

Passive Isolation of Vibrations in Stone Cutting Process

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Abstract

This paper focuses on the problem of mechanical vibrations induced in the cutting process of stone and marble in stone cutting machines. The study shows that the main source for these vibrations is the lateral motion of the saw blade causing friction between the side body of the blade and the stone. This periodic force induced in the cutting area is reduced passively by using elastomeric pad that isolates the base of the machine from the head and the table. Adding less than 3% of passive damping ratio to the isolator could significantly reduce the level of vibration on the saw blade and on the table. To reduce the propagation of these vibrations through the base into the floor, another elastomeric pad is mounted under the machine. This pad reduces the immigration of oscillations through the floor to the other places in the factory.

Keywords

Stone and marble, Cutting vibration, Passive damping, Elastomer pads, Vibration Isolation

Biographies

Ahmed Abu Hanieh is an Associate professor in Mechanical Engineering and Mechatronics Department at Birzeit University and worked as a department chairperson. Participated in Tempus project aims at establishing a new Master program in sustainable engineering in BZU and another Tempus project in the field of modern car maintenance. He supervised two Doctorate students in European Universities and several Bachelor and Masters graduation projects. Participated in the judgement of several local and international innovation competitions like Made in Palestine, Intel Science competition and First Lego League. Participated in founding a few specialized associations. Abu Hanieh is the author of two books, fifteen journal papers and more than 30 conference articles. He is a reviewer for more than 15 international specialized journals.

Ahmad Al Balasie has a Ph.D. degree in Mechatronics Engineering from Technische Universität Berlin, Germany, since 2016. He has a M.Sc. degree in Automatic Control Technologies from Politecnico di Torino, Italy, in 2012. He also finished his B.Eng. degree in Mechatronics Engineering from Palestine Polytechnic University, Palestine, in 2008. He also worked as a lecturer in Palestine Polytechnic University for three years. But, nowadays he is an Assistant Professor at Birzeit University, Palestin since 2016. His research focuses on the fields of optimal control, model predictive control, and path planning for the under-actuated robots to maximize the energy saving, with several publications.