

**MOUNTAIN TOP MINING/VALLEY FILL  
TECHNICAL STUDIES**

**STUDY OF FUGITIVE DUST AND FUMES**

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## ABSTRACT

We find no indication that there are any significant health risks due to exposure when no personnel are in close proximity to the blast zone. This is the standard procedure for safety purposes anyway. A common safety zone for large blasts from which all personnel are excluded is a 2,000-ft radius. As blasts grow smaller, the required safety zone also shrinks. But even within 1,000 feet, measurements of adverse levels are infrequent and of short duration.

This investigation is concerned with fugitive dust and fumes, meaning that which escapes the confines of the mining property. This investigation indicates that these emissions present no potential health problem for the following reasons.

- C No event produced any harmful levels of any duration at distances exceeding 1,000 feet, except one measurement of 3.6 ppm NO<sub>2</sub> at 1251 feet.
- C This measurement, and all others were of very short duration.
- C Fugitive emissions are those that leave the property; if the property boundary is closer than 2,000 feet, persons within this area are evacuated.

Quality of life issues other than health, that is the enjoyment of life and the potential of reducing that enjoyment, is harder to define because of its very subjective nature. Photographs of dust settling out of blasting clouds do not show significant deposition beyond 1000 feet. When viewed alongside the fact that four-wheel drive vehicles can produce 75 pounds of fugitive dust per mile traveled on a dirt road (Hesketh, 1983), and that many county roads in the vicinity of a surface mine are unpaved, blasting would appear to be an unlikely source of significant dust at off-site locations.

Dust and fume emissions from 11 blasting events at three mines were measured, 10 of which were useable. Both respirable and non-respirable dust was measured, as well as nitrogen dioxide (NO<sub>2</sub>), nitric oxide (NO), carbon monoxide (CO), and ammonia (NH<sub>3</sub>). Nitrogen dioxide, total dust, and respirable dust were measured at 10 points for each event; the remaining fumes were measured at only one. At four events, settled dust at the monitoring stations was caught on filter paper and photographed.

Results are consistent, but the statistical correlations are not all good. The suspected primary reason for poor correlations is the inability to account for wind velocity and direction across the measurement sites close to ground level. Surprisingly, the best average correlation ( $r = 0.86$ ) was an inverse relationship between NO<sub>2</sub> and humidity. The CO and NH<sub>3</sub> highs were also a surprise. Topographical constraints, although expected, were worse than expected. Topographical constraints were such that all sites were within 1900 feet, with an average distance of 943 feet. This was actually a fortuitous turn of events because of the very low levels of anything that were detectable as the stations approached 2000 feet.

## ACKNOWLEDGMENTS

The investigators received a substantial amount of help from a number of organizations and individuals that enabled us to accomplish far more than originally planned. It also enabled us to stretch our budget dollars substantially.

The Office of Surface Mining supported a trip for the primary investigator to Gillette, Wyoming, where a conference was held on blasting fumes. This trip provided a substantial insight on explosive fumes that would have been available in no other way. One of the cooperating companies also underwrote a trip to talk to a number of experts investigating explosive fume emissions, and this also was a great aid in performing this work.

Rich Mainaro, James Roland, Steve Page, and John Organiscak of the NIOSH research facility in Bruceton, Pennsylvania, provided us with substantial background information on the measurement of fumes and dusts. This information enabled us to avoid a number of instrumentation mistakes we might have otherwise made, and pointed the most reasonable directions for us to proceed, given budget and time constraints.

In particular, the authors would like to express thanks to Ken Eltschlager who made his substantial expertise and experience available to us at all times, and also reviewed the rough draft of this manuscript, capturing a number of typographical and referential errors for us in the process.

Above all, credit must be given to the cooperating mining companies who granted us free access to their facilities and operations and provided us with information. They did so in a spirit of cooperation and in agreement that this information was worth pursuing and potentially useful, regardless of the outcomes. Cooperation such as this is what enables us to reach beyond theory and into practicality, which does not always agree with the theoretical. Our special thanks goes to these companies who were willing to take risks to advance the state of knowledge about mining and blasting.

