

Strip Coal Mine Reclamation Problems in Indiana

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Introduction

This is apparently a timely topic since public interest is focused on strip coal mine reclamation problems from many specific angles. The states of Indiana and Pennsylvania have enacted legislative amendments to their existing strip mine reclamation laws during their last legislative assemblies, and the first strip mine reclamation act became effective in Illinois on January 1, 1962. It has been stated that the 1963 amendments to the strip mine law of Pennsylvania are "the single, most controversial piece of legislation of the past decade." (1.)

On the national scene, the passage of the Economic Opportunity Act of 1964, commonly termed the anti-poverty bill, has highlighted the physical and economic effects of strip mining. Outside of the state and federal governments, even more basic questions have been raised in Harry Caudill's book, *Night Comes to the Cumberlands*, and Frank Harvey's book entitled, *Nightmare County*.

A few decades ago, when strip mining operations were small and affected only a limited area, the general public was but little concerned about the impacts of strip mining. As a consequence, little was done about reclaiming strip mined lands. It has only been during the last few decades, when numerous hazards to our public health and safety have resulted from extensive strip mining operations, that the general public has become very concerned about the need for more widespread and better reclamation practices. Today, strip coal mining is attracting more public attention than ever before.

Environmental Problems

Strip coal mining has created reclamation problems which are related to the interaction of such site conditions as texture, compaction, and acidity.

The texture of Indiana's strip mined lands vary considerably from one part of the state to another. Such differences in the composition of the spoil banks markedly affect drainage problems, soil aeration, and soil moisture. Spoil banks composed largely of sand, sandstone, and hard shales have the advantage of better drainage, but are normally more droughty than spoil banks composed of clay, limestone, and soft shale.

The compactness of Indiana's spoil banks vary from about 70 to 90 per cent as dense as the adjacent unmined materials. Those having the lowest density are commonly composed of sandstone or sandy shale. The most compact banks normally contain the greatest amounts of silt and clay and were graded when wet.

The acidity of Indiana's spoil banks is affected largely by the oxidation of pyrite and marcasite contained within the coal. The resulting sulphuric acid is highly reactive and combine readily with

the aluminum of the clays. The result is to release large amounts of soluble ions at rapid rates. The acidity influences the availability of soil nutrients by its effects on both the solubility of minerals absorbed by plant roots and on the occurrence and abundance of micro-organisms. If limestone or other basic materials are present in the rock, the acid is neutralized and the pH of the spoil banks is nearer to seven.

Pollution Problems

Water pollution, resulting from acid drainage and sedimentation, is a serious problem associated with strip mining. It is responsible for long distances of some Indiana streams that are devoid of fishlife or vegetation. Sedimentation results from the erosion of spoil banks, denuded hillsides, and access roads. Sediment in streams destroys fish habitat, erodes bridges and roadways, clogs culverts, and aids in undercutting stream banks. It shortens the life of the flood control and water storage projects of the Wabash River watershed. Both acid drainage and sediment contribute to increased treatment costs for such downstream consumers as cities, industries, and farmers.

Land problems go hand-in-hand with water problems. The land that is downslope or downstream from a strip coal mine may receive eroded material from the mined area. It may become devegetated. In some cases sediment and coal fires have choked stream valleys until the fields become swampy and were abandoned for agriculture uses. There is some evidence that choked stream beds and the bursting of sediment-built dams are responsible for increased flood damages. Forest development is often altered and wildlife habitat destroyed. Stagnant pools commonly develop in old strip pits.

Acid mine drainage is a difficult problem because its adverse effects are extremely persistent. A stream may require more than two years to restore after acid mine waters have flowed through it for only one hour (2). It should be apparent that keeping acid mine waters out of streams or of diluting them so as to be nontoxic is fundamental to the wise uses of Indiana's waterways.

Grading Problems

Since the topography of strip mined lands is primarily man-made, it is the public consensus of opinion that the first step in reclamation is to reduce the relief of the spoil banks by grading. Poor aeration, water penetration and moisture conditions are frequently mentioned, but seldom measured, factors of graded strip-mined lands. They are usually said to be due to compaction from the weight of grading machinery and from the weight of materials which were located above the newly formed surface before grading.

The amount of compaction varies with a number of factors, including the length of time between stripping and grading, the character of the bank materials, the weight and type of grading machinery used, the time required for the machinery to perform the grading, and the moisture content at the time of grading.

