



HOW **KENNEDY VALVE** REVIVED **IN-HOUSE** **PATTERNMAKING** WITH ADDITIVE

Kennedy Valve was working with an aging workflow in sand casting applications, developing patterns and tooling with an external supply strategy that replaced their long retired in-house pattern shop. By modernizing their factory floor with a 1 m³ BigRep industrial 3D printer, in just one case they reduced their sand casting pattern and tooling expenses by an astounding \$13,000 USD. Kennedy Valve's BigRep ONE returned its value after just 5 prints!

Kennedy Valve quickly recouped their additive manufacturing investment and continue to reap the benefits of reduced overhead. They also have an dependable, robust machine for on-demand production of prototypes and showcase models – adding incredible value to their product development, marketing, and sales departments.

With their BigRep 1 m³ industrial 3D printer, Kennedy Valve...

- Affordably and efficiently modernized an aging industrial workflow
- Reduced sand casting pattern and tooling expenses by \$13,000 USD for one part
- Streamlined the prototyping process with in-house additive manufacturing
- Creates affordable product showpieces for tradeshow and potential investors



Without realizing, you probably walk past dozens of Kennedy Valve products a day. The New York-based quality waterworks manufacturer produces, among other products, fire hydrants that are installed across the United States of America and the world. Now, the industrial giant, in business since the 19th century, has modernized their manufacturing workflow to astounding cost savings with a BigRep industrial 3D printer.

“I want to run as much production tooling as I can through that machine,” Jacob Brueckman, a Product Engineer at Kennedy Valve, said of the company’s BigRep ONE. “I want it to be an important part of Kennedy Valve’s engineering, and pattern and mould production.”

With their new additive manufacturing system, Kennedy Valve has simplified production across their industrial processes, even reviving in-house patternmaking for sand casting processes. The company has also observed a variety of added value from their new large-format 3D printer and are regularly leveraging the equipment for product development, marketing, and sales projects.

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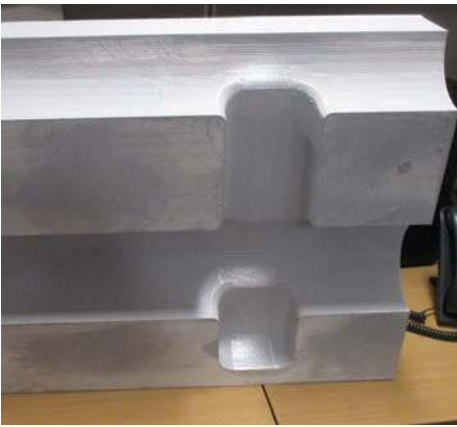
Though Kennedy Valve routinely outsources many of their prototyping and manufacturing activities, most of their work is conducted from an in-house foundry. The foundry is where the company earns their bread and butter, creating the fire hydrants and other quality waterworks products that they are known for. Now, large-format 3D printing is enhancing their foundry’s sand casting workflow and other industrial processes.

PATTERNS, FORMS AND MOULDS



Kennedy Valve's sand casting process consists of several stages that each require a high-quality output for a suitable final product:

1. Create an original one-time-use pattern
2. Compact air set sand around the pattern to create an initial lake sand mould
3. Fill the mould with molten iron to create a rough copy of the pattern called a "blank"
4. Post-process the blank with programmable CNC milling to create a production-ready pattern
5. Compact green sand around the production pattern for a mould to produce a "casting," the final product before post-processing



A 3D printed core box pattern.



A 3D printed hydrant end cap ready prepared for sand encasement.



The final product: a hydrant end cap made of iron after casting.

Step one – pattern making – is often the most difficult. For sand casting to work, a pattern must be perfect. Just a simple crease or ridge in the wrong place can tear the heavily compressed sand mould, a pattern is used to create and ruin it. Or, time spent post-processing the casting will be increased to reach the desired final shape – wasting excess time and material.

Before using 3D printing, patterns required extreme lead times while highly experienced, artisan pattern makers worked to form designs from hand. "Traditionally, piece together and blend wooden shapes made from manual routers, lathes and mills. Pattern making is a very high skill process," said Brueckman. As pattern makers became increasingly rare and expensive, it started to make more sense for Kennedy Valve to outsource the process – trading even higher lead times and costs per part for the elimination of recruitment, payroll, and equipment complications.

Fortunately, industrial 3D printers have modernized the patternmaking process. Now, patterns can be easily 3D

printed in one full scale piece and simply smoothed out to achieve their perfect form.

"We'll use that casting to make many, many moulds on our inliner machine." Brueckman said. "It's a cheap way to achieve a production tool."

Before their BigRep industrial 3D printer, the sand casting process cost Kennedy Valve about \$52,000 USD from start to finish. Now, having replaced a dated process that required machine milling a solid block of iron to achieve a CNC-programmed pattern, they've saved about 22% of previous expenses. An incredible \$13,000 USD in one case.

Kennedy Valve's BigRep ONE returned its value in roughly five prints.



Prototypes

Kennedy Valve outsources more than just their patternmaking. The company's prototypes were also previously external products, formed with aluminum for a lighter model than their final iron products that can weigh up to 300-pounds. With the combined cost of external fees and expensive low-volume aluminum casting, the impact on product development was considerable in both time and money. Now, the company simply prints their prototypes in house directly from CAD files created by their product designers.

The new prototyping process helps Kennedy Valve eliminate prototype lead time and keeps their production in complete control. One such prototype, the K-81 upper barrel and bonnet fire hydrant model that's now used as a marketing showpiece, took only 130 hours to 3D print with two other industrial parts created in the build volume at the same time. Brueckman predicted that the same model would have taken anywhere from six to eight weeks were it made with their old external aluminum process. With their BigRep industrial 3D printer, Kennedy Valve is no longer held back by the schedules of other companies.

