

Some Aspects of the Rock Deformation Mechanism at the Contact with Cutting Tools

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In the mining industry, tools which are mounted on the operating parts of different machines are used for the rock cutting.

The process of deformation, cracking and detachment of the rock chips due to the interaction of the cutting tool with the rock is a complex process in which many physical phenomena occur. At the level of cutting edge, a dust core is produced, which generates tensile stress in the rock, and the cracking process is developed producing rock chip detachment.

The variation of the shear stress during the rock chip detachment is divided into two stages. The first stage is characterized by a continuing increase of the stress, together with the accumulation of elastic energy in the rock, as a result of its deformation, and a local failure process of the rock around the contact zone, having as result the dust core.

The second stage begins with the reaching of the yield value of the stress, when the detachment of the rock chip occurs, the stress value decreases and the further development of the cracks is produced on the basis of the release of the previously accumulated elastic energy.

The values of the successive peak values of the stress can be considered as a random variable. The dynamic character of the process is due to this random variation of the involved parameters, so an appropriate statistical analysis is to be done.

The paper is devoted to this analysis, on the basis of performed experimental and field tests in order to explain the mechanism of rock deformation and failure during the cutting process.