Mining and Reclamation Poster Text

Mining and reclamation procedures that meet with the Surface Mining Law's requirements are illustrated on this poster for each of the three major surface coal mining methods: area mining, contour mining, and mountaintop removal mining. The three methods involve the same basic procedures: Clearing the land of trees and other *vegetation*, removing the topsoil and overburden, removing the coal, and reclaiming the land. Although all three methods would not likely be seen in one view such as this, the mining and reclamation methods can be compared to get a basic understanding of *reclamation processes* under the Surface Mining Law.

Area Mining

The area mining method is commonly used to mine coal in the flat to moderately rolling terrain found principally in the Western and Midwestern States. In this method, the overburden is excavated down to a coal seam and then the mining area is enlarged horizontally to expose and remove the coal. In the West, coal seams are commonly 10 to 20 feet thick, with up to 100-foot seams in the Powder River Basin of Wyoming; in the Midwest coal seams are typically 3 to 7 feet thick and 75 to 100 feet below the surface. The life of some mines in the West may be more than 50 years. Because many area mines are extremely large and operate in places with few if any residents or neighboring businesses, enormous equipment can be used in removing overburden and reconstructing the land.

The area mining operation in the illustration is on land that was formerly used for farming. As can be seen, the agricultural use is being reestablished immediately following reclamation. The mining is proceeding across the land toward the left side of the area. The initial excavation was made far enough away from the stream along the right edge of the area to prevent damage to the stream.

The coal under most of the area has been removed, and reclamation has been completed on some of the land. For example, some of the cattle in the foreground and those in the feedlot behind the silo are grazing on reclaimed land that was previously mined by this operation.

On the far left of the illustration, the *topsoil* from the unmined area is being removed by scrapers, transported across the area of active mining, and immediately spread on the land on the right that is being reclaimed. (Reclamation of the land as soon as practical is called *contemporaneous reclamation.* It's required by the Surface Mining Law.) A large stockpile of topsoil in the center background of the operation, removed from the initial mining cut, has a grass cover to prevent erosion and will be spread over the last mined area to be reclaimed. After blasting, the loosened overburden is removed by *dragline* and is dumped onto an adjoining previously mined area in one motion. In some mining operations, overburden is removed with power shovels, bulldozers, or scrapers rather than with draglines.

The exposed coal seam can be seen where the *overburden* has been removed. The coal is removed with power shovels and loaded into large trucks, which carry the coal to the preparation plant (behind the dragline). After the coal goes through the plant, it is loaded into railroad cars, possibly for transportation to an electric generating plant, or to a port loading facility for
export.

The ridges formed by the dragline as it dumps the overburden are regraded with bulldozers. Then topsoil is spread to provide a finished surface similar to the surface before mining. The land is then tilled using traditional farming methods and, as shown, crop- and pasture land are reestablished. After reclamation is completed, the productivity of the land will be similar to its productivity before the mining operation began, possibly higher.

Contour Mining

The *contour mining method* is typically used in the mountainous terrain of the Eastern U.S., where coal seams are exposed in *outcrops* on hillsides and mountainsides. First, a cut is made in the hillside above a coal seam and the coal is further exposed as the overburden is removed. The mine is then enlarged by successive cuts that follow the coal seam around the side of the hill. The mining extends into the hill to the point where the overburden is too thick to make further exposure of the coal economic. Auger mining often is used at this stage to maximize coal recovery.

The contour mining operation in the illustration is removing *multiple seams* of coal. Reclamation has been completed in the foreground. Active mining is proceeding around the hill in the middle foreground. A *sedimentation pond* for this operation was constructed adjacent to a natural drainage swale just below the mining area. As the reclamation is completed, such ponds become unnecessary and usually are removed and the entire site reclaimed and planted.

After the area has been cleared and blasted, the spoil in the active mining area is loaded by front-end loaders into trucks and taken to the previously mined area, where it is spread. As coal is uncovered, it is loaded and trucked to a coal preparation plant. Smaller pieces of equipment are generally used in contour mining than in area mining because of the restricted working area.

As can be seen in the right foreground of the cross section, a temporary highwall is left in the hill at each level of mining after the overburden and coal have been removed, because the mining operation has cut into the hill. One of the principal reclamation requirements for contour mining is that *highwalls* must be covered after mining is completed. Spoil is trucked from a working cut, dumped on the mined-out area, spread with bulldozers until it covers the highwall, and compacted as necessary to ensure stability of the reclaimed hillside.

As can also be seen in the cross section, a ridge of *undisturbed* natural material 15 to 20 feet wide is intentionally left at the outer edge of the mined area. This barrier adds to the stability of the reclaimed slope by preventing the spoil from slumping or sliding downhill.

Following backfilling and grading of the spoil with bulldozers, the topsoil is spread and a seedbed is prepared. In steep slope conditions, such as in the middle foreground of the illustration, a slope disk may be used to prepare the topsoil for seeding without having to drive equipment on the steep slope. *Hydroseeding* may be used to aid in establishing vegetation and preventing soil erosion on steep terrain. This truck-mounted equipment makes it possible to seed the steeply sloping ground from the base or top of the reclaimed slope without disturbing the graded topsoil.

In the completed reclamation area shown in the center foreground of the illustration, seedling trees and shrubs were hand planted to enhance the wildlife habitat, stabilize the site, and provide a long-term economic return from the reclaimed land.

Mountaintop Removal Mining

The mountaintop removal method is used predominantly in the East to remove coal underlying the tops of mountains. Instead of mining along the contour around the perimeter of a mountain, the entire top of the mountain is area mined, resulting in almost 100 percent recovery of the coal seam(s). Removing the top of the mountain results in a unique opportunity to create relatively flat terrain that is suitable for residential, agricultural, and other development in areas where much of the natural terrain is too steep for any developed economic use. Except where there is advance approval to create a level plateau, however, the finished reclamation must approximately resemble the orginal contour of the land.

The flat or very gently rolling area on the right side of the illustration is land reclaimed after a mountaintop removal operation was completed. Many new land uses can be established on reclaimed mountaintop removal mining sites. The illustration shows a mined area reclaimed for agricultural use in the foreground, and for the site of a new village in the background. In the far background to the left of this reclaimed operation, another mountaintop removal operation is underway on an adjacent hilltop.

To provide a flat surface for the operation of equipment, a first cut is made parallel to the top of the ridge after the vegetation and topsoil have been removed. The overburden is loosened by *blasting*, removed in a series of parallel cuts, and loaded into trucks in a fashion similar to that of contour mining. If the entire top of the mountain is to be removed, the spoil created by the mining is disposed of on an adjacent area. The spoil is usually placed in a *valley or head-of-hollow fill*. Special care is taken to stabilize large-scale fills, and to provide adequate drainage for safety and stability. Once the coal seam is uncovered, the coal is removed and trucked to a preparation plant in a fashion similar to the other types of operations.

In the illustration, the valley fill is located immediately to the left of the active operation. Here, the spoil was placed at the head of the narrow, steep-sided valley or hollow. In preparation for filling this area, the vegetation and soil have been removed and a rock drain constructed down the middle of the area to be filled, where a natural drainage course previously existed. When the fill is completed, this *underdrain* will form a continuous water runoff system from the upper end of the valley to the lower end of the fill. Typical head-of-hollow fills are graded and terraced to create permanently stable slopes.

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For more information about coal mining and reclamation visit the LEARNING GATEWAY at the Office of Surface Mining world wide web site (www.osmre.gov/learn.htm).