Press Release by O.R. Lasertechnologie GmbH

Additive Manufacturing Technique Extends Life of Sensors

An additive manufacturing technique called DMD (for "Direct Metal Deposition") developed by O.R. Lasertechnologie in Dieburg, Germany enables reliable protection of sensor elements by means of a hard alloy. It makes it possible to significantly extend their lifetimes, for example in pipelines of the oil and gas industry.

Industrial sensors are very sensitive components. They are deployed to precisely and reliably monitor temperatures, flow rates, and pressure over long periods of time, for example in oil and gas pipelines. They are subjected to extreme stresses while doing so. Each day, about a million barrels of crude oil, or 160,000 cubic meters, pass through a pipeline with a diameter of one meter. That is equivalent to 1850 liters per second. Onshore gas pipelines have an extremely high internal pressure of 100 bars, which can even reach 200 bars or more in offshore pipelines. Sensor elements used to monitor the flow suffer considerable wear as a result of corrosion and abrasion. This shortens their lifetimes and necessitates costly repairs.

Thanks to an innovative powder nozzle developed by the company of O.R. Lasertechnologie (OR LASER), the technology of powder-based laser cladding also known as DMD can be used to greatly prolong the life expectancy of these sensors. The compact EVO Mobile laser welding system is excellently suited for applying wear-resistant coatings and carrying out repairs or modifications. The system uses relatively low laser output levels starting at 200 watts, but its high deposition rate of up to 5000 mm^3/h makes it ideal for a vast range of applications. It boasts both high efficiency and great value for money due to its low price.

The way to lastingly protect a sensor from wear is to coat it with Stellite. The cobalt-chromium-based alloys known by this name are very difficult to machine. The conventional approach is to apply composite clad layers with a total thickness of several millimeters. However, the intense heat applied during the process results in considerable mingling of the sensor's material with the Stellite cladding. Use of the conventional method therefore considerably shortens its lifetime.

Unlike with conventional methods, the laser only minimally melts the surface of the sensor, and only at scattered points. Metallic powder, with grain sizes between 45 and 90 µm, is fed coaxially to the laser beam and permanently fuses with the object's surface. The advantages of this approach include precise deposition of the material, low heat penetration, and an undistorted, crack-free coating. Track widths between 200 µm and 2 mm are possible.

The coaxial arrangement also permits deposition of material independently of the direction of cladding, so that the workpiece can be freely rotated in all directions and, if required,

even “grow” in three dimensions. Moreover, the laser parameters can be dynamically adjusted to changing conditions on the fly.

In order to prevent oxidation and the formation of tiny bubbles, the work is done in a shielding atmosphere of argon, a noble gas. The resulting surface quality is like new, free of pores and cracks, very close to the required final contours, and neat. The sensor itself is hardly affected by this “minimally invasive” technique, while its resistance to wear is greatly improved.

The team of the R&D department of OR LASER spent a year collaborating with the Fraunhofer Institute to develop a highly efficient, easy-to-install powder nozzle that works with high repeatability and is suitable for automated processes.

“We’re proud of having found a way to increase the durability of these sensors with our additive laser technique and thus improve the reliability of gas and oil pipelines,” says Markus Wolf, head of the R&D department at OR LASER.

The system is completely manufactured in Germany, and the nozzle is the first of its kind to enable a combination of wire- and powder-based laser cladding.

OR LASER not only develops laser welding and cladding systems, but also appropriate means of controlling them. For example, the CAD/CAM software solution called the ORLAS Suite is even able to program the cladding strategy for complex geometries and align the required laser tracks with micron accuracy. For clamping the workpiece, there is a rotary shaft that allows full five-axis CNC work to tap the full potential of this innovative additive manufacturing technique.

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About O.R. Lasertechnologie GmbH

Producer of Industrial Laser Systems

Since founding O.R. Lasertechnologie GmbH in September 1997, Yhushua Resnik and Uri Resnik have steadfastly pursued the goal of developing new applications for lasers in materials processing and innovative laser technologies for a wide range of customers in the metal- and plastics-processing industries.

The company’s comprehensive portfolio of products is the outcome of unceasing efforts to build on and apply many years of practical experience in the fields of laser welding and cladding.

Development and manufacture of laser equipment in Germany for companies that include Siemens, Bosch, Geberit, Freudenberg, and General Electric.
Solutions for the automotive and aerospace, mechanical engineering, electrical, medical, plastics, and tool- and mold making industries
Managing directors: Yhushua Resnik and Uri Resnik

Own branches: 6
International distributors and customer service providers: 30
Employees in Germany: 70
RD department: 20 staff
Market share: 25% worldwide across all relevant industries

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