

**AN IMPROVED SEAT FOR UNDERGROUND MOBILE EQUIPMENT.** S. Gallagher, A.G. Mayton, National Institute for Occupational Safety and Health Pittsburgh, PA; R. Merkel, Roush Anatrol, Livonia, MI

Operators of underground mobile equipment, particularly shuttle cars, are often exposed to significant levels of shock and whole-body vibration (WBV). Studies have reported that as many as one-third of underground equipment operators may be exposed to adverse levels of shock and WBV. Moreover, seats on mining equipment, historically, are inadequate relative to the ergonomic needs of the equipment operator. In the extreme, a mine vehicle seat has sometimes consisted of blocks of wood or a bent steel plate bolted to the machine frame. Also, the lack of sufficient vertical clearance in some underground mines is an impediment to providing adequate shock isolation systems on mine equipment seats.

The National Institute for Occupational Safety and Health (NIOSH) is conducting research to improve seats on mine shuttle cars using viscoelastic foam. The foam was used to reduce the amount of shock transmitted through the mining vehicle seat to the vehicle operator. Using information from shock tests at NIOSH's Pittsburgh Research Laboratory, two ergonomic seats incorporating foams with favorable shock attenuation characteristics were constructed for in-mine testing. The purpose of these tests was to evaluate whether these viscoelastic foams did, in fact, reduce shock loading experienced by the shuttle car operator. Shock data were collected on one of the ergonomic seats installed on the shuttle car and were compared with shock data from the original seat. Significant improvements in isolation were achieved (down to 15 Hz) with the ergonomic seat in the full-load operational mode. Additional testing of seven viscoelastic foams was done to further improve isolation from shock and better characterize the material properties of each foam. Results identified a combination of two materials that provided shock isolation characteristics of the seat pan to approximately 4Hz. Results of this study indicate that viscoelastic foams can be of benefit in the design of seats in underground mobile equipment.