

Earth and Space 2010

Magna Parva attended the Earth and Space 2010 conference in Honolulu, Hawaii. The conference was a great opportunity to network with an international community of space engineers and scientists. During the conference Magna Parva presented an academic journal paper which resulted from a technology study that was undertaken in conjunction with the European Space Agency on the subject of ultrasonic drill tools. The presentation was well received.

Paper Abstract

Between 2006 and 2009 Magna Parva performed a European Space Agency (ESA) study "Ultrasonic Tools for Planetary Surface Exploration". It was partially funded by the ESA Technology Research Programme (TRP) framework. During the course of the work Breadboard and Engineering Model drill concepts were designed, developed and tested in a range of media and environmental conditions. The tools were demonstrated to drill and collect samples from various mediums. The abilities of the devices and phenomena encountered during experimental testing were documented and through an iterative development and test programme, the Engineering Model concept's material removal rate was improved by 3600%. Effects encountered during testing included: ultrasonic erosion machining (including particle disintegration), ultrasonic consolidation of fine powders, vibro-fluidisation of granular medium, ultrasonically induced atomisation of water, phenomenologically modified frictional characteristics, alleviated jamming of mechanisms in the presence of granular medium, and ultrasonic particle/fluid transport. From the experimental evidence presented, four ultrasonic drilling mechanisms were proposed along with recommendations for improving the efficiency of ultrasonic drilling devices. The Autoresonant Control System developed by Magna Parva facilitated stable control of the ultrasonic tools during the study (even when subjected to an inherently nonlinear and ill-defined loading) and a description of the control strategy was given. Finally, a potential future capability of the ultrasonic tool was introduced - its ability to act as a ranging/sonar type device to interrogate both solid rocks and subterranean geological features.

Reference

Thomas, P. N. H. (2010). "Magna Parva and ESA's Ultrasonic Drill Tool for Planetary Surface Exploration" Earth and Space 2010: Engineering, Science, Construction, and Operations in Challenging Environments, ASCE: pp. 1235 – 1245.

Conference Website

<http://content.asce.org/conferences/earthspace2010/index.html>