# TABLE OF CONTENTS

Abstract.....	ii
Acknowledgments.....	iii
1.0 Introduction and Background .....	1-1
1.1 Problem Statement.....	1-1
1.2 Literature Search.....	1-1
1.3 Fume and Dust Standards .....	1.3
1.4 Familiarization Trip.....	1.4
1.5 Wyoming Seminar.....	1.18
2.0 Experimental Approach.....	2-1
2.1 Parameters.....	2.1
2.2 Experimental Protocol .....	2.1
2.2.1 Anticipated Difficulties.....	2.1
2.2.2 Method.....	2.2
2.3 Equipment.....	2.5
3.0 Cooperating Mine Descriptions.....	3-1
4.0 Field Measurements.....	4-1
4.1 Preliminary Familiarization Trip .....	4-1
4.2 Field Measurements.....	4-7
4.2.1 Event A0622 .....	4-9
4.2.2 Event A0727 .....	4-16
4.2.3 Event B0602.....	4-25
4.2.4 Event B0619.....	4-34
4.2.5 Event B0620.....	4-41
4.2.6 Event B0627.....	4-48
4.2.7 Event B0816.....	4-53
4.2.8 Event C0712.....	4-62
4.2.9 Event C0714.....	4-71
4.2.10 Event C0726.....	4-80
5.0 Discussion.....	5-1
5.1 Viewing the Data by Relative Location.....	5-3
5.1.1 Relative Locations Mapped by True North .....	5-3
5.1.2 Relative Locations Mapped by General Wind Direction.....	5-11
5.2 Assessing the Data by Distance.....	5-17
5.3 Assessing the Data by Comparison of Individual Events.....	5-28
5.3.1 Powder Factor.....	5-28
5.3.2 Weight of Explosives.....	5-32
5.3.3 Humidity .....	5-36

5.3.4 Summary of Correlations.....	5-40
5.4 Visual Dust .....	5-42
5.5 Measurement Durations.....	5.48
5.6 Conclusions.....	5.58
6.0 Recommendations.....	6-1
6.1 A Word About Approach.....	6-1
6.2 Recommendations for Future Work.....	6-4
6.2.1 Information to Obtain .....	6-4
6.2.2.1 Blasting-Related Information.....	6-4
6.2.2.1 Non-Blasting Related Information.....	6-5
6.2.2 Potential Methods .....	6-5
7.0 Bibliography and References.....	7-1

## LIST OF FIGURES AND ILLUSTRATIONS

Figure 1.1 Particle Suspension Velocities .....	1.2
Familiarization Trip Photographs .....	1.6 4 to 1.17
Figure 2.1 Ideal Experimental Layout .....	2.4
Equipment Illustrations and Specifications .....	2.6 through 2.13
Figure 2.2 Photograph of Assembled Monitoring Station .....	2.14
Figure 4.1-1 Event 0531 map.....	4.2
Event A0531 Photographs <sup>1</sup> .....	4.3 to 4.5
Event A0622 Sketch of Surface Area .....	4.10
Event A0622 Photographs .....	4.11 to 4.13
Event A0622 Event Maps of Measurement Values.....	4.14 to 4.15
Event A0727 Sketch of Surface Area .....	4.17
Event A0727 Photographs .....	4.18 to 4.22
Event A0727 Event Maps of Measurement Values.....	4.23 to 4.24
Event B0602 Sketch of Surface Area .....	4.26
Event B0602 Photographs .....	4.27 to 4.31
Event B0602 Event Maps of Measurement Values .....	4.32 to 4.33
Event B0619 Sketch of Surface Area .....	4.36
Event B0619 Photographs .....	4.37 to 4.38
Event B0619 Event Maps of Measurement Values .....	4.39 to 4.40
Event B0620 Sketch of Surface Area .....	4.42
Event B0620 Photographs .....	4.43 to 4.45
Event B0620 Event Maps of Measurement Values .....	4.46 to 4.47
Event B0627 Sketch of Surface Area .....	4.49
Event B0627 No Photographs.....	4.50
Event B0627 Event Maps of Measurement Values .....	4.51 to 4.52
Event B0816 Sketch of Surface Area .....	4.54
Event B0816 Photographs .....	4.55 to 4.59
Event B0816 Event Maps of Measurement Values .....	4.60 to 4.61
Event C0712 Sketch of Surface Area .....	4.63
Event C0712 Photographs .....	4.64 to 4.68
Event C0712 Event Maps of Measurement Values .....	4.69 to 4.70
Event C0714 Sketch of Surface Area .....	4.72
Event C0714 Photographs .....	4.73 to 4.77
Event C0714 Event Maps of Measurement Values .....	4.78 to 4.79
Event C0726 Sketch of Surface Area .....	4.81
Event C0726 Photographs .....	4.82 to 4.85
Event C0726 Event Maps of Measurement Values .....	4.86 to 4.87
Figure 5.1 All Sites by North.....	5.4
Figure 5.2 All Sites by North, Observation Points Excluded .....	5.5

