Preparation For Using Fiber Optic Cables To Monitor Distributed Strain And Temperature Profiles In An Underground Mine Setting

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Early detection of rock movement signaling imminent underground space or pit wall collapse in mines has the potential to prevent loss of life and serious injuries from mine disasters. Unlike most traditional instrumentation that provides data at a single point, fiber optic cables can be deployed in a network that allows continuous monitoring of distributed profiles of ground movement and temperature variations.

Researchers at Montana Tech and UW-Madison are collaborating to demonstrate that this fiber optic-based Distributed Strain and Temperature (DST) technology can be employed in an underground mine to reliably and accurately detect ground deformation of different characters, and fluctuating temperature profiles. The focus of the research is a field experiment that will be conducted at Montana Tech's Underground Mining Education Center (UMEC). In order to demonstrate the field performance of the technology under a variety of conditions, strain-sensing cables will be attached to the rock faces with grout and epoxy, and grouted into boreholes, and a temperature-sensing cable will be submerged to significant depths in two flooded shafts, allowing continuous monitoring of the water in the shafts and the air in the drift between. Data will compared to that collected using traditional geotechnical instrumentation and to predictions made using numerical models. Laboratory experiments and tests will be conducted to support the field deployment and modeling aspects.

This presentation summarizes the preliminary work done to support the field deployment, focusing on preparation/calibration of the cables, design and implementation of the laboratory experiments, and development of the field instrumentation plans.