

suitable under all conditions, including ledging and the extraction of the remnant.

The effect of misfires on the face stope was tested by leaving every twentieth hole empty in one blast, and the proportion of sockets less than 5 cm in length was found to be 73 per cent, compared with 87 per cent for the same explosive under normal conditions. The face shape was always recovered by the third hole after the misfire.

The time taken to charge-up with unitized charges was found to be very small; 120 holes were usually charged in half an hour (Plate III). The simulation runs had shown that rapid charging-up was an important requirement.

Because of the success of these experiments, a second experiment in the nature of a pilot production trial was begun, using the 600 mm-by-24 mm cartridges of 60 per cent Ammon gelignite. The lowest of the four panels at this site is adjacent to a strike fault, and the rock on the face is less fractured than anywhere else. Whether this was the result of variation in the strength of the rock, or of a change in stress due to the fault, is not known. However, the breaking on this panel when drillsteels of all gauges were used was not as good as was hoped for, the proportion of sockets less than 5 cm in length being only 65 per cent, even when 34 mm gauge drillsteels were used. Accordingly, it was decided to increase the charge by enlarging the diameter of the cartridges to 25 mm. This appears

to have had a satisfactory effect, the proportion of sockets less than 5 cm in length being 90 per cent in holes drilled with 36 mm gauge steel.

On average, the explosive efficiencies were about 12,5 centares per case, or 2 kg per centare, and drilling efficiencies about 4 m per centare. Productivity has been hampered by difficulties in maintaining a full complement of personnel, but it appears to be well over 20 centares per Black worker per month.

## CONCLUSION

Stoping by drilling and blasting is a cyclic operation comprising the inter-related operations of drilling, blasting, cleaning, and support. On most mines at present, stope production is not very sensitive to the cyclic nature of the operation. In any efforts to improve production, it is necessary that the advance per blast should be less than the stope width, so that the duration of the stoping cycle must be reduced (see Fig. 1). As soon as this is done, production becomes critically dependent upon the advance per blast, which must be in the range of 0,7 to 0,8 m.

A safe, satisfactory, unitized explosive charge has been developed for this range of advance per blast under a wide variety of mining conditions. Pilot production trials using unitized charges and improved cleaning and drilling are in progress, and the improvement in stope production appears to be similar to that indicated by the arrows marked

II in Fig. 1. Using the same equipment and night-shift cleaning, it appears that stope production could be improved further, as indicated by the arrows marked III in Fig. 1.

However, the use of mechanical face conveyors and hydraulic rock-drills could improve stope production even further on a one-day cycle as indicated, and this production could be doubled by blasting on each of two shifts per day. The unitized charges appear to be eminently suitable for mechanized stoping.

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## Contribution to above paper by L. H. Stein\*

We should like to congratulate the authors on the excellence of their paper and the advance that has been made in developing the technique. We in AE & CI have been very happy to be associated with this work.

We have found in further experiments with Iremite, which were not connected with those reported here, that its performance when decoupled was not as good as we expected. It appears that Iremites and similar slurries should preferably be used under conditions of tight coupling.

\*AE & CI Limited.

## Papers of Interest

The following papers may be of interest to members.

Logarithmic analogue to digital conversion for processing acoustic signals, by J. A. Raath and P. J. Knight.

Die invloed van geleiergrofheid op radiatoris, by F. P. J. Botha.

The application of a reduced voltage, reduced frequency supply to brake an induction motor, by S. M. Schuck and M. Hammerschlag.

Faso vertoning, by F. J. C. Louw and P. J. Labuschagne.

Telemetrie registrering van asem-

haling, by J. G. Barnardo and J. D. Leonard.

*Trans. S. Afr. Inst. Elect. Engrs.*, October 1974.

The ARG Programme, by F. J. Halligey.

*S. Afr. Mech. Engr.*, October 1974.

## APCOM

The Thirteenth International Symposium on the Application of Operation Research and Computer Techniques for Decision Making in the Mineral Industries will be held at the Technical University Claus-

thal, Federal Republic of Germany, from 6th to 11th October, 1975. This is the first APCOM Symposium to be held in Europe, following successful symposia in the U.S.A., Canada, and South Africa.

Information is obtainable from: Vorbereitungs-komitee, APCOM 75, Prof. Dr. F. L. Wilke, Technische Universität Clausthal, D-3392 Clausthal-Zellerfeld, Erzstrasse 20, Bundesrepublik Deutschland.