A comparison of Dust Data From 29 Select Underground Coal Mines 1968-1986

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A COMPARISON OF DUST DATA

FROM TWENTY-NINE SELECT UNDERGROUND COAL MINES

(1968 - 1986)

by

Lewis D. Raymond and Thomas F. Tomb

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ABSTRACT

The Federal Coal Mine Health and Safety Act of 1969 established mandatory dust standards for coal mines. These standards and regulatory requirements were continued under the Federal Mine Safety and Health Act of 1977 until November, 1980, when major regulatory revisions were made in the operators' sampling program. This paper presents a compilation and analysis of mine operator dust data for selected mines which were surveyed prior to enactment of the 1969 Act and are still in a production status. Data obtained since the November, 1980, revisions to the Act through December 31, 1986, are compared to data compiled and presented in previous studies.

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INTRODUCTION

The Federal Coal Mine Health and Safety Act of 1969[3/] established mandatory dust standards for the nation's underground and surface coal mines. Regulations for enforcement of these standards are contained in Title 30, Code of Federal Regulations, Parts 70, 71 and 90[4/]. Part 70 contains the mandatory health standards for underground coal mines, Part 71 the standards for surface coal mines and surface work areas of underground coal mines and Part 90 the standards for coal miners who have evidence of the development of coal workers' pneumoconiosis.

In April, 1980, the mandatory health standards for underground coal mines (Part 70) were revised. The subparts affected by this revision were: A-General, B-Dust Standards and C-Sampling Procedures. One major revision was the change in the respirable dust sampling requirements for mine operators. Subsequent revisions were also made to Parts 71 and 90. Prior to these revisions, each operator was required to initially collect 10 valid samples, which constituted a basic sampling cycle, on the "high risk" miner in each coal producing section. The "high risk" miner was defined as the worker exposed to the highest respirable dust concentration on that producing section. After establishing this basic sampling cycle, the operator was required to collect five valid samples every other month, provided compliance with the applicable standard was maintained. In addition to the samples taken on the "high risk" miner, all underground miners, regardless of where they worked, were required to be sampled periodically during the year. Workers employed on section had one sample collected every 120 days and nonsection workers employed in other underground occupations had one sample collected every 180 days.

After November 1, 1980 (the effective date of the revisions promulgated in April, 1980), each operator was required to collect five valid respirable dust samples from the "designated occupation" in each "mechanized mining unit" (the new nomenclature replacing section terminology) every two months (bimonthly). The designated occupation is defined as that occupation on a mechanized mining unit that previous sampling has shown to have the highest respirable dust exposure. A mechanized mining unit (MMU) is defined as a unit of mining equipment (including hand loading) used for the production of material. In addition to these samples, each operator is required to take one valid respirable dust sample every two months from each "designated area". A designated area is defined as an area specified in the operator's Ventilation System and Methane and Dust Control Plan which is approved by the district manager.

3/ U. S. Congress. Federal Coal Mine Health and Safety Act of 1969. Public Law 91-173. December 30, 1969, 83 Stat. 742.

4/ U. S. Code of Federal Regulations. Title 30--Mineral Resources; Chapter I--Mine Safety and Health Administration, Department of Labor.

Implementation of these revisions has had a major impact on the number of respirable dust samples collected by mine operators. For the 12-month period prior to April 8, 1980, approximately 500,000 samples were collected, while for the 12-month period subsequent to November 1, 1980, approximately 150,000 samples were collected. In calendar year 1986, only 97,000 samples were collected. The main reasons for these substantial reductions were the elimination of the periodic sampling of all miners, the reduction (from 35 to 30) in the number of samples collected annually on the "high risk occupation" (designated occupation) and the closing of mines because of poor economic conditions.

Since 1969, several studies have been conducted to assess the effect of the Federal Coal Mine Safety and Health Act on the environmental dust levels in underground coal mines. The first study[5/], published in 1972, compared data obtained in 29 mines prior to the Act with data obtained from the coal mine operators' sampling program in those same mines during 1971. The second study[6/], published in 1975, discussed the status of dust levels in underground coal mines during 1973, the effect of the 2.0 mg/m^3 respirable dust standard that became effective December 30, 1972, and delineated dust levels measured during 1973 with respect to specific operations and occupations. The third and last study[7/], published in 1979, presented a chronological overview of the status of respirable dust exposures in underground and surface coal mines since inception of the Act and compared data from the mine operators' sampling program with data from Mine Safety and Health Administration (MSHA) surveys.

