

## **Firm combines 3-D printing with ancient foundry method**

March 27 2015, by Rick Barrett, Milwaukee Journal Sentinel

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A century-old firm that's done custom metal work for some of the nation's most prestigious buildings has combined 3-D printing and an ancient foundry process for a project at the National Archives Building in Washington, D.C.

Louis Hoffmann Co., whose clients include the Smithsonian Institution, the U.S. Capitol, Bank of America, the Chicago Mercantile Exchange and Tiffany & Co., is making two sets of bronze doors and custom door pulls for the National Archives facility on Pennsylvania Ave.

For the door pulls, the Milwaukee-area company bridged the technology of investment casting, which was used by the Egyptians 5,000 years ago, with 3-D printing.

It was the company's first foray into 3-D printing, where objects can be replicated by laying down successive thin sheets of plastic or other materials from a computer drawing.

Louis Hoffmann worked with Stratasys Direct Manufacturing, a California firm, to create a 3-D polymer replica of the door pulls. From that, investment casting - a process that creates a mold filled with molten metal - was used to produce the bronze door pulls.

"As we approached this project, we weren't sure where 3-D would fit into our processes," said Bryan Hermus, a Louis Hoffmann vice president. "But a little more than a year ago, we started working with a

new modeling software that allows us to generate 3-D models of something like a set of doors or a staircase. To us, it's a new technology. But I think it could provide an interesting way to produce some old objects."

Founded in 1887, the company has done ornate metal work for many historic buildings.

"A lot of our techniques are the same as they were 100 years ago, with some improvements here and there. All of our work is custom. ... That is the challenge of what we do," Hermus said.

Once the 3-D replica of the historic door pulls was made, the company used Vanguard Sculpture Services in Milwaukee for the bronze casting.

The northwest side foundry is a mecca for Midwestern artists who want their ideas translated from clay and plaster models into bronze and museum-quality castings.

Vanguard's clients range from wildlife artists to industrial designers. The foundry has cast life-size works of art and monuments.

The steps taken in modern metal casting aren't so different from those used thousands of years ago.

It starts with a wax mold, or in this case polymer, that's dipped into a ceramic slurry and then kiln dried into a hard shell.

The mold material is burned off in the heating process, and molten metal is poured into the shell that remains to make a cast part.

The use of 3-D technology speeds up the process and is less expensive than making a wax mold.

It also generates a prototype product that designers can review for changes before the final version is cast in metal.

Vanguard and Louis Hoffmann have worked together on previous projects, besides the casting of the bronze door pulls.

"They can do things for us that we can't do, and we can do things for them," said Beth Sahagian, a partner with Vanguard.

Louis Hoffmann has metal specialists who have been with the company for up to 40 years.

The company won the National Archives project through competitive bidding.

Through many projects, it is well-known in Washington, D.C., according to Hermus.

Louis Hoffmann made doors for the Library of Congress and for the Capitol visitors center when that was remodeled a few years ago.

In addition to having its own craftsmen, the company has worked with other Milwaukee-area firms on high-profile projects in Washington and New York City.

"It's why we are able to compete on a national level," Hermus said.

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Citation: Firm combines 3-D printing with ancient foundry method (2015, March 27) retrieved 16 August 2024 from <https://phys.org/news/2015-03-firm-combines-d-ancient-foundry.html>

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