

**Grant:** AFC113FO-87

**Title:** Application of Pressure Balancing Techniques at the West Elk Coal Mine

**Organization:** University of Utah

**Principal Investigators:** Dr. Felipe Calizaya and Dr. Jeffrey C. Johnson

**Topic:** Health and Safety Interventions

**Priority Area:** Fires and Explosion Prevention

### SYNOPSIS

**Problem Statement:** . In the U.S., by law, worked out areas in coal mines must be either ventilated by a bleeder system or isolated by explosion-proof seals to exclude leakage flow. Experience has shown that seals are not airtight structures as such they allow some leakage of air into the gob. In fact, seals “breathe in and breathe out” with changes in barometric pressure. In some mines the gob is kept under negative pressure. Under these circumstances, an increase in barometric pressure may cause an influx of fresh air into the gob. This quantity may be sufficient to start the self-heating of coal and spontaneous combustion, with the possibility of a catastrophic underground fire.

**Research Approach:** The proposed research plan includes the construction and operation of two pressure chambers at the Mountain Coal Company’s West Elk coal mine to demonstrate the practical application of pressure balancing techniques to reduce or eliminate the risk of Sponcom fires in coal mines. Two chambers, one passive and another active, will be constructed and tested near the mine gob. In both cases, the chambers will be constructed using designs and materials similar to those used at the mine, except for some modifications to accommodate the required instrumentation for each chamber. The location of each chamber, type, pressure sources and other required facilities will be determined after a mine visit and in consultation with the mine personnel. The designs will be developed by the University of Utah personnel in coordination with the mine personnel before they are submitted to the MSHA District 9 Manager for approval. Using each chamber, a number of pressure-balancing tests will be conducted for different mine ventilation conditions. For example, as the data is being collected and evaluated and a negative pressure differential is detected across an isolation stopping or seal, then pressurized ventilation air or nitrogen gas will be injected to the chamber. Once the field experiments are complete, each chamber site will be restored to a condition comparable to that prior to the beginning of the project or remain as such as determined by MSHA and the mine.

**Impact of the Research:** Spontaneous combustion (Sponcom) is a safety hazard frequently found in underground coal mines. If not detected in time, it can lead to mine fires and explosions. Low-rank coals, like those found in the western U.S., can self-heat and combust at temperatures as low as 95°F. Sponcom fires account for approximately 15% of the total number of fires recorded in the U.S. since 1990 and have claimed the lives of many miners. Two such events have occurred as recently as 2003, one in the U.S. and one in Australia. Pressure balancing is one proven way to control self-heating and the consequent fires in coal mines.