Grading of spoil banks can be accomplished in the mining process and does not have to constitute a separate operation. A dragline

with a long boom can precede the stripping shovel, take up the top soil and dump it between the two preceding spoil banks. The ridges left by the stripping shovel are covered and the intervening valley partially filled with topsoil. The result is not a level terrain but a corrugated surface with ridges about one-half the height of the ridges and the depth of the valleys which would have otherwise been formed. This type of grading is currently being done by several strip coal operations in Indiana (3).

Legal Problems

When one studies the difficult problems of how to reclaim existing strip coal mine lands, he finds that our state law presently in force is inadequate to handle the range of problems presented by strip coal mining. The law does not recognize that conditions vary, hence that external costs vary within the state. Nor does it recognize that both reclamation costs and potential benefits depend critically upon location and upon terrain conditions. The many geographic differences between areas of stripping are usually ignored. Regulations are normally applied across-the-board.

Actually, the appropriate kind and degree of grading depends upon the terrain, without major remodeling of the entire surface. Grading should permit development, at a reasonable cost, of the widest variety and the economically most profitable types of highly specialized land use.

On the other hand, a useful feature of Indiana's law is its provision for substitution of land. Rather than reclaim land now being mined, an operator can elect to reclaim an equal number of acres of land not previously reclaimed. Although open to possible abuse, substitution does permit reclamation on strip mined lands which will return the greatest net benefits.

Revegetation Problems

Since newly created spoil banks are barren of vegetation, detailed planting plans should be known at the time of mining. The most important problems to consider are proper selection of plant species, planting methods, planting stock, and special measures for erosion control.

One of the planting problems is that revegetation of Indiana's strip mined lands has been dominantly that of tree plantings. Studies have shown that forestry is the most productive use for the largest percentage of Indiana's land after strip mining. Tree plantings are normally the least costly kind of reclamation. Trees normally hide the unsightly lands quickly, and often provide an attractive cover. But, to date, all the trees which have been planted on Indiana's strip mined lands are of limited marketable value. Nevertheless, it is probably more important to have tree plantings which will provide a cover and nurse crop to curtail the severe weathering and erosion than it is to have marketable timber products.

Thousands of acres of Indiana's older strip mined tree plantations are now reaching a stage of growth when more information is necessary in order to determine how to manage the forests properly. But, to date, there have been only a few detailed studies analyzing proper

management of strip mined tree plantations, and very little has actually been done about the proper management of forest plantings on strip mined lands.

Land Use Problems

With proper study and more intensive reclamation practices, without a doubt past, present, and future strip mined lands in Indiana could be developed into such uses as parks, tourist attractions, nature trails, outdoor education centers, and many other recreational facilities which are badly needed now in Indiana.

The use of Indiana's mine lakes for fishing, boating, swimming, water skiing, fish hatching, stock watering ponds, farm and community water supplies, and lake frontages for homes and cabins could be greatly increased. Indeed, the possibilities of utilizing Indiana's strip coal mine lands and lakes for highly specialized purposes is almost unlimited. We need these specialized uses of surface mined lands and lakes now.

More intensive and more specialized land uses could bring a much higher economic productivity per acre, and would also be more aesthetically appealing to all. There is little reason to doubt that Indiana's lands disturbed by strip coal mining could be used more wisely and more intensively than they are now.

Conclusions

Reclamation is an inseparable part of strip coal mining. It can not be markedly improved without improvement in mining techniques. Achieving improved mining techniques becomes primarily a matter of preplanning.

Complete and comprehensive preplanning must consider the previous and intended use of the strip mined lands and the surrounding area, topography, agricultural value of the overburden, available mining equipment, degree of grading, cost of reclamation, economy of the area, and legal requirements. The planning of future land use depends not only upon the geographical characteristics of the area, but also upon the wishes of the land owner, and the desires of the surrounding community.

A forward-looking coal mining company will begin with the determination of the future land use and then ascertain the best way to combine their coal production with this determined goal. They will determine the kind of equipment, the method of mining favoring reclamation, the grading to be done, and the revegetation of the spoil banks. If these steps are taken by Indiana coal producers, strip mine reclamation can be of higher quality, produce better results, and reduce public criticism of strip coal mining.

Literature Cited

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