Complex determination the detonation parameters of detonators

Abstract

Explosive initiation systems applied in the mining industry must adhere to stringent criteria regarding energy characteristics, delay accuracy, and resistance to external stimuli to ensure the safe and effective execution of blasting operations. Achieving optimal rock fragmentation, minimizing the impact of ground-born vibrations generated by blasting on surrounding areas and constructions, as well as controlling the range of fly-rocks necessitate the use of reliable detonators with consistent physical properties tailored to specific drilling and blasting patterns.

This PhD thesis introduces a novel method for determining critical detonation parameters of electric and electronic detonators using a custom-designed test stand at the Central Mining Institute – National Research Institute in Poland. The innovative aspect of this method lies in its comprehensiveness, enabling the simultaneous determination of selected parameters during a single test. This approach provides essential information about the detonators, even when their quantity is limited, which is particularly valuable for post-accident studies and cost-effective research involving a small number of detonators.

The research methodology detailed in the thesis facilitates a reliable assessment of the effects of hydrostatic and dynamic pressure on detonator performance. These activities are crucial for determining the applicability of new explosive constructions, including dispersed materials designed for methane and tremor prevention measures through sequenced blasting in a single hole.

This comprehensive evaluation enhances the understanding of detonator behavior under various conditions, contributing to advancements in mining safety and efficiency.