

Fast-tracked availability

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Additive manufacturing engineered pump impeller supply avoids downtime and extends reliability

Large industrial complexes, such as oil and gas refineries, need to have a well-organized strategy for planned maintenance events as well as unexpected downtime. However, procurement can become more difficult as machinery ages and original equipment manufacturers (OEMs) reduce levels of support. For one major liquified natural gas (LNG) plant in Southeast Asia, which needed a high-precision part quickly, Sulzer was able to deliver the solution in less than half the time offered by the OEM.

Planned maintenance enables the necessary resources to be in place for timely repairs to be achieved within the specific shutdown period. A great deal of forward planning is required to ensure all parts are available, especially if they have long lead-times. This process can be exacerbated by OEMs reducing their support for ageing equipment and potentially lead to downtime if the machine suffers from an unexpected failure.

Tackling parts deliveries

In this case, a condensate pump, which was operating on a closed loop system, was displaying a high rate of wear. The cast iron component was suffering from erosion and corrosion, which was reducing the efficiency of the pump.

The main concern for the plant was any operational lapses of the condensate pump would put its availability and reliability at risk. The next planned outage was several months away, but at the time, there was no spare impeller in stock. Initial indications from the OEM showed that a new impeller would not be available in time.

The same site had a long-standing relationship with Sulzer, which has previously carried out a major retrofit project to upgrade several of the boiler feed pumps. With escalating time pressure, the need for a flexible, customer-focused supplier that could meet the various challenges of the project was essential. Renowned for its expertise in design and engineering across all brands of pumps, Sulzer was once again appointed for its considerable experience in applying additive manufacturing technologies to production, retrofit and repair projects.

Optimizing the designs

Additive manufacturing techniques are perfect for creating unique and intricate components in small numbers. The process often starts with 3D laser scanning of the original part and design specialists digitally restoring the worn areas to create an as-new component. At this point, additional changes, such as improved hydraulics or material enhancements, can be implemented.

Choosing the specific process to manufacture the new component depends on many factors. In this case, selective laser melting (SLM) was chosen as the most appropriate solution. This 3D printing technique uses a high power-density laser to melt and fuse metallic powders to produce high-quality parts that require very little final machining.

Metal powder is evenly spread onto a powder bed using a roller. A focused laser beam is then utilized to melt the powder, forming a 2D shape that corresponds to a

single slice of a 3D metal object. This process is iterated, often across thousands of layers, until the complete 3D geometry is constructed.

This technology also offered the opportunity to change the material used to create the new impeller. Considering the working environment, stainless steel was selected for the new component, a material that has considerably better resistance to corrosion and erosion. Based on Sulzer's decades of experience, this will significantly extend the working life of the impeller.

Cutting delivery times

Once the order was received by Sulzer, the original impeller was scanned, and reverse engineering began. Initial tests showed that the original material chosen by the manufacturer was the cause of the high rate of wear, which led to the selection of a more appropriate alloy for the new component. In all, the process took only eight weeks from project kick-off to delivery to customer. This is less than half of the 20-week lead time that was offered by the OEM in the past for a conventional casting process.

The expedited delivery of the new impeller ensured that planned maintenance during the outage could be completed on time, removing any risks associated with the condensate pumps being unavailable. Furthermore, the success of this project has prompted the customer to review their spares replacement strategy with a view to widening the use of advanced manufacturing techniques and achieving more efficient operations.

Continuing support for legacy assets is a constant issue for major industries, and additive manufacturing is quickly becoming a widely recognized technology that can deliver high-precision parts quickly and extend the service life of many pieces of

equipment. Especially beneficial for industries where the costs of unexpected downtime can be very significant, the reduced lead times and ability to work in a wide variety of materials are the ultimate benefits.

Image captions:



Image 1: Additive manufacturing techniques like selective laser melting (SLM) are perfect for creating unique and intricate components, like impellers.



Image 2: SLM uses a high power-density laser to melt and fuse metallic powders to produce high-quality parts. (shutterstock_1085138906)

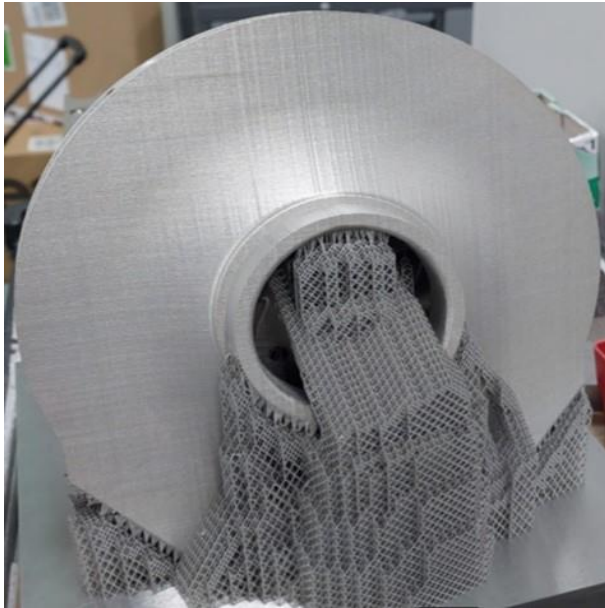


Image 3: Sulzer manufactured a replacement pump impeller using SLM for an LNG plant in Southeast Asia.

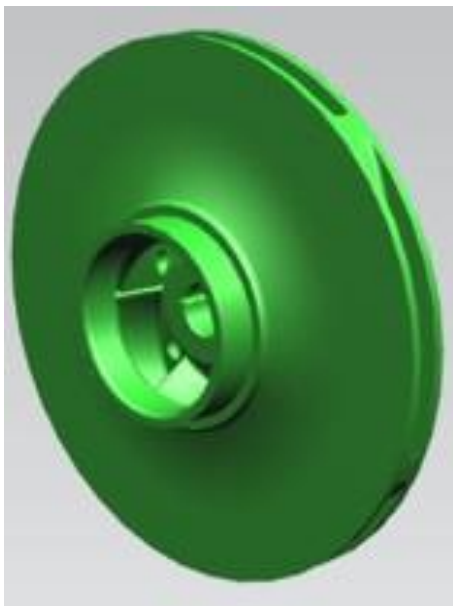


Image 4: The worn areas of the original impeller were digitally restored to create an as-new component.

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About Sulzer

Sulzer is a global leader in fluid engineering and chemical processing applications. We specialize in energy-efficient pumping, agitation, mixing, separation, purification, crystallization and polymerization technologies for fluids of all types. Our solutions enable carbon emission reductions, development of polymers from biological sources, recycling of plastic waste and textiles, and efficient power storage. Our customers benefit from our commitment to innovation, performance and quality through our responsive network of 180 world-class manufacturing facilities and service centers across the globe. Sulzer has been headquartered in Winterthur, Switzerland, since 1834. In 2022, our 12'900 employees delivered revenues of CHF 3.2 billion. Our shares are traded on the SIX Swiss Exchange (SIX: SUN).

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