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## THE DYNAMIC CHARACTERISTICS ANALYSIS OF MOON SOIL DRILLING DEVICE

**Abstract**

Drilling is one of the prime methods to obtain sample deep down the moon surface. What is under the surface of the moon attracts many scientists, experts and researchers. However, little is known about the deep moon. Before arriving on the moon and starting to drill, little is known accurately about the contact point of drill and the condition of the local site, whether it is like dust, sand, ice (frozen lunar soil) or rock and mineral blocks. The physical and mechanics behaviors, such as hardness, strength, and brittleness, are of great importance to the results of the works. Because the hardness and density of soil from different layers under the moon surface are vary, the load and force required for drilling the soil, ice or rock on the moon may vary greatly as the sampling target changes. Theoretical and experimental research was done in order to increase reliability. Firstly, the mathematical model is built and the equations are presented to describe the different loads, power parameters, and intrinsic characters of the hollow drilling pipe, such as mass and elastic model. Secondly, the axis force, torque moment, and radical force are taken into account in the solution and analysis of the equations respectively. Thirdly, all these loads are synthetically calculated, simulated and tested. The dynamic responses of the system under different conditions are obtained. The results of these analysis showed that the length of the drill pipe is the main parameter to effect the vibration of torsion and bending among the other structure and size parameters. The data showed that the vibration magnitude is related to the drive torque, axis force and rotate velocity. A large improvement in the efficiency of drilling can be made by selecting suitable these power parameters. It was found that impact vibration increase intensively when the drill acted on the hard and brittle rocks. Further more, great dynamic loads are produced when the load frequency approximates the intrinsic frequency of the drill. Key words: moon, sampling, drilling, dynamic, load