Room enough in the narrowest of pipes

iClad® offers a durable answer to the challenge of internal contour laser cladding at a working depth of 750 mm

Whether they are transmission components, cylinder liners or conveyor systems, the problem is the same: in industrial manufacturing processes, heavy-duty components are always the Achilles' heel of overall plant efficiency. Customised surface treatment per laser cladding can render such components fit for the extreme stresses of their tasks. But this style of optimisation technology is challenged when it comes to difficult-to-access surfaces or bores. Tight aperture diameters, large working depths or internal steps soon confront conventional laser cladding heads with their limits. But not the special processing head iClad® made by Pallas GmbH & Co. KG. It can provide the full spectrum of internal contour processing through an access aperture as small as 30 mm in diameter, and to a working depth of 500 mm. Most frequently, a 42 mm iClad® is deployed for apertures from 50 mm upwards and a penetration depth of up to 500 mm. Now, the deployment potential of these special laser heads – which have already proved their worth in so many industrial applications – has been significantly expanded. A combination of a screw-on taper and a new nozzle type now makes it possible to process the internal contours of a bore that, at a depth of 500 mm, tapers down to a diameter of 36 mm, and to do this to a working depth of 750 mm – for hours on end of continuous operation, if required.

Laser cladding is a highly versatile technology. To protect heavily stressed surfaces against wear and corrosion, laser cladding processes are applied to give them application-specifically enhanced tribological, mechanical and chemical properties. Using strictly localised heat input – with practically no warpage – this generative process facilitates reliably reproducible, near-net-contour 2D or 3D applications. And it is not only useful for the functionalisation of surfaces, but also for design changes or repairs. For external surfaces or internal contours with large access apertures, this kind of customised surface adaptation to specific stresses has long become the established standard. On the surface to be treated, the tightly focused laser beam melts a thin surface layer of the base material together with the powder sprayed in through the nozzle. In this so-called melt pool, the two materials join metallurgically into a dense coating with low dilution. Using CNC- or robot-control, coatings and geometries with thicknesses ranging from a few tenths of a millimetre up to several millimetres can be accomplished. The problem used to be that, for conventional optical processing heads, the smaller the access aperture of the internal contours to be processed, the more restricted the possible working depth was. Until Pallas succeeded in breaking the rule with its iClad®. This special laser head with integrated process media feed makes laser cladding of internal contours and blind bores possible through access apertures as small as 30 mm in diameter and to a working depth of 500 mm. This is possible due to its compact casing, which houses all the necessary assemblies for beam guidance and formation. The plugs for the laser fiber and process media feed lines are located at the rear end of the head. An active cooling system protects the optical components from overheating. An internal lens protection prevents contamination or damage through build-up of powder particle deposits. In addition, the optical path is constantly flushed with shielding gas. During processing, the pipe is rotated around the fixed

processing head, which – depending on the positioning of the surface to be treated – may employ different laser beam angles. With blind bores, where the laser beam's working point is in front of the head, a beam directed precisely into the angle ensures the required coating result. With through bores, the laser beam is deployed at a 90° angle. In contrast to conventional processing heads, the iClad® only needs a working distance between head and component surface of 5 to 12 mm. Because it can be inserted into the component from the side or from the top, it affords extremely flexible processing possibilities. An optional camera connection supports calibration and monitoring of the process.

Two in one

Now, with two simultaneous breakthrough developments, Pallas has added a new chapter to the success story of its laser cladding head in slimline format. A screw-on taper can significantly increase the deployment scope of an existing iClad®. In this configuration, the iClad® taper allows a working depth of 750 mm. The diameter of the taper is 12 mm smaller than that of the standard iClad®, enabling it to access places that even the special laser head – in itself already exceptionally slender – has so far been unable to reach. Thanks to the tiny working distance required – just 6 mm – an iClad® extended in this way can even efficiently process components with internal steps. This 50% increase in the accessibility of surfaces to be processed inside components with varying internal diameters opens up a range of new application possibilities. And the easy handling instead of complicated reconfiguration – only three screws are involved in attaching or detaching the taper – is an additional bonus in terms of process efficiency. When processing large components, you simply process the surfaces with larger access apertures with the standard iClad® – as usual – and, when it comes

to smaller diameters, you only need a couple of minutes to fit the taper on and can then carry on working.

In addition, a new type of nozzle developed by Pallas in collaboration with its strategic partner GTV Verschleißschutz GmbH now enables the iClad® with taper to be deployed for long internal cladding jobs lasting up to seven hours or more. This makes the processing head perfectly suited not only for industrial series coating of small components but also for the continuous coating of large internal contours like those found in, for example, components for conveyed media. In such equipment, a consistently identical geometry of the coated cylinder surfaces is crucial for the efficiency of the output. So, in this configuration, the iClad® is also optimally qualified to be deployed in the fields of prospecting, extrusion or power plants for the internal coating of existing components instead of replacing them with new ones.

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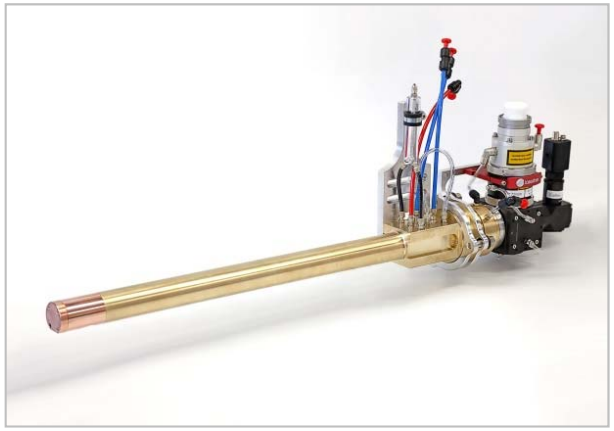
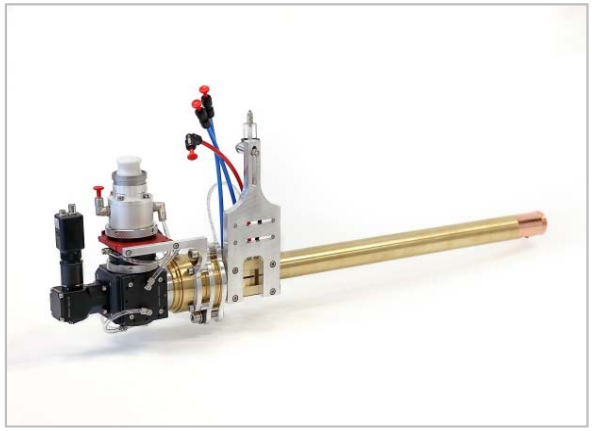
Picture 1: Pallas has added a new chapter to the success story of its laser cladding head in slimline format: A screw-on taper can significantly increase the deployment scope of an existing iClad®.

Picture 2: The taper allows a working depth of 750 mm and its diameter is 12 mm smaller than that of the standard iClad®.





Pictures 3-4: The standard iClad® can provide the full spectrum of internal contour processing through an access aperture as small as 30 mm in diameter, and to a working depth of 500 mm.

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