

Technology News

From the Bureau of Mines, United States Department of the Interior



Technology News describes tested developments from the Bureau of Mines Research Programs. It is published to encourage the transfer of this information to the minerals industry and its application in commercial practice. Mention of company or product names is for documentation only and does not imply government endorsement of a specific firm or product.

Bureau of Mines research is performed and reported under mandate of the United States Congress. For a free subscription to Technology News, write to: Technology Transfer Group, Bureau of Mines, 2401 E St., NW, Washington, D.C. 20241.

No. 92, February 1981

Two Bulldozer Blades and Grading Bar Raise Recontouring Efficiency

Objective

Reduce costs of recontouring surface mined land by improving bulldozer blades.

Approach

A specialized 48-foot-wide bulldozer blade set at an angle, a 13-foot bulldozer blade with swept-forward end sections, and a 24-foot grading bar are used in conjunction with conventional bulldozers to reduce the cost of recontouring surface mined land.

How They Work

The angle blade is used to do the initial and intermediate leveling of long spoil banks. It is mounted at an angle on two 410-horsepower crawler tractors in a side-by-side offset configuration, but requires only one operator since both tractors are controlled by a single set of controls.

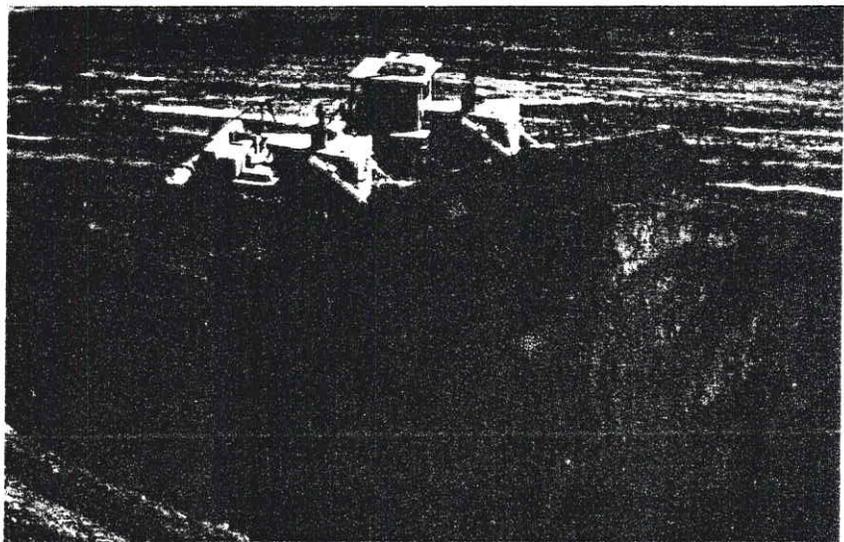
The angle blade usually begins its cycle at one end of the spoil bank where the operator fills the blade and moves forward, continuously cutting and casting the material to the repose slope. At the opposite end of the spoil bank, the angle blade

turns around and begins cutting and casting material to the opposite repose slope. This action continues until adjacent banks meet or the lateral distance from the center line of the spoil bank to the repose slope exceeds approximately 40 to 50 feet. At this distance, the sidecasting angle blade is no longer effective, and conventional bulldozers are used to do the final land shaping.

In 120-foot (crest-to-crest) spoil, it was determined that the angle blade could move 60 to 80 percent of the material before exceeding its

effective range. The average production rate was approximately 6,000 Bcy/hr.

The value of conventional bulldozers in recontouring work was not diminished by the success of the 48-foot angle blade. They are still relied on to cut access roads to the spoil banks for the angle blade, to do the initial topping-out work in irregular spoil, and to move 20 to 40 percent of the material during the final phase of land reshaping. However, conventional "U" blades require 2 to 3 tractor lengths (45 to 65 feet) to fill to capacity using



One operator controls angle blade pushed by two tractors.

