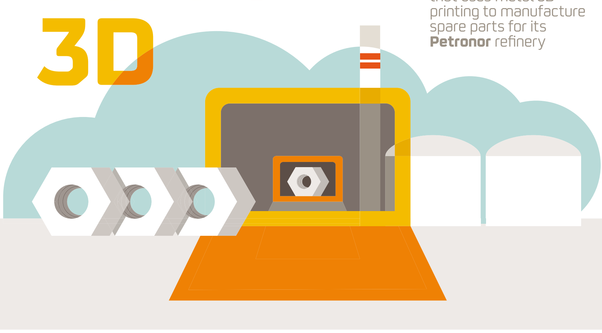
PRINTING 3D

Repsol participates in a pilot project that uses metal 3D printing to manufacture spare parts for its **Petronor** refinery



Metal 3D printing to make bespoke spare par

Through the Basque government's Bind 4.0 program for start-ups, Repsol has took part in a pilot project to produce spare parts for its Petronor refinery in the province of Biscay using metal 3D printing. This technology, known as additive manufacturing, opens the door to future virtual catalogs that remove the need to store large numbers of spare parts in industrial facilities, facilitating maintenance and reducing costs.

Based on a 3D model, metal additive manufacturing uses metal powders that are fused by a laser to create a part. Once the virtual model is received, the components can be manufactured in 48 hours.

This technology "makes it easier to manufacture metal parts with complex structures and geometric forms that up until now could only be forged by casting," explains Arturo Fernández Goyenechea, Innovation Manager at Petronor.

Additive manufacturing allows for on-demand small series production and also simplifies the replacement of old parts for which models and molds no longer exist. "If this technique is consolidated, spare parts will be less likely to be discontinued as our suppliers will be able to manufacture them again in a few days."

Addimen

uses additive manufacturing to produce 10 pump impellers for the Petronor refinery

Industry 4.0 acceleration

The public-private acceleration program Bind 4.0 promotes an industry 4.0 technology hub in the Basque Country , strengthening new developments in big data, additive manufacturing, computer vision, and collaborative robots. Unlike other types of accelerators focused helping start-ups find an investing partner for the start-up, the aim is for them to get their first contract of up to 75,000 euros with one of the participating major industrial companies.

"This technology was already on our radar," continued Fernández, and in order to test it, Petronor placed an order with the Biscay-based SME Addimen to use additive manufacturing to manufacture impellers for 10 pumps "that are used to pump out water in a non-critical service at the Muskiz (Biscay) refinery and that do not compromise operations or safety."

"It's old machinery and when there is a problem we don't have spare parts." Therefore, Addimen printed these impellers in stainless steel. These parts have a complex structure similar to a fan that, before, could only be forged by casting. The parts made with this technique will be installed shortly and "even though we can't provide any specific data as of yet, we're optimistic about them."

digital catalogs

Industrial equipment manufacturers will have a digital catalog with all of their parts

Once the digital model is received, the part is manufactured within a few days

Reverse engineering for old parts

Based on a digital model, the parts start to take shape as 50 micron layers of metal powder are micro-fused in precise points using a laser beam. Once printed, it is subjected to a final process to create the definitive product (machining, blasting, shot peening, etc.) and then it's ready to be installed.

In the case of older parts where not enough information is available, so-called reverse engineering is employed: the part is scanned and analyzed to build up the most critical parts and fine tune the definitive 3D design. Once the reverse engineering, the most laborious part of the process, is completed "the part is physically manufactured in a question of a few days. Compared to foundry timelines, which can be months, this is a substantial improvement."

This manufacturing technique still has limitations, such as the size and material used to make the part, which excludes "other metals that are commonly used in industrial equipment, such as conventional carbon steel and bronze."

Alternative to casting

"This is still an emerging technology, but if it is developed as a manufacturing model that complements casting, it could solve an endemic problem with the most complicated parts and allow for unit series without manufacturing models," stated Fernández. Often, the manufacturers of old machinery no longer sell the spare parts, which means that Petronor has to carry out the entire casting process again and "if what we need is a single piece, the price and timeline is exorbitant."

Faced with the risk that certain spare parts will be discontinued, the refinery stores more spare parts than it actually needs. Additive manufacturing shortens timelines and may reduce the levels of stocks in the warehouse "since they give us the old part and we perform the reverse engineering, we then have the virtual model on file for the next time they need it," stated Joseba Sagarra, Head of Addimen.

This company, founded in May 2014 and the first to offer this service in Spain, is thankful for Repsol's collaboration to drive a technology that "we are still trying to establish, but that, paradoxically, has already been implemented for 15 years in Germany," the largest producer of this machinery, "where it is common to see metal 3D printers."

Large industrial equipment producers will benefit the most from additive manufacturing, but digitalization will make it possible for them to have a virtual catalog and save the models for each new part forever, "something that will benefit all end maintenance users," concluded Fernández.

Download
all the images
in this News
ZIP. 3,2 Mb

Download
the complete articles
in this News
PDF. 2,8 Mb

Dirección de Comunicación
prensa@repsol.com

Campus Repsol · C/ Méndez Álvaro, 44
28045. Madrid · Tlf: 917538787 - 917537189