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APPLICATION TESTS OF A REMOTE CONTROLLED MACHINE FOR LASER SEALING AND CUTTING OF PIPELINES IN HAZARDOUS CIRCUITS

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*ANSALDO RICERCHE, Corso Perrone 25, I-16161 Genova, Italy***RTM, Vico Canavese (TO), Italy***ABSTRACT**

Dismantling chemical or nuclear plants is often hazardous and several studies are in progress to reduce mobile robots capable of cutting to reduce the volume of contaminated metallic components. In particular cutting tubes from these plants usually requires that the tubes be sealed in order to prevent dangerous liquids or gases from diffusing into the environment.

We refer to tube diameters of around 2 inches and thicknesses of around 0.16 inches.

It is not always sufficient to press the edges of the tube segment before cutting. Moreover powerful presses capable of performing fully reliable mechanical sealing of the tubes can be complex to install on mobile robots.

A further problem is linked to the strong mechanical reaction on the robot when conventional cutting tools are used.

Laser for cutting has already been considered as a potential solution to the problem due to the absence of mechanical forces on the workpiece. This paper deals with the experimental investigation of a more complete solution: the same laser beam can be used to seal, by welding, the edges of the tube before cutting and after partial compression of the tube using presses of limited forces which are thus easier to install on the robot. This is possible due to the fact that a gap between the metal sheets is left when performing laser lap welding without any degradation of the sealing quality. This solution foresees a single tool for two operations and a reduced load on the robot and is all the more feasible given that powerful laser beams can be sent to the robot which handles them by means of light and flexible mirror systems or optical fibres. For optical power transmission applications these fibres have up to now only been available for the wavelength of solid-state lasers.

We performed experimental comparisons between carbon dioxide and solid-state lasers for performing the above mentioned tasks. Economic and reliability evaluations of the two solution were made based on the experimental results and on the state of the art of high power industrial lasers.

It should be noted that recent improvements in commercially available high power solid state lasers and in the optical fibres used for beam transport, render the technological applications considered in this paper increasingly feasible.