This paper presents a compilation and analysis of mine operator data for those mines, originally surveyed prior to enactment of the 1969 Act, that are still in a production status. Data obtained since the effective date (November 1, 1980) of the regulatory revisions through December 31, 1986, are compared to data compiled and presented in the previous studies discussed above.

DATA COMPILATION AND ANALYSIS

Only 17 of the 29 mines originally surveyed in 1968-1969 were active at any time during the period covered by this study. The status of the 29 mines as of August, 1986, is as follows: 20 have been abandoned, three are in a non-producing status and six are in a producing status.

5/ Parobeck, Paul S. Effect of Coal Mine Health and Safety Act on Respirable Dust Concentrations in Coal Mines. Am. Ind. Hyg. Assoc. J., v. 33, December, 1972, pp. 806-810.

6/ Parobeck, Paul S. Effect of the 2.0 mg/m^3 Coal Mine Dust Standard on Underground Environmental Dust Levels. Am. Hyg. Ind. Assoc. J., v. 36, August, 1975, pp. 604-609.

7/ Parobeck, Paul S. and R. A. Jankowski. Assessment of the Respirable Dust Levels in the Nation's Underground and Surface Coal Mining Operations. Am. Ind. Hyg. Assoc. J., v. 40, October, 1979, pp. 910-915.

In these 17 mines there are a total of 145 producing MMUs; 120 continuous, 16 conventional operations and nine longwall operations.

Table 1 shows the codes assigned to the 17 mines for identification purposes, the production status of each mine and the type of mining method(s) employed on the operating MMUs.

For each mine the following data were compiled:

1. The number of bimonthly periods for which samples were submitted.

2. The mean concentration for each bimonthly period for which samples were submitted.

3. The number of bimonthly periods for which the concentration was greater than 2.0 mg/m^3.

4. The mean and standard deviation of dust concentration data for all bimonthly periods sampled.

5. The mean concentrations of the continuous, conventional and longwall MMUs in the respective mines sampled during the 1968-1969 survey and from operator samples reported during the period from June, 1970, through July, 1971.

A detailed summary of the data is included in the Appendix.

Table 1. - Mine Status and MMUs Sampled

Mine	Status*	Continuous	Conventional	Longwall	Total
AL-1	C	8	5	0	13
AL-2	A	2	8	0	10
IL-1	A	19	0	4	23
IL-2	C	16	0	0	16
PA-1	B	10	0	0	10
PA-2	C	4	0	0	4
PA-3	A	6	0	0	6
PA-4	B	18	0	3	21
VA-1	C	4	0	0	4
VA-2	C	2	0	0	2
VA-3	C	0	2	0	2
VA-4	C	2	0	0	2
WV-1	C	1	1	0	2
WV-2	A	9	0	0	9
WV-3	A	12	0	2	14
WV-4	B	2	0	0	2
WV-5	A	5	0	0	5
TOTAL		120	16	9	145

* Production Status as of 08/11/86. A-Active, B-Nonproducing, C-Abandoned

Of the 17 mines which were active during any part of this study, seven were active during 1986. Figure 1 shows a comparison of dust levels in these seven mines, as determined from mine operators' samples submitted during 1986. Present dust levels are compared with those found during the original 1968-1969 survey and with dust levels found in mine operators' samples submitted during the period of July 1, 1970, through June 30, 1971, from those mines. Dust levels at all seven mines were under the 2.0 mg/m^3 dust standard in 1986. The lowering of dust levels which was noted in the July, 1970, through June, 1971, data was continued with even lower dust levels in five mines, the same level in one mine and a slightly higher dust level in one mine. It should be noted that dust levels determined from mine operator samples tend to be lower than dust levels determined from MSHA inspection samples[8/].

A similar comparison for all 17 mines is shown on Figure 2. In this comparison, data compiled between 1980 and 1986 were separated into two groups: data from November, 1980, through December, 1982, and data from January, 1983, through December, 1986. For the 1983 to 1986 period, the average dust concentration for mines with data was below 2.0 mg/m^3; however, in four mines dust levels increased slightly, while in five of the mines dust levels decreased or remained the same. In the 1980 through 1982 period, dust levels were reduced or the same as the levels found in operators' data for the period July, 1970, through June, 1971, in 14 mines and slightly higher in three mines.

A yearly comparison of average dust levels from 1980 to 1986 for each of the three types of mining in these 17 mines is shown in Figure 3. Also shown on Figure 3 is the national average for each type of mining (bars with asterisks) for all mines submitting samples during Fiscal Year 1986 (October 1, 1985, through September 31, 1986). In general, for each year except 1983 and 1984, the highest dust levels were found in longwall mining and the lowest levels in continuous mining. For all types of mining, the average dust levels in the selected mines ranged from 0.9 to 1.9 mg/m^3 and no clearly defined trend throughout this time period is evident.