normal cutting techniques. This bladefull point is also the push distance at which the maximum production rate for the dozer is achieved. Consequently, production rates diminish beyond this point because the bulldozer is just drifting the material. Prior to this point, the blade is not full before it is dumped. Therefore, if push distances are short, say less than 65 feet, rapid blade filling action becomes important. The narrow, deep, 13-foot "U" blade was designed with this in mind and can fill fast over short push distances by sidecutting as much as 18 inches into banks 5 to 6 feet high. The operator does not need to use steering clutches to keep from cutting too deep unless he takes too big a bite or hits a very large boulder. The 30°-swept-forward sections of the blade allow the material to flow rapidly across the blade and also form a bowl for high capacity. In comparison to a conventional 15¾-foot "U" blade, the 13-foot, narrow, deep "U" blade has the same capacity, weighs approximately 300 pounds less, and can reach its blade full point in approximately 30 to 40 feet, thereby out-producing the conventional blade in the short-distance range. In longer push conditions, the two types are approximately equal.

The grading bar is a finishing tool and is pushed

rather than dragged. It is made from a 24-foot long piece of channel iron, with side wings and a cutting edge for carrying live soil, and is mounted under the heel plate of a conventional blade using two 2-inch pins. Mounting time is about 5 minutes. Under operating conditions, the blade support arms rest on top of the channel iron, and the cutting edge of the tractor blade can penetrate the ground about 1 inch. The operator has full control over lift and tilt of the grading bar since it is attached to the blade and can smooth rough land at rates between 2.5 and 7 acres per hour, depending on ground conditions.

Test Results

The three specialized tools, which were developed under a cost-sharing project between the Bureau of Mines and the Pittsburg and Midway Coal Mining Company, were recently demonstrated along with conventional tractor dozers at a surface coal mine in Texas by the Russell and Sons Construction Company under a Bureau of Mines' contract. Approximately 312 acres (of 120-foot, crest-to-crest and box-cut spoil banks) were recontoured. The results showed that the specialized tools performed satisfactorily and resulted in a 32-percent decrease in cost and fuel requirements for 120-foot, crest-to-crest spoil, and a 27-percent decrease in

cost and fuel for box-cut spoil (over conventional equipment). It was also evident that no single tool was effective in all situations; a combination of tools was required to effectively and efficiently level and reshape the spoil banks.

As a result of the performance of the specialized tools, the manager of the demonstration mine adopted the equipment as his primary land recontouring system.

Patent Status

The United States Department of the Interior is not applying for a patent on this development.

For More Information

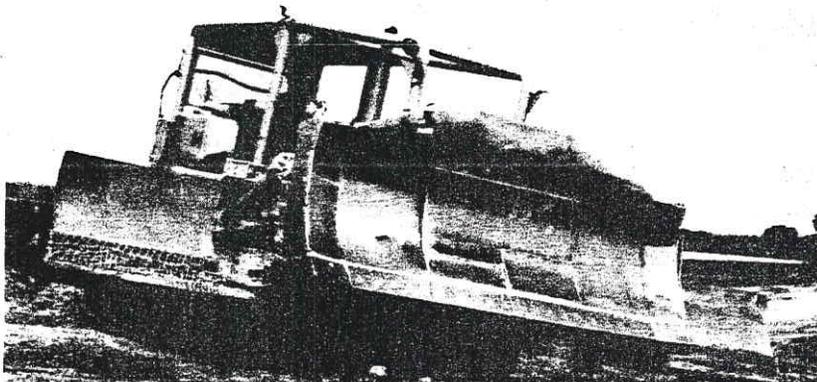
A 16-mm sound and color film entitled "A System for Recontouring Surface Mine Spoil Banks", describing these specialized tools is available. To borrow this 15-minute film, write to:

Motion Pictures
Bureau of Mines
4800 Forbes Avenue
Pittsburgh, PA 15213

Additional information appears in the proceedings of the Bureau of Mines Information Curcular 8823, "Surface Coal Mine Reclamation Equipment and Techniques," proceedings of the Technology Transfer Seminar held in Evansville, Indiana, and Denver, Colorado, in June 1980. Single copies can be obtained free from: Publications Distribution, Bureau of Mines, 4800 Forbes Avenue, Pittsburgh, PA 15213. Or telephone (412)621-4500, ext. 342.

For additional information, or to ask specific questions, write to:

Technology Transfer
Officer
Bureau of Mines
Spokane Research Center
East 315 Montgomery Ave.
Spokane, WA 99207



Grading bar has bulldozer blade wings.