

Performance Analysis of Abrasive Waterjet Machining Process at Low Pressure

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Abstract. Normally, a commercial waterjet cutting machine can generate water pressure up to 600 MPa. This range of pressure is used to machine a wide variety of materials. Hence, the price of waterjet cutting machine is expensive. Therefore, there is a need to develop a low cost waterjet machine in order to make the technology more accessible for the masses. Due to its low cost, such machines may only be able to generate water pressure at a much reduced rate. The present study attempts to investigate the performance of abrasive water jet machining process at low cutting pressure using self-developed low cost waterjet machine. It aims to study the feasibility of machining various materials at low pressure which later can aid in further development of an effective low cost water jet machine. A total of three different materials were machined at a low pressure of 34 MPa. The materials are mild steel, aluminium alloy 6061 and plastics Delrin®. Furthermore, a traverse rate was varied between 1 to 3 mm/min. The study on cutting performance at low pressure for different materials was conducted in terms of depth penetration, kerf taper ratio and surface roughness. It was found that all samples were able to be machined at low cutting pressure with varied qualities. Also, the depth of penetration decreases with an increase in the traverse rate. Meanwhile, the surface roughness and kerf taper ratio increase with an increase in the traverse rate. It can be concluded that a low cost waterjet machine with a much reduced rate of water pressure can be successfully used for machining certain materials with acceptable qualities.