The national average dust levels, established from the operator samples submitted during Fiscal Year 1986, were substantially lower than those levels found in the selected mines for continuous and conventional MMUs; however, dust levels for longwall mining during the same period were approximately the same. It should be noted that the number of MMUs used to establish the average concentration for the selected mines was very small compared to the number used to establish the national average dust level. For continuous mining there were 27 out of 2,240; for conventional mining, seven out of 545; and for longwall mining, four out of 119.

The dust levels presented in Figures 1 and 2 for the period(s) subsequent to 1980, represent the average dust levels of the Designated Occupation for all MMUs in the 17 mines for which samples were submitted. The dust levels were determined from the five samples required to be submitted bimonthly.

8/ Ibid.

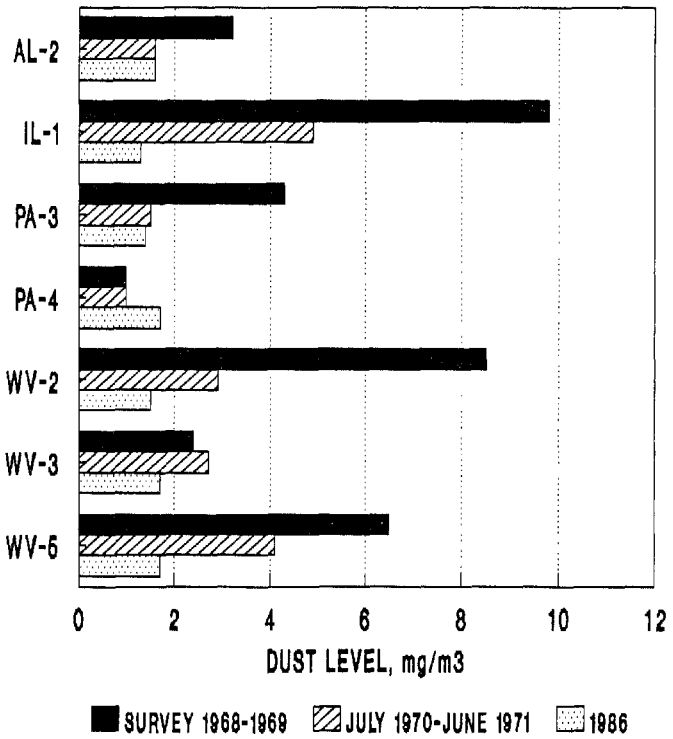

Figure 1 - Comparison of dust levels in selected mines active during 1986.

