World Academy of Science, Engineering and Technology
International Journal of Mechanical and Industrial Engineering
Vol:9, No:04, 2015

Improvement on a CNC Gantry Machine Structure Design for Higher Machining Speed Capability

Authors : Ahmed A. D. Sarhan, S. R. Besharaty, Javad Akbaria, M. Hamdi

Abstract : The capability of CNC gantry milling machines in manufacturing long components has caused the expanded use of such machines. On the other hand, the machines' gantry rigidity can reduce under severe loads or vibration during operation. Indeed, the quality of machining is dependent on the machine's dynamic behavior throughout the operating process. For this reason, this type of machines has always been used prudently and are non efficient. Therefore, they can usually be employed for rough machining and may not produce adequate surface finishing. In this paper, a CNC gantry milling machine with the potential to produce good surface finish has been designed and analyzed. The lowest natural frequency of this machine is 202 Hz at all motion amplitudes with a full range of suitable frequency responses. Meanwhile, the maximum deformation under dead loads for the gantry machine is 0.565μm, indicating that this machine tool is capable of producing higher product quality.

Keywords : frequency response, finite element, gantry machine, gantry design, static and dynamic analysis
Conference Title : ICMPE 2015 : International Conference on Mechanical and Production Engineering
Conference Location : Boston, United States
Conference Dates : April 20-21, 2015