

Characterization of the rock fragmentation process during down-the-hole drilling: System application and ROP improvement

Jorge AISING jorge.aising@mines-paristech.fr

Down-the-hole (DTH) percussion is a highly effective method for drilling in hard rocks with air being widely used for delivering percussive energy down hole. The interaction of the tool and the rock is the focus of many studies as this is where the destructive energy from the hammer blow may be dissipated, if so, reducing the energy and stress magnitudes within the rock itself and, hence reducing efficient breakage. Main variables affecting the drilling efficiency can be grouped in bit design variables (tungsten carbides sizes, shapes and arrangement, flushing holes of the bit, bit head design, etc.), hammer design variables (blow impact speed and frequency, piston mass, length and shape), operational variables (weight on bit and rotational speed) and rock conditions (confining, overburden and pore pressure).

The aim of this research is therefore to improve hammer efficiency (i.e. create faster penetration while ensuring sustainability of components) through knowledge gained from an experimental campaign to characterize the effect of the mentioned variables in the rock fragmentation process. To achieve this, the project aims to identify the effect of such variables in the crack generation, propagation and coalescence, by identifying the modes of cracking in progressively complex conditions. It is proposed to begin with a single-insert bit hammer and a single impact and progress to a multi-insert multi-blow, for a different set of rocks.