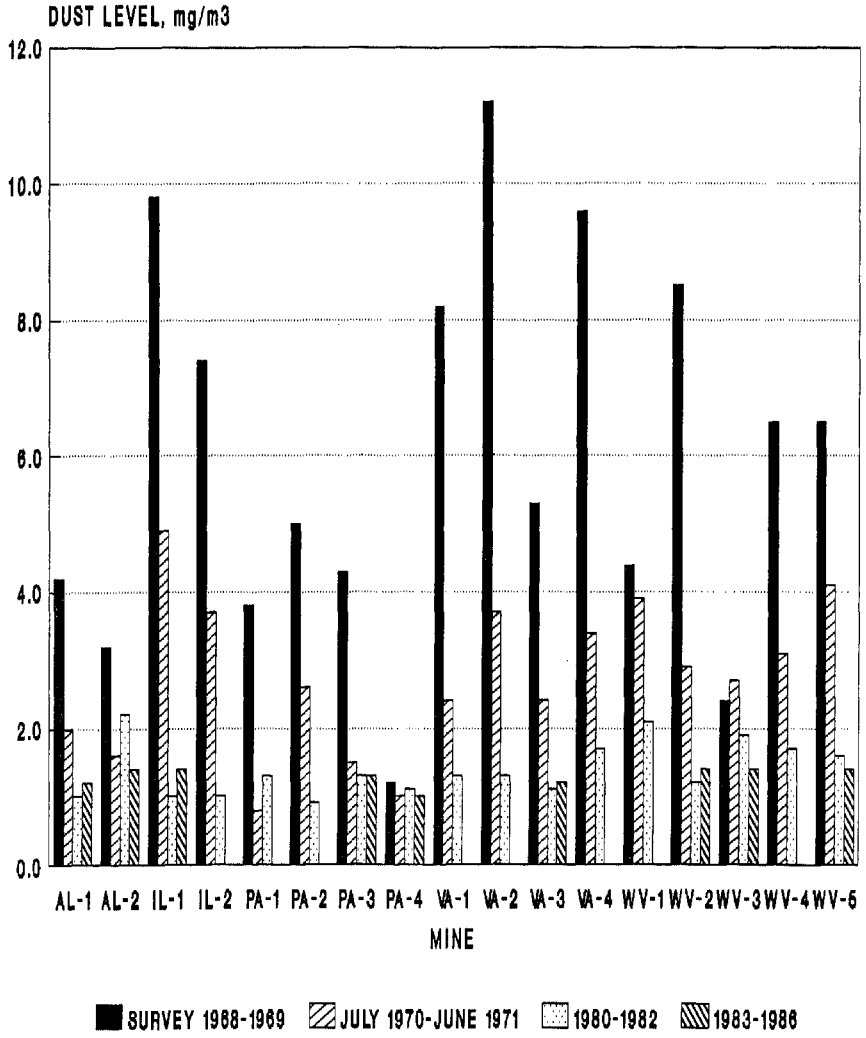

Figure 2 - Comparison of dust levels in selected mines active at anytime during 1980 - 1986.

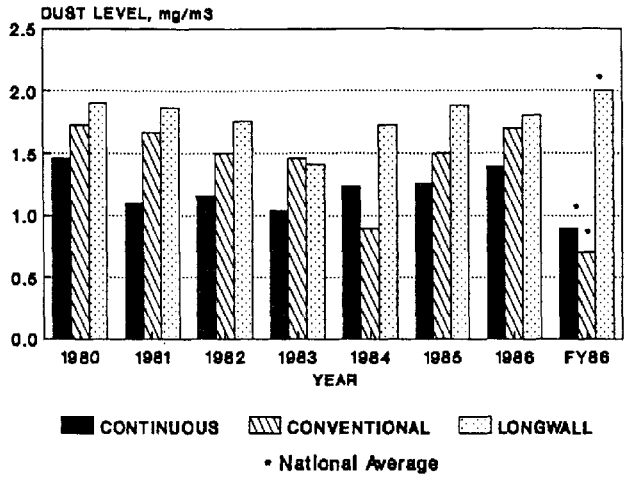

Figure 3 - A yearly comparison of dust levels for three types of mining in selected mines.

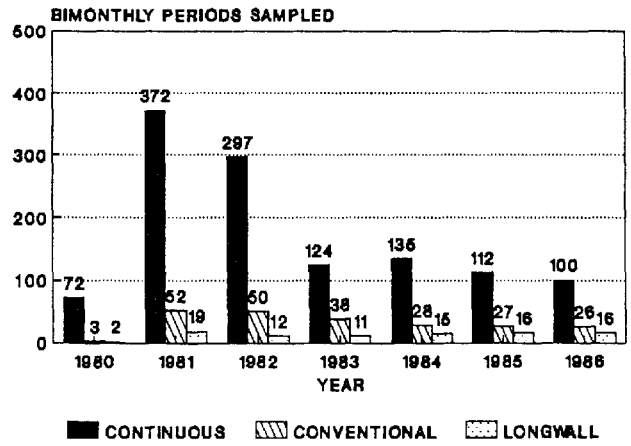

Figure 4 - Number of bimonthly period determinations made for three types of mining, by year, for selected mines.

Figure 4 shows the number of bimonthly period determinations made for all MMUs in the 17 mines for each type of mining for each year. Figure 5 shows the percentage of time these mechanized mining units were in a state of compliance with the dust standard. As the data in Figure 5 show, compliance for continuous mining operations has remained about 90 percent from 1980 to 1986 with a slight downward trend since 1983, whereas compliance for conventional mining operations has cycled both upward and downward between 65 and 95 percent. Compliance for longwall mining operations has also been cyclic with the percentage of time in compliance increasing from 50 percent in 1980 to 75 percent in 1986. Again, it should be noted that the number of conventional and longwall mining operations represented by these 17 mines is extremely small.

The average tons of coal produced per shift, for each MMU, was calculated from data reported with the operators' designated occupation dust samples on each MMU. Figures 6 through 8 show both the average tons of coal produced per shift and the average dust level for each year, 1980 through 1986, for continuous mining, conventional mining and longwall mining, respectively. Both conventional and continuous MMUs showed a small increase in production with time, possibly caused by the use of more efficient techniques of mining such as deep cut mining and the closing of inefficient mines due to poor economic conditions. A much greater increase in production was noted in operations employing longwall mining. The annual average dust level established for the respective types of mining does not appear to be related to production.

