

STAMS¹: New tools for monitoring flooded and non-flooded mine shaft

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Abstract:

In European coal mines, there are many abandoned shafts, in Poland, Germany, France, Spain, UK and other countries, that require long-term stability assessment to manage the risk of potential collapse with consequential risk to property and human life. This paper presents the results of the European STAMS project which was funded under the Research Fund for Coal and Steel (RFCS). It builds on previously developed technologies, that were applicable only to the non-flooded sections of shafts, by also permitting the flooded portions of shafts to be monitored.

The objective of STAMS is to implement and integrate individual monitoring devices into multifunctional monitoring and inspection modules, and to design permanently installed sensors. This will allow periodic and long-term continuous monitoring to assess the condition of flooded mine shafts. The solutions developed can monitor and evaluate the stability and state of the flooded and non-flooded portions of partially flooded shafts, for long periods of time. The Multi-functional Monitoring Module is able to capture visual and ultrasonic images and make periodic measurements of a wide range of parameters relating to a shaft's geometry and condition. The Ultrasonic Inspection Module uses a profiling sonar to detect any deformations, with high precision, between periodic inspections. Electronic sensors, and tube bundles that sample air in the shaft for analysis on the surface, permit long-term continuous monitoring of environmental and chemical conditions. In addition to monitoring, a modelling approach has also been developed to assess the long-term stability of shafts during and after flooding.

In this paper, we start by showcasing some of the costly collapses that mine shafts have suffered. We then move on to describe the technologies that have been developed to monitor and assess their long-term stability, with a view to taking preventative action before collapses can occur.

Key words: Shafts, lining, flooded, inspection, damaged, monitoring.

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