, a simple T-shaped control valve you can hold in your hand cost \$600 to \$800 to prototype and took two weeks to obtain from a service bureau that used expensive stereolithography (SLA) prototyping technology. For a set of seven or eight design options, SSI's tab was upwards of \$6,000.

### Solution

#### In-house '3D printing'

In early 2005, SSI learned of a smarter approach that would eventually yield enterprise-wide benefits: creating prototypes in house with a 3D printer. A 3D printer creates a detailed physical object from 3D data, such as a computer-aided design file, much as an office printer creates documents from word-processing files.

"With a 3D printer we could print sets of the same control valve overnight for \$50, saving ourselves thousands of dollars, weeks of waiting and, most importantly, letting us create many more iterations in our design window," said SSI Product Development Engineer Leslie Penfield. "We could now test more design profiles and flow patterns – tapping threads into the 3D printed part as easily as we did the SLA part – and get the design absolutely right before approving it for tooling."

SSI chose the ZPrinter® 310 from Z Corporation of Burlington, Mass., USA, over machines from Stratasys and Objet because of its versatility, part quality, price and low operating cost. "What really sold us on the ZPrinter is the fact we could use it for so many different applications: prototypes, fluid flow analysis and, as it turns out, sales, marketing and tradeshows," Penfield says. "It's just such a versatile machine versus the others. And the cost was significantly less."

Investing in the 3D printer is part of a larger SSI strategy for streamlining product development. For example, SSI has invested in SolidWorks® 3D CAD software and CFdesign® fluid flow and heat transfer analysis software to refine designs through virtual simulations.

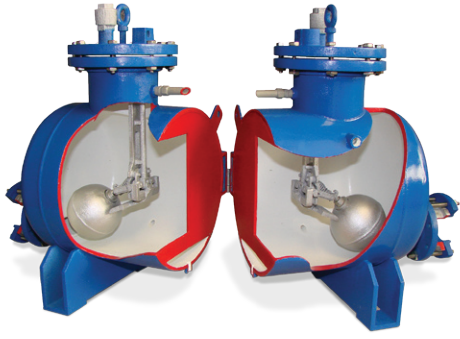
### Results

#### Shorter design cycle, better products, more sales

"Between the software and the 3D printer, we have compressed our design cycle by 25 to 30 percent," Penfield says. "Prior to that, product development was trial by fire: design a prototype, cut tooling, test the prototype, iterate the design, and cut tooling again and again until the design was good enough. Now we get the design to where we really want it, print some prototypes, and cut tooling just once."

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PRODUCT DEVELOPMENT ENGINEER  
SPIRAX SARCO INC.



This one-third scale 3D printed model of the PTF4 Condensate Pump saves tradeshow staff hours that, with a full-scale model, would go to setup, teardown, packing and shipping

**“We’ve printed thousands of models ... Somehow, wherever we decide to 3D print we see an improvement in business performance.”**

– LESLIE PENFIELD  
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**SSI has expanded its use of 3D printing well beyond basic prototypes**

The company quickly found other valuable uses for the 3D printer beyond creating a simple plaster part model. In October 2005, the company began using 3D printing to reduce the costs of investment cast prototypes. The company ZPrints the burnout pattern rather than sending a CAD design to a tooling contractor. This approach saves three to four weeks and avoids the \$3,000 to \$5,000 tooling charge, ultimately creating a prototype for \$8 versus \$5,000. SSI is now experimenting with direct pour casting into ZPrinted molds as another method for fabricating metal prototypes.

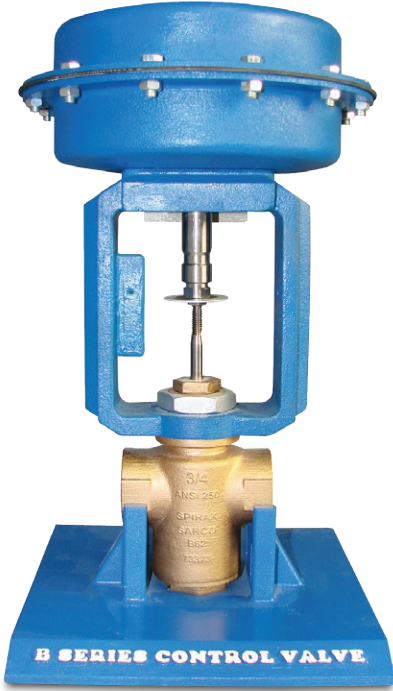
In 2006, SSI started ZPrinting parts and assemblies for sales demonstrations. The company ZPrinted models of its new B Series Control Valve, attached real internal trim, and gave the models to their regional sales offices. Rather than a 40-pound control valve, salespersons now had a six-pound model to tote – authentic in appearance on the inside as well as out. Says Penfield, “Salesmen can just throw them in the back seat of their car and take them wherever they’re going.”

Later in the year, SSI began making scale models of products that hadn’t yet been built. For example, Penfield’s team created a scale model of an EasiHeat heat exchanger customized for a new construction bid in Alaska. The full-scale product stands 6-feet-by-4-feet-by-5-feet and weighs 1,000 pounds. SSI ZPrinted a portable one-third scale model, presented it to the customer, and won the \$600,000 job. Competitors presented only drawings.

In 2007, SSI began creating more sophisticated models for tradeshow, such as the scale model of the PTF4 Condensate Pump, a one-third scale model with a cutaway section exposing internal floating mechanisms. Using the real 6-foot-by-3-foot-by-4-foot product would have taken up three times the floor space, weighed 600 pounds instead of 20 pounds, and consumed extra staff hours at the booth for set up, tear down, packing and shipping.

“We paid for the ZPrinter in the first year through the SLA and investment casting cost reductions alone,” Penfield says. “Time, weight, booth space, model portability, sales impact, design improvements and overall customer satisfaction have made 3D printing a strategic solution.”

“ZPrinting has become second nature – like printing off an email – it’s that convenient and that cheap. Printing off a part in 10 different design variations is nothing to us anymore. We’ve printed thousands of models. The part cost is so insignificant compared with the knowledge you gain. Somehow, wherever we decide to 3D print we see an improvement in business performance. We like that.”



This model weighs six pounds instead of 40, making it easy for salespersons to tote to customer calls



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