

TITLE : Routine testing of the Dubaco stone dust bags

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Executive summary

The CSIR was contacted for assistance in conducting routine tests on the stone dust bags from Dubaco Pty (Ltd). The tests were conducted in the 200-m test gallery at Kloppersbos to determine if the stone dust bags from Dubaco Pty (Ltd) conform to the specifications as set by the Department of Mineral and Energy's Guideline for the compilation of a mandatory code of practice in the prevention of coal dust explosions in collieries (DME 7/4/118- ACT1, November 1997). Sub-section 3.2.2 of this document states that for bagged stone dust barriers, the quality of the bags, hooks and rings as well as the rupture characteristics of the bags should comply with the specifications of the products tested for this purpose at the Kloppersbos Research Facility. The ACT requires that all the bags that are used for barrier purposes should rupture at pressures not exceeding 50 mbar.

Two tests were conducted with five Dubaco stone dust bags each filled with 6kg of stone dust. Two different percentages of air/methane mixtures were introduced into the tunnel to determine the rupture characteristics of the bags.

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1 Introduction

The Kloppersbos research facility, which is a unit within CSIR Knowledge Services, was established in 1987. Numerous research projects related to the prevention and suppression of underground explosions in South African mines have been conducted at Kloppersbos.

It was required to assess the performance of Dubaco plastic bags when used in bagged stone dust barriers in underground coal mines as part of their quality control programme. Two tests were conducted in the 200-m long test gallery at Kloppersbos to determine whether the bags conformed to the DME specifications.

The selection of the sample bags was performed by the client and therefore no responsibility can be accepted by the CSIR regarding the representivity of the sample.

2 Test methodology

The routine testing of the stone dust bags was performed in the 200-m test gallery at Kloppersbos. The test installation consisted of five Dubaco bags with hook and ring assemblies, each filled with 6 kg of stone dust, suspended from steel rods located just inside the open end of the test gallery.

The test explosion was initiated in the explosion chamber at the opposite end of the gallery from where the test installation was located. A plastic membrane is used to seal of the explosion chamber. The explosive mixture is formed by introducing and mixing methane gas in the chamber. A fuse cap is used as an ignition source. The membrane would rupture upon ignition of the explosive methane mixture and allow for the propagation of the resultant pressure front along the length of the test gallery. No coal dust was used during these experiments.

Two tests were conducted, one with a methane concentration of 7% by volume in the explosion chamber and the other utilising a 9% methane/air mixture. No data was captured.

Stone dust bags for use in the underground coal mining environment should comply with the requirements as set out in the DME 7/4//118- ACT1, November 1997. The specification requires that:

- Plastic bags should break in strips,
- easily tear in one direction,
- rupture when subjected to pressures not exceeding 5 kPa, and
- that hooks should be sufficiently strong to withstand the explosion pressures.

3 Discussion of results

The test results are summarized in Table 4. All plastic bags broke into strips during testing thereby releasing all the stone dust they contained. A visual assessment of the dispersion of the stone dust in front of the tunnel revealed satisfactory results during both tests.

During the test with a concentration of 7 % air/methane mixture introduced into the tunnel, all five bags used during this test fell inside the tunnel. Though the stone dust was satisfactorily dispersed in front of the tunnel, this explosion was a weak one.

The explosion pressure during the test with 9 % methane was higher than the pressure during the test with a 7% methane mixture. During the 9 % methane all the stone dust bags were satisfactorily broken and the stone dust was spread evenly in the front of the tunnel. The dispersion was very good.

The dispersion of the stone dust from all the stone dust bags was good.

Table 4: Summary of test results

Test Number	% Methane	Rupture characteristics
1	7	Good
2	9	Good

4 Conclusions and recommendations

It can be concluded from the tests conducted in the 200-m test tunnel that the batch of Dubaco plastic bags from which the tested bags were taken, fulfilled the requirements of the specifications as set out by DME in Sub-section 3.2.2 of the Guideline for the compilation of a mandatory code of practice for the prevention of flammable gas and coal dust explosions in collieries.

5 Reference

DME 7/4/118- ACT1, November 1997: Mandatory code of practice for the prevention of flammable gas and coal dust explosions in collieries.

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