

# Technology News

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## New Flammability Test for Conveyor Belting

### Objective

Minimize the risk of conveyor belt fires in underground coal mines by improving the accuracy of and means by which flammability data are acquired.

### Approach

Develop a large, laboratory-scale flammability test for mine conveyor belting that realistically assesses its fire resistance.

### Background

A conveyor belt fire in an underground coal mine is a serious threat to life and property. To minimize the risk of belt fires, the U.S. Code of Federal Regulations (CFR) for underground coal mines requires approved fire-resistant belting. Despite this precaution, about 25% of the reportable underground coal mine fires from 1983 through 1988 involved conveyor belting. In several instances, hundreds of feet of belting were destroyed. The current flammability test for fire-resistant belting is specified in 30 CFR, Part 18.65 and is conducted by the Mine Safety and Health Administration (MSHA). The small-scale test is performed in a 21-in-cubical chamber with 6-in-long by 1/2-in-wide belt samples.

To evaluate the flammability of conveyor belting under more realistic conditions, the U.S. Bureau of Mines conducted large-scale fire tests of belting. The large-scale data were then utilized in the development of an improved laboratory-scale flame test for fire-resistant belting.

### About The Tests

The large-scale fire tests were performed in an above-ground ventilated gallery. The gallery is 12.5-ft-wide by 8-ft-high along the centerline, with an 81-ft-square cross-sectional area. For the tests, a 30-ft length of belting was placed on the top rollers of a conveyor belt frame. The airflow was 300 ft/min and the ignition source was a 2 gal liquid fuel tray fire located at the upstream end of the belt sample.

Nine synthetic rubber belts and eight polyvinyl chloride (PVC) belts were examined. All the belts, except one rubber belt, passed the current small-scale acceptance test for fire-resistant belting. The belts were about 42-in-wide, and varied in thickness from 3/8-in to 9/16-in. The criterion of belt fire damage was selected to determine whether a belt passed or failed the large-scale gallery test. A belt passed if fire damage did not extend to the end of the 30-ft-long sample and a portion of the sample was undamaged. Of the 17 belts tested, 11 (7 rubber and 4 PVC) failed the gallery test and 6 passed.

The laboratory-scale flammability test for belting was conducted in a 5.5-ft-long by 1.5-ft-square ventilated chamber. The ignition source was a commercial 12-jet gas burner and the belt sample was fastened to a steel rack. After a series of preliminary experiments, the following test conditions were established: sample size, 5-ft-long by 9-in-wide; distance of sample rack to roof, 8 in; airflow, 200 ft/min; duration of gas igniter, 5 min; methane gas flow to burner, 1.2 standard ft<sup>3</sup>/min.

To conduct a test, a belt sample on the rack was placed in the chamber and the airflow set. The burner was applied to the front edge of the belt sample with the flames

distributed equally on the top and bottom surfaces of the sample. After 5 min, the burner was removed, and the belt sample allowed to burn until the flames were out.

A belt passed the laboratory-scale test if, in three trials, there remained a portion of the 5-ft sample that was undamaged across its width. A belt failed the test, if in any single trial, fire damage extended to the end of the sample. All 17 belts that were examined in the large-scale gallery test were subjected to the laboratory-scale fire test. Of the nine rubber belts, seven failed the laboratory-scale test and two passed. For the eight PVC belts, four failed the laboratory-scale test and four passed.

## Comparison of Test Results

A comparison of the pass/fail results for the large-scale gallery and laboratory-scale fire tests showed that they were in very good agreement. For the nine rubber belts, the results were in complete agreement, with the same seven belts failing the gallery and laboratory-scale tests, and two belts passing both tests. For the PVC belts,

the pass/fail results for six of the belts were in agreement, with the same three belts failing the gallery and laboratory-scale fire tests and three belts passing. There were discrepancies in the comparison for two of the PVC belts.

MSHA has announced plans to replace the current small-scale conveyor belt flammability acceptance test with the Bureau's new laboratory-scale fire test for belting.

## For More Information

Details of the experimental test procedures and results are described in a paper published in the Proceedings of the 23rd International Conference of Safety in Mines Research Institutes, "Conveyor Belt Flammability Tests: Comparison of Large-Scale Gallery and Laboratory-Scale Tunnel Results," 1989, pp. 138-150.

For additional information about this subject, contact Charles P. Lazzara, at the U.S. Bureau of Mines, Pittsburgh Research Center, P.O. Box 18070, Cochrans Mill Road, Pittsburgh, PA 15236. Telephone: 412/892-6628.

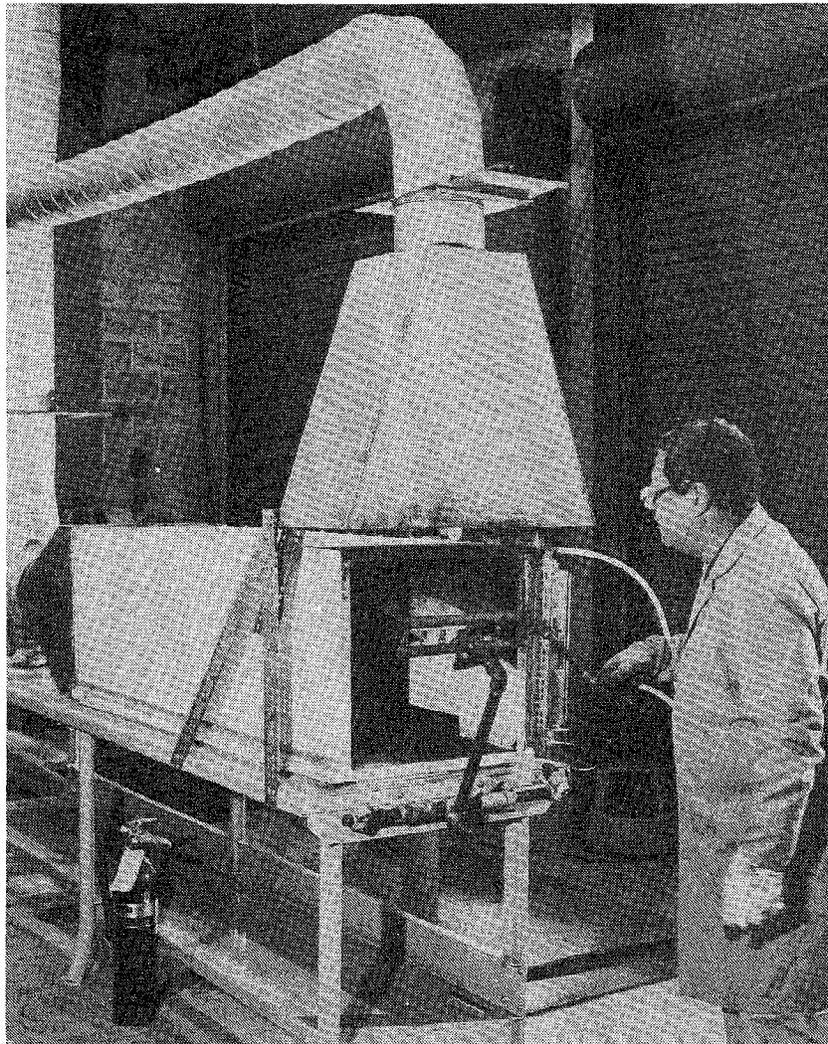


Figure 1.—Laboratory-scale flame test apparatus for conveyor belting.