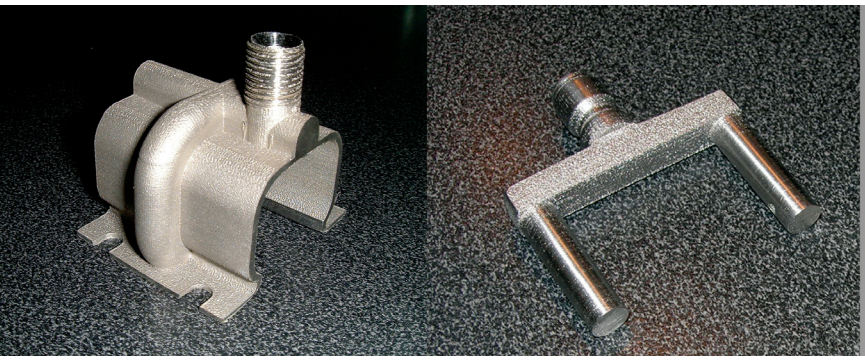


Utilizing Direct Metal Printing to Improve Existing Equipment

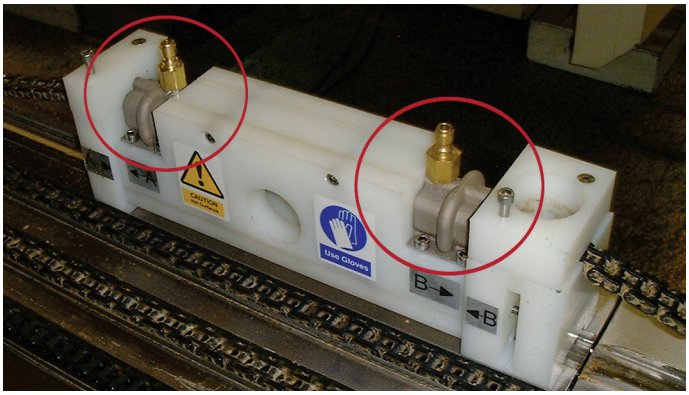
Design for Function

A major bakery realized it had a problem with its conveyors when the production lines had to be halted once every year to change the plastic chain belts. In the food production business, breadcrumbs and cooking oils build up on the chains, yet there was no mechanism to clean the chains in situ. As a result, replacing the chains was a time-consuming and costly process.

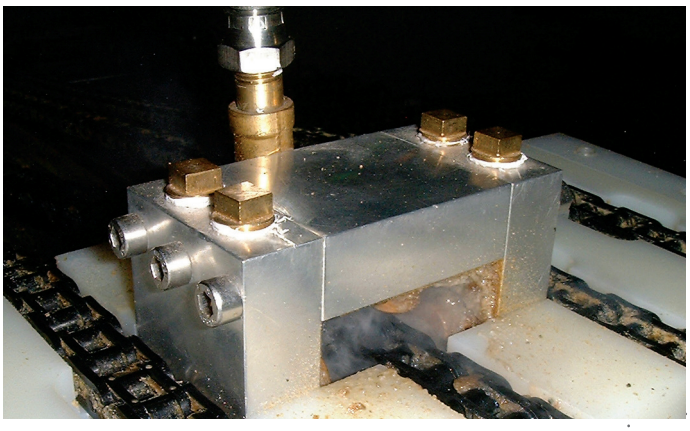
Industrial product designer Keith Handy stepped in to tackle the problem by designing a steam cleaning device for the conveyors. To do this, he enlisted the help of a 3D Systems' sPro™ Direct Metal Sintering (DMS) System, to produce fully operational end-use parts—functional parts that had previously been impossible to manufacture—for his conveyor cleaning system.

From CAD to Direct Metal Part

For the steam cleaner to be effective, it had to jet steam onto the small, fast-moving chain belts, with the steam applied close to the nozzles. Handy's team produces various aluminum manifolds, and machined, anodised and assembled them with proprietary jet nozzles. But size limitations in the manufacturing of these parts meant the finished product couldn't fit into tight spaces, and there were always some parts of the chain not being cleaned. They tried several versions and although the results were promising, the cleaning operation was only reaching about 70% of the chain. Also the cleaning process was slow, requiring several passes of the belt. Using DMS technology, Handy realized that 3D printing could create previously impossible parts, in materials that would withstand high temperatures and pressures. He created his design in CAD, and sent it to the DMS system.



The new manifold (photo above,) built on 3D Systems' DMS system for the conveyor cleaning system for a bakery, replaced the old manifold (below), allowing the chain to be cleaned and eliminating the need for replacement every year.



