

FIBER OPTIC PROBE TO MEASURE DOWNHOLE DETONATION VELOCITIES OF EXPLOSIVE COLUMNS

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ABSTRACT

Following ideas developed by researchers at the University of Maryland, the Bureau of Mines assembled a versatile, readily available, and very inexpensive fiber optic probe for downhole measurement of explosive shock front position and velocity. The accuracy of the probe was determined in field testing.

INTRODUCTION

Detonation velocities of explosive columns are often measured to determine in situ explosive performance. Several methods are in use, ranging from simple resistance probes to very sophisticated and expensive electromagnetic resonance measuring systems.

In a recent study on blasting, under Bureau of Mines contract S0245046, University of Maryland researchers used a fiber optic system to measure detonation velocity. Discussions with these researchers and further Bureau work led to the development of the fiber optic probe described in this paper.

SYSTEM DESCRIPTION

The fiber optic probe consists of a fiber optic cable to detect and carry the detonation-zone light emission and a sensor to detect and convert the light signal into an electrical signal. Figure 1 shows the Bureau's system.

FIBER OPTIC CABLE

The fiber cable is a DuPont Crofon lightguide consisting of sixteen 0.010-in-diameter optic strands in a plastic tube with an overall outside diameter of 0.087 in. The lightguide used in the Bureau's tests was obtained from the Edmund Scientific Co. at a cost of about \$0.70/ft in September 1986.

LIGHT-DETECTING SENSOR