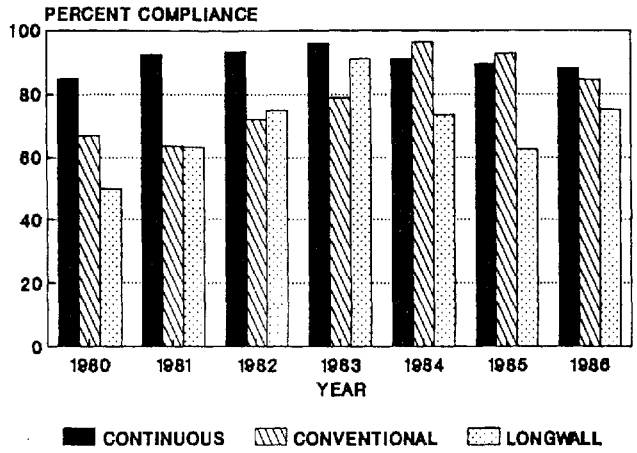

Figure 5 - Compliance with dust standard for three types of mining, by year, for selected mines.

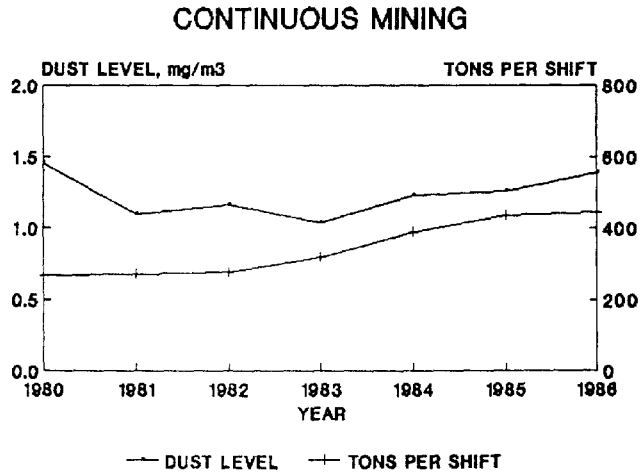

Figure 6 - Average dust level and tons per shift for continuous mining MMUs, by year, for selected mines.

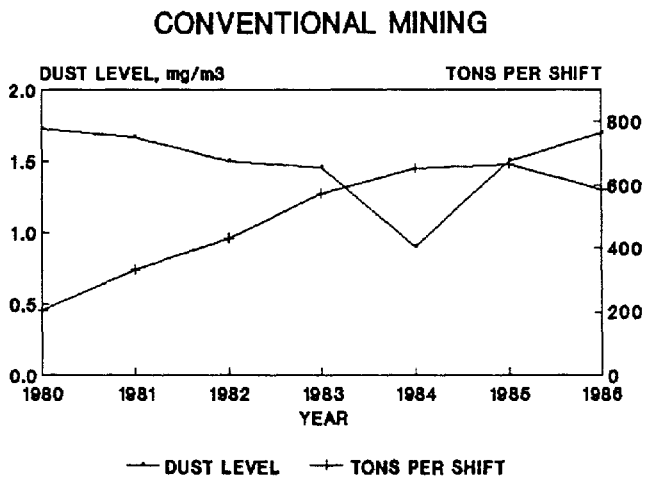

Figure 7 - Average dust level and tons per shift for conventional mining MMUs, by year, for selected mines.

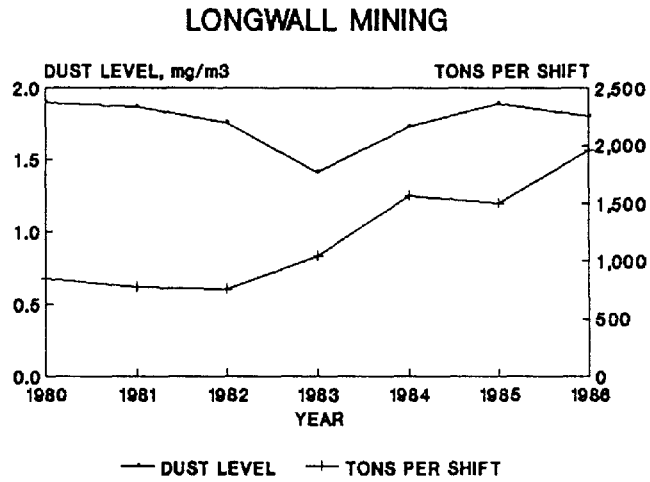

Figure 8 - Average dust level and tons per shift for longwall mining MMUs, by year, for selected mines.