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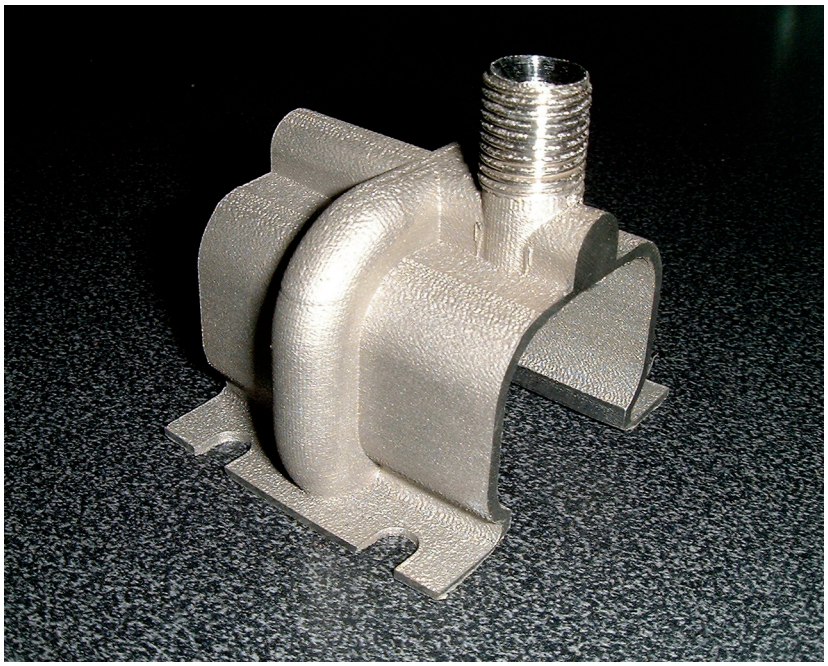
MANUFACTURING*THE*FUTURE

"The design freedom of DMS let me design a hollow 3D manifold with predetermined steam nozzle positions at specific angles to clean each critical point of the chain," Handy said. "I did not have to worry about parting lines, assembly techniques or post-finishing for this application."

He continued, "I was able to integrate a 0.635 cm (0.3 in) BSP thread in the CAD file to attach the steam fitting. The result is a manifold that delivers 10 bar (145 psi) steam through 10 jets at multiple angles, all within a single component that is 50 by 50 by 50 mm (1.97 in)."



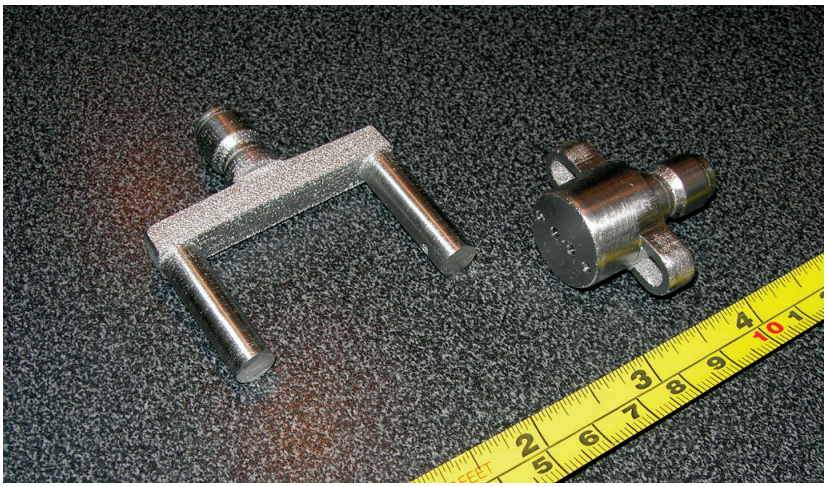
Direct metal-printed parts (above and below) that make up the hollow 3D manifold with predetermined steam nozzle positions at specific angles to clean each critical point of the chain.

100% Clean in One Pass!

The new manifold was built and tested at the bakery within two days of starting the printing. Tests showed a big improvement: 85% clean. A second manifold was digitally redesigned and built the same way, and further tests showed a full 100% clean in one pass.

The manifold was integrated into a production design for the customer, then sold to other bakeries.

"In effect, I was designing something that was otherwise impossible to manufacture; it was like being back at college," Handy said.



Broad Range of Applications

The DMS system is well suited to a broad range of medical, dental, aerospace, automotive, electronics and military applications as well as for tooling and conformal cooling applications that require accurate, fully dense metal parts. The system builds in a variety of metals, from aluminum to titanium to tool steels, for a number of applications, including rapid, low-volume manufacturing.

For more information on Direct Metal Sintering, please visit 3D Systems' web site at www.3dsystems.com.