SM25S_12861

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Drilling under Percussive Vibro-Impact with Dry Friction

Luiz F.P. Franca, **Hans I. Weber**

Department of Mechanical Engineering, Rio de Janeiro, Brasil

New drilling techniques have been studied to increase the penetration rate in hard rock formations. One approach, that appears suitable for off shore drilling in deep seas, uses harmonic loads and, in some cases, impacts. Hard rocks present a resistance to drilling that can be modeled as a dry friction on the drill bit, which is rotating under static loading. The drilling is therefore a percussive penetration phenomenon, allowing the forward motion (with a drift) but in stick-slip condition due to the rock resistance and may be considered with and without impact. This paper focuses on numerical investigations and presents results using a novel way to change between the several phases that are possible in this non-smooth problem with two discontinuities. It is also shown that the behavior may vary from periodic to chaotic motion. Some engineering aspects are also analyzed.

View the extended summary