SUMMARY

The regulations for dust sampling in coal mines were revised in 1980. A comparison of dust levels measured in 29 coal mines, prior to the 1969 Federal Coal Mine Health and Safety Act, was made with dust levels in these mines in subsequent years and most recently since the 1980 change in regulations. Most recent data could only be obtained in 17 of the 29 mines because 12 of the mines were no longer actively producing coal.

The data which are presented indicate that, in general, respirable dust exposures in these mines are currently being maintained at or below the 2.0 mg/m^3 respirable dust standard. The data from 1980 through 1982 continue to show that dust levels are significantly lower than levels reported in 1970 through 1971 and that there has been no substantial change in dust levels during the period 1980 to 1986.

A comparison of the average dust levels established from the 17 active mines and from all mines producing coal during Fiscal Year 1986 (October, 1985, through September, 1986) indicates that dust levels in these mines do not reflect the status of dust levels nationally, possibly due to the limited number of mines in the population studied.

The data from these mines also show that, on average, compliance with the respirable dust standard has been slightly decreasing since 1984 for conventional and continuous mining operations; however, approximately 90 percent were in compliance. Compliance was found to vary between 65 and 75 percent for longwall operations.

APPENDIX

Summary of Mine Operator Dust Data From 1980 Through 1986 For Selected Mines

MINE I: AL-1

MMU	OCC CODE[1]	BIMONTHLY PERIOD DUST LEVEL AVG	LOW	HIGH	STD DEV	TOTAL PERIODS	PERIODS OVER 2.0 MG/M^3	AVG TONS/ SHIFT
001-0	036	1.0	0.9	1.1	0.141	2	0	336
002-0	036	1.1	0.3	2.7	0.786	12	2	190
003-0	036	1.2	1.2	1.2	0.000	1	0	128
	038	0.3	0.2	0.4	0.141	2	0	129
004-0	036	0.8	0.2	1.4	0.373	14	0	310
005-0	038	0.9	0.4	1.4	0.343	10	0	252
005-1	043	2.9	2.8	3.0	0.141	2	2	284
006-0	038	0.7	0.4	1.1	0.224	9	0	198
007-0	038	1.0	0.5	1.7	0.442	12	0	271
008-0	036	1.0	0.2	2.3	0.746	8	1	238
009-0	038	0.9	0.4	2.2	0.515	10	1	266
010-0	036	0.8	0.4	1.3	0.283	11	0	226
012-0	036	1.3	0.9	1.8	0.636	2	0	218

[1] Occupation Codes:

036 - Continuous Miner Operator
038 - Cutting Machine Operator (Conventional)
041 - Jacksetter (Longwall)
042 - Loading Machine Operator (Conventional)
044 - Longwall Operator (Tailgate Side)
052 - Tailgate Operator (Longwall)
064 - Longwall Operator (Headgate Side)

MINE ID: AL-2

MMU	OCC CODE	BIMONTHLY PERIOD DUST LEVEL AVG	LOW	HIGH	STD DEV	TOTAL PERIODS	PERIODS OVER 2.0 MG/M^3	AVG TONS/ SHIFT
001-0	038	1.7	0.3	3.0	0.695	27	8	628
	043	1.5	1.4	1.7	0.141	4	0	588
002-0	038	1.4	0.8	2.4	0.502	10	1	645
	043	1.8	1.4	2.0	0.263	4	0	599
003-0	036	0.9	0.4	2.5	0.658	9	1	482
	038	1.6	0.8	2.8	0.679	13	4	578
004-0	038	1.6	0.8	2.1	0.563	5	2	549
	043	1.4	0.4	3.5	0.837	25	5	617
005-0	038	1.2	0.5	2.1	0.536	14	2	659
	043	1.9	1.5	2.7	0.532	4	1	584
006-0	038	1.4	0.3	2.3	0.480	23	2	638
	043	2.1	1.5	3.3	0.802	4	1	559
007-0	036	1.1	0.6	1.9	0.493	5	0	541
008-0	038	1.7	0.7	3.3	0.650	12	2	574
009-0	038	2.1	0.9	3.2	0.639	16	9	552

