DESIGN AND INTEGRATION OF A CO_2 LASER HYBRID CUTTING SYSTEM FOR MATERIALS PROCESSING

by

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Abstract

A CO_2 laser cutting system has been designed and developed based on hybrid motion of moving workpiece and moving beam. This system has been utilised in the studies of laser cutting of various materials in various profiles.

The structural design of the laser cutting system was carried out with AutoCAD Mechanical Desktop. The planning included materials selection, system configuration and re-use of existing available components in order to minimise the research budget. A fast-axial-flow CO_2 laser was adopted and optimised for high output power. The beam delivery system and the laser head were designed and integrated to the entire system.

The hybrid positioning system was tuned for its motion control parameters. Both the motions of the jig and beam delivery system were fine-tuned for smooth movement at high speed and acceleration. Interfacing software was developed to offer a user-friendly and programming-free operating environment for setting the profile cutting process.

Parametric studies on the dependence of the cut quality on various materials have been carried out. Finally, the laser cutting system was tested in profile cutting. Various shapes were cut and the desired outline was achieved successfully.

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