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<sup>1</sup>Note: Because it is desirable to keep the photographs of blasting events together in sequence to aid sequential viewing, the standard practice of placing figures after the first page that cites them was not followed.

Figure 5.3 All Sites by North, Monitoring Stations Only.....	5.6
Figure 5.4 All Sites by North, Total Dust at Monitoring Stations.....	5.7
Figure 5.5 All Sites by North, Respirable Dust at Monitoring Stations.....	5.8
Figure 5.6 All Sites by North, NO <sub>2</sub> at Monitoring Stations.....	5.9
Figure 5.7 All Sites by North, NO <sub>2</sub> at Monitoring Stations, Zeros Eliminated.....	5.10
Figure 5.8 All Sites by Wind Direction.....	5.12
Figure 5.9 All Sites by Wind Direction, Total Dust at Monitoring Stations.....	5.13
Figure 5.10 All Sites by Wind Direction Respirable Dust at Monitoring Stations.....	5.14
Figure 5.11 All Sites by Wind Direction NO <sub>2</sub> at Monitoring Stations.....	5.15
Figure 5.12 All Sites by Wind Direction NO <sub>2</sub> at Monitoring Stations, Zeros Eliminated.....	5.16
Figure 5.13 Station Measuremen Values, All Values Plotted.....	5.18
Figure 5.14 Total Dust vs. Distance.....	5.20
Figure 5.15 Respirable Dust vs. Distance.....	5.21
Figure 5.16 NO <sub>2</sub> vs. Distance.....	5.22
Figure 5.17 NO <sub>2</sub> vs. Distance, Zeros Eliminated.....	5.23
Figure 5.18 Main Station Maximum Values, NO and Dust.....	5.26
Figure 5.19 Main Station Maximum Values, CO and Ammonia.....	5.27
Figure 5.20 Event Average Values vs. Powder Factor, Dust.....	5.29
Figure 5.21 Event Average Values vs. Powder Factor, Fumes.....	5.30
Figure 5.22 Event Average Values vs. Powder Factor, Correlations.....	5.31
Figure 5.23 Event Average Values vs. Explosive Weight, Dust.....	5.33
Figure 5.24 Event Average Values vs. Explosive Weight, Fumes.....	5.34
Figure 5.25 Event Average Values vs. Explosive Weight, Correlations.....	5.35
Figure 5.26 Event Average Values vs. Humidity, Dust.....	5.37
Figure 5.27 Event Average Values vs. Humidity, Fumes.....	5.38
Figure 5.28 Event Average Values vs. Humidity, Correlations.....	5.39
Figure 5.29 Visual Dust, Event A0727.....	5.43
Figure 5.30 Visual Dust, Event B0816.....	5.44
Figure 5.31 Visual Dust, Event C0714.....	5.45
Figure 5.32 Visual Dust, Event C0726.....	5.46
Time Curves for NO <sub>2</sub> Detection.....	5.49 through 5.54
Time Curves for CO Detection.....	5.55 and 5.56
Time Curves for Ammonia and NO Detection.....	5.57

## LIST OF TABLES

Table 1.1 Threshold Limit Values (TLV's) as set by the American Council of Governmental Industrial Hygienists, 2000 .....	1.4
Table 3.1 Comparison of Cooperating Mining Sites .....	3.2
Table 5.1 Accounting of Data Collection Points .....	5.1
Table 5.2 Correlations: Dust and Fumes vs. Powder Factor.....	5.40
Table 5.3 Correlations: Dust and Fumes vs. Explosive Weight .....	5.41
Table 5.4 Correlations: Dust and Fumes vs. Humidity.....	5.41
Table 5.5 Summary of collected data .....	5.57