MINE ID: IL-1

MMU	OCC CODE	BIMONTHLY PERIOD DUST LEVEL AVG	LOW	HIGH	STD DEV	TOTAL PERIODS	PERIODS OVER 2.0 MG/M³	AVG TONS/ SHIFT
001-0	036	1.1	0.1	2.6	0.705	12	1	308
002-0	036	0.9	0.2	1.7	0.554	8	0	308
003-0	036	0.9	0.4	1.8	0.501	8	0	485
004-0	036	1.1	0.2	2.6	0.632	26	2	441
005-0	036	1.1	0.2	2.0	0.499	12	0	376
007-0	036	1.0	0.3	2.0	0.432	22	0	487
008-0	036	1.3	0.6	3.1	0.794	10	2	335
009-0	036	1.0	0.1	1.9	0.469	21	0	474
010-0	036	1.1	0.2	2.8	0.589	32	3	500
011-0	036	1.2	0.2	2.0	0.600	22	0	509
012-0	036	1.1	0.1	3.1	0.828	16	2	442
014-0	044	1.5	0.2	3.1	0.755	22	4	1055
015-0	036	1.2	0.5	1.8	0.395	13	0	408
016-0	044	1.6	0.9	2.7	0.535	12	2	1979
001-0	036	1.3	0.4	2.5	0.676	15	2	476
002-0	036	1.4	0.6	2.8	0.592	13	1	549
003-0	036	1.4	0.6	2.2	0.433	15	1	477
004-0	036	1.2	0.3	2.7	0.625	15	1	538
005-0	036	1.7	1.7	1.7	0.000	2	0	473
006-0	044	1.7	0.7	2.2	0.476	7	1	2310
007-0	036	1.9	1.2	3.0	0.945	3	1	600
008-0	036	1.7	1.0	2.2	0.482	6	1	588
009-0	044	2.1	1.6	2.7	0.431	7	4	1266

MINE ID: IL-2

MMU	OCC CODE	BIMONTHLY PERIOD DUST LEVEL AVG	LOW	HIGH	STD DEV	TOTAL PERIODS	PERIODS OVER 2.0 MG/M^3	AVG TONS/ SHIFT
001-0	036	1.3	0.2	2.0	0.768	5	0	169
002-0	036	1.1	0.4	1.7	0.507	5	0	299
003-0	036	1.2	1.0	1.4	0.283	2	0	417
004-0	036	0.7	0.2	1.4	0.403	7	0	381
005-0	036	1.1	0.5	2.1	0.539	9	1	314
006-0	036	0.6	0.2	1.1	0.276	11	0	413
007-0	036	0.7	0.2	1.7	0.465	12	0	474
008-0	036	1.0	0.3	2.0	0.500	11	0	328
009-0	036	1.1	0.5	1.6	0.551	3	0	325
010-0	036	1.0	0.4	1.5	0.327	11	0	451
011-0	036	1.2	0.8	1.8	0.385	8	0	290
012-0	036	1.6	1.5	1.7	0.100	3	0	336
013-0	036	1.4	0.7	1.9	0.454	6	0	274
014-0	036	1.6	0.7	2.8	0.747	6	2	300
015-0	036	1.1	0.7	2.0	0.445	7	0	341
016-0	036	1.1	0.3	2.0	0.626	10	0	344

MINE ID: PA-1

MMU	OCC CODE	BIMONTHLY PERIOD DUST LEVEL AVG	LOW	HIGH	STD DEV	TOTAL PERIODS	PERIODS OVER 2.0 MG/M^3	AVG TONS/ SHIFT
001-0	036	1.8	0.9	2.5	0.739	4	2	235
002-0	036	0.6	0.2	0.9	0.495	2	0	203
003-0	036	1.5	0.5	3.3	0.919	7	1	199
004-0	036	0.7	0.7	0.7	0.000	1	0	168
005-0	036	1.0	0.4	1.9	0.577	5	0	252
012-0	036	0.7	0.4	0.9	0.289	3	0	311
015-0	036	1.2	0.4	2.3	0.832	5	1	202
017-0	036	1.5	0.9	2.0	0.608	4	0	166
018-0	036	1.0	0.3	2.2	0.744	8	1	333
019-0	036	1.3	0.7	1.8	0.376	6	0	282

MINE ID: PA-2

MMU	OCC CODE	BIMONTHLY PERIOD DUST LEVEL AVG	LOW	HIGH	STD DEV	TOTAL PERIODS	PERIODS OVER 2.0 MG/M^3	AVG TONS/ SHIFT
020-0	036	1.1	1.1	1.1	0.000	1	0	156
021-0	036	0.7	0.5	0.9	0.160	7	0	198
022-0	036	0.9	0.3	1.7	0.434	7	0	196
023-0	036	1.0	0.4	1.9	0.483	7	0	202