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faster for far less money, helping them to create a better product and get to market sooner. Product iterations are easily and cost-effectively developed to put functional models into management's hands, enabling a real-world assessment of products before moving forward with the expensive tooling processes required for production runs. They're not only increasing efficiency in manufacturing operations, but also protecting the company's bottom line and creating room to invest elsewhere to improve products and processes.

Kennedy Valve Hydrant Valve

Application: Molds **Industry:** Foundry

Dimensions:

- Bonnet: 28.7 x 28.7 x 28.7 cm (Bottom left)
- Elbow: 34.5 x 33.7 x 34.3 cm (Upper left)
- Lower: 38.7 x 28.1 x 28.1 cm (Bottom right)
- Upper: 27.9 x 55.4 x 27.4 cm (Upper right)

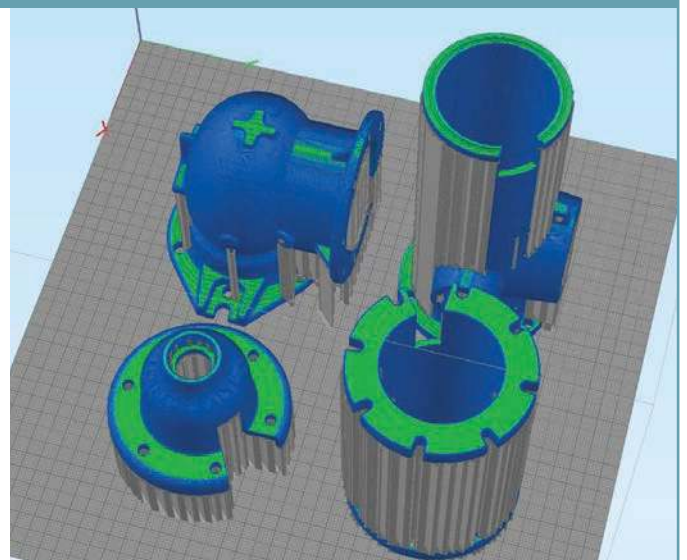
Nozzle: 1 mm

Layer Height: 0.5 mm

Plastic Weight: 16.5 kg

Filament: ProHT

Printing time: 325 hours





Showpieces

Having so much control over their production process also gives Kennedy Valve some unique opportunities for marketing, PR and tradeshows that were much more difficult and expensive when they relied so heavily on outsourcing.

To get the most out of the industry events that the company attends, Kennedy Valve routinely brings their products with them to show potential partners, investors, and the public. Their 3D printed prototypes are adding value as lightweight, show-quality models for presentations.

Ordinarily, acquiring showpieces like the ones Kennedy Valve uses is a complicated and expensive process. If aluminum prototypes weren't carefully post-processed into show quality, manufacturing a showpiece can be a tough expense for a business to justify. But often the ability to showcase products that aren't easily portable, like 300-pound iron fire hydrants, is incredibly valuable to product demonstrations that increase customer and investor interest alike. Fortunately, because industrial 3D printers can easily create exact replicas of a product – at a third of the weight in this case – Kennedy Valve can now easily support marketing and sales strategies with their luxurious resource.

Kennedy Valve's BigRep 3D printer can easily create exact replicas of their products at a third of the weight. Great for a traveling showpiece!



Affordably and efficiently modernized an aging industrial workflow



WHY BIGREP?



Two things were important to Kennedy Valve when considering which industrial 3D printer they would invest in: build volume and reliability.

Because of the massive size of their products, having a build volume with room to spare ensures Kennedy Valve's new workflow is never restricted. With the BigRep ONE's one-cubic-meter build volume, the company has all the room they need to produce on-demand patterns for their industrial parts and more.

"You can really rely on German engineering," Brueckman said as he explained why the company trusted the BigRep ONE's reliability. "I enjoy working with the machine, I enjoy producing these prints. They're really working for us, so we're quite happy."

When Kennedy Valve examined the state of their industrial processes, they found aging workflows ripe for optimization. "It's a general trend in the industry to

go for automated processes like this," said Brueckman as he explained that modernizing Kennedy Valve's workflows was a key motivator when choosing to invest in a BigRep industrial 3D printer.

Though they had previously invested in a desktop 3D printer, the industrial value of large-format additive manufacturing system simply wasn't there. "We didn't really utilize it like the BigRep," said Brueckman.

Modernizing their manufacturing facilities with a BigRep industrial 3D printer has proven to be highly effective for Kennedy Valve's sand casting workflow and has added value to other important processes outside the foundry. The company has quickly returned their investment in costs saved, and will continue to reap the benefits of affordable, in-house manufacturing for years to come.



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UP TO 1 M³ LARGE-FORMAT, INDUSTRIAL 3D PRINTERS

Built to take you from prototyping to production.

A global leader in large-format FFF 3D printing, BigRep strives to transform its user's productivity and creativity with easy-to-use additive manufacturing solutions. With an aim to help companies accelerate innovation and rethink manufacturing, BigRep's German-engineered 3D printers enable engineers, designers and manufacturers from start-ups to fortune 100 companies to go from prototyping to production faster, getting their products to market first. Through collaborations with strategic partners – including BASF, Bosch Rexroth, Etihad Airways, and Deutsche Bahn – BigRep continues to develop complete additive manufacturing solutions comprising of industrial 3D printers, software, and advanced materials.

Founded in 2014, BigRep is headquartered in Berlin with offices and technical centers in Boston and Singapore.

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