



Grande Cache Coal Corporation

The Miners' Lamp

Methane ignition and explosions caused by open flame torches and carbide lamps were a nemesis of underground coal mines for centuries. Early in the 19th century the Davy Lamp or safety flame was introduced to English and later to continental underground coal mines.

The lamp was invented by Sir Humphrey Davy in 1815. It consisted of a glass cylinder, within which the flame was further encased in wire gauze so as to permit air to enter but prevent the flame escaping to ignite any inflammable gases which might be present in the mine air. Davy's invention has stood the test of time and has been the means of saving innumerable lives. The modern flame safety-lamp, although superior in illuminating power, still owes its safety to the basic principle discovered by Davy.

The basic use of safety flame lamps of the last century or so is not really illumination of the workplace but detection of methane in the mine air and warning against oxygen deficiency.



The methane concentrations can be detected by observing length of the flame (sometimes glass cylinders have etching showing methane concentrations corresponding to the flame length); the longer the flame, the higher the methane concentrations. When the flame becomes elongated and wispy, the methane concentration is about 2.5% which is a typical threshold for emergency withdrawal action. When the flame goes off in a miniature explosion within the containing gauze cage, the conclusion is obvious, the atmosphere has become explosive and nobody should remain in that part of the mine.

Alternatively, if the regular well shaped flame in the lamp suddenly went off, the mine atmosphere could be oxygen deficient. The normal content of oxygen in mine air is about 20-21%; the flame would grow weaker and oxygen was depleted and would go off at about 16% of oxygen in the air.

It is relatively recent (last three or four decades) that the versatile and reliable safety flame lamps were replaced by modern gas monitoring instruments that continuously measured and indicated and /or alarmed of any elevated or dangerous concentration of typical mine gases such as methane, carbon monoxide, carbon dioxide, H₂S, etc. The oxygen deficiency in the air can also be instantly detected. As these instruments became more reliable they gradually replaced old Davy Lamps. However, old mining tradition is still strong; two centuries old safety flame lamps can be still found glimmering in many underground coal mines around the globe.