MINE ID: PA-3

MMU	OCC CODE	BIMONTHLY PERIOD DUST LEVEL AVG	LOW	HIGH	STD DEV	TOTAL PERIODS	PERIODS OVER 2.0 MG/M^3	AVG TONS/ SHIFT
005-0	036	1.5	0.6	2.4	0.534	13	1	328
006-0	036	1.2	0.5	2.1	0.615	13	2	295
007-0	036	1.1	0.1	2.3	0.648	23	1	415
008-0	036	1.2	0.3	2.5	0.679	17	2	375
010-0	036	1.3	0.6	2.0	0.497	6	0	222
011-0	036	1.3	0.4	2.3	0.556	16	1	205

MINE ID: PA-4

MMU	OCC CODE	BIMONTHLY PERIOD DUST LEVEL AVG	LOW	HIGH	STD DEV	TOTAL PERIODS	PERIODS OVER 2.0 MG/M³	AVG TONS/ SHIFT
029-0	036	1.0	0.3	1.7	0.427	21	0	134
037-0	036	0.6	0.2	1.2	0.248	20	0	201
048-0	036	0.9	0.3	1.9	0.453	20	0	230
055-0	036	1.0	0.4	1.9	0.503	19	0	164
063-0	036	1.0	0.3	2.0	0.411	20	0	151
065-0	036	1.0	0.4	1.9	0.483	20	0	277
067-0	036	1.0	0.5	3.2	0.564	21	1	255
071-0	036	0.7	0.5	1.2	0.226	8	0	158
072-0	044	1.7	0.7	4.9	1.040	16	3	713
073-0	036	1.1	0.6	2.3	0.483	18	1	231
074-0	036	1.2	0.2	2.9	0.602	19	1	219
075-0	036	1.0	0.6	1.5	0.359	7	0	166
076-0	036	1.2	0.4	2.4	0.734	7	1	155
077-0	036	1.0	0.6	1.7	0.343	13	0	251
078-0	036	0.9	0.6	1.2	0.263	10	0	324
079-0	036	1.0	0.6	1.6	0.319	10	0	254
080-0	044	1.7	1.0	2.7	0.539	9	2	1755
080-1	064	1.4	1.4	1.4	0.000	1	0	1342
081-0	036	0.9	0.5	1.2	0.330	4	0	197
082-0	036	1.3	0.8	2.3	0.685	4	1	259
083-0	036	1.4	0.7	2.5	0.579	8	1	303

MINE ID: VA-1

MMU	OCC CODE	BIMONTHLY PERIOD DUST LEVEL AVG	LOW	HIGH	STD DEV	TOTAL PERIODS	PERIODS OVER 2.0 MG/M³	AVG TONS/ SHIFT
020-0	036	0.9	0.3	1.6	0.460	10	0	208
025-0	036	1.5	0.5	2.5	0.675	10	2	149
027-0	036	1.2	0.6	1.7	0.378	10	0	190
028-0	036	1.6	0.6	3.2	0.735	10	1	145

MINE ID: VA-2

MMU	OCC CODE	BIMONTHLY PERIOD DUST LEVEL AVG	LOW	HIGH	STD DEV	TOTAL PERIODS	PERIODS OVER 2.0 MG/M³	AVG TONS/ SHIFT
004-0	036	1.2	1.2	1.2	0.000	1	0	205
010-0	036	1.3	1.3	1.3	0.000	1	0	208

MINE ID: VA-3

MMU	OCC CODE	BIMONTHLY PERIOD DUST LEVEL AVG	LOW	HIGH	STD DEV	TOTAL PERIODS	PERIODS OVER 2.0 MG/M³	AVG TONS/ SHIFT
001-0	038	1.4	0.5	2.7	0.732	12	2	203
003-0	038	0.9	0.1	1.8	0.580	10	0	195

MINE ID: VA-4

MMU	OCC CODE	BIMONTHLY PERIOD DUST LEVEL AVG	LOW	HIGH	STD DEV	TOTAL PERIODS	PERIODS OVER 2.0 MG/M³	AVG TONS/ SHIFT
013-0	036	1.9	0.3	3.9	1.767	6	3	254
017-0	036	0.8	0.4	1.3	0.369	6	0	279

MINE ID: WV-1

MMU	OCC CODE	BIMONTHLY PERIOD DUST LEVEL AVG	LOW	HIGH	STD DEV	TOTAL PERIODS	PERIODS OVER 2.0 MG/M³	AVG TONS/ SHIFT
014-0	038	1.6	1.2	2.3	0.485	5	1	202
015-0	036	2.4	2.0	3.2	0.493	6	5	195

MINE ID: WV-2

MMU	OCC CODE	BIMONTHLY PERIOD DUST LEVEL AVG	LOW	HIGH	STD DEV	TOTAL PERