

INVESTIGATION OF DUST SOURCES AND CONTROL TECHNOLOGY FOR LONGWALL PLOW OPERATIONS

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ABSTRACT

The Bureau of Mines conducted a study of longwall plow operations to identify dust sources and existing control technology. Three longwalls employing either the high-speed overtaking or conventional method of mining were surveyed. Principal operating parameters and on-site dust control technology at the time of each survey are described. Short-term gravimetric and instantaneous sampling results are discussed in detail. The relationship between longwall dust levels and dust control technology was examined.

INTRODUCTION

The plow is a continuous mining machine equipped with a static set of cutting bits, positioned at a predetermined depth and height, for mining in both directions along a longwall face. The plow is pulled in either direction by a heavy-duty chain. The broken coal is loaded onto an armored flexible face conveyor which, with the aid of hydraulic rams, holds the plow to the coal face, thereby causing the bits to bite into the coal as they are pulled along it (fig. 1).

Coal plows were initially developed in the Federal Republic of Germany (FRG) in the 1940's for mining friable coal seams less than 4.3 ft thick (1). At the present time, they are used on 50 pct of the longwalls in the FRG (2). The first application of coal plow on a longwall face in the United States was in 1951 at a southern West Virginia coal mine (3). The growth of plows in the U.S. coal market has been limited by advances in thin-seam shearer technology. Today, plow longwalls represent a small percentage of U.S. longwalls and are primarily located in the Appalachian coal fields.

Two mining methods are commonly employed in longwall plow operations: (1) the conventional method, which uses a plow speed of less than 125 ft/min, and (2) the high-speed overtaking method, which uses a plow speed of more than 300 ft/min. With the conventional method, the plow runs more slowly than the conveyor. This method is usually used in thick-coal seams, where the faster conveyor clears the larger product more easily. With the high-speed overtaking method, the plow travels much faster than the conveyor. This method is generally used for seams less than 42-in thick because of the high output potential. Uniform loading of the face conveyor is achieved by maintaining an optimum speed differential of 2:1 to 3:1 between the plow and conveyor (4).