

PRINCIPLES IN THE CONTROL OF ACID MINE-DRAINAGE

Research and study into the causes of acid mine-drainage, of preventing it, and of ameliorating its pollutional effects, have been going on for a number of years. Many individuals, agencies and institutions, in addition to the mining industry, have given much time to this problem. As yet there is no positive or complete solution known, but means have been found for helping the situation in many instances, and research and study are continuing.

In the meantime, certain fundamental principles which can be applied in the control of acid mine-drainage from coal mining and related operations have been recognized. These principles form the basis for the control measures contained in *ORSANCO* Resolution 5-60.

A copy of *ORSANCO* Resolution 5-60 is included with these Principles. It was adopted after years of study and extensive deliberations by the *ORSANCO* Engineering Committee and the Coal Industry Advisory Committee. It has been approved by both the Commission and the industry. The coal industry in the Ohio River watershed is now required to carry out the provisions of Resolution 5-60.

A study of the principles upon which the control measures contained in *ORSANCO* Resolution 5-60 are based will not only help to understand those measures, but will also help in carrying them out.

THE PROBLEM

Coal mining is one of the great industries of this country, but even before a single ton of coal was mined, water pollution from "coal drainage" was noted by early explorers. They documented it in their records, predicting the presence of ample quantities of coal by streams that were " . . . so impregnated with bituminous and sulphurous materials as to be frequently nauseous to the taste" (The First Century and a Quarter of the American Coal Industry, Howard N. Evansen, Waverly Press, Baltimore (1942), Pg. 169).

Acid drainage is a natural occurrence which has been greatly increased by the mining process. Just as certain materials associated with the outcrop coal

measures came in contact with other natural elements to cause pollution before mining, so do they come in contact with these elements in the mining process, and in far greater quantity. The elements which cause water pollution when associated with certain materials in the coal measures are two of the most common and essential in nature – air and water.

If we could completely eliminate either air or water from coal mining operations there would be no acid mine-drainage. This has so far proven to be impractical of accomplishment by either physical or chemical means. Some control can be exercised over these elements, however, and another factor involved in the development of acid mine-drainage provides an opportunity for this control. That factor is time.

The production of acid is not an instantaneous process. The rapidity of its formation varies with different acid-producing materials, but the *amount of acid contributed by a given material is related to the length of time that material is exposed to air and water; however, complete submergence under water will prevent exposure to air, thereby eliminating acid production.*

THE FUNCTIONS OF AIR, WATER AND TIME IN PRODUCING ACID MINE-DRAINAGE

Oxidation of the acid-producing materials associated with coal mining is necessary for the formation of mine acids. Oxygen is a part of the chemical composition of these acids which is lacking until the material is exposed. There can be no acid, therefore, until exposure of the acid-producing materials to air.

Oxidation begins on the exposed surface of the materials, and proceeds according to the rapidity with which it can break down the other elements. Water, in the form of moisture in the atmosphere, hastens the process. As oxidation continues, acid is formed, and the parent materials are disintegrated to expose new surfaces to oxidation and further acid formation. Thus time becomes an important factor in the amount of acid formed. The longer the acid-producing materials are exposed to the atmosphere, the greater the amount of acid which will be formed.