Request for Proposal

Topic: Minimizing Rib Failure Hazard

Background: Rib failures are already responsible for about one-half of the ground-control fatalities in underground coal mines. As coal mines go deeper or seams thicken, this condition will only worsen. Unlike coal mine roofs which are systematically bolted in all mines and often supported with secondary standing support systems, rib control is more sporadic, typically limited to some form of limited bolting when applied, and variable in practice.

Prevention of rib injuries requires a combination of approaches including: knowledge of the conditions that cause rib instability, engineering controls such as optimally designed support to stabilize ribs, and monitoring technologies to detect rib movements. Many mine operators naturally create a functional rib hazard assessment through operational experience. Researchers have worked to institutionalize these experiences into a rib stability index and rating system of some sort that can be universally applied. A good example of this is the NIOSH Coal Pillar Rib Rating (CPRR)[1]. Likewise, rib support practices continue to evolve as experience is gained in what works best under various conditions, but there is not a universally accepted design method for rib support. Also, in many situations (bolting, cutting) a temporary support option may be most effective. Finally, most present rib monitoring is typically done by visual inspection and suffers from a lack of detail in recognizing changes and from only sporadic application. An automated rib monitoring system that can be developed for mine implementation would be a significant safety improvement

Project Goals: To develop methods to minimize rib failure hazards for coal mine applications.

Scope or Work: Three topics are presented for study. The submitter can propose to address any or all of the three subtopics. If more than one subtopic is being proposed, the proposal should provide a breakdown of effort by subtopic including segregated cost since the Foundation will evaluate each on its own merit and may choose to fund selected topics based on the strength of each subtopic proposal.

Subtopic 1 – Assessment of Rib Stability Rating Systems

- Review existing rib stability rating systems such as the NIOSH Coal Pillar Rib Rating (CPRR).
- Determine the effectiveness and weaknesses of existing rib stability systems.
- Examine the level of implementation of these systems by the mining industry and barriers for implementation.
- Propose improvements to current rib stability rating systems, or a new system.
- Conduct trials to examine the efficacy of the proposed rating system.

Subtopic 2 – Improved Rib Support Design, Including Temporary Supports

- Review existing rib support design.
- Determine the effectiveness and weaknesses of existing rib support design methods.

[1] NIOSH Coal Pillar Rib Rating Research

- Propose improvements to current rib support design, potentially building on the rib stability rating.
- Conduct tests/analysis to examine the efficacy of the proposed rib support design method.
- Investigate if some form of temporary safeguard can be incorporated into miner/bolter or bolting machine that can further protect the mine worker beyond what is currently used.
- Investigate if some form of temporary rib support structure external to any machine can be employed to safeguard the miner working in the immediate vicinity.

Subtopic 3 – Assessment of Rib Motion Detection Technologies

- Examine the feasibility of automatic rib monitoring technologies including Lidar, photogrammetric, thermal imaging, etc.
- Investigate if more simplistic alternative approaches to rib motion including mechanical systems similar to Tell-Tale[2] monitors used for roof movement can be utilized.
- Investigate if rib bolts and/or other supports can incorporate some mechanism to monitor bolt/support movement.
- Investigate if the miner/bolter can be used as a platform for rib monitoring technologies.

Submission Requirements: The submitter is required to submit a proposal not to exceed 20 pages in length to provide documentation of how the scope will be accomplished, the project team and its experiences, a detailed budget to support the project costs and a project timeline. Proposals with advanced planning or more detail with how the scope of work will be accomplished will be rated higher than those lacking detail.

Evaluation Criteria:

- (40%) Knowledge of rib rating, rib support design, and rib monitoring technologies and research
- (25%) Soundness of research approach
- (20%) Relationships with mining companies and demonstrated ability to conduct mine studies
- (15%) Cost and timeline validation

[2] Tell-Tale monitors