

## **Water-Jet Guided Laser Machining of Metal Matrix Composites**

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Laser cutting or drilling of monolithic materials like metals and alloys is a well-established process and used extensively in various applications like aerospace, medical and automotive. However, laser processing of materials like metal matrix composites (MMC) is challenging due to the differences in the chemical and physical properties of the matrix and reinforcement particles. The water jet guided (WJG) laser processing, first presented by Richerzhagen in 1994 [1], has securely established itself and is making a big impact in various industrial applications - especially for machining of exotic materials. The water jet guided laser process is based on the concept of using a pressurized micro water-jet as a laser beam guide. The water jet also offers additional benefits including efficient removal of melted material and reduced conventional thermal defects. As the sample is cooled right after the end of the laser pulse at exactly the site that was heated before, heat conduction into the workpiece is efficiently decreased and in consequence the thermal load of the sample is strongly reduced. The main investigation on this paper concentrates on the water-jet guided laser (WJG) cutting of aluminium metal matrix composite reinforced with aluminium oxide fibre and WJG drilling of aluminium metal matrix composite reinforced with silicon carbide particles (Al MMC). The results of WJG laser machining of Al MMC was compared with conventional laser cutting and drilling process.

[1] Richerzhagen, B., 1994. Development of a System for Transmission of Laser Energy (Doctoral dissertation, Ph. D. Thesis work, EPFL, Switzerland).