

VITAL CHEMICAL PTY LTD

WIND TUNNEL TESTS FOR THE EVALUATION OF VITAL CHEMICAL SURFACE VENEER PRODUCTS TO REDUCE DUST LIFT-OFF FROM COAL STOCKPILES

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**TITLE OF DOCUMENT: EVALUATION OF VITAL CHEMICAL SURFACE VENEER
PRODUCTS TO REDUCE DUST LIFT-OFF FROM COAL STOCKPILES**

**CONDUCTED AT TUNRA BULK SOLIDS HANDLING RESEARCH ASSOCIATES,
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1 INTRODUCTION

This Report provides details of a series of laboratory wind tunnel tests conducted at the request of Vital Chemical Pty Ltd (Vital). The tests were undertaken to determine the effectiveness of the Vital Chemical surface veneer treatment product Vital Bon-Matt Stonewall to reduce dust emission from the surface of coal stockpiles.

The test program procedure was selected to simulate typical Australian coal stockpiling operational conditions.

The tests were conducted in the laboratory of Tunra Bulk Solids Handling Research Associates (Tunra), University of Newcastle, and involved the use of the wind tunnel, shown in Figure 1, specifically designed for Introspec Consulting to simulate typical operational conditions.



Figure 1: Wind tunnel with two sample trays containing typical coal type

2. TEST PROCEDURE

2.1 Coal sample

A typical coal type was used in the program. Sample moisture content was set at 75% of dust extinction moisture level (DEM) for the selected coal type.

The coal samples were screened to remove any product greater than 6.3mm to represent the sizing most vulnerable to dust lift-off and to increase consistency in the sample tray size.

2.2 Wind tunnel test procedure

Two test trays 225mm x 150mm x 25mm deep were placed in the wind tunnel at an angle of 35 degrees, simulating typical angle of repose of coal in stockpiles, or at an angle of 10 degrees to simulate the typical incline of open cut mine haul roads.

The surface of the samples had the following surface treatment:

- Untreated
- Single application of Vital Bon-Matt Stonewall surface veneer in water at dosage rate 3%

The solution application rate was 1 litre/m² of coal stockpile surface.

The test procedure was adapted to simulate typical summer conditions by the pre-drying of each sample for 120 minutes at a temperature of 30-35 degrees C. before placing in the wind tunnel.

The sample trays containing the surface treated sample were then placed in the wind tunnel for a period of 8 hours exposed to a wind speed of 10m/sec (36 km/hour)

Mass of dust lift-off was determined by the following procedure:

- Initial drying of the sample to remove all moisture content and measurement of the sample mass
- Water added to achieve the nominated pre-sample moisture content
- Conduct wind tunnel test
- Dry the sample to remove all moisture
- Compare final post-test sample mass with the pre-test sample mass to determine mass of dust removed

3 SUMMARY TEST RESULTS

Table 1 provides a summary of test results from simulation of a typical coal type to show the mass of observed dust lift-off.

Table 1 –Dust lift-off (grams) from a typical coal type following application of Vital Bon-Matt Stonewall surface veneer treatment (dosage rate of 3%) at 1 litre/square metre, when exposed to wind speed of 10 metres per second for eight hours

Simulated Operation	Wind speed and Duration	Treatment	Dust lift-off grams	Dust lift-off grams/m2
Coal stockpile	10m/s 8 hours	Nil	8.3	250
Coal stockpile	10m/s 8 hours	Vital Bon-Matt Stonewall	0.0	0.0

4 OBSERVATIONS

The test program procedure was selected to simulate coal stockpile operating conditions for a typical coal type. The sample trays were exposed to a wind speed of 10 metres per second (36 km per hour) for eight hours. This time period when added to the two hour pre-heating, simulated typical coal industry summer operating conditions.

The test program resulted in no dust lift-off observed from the typical coal stockpile following application of Vital Bon-Matt Stonewall surface veneer treatment, at a solution application rate of 1.0 litre/m² of coal surface, at chemical dosage rate in water of 3.0%.

When no surface veneer treatment was applied, 8.3 grams dust lift-off was observed, which is equivalent to 250 grams per square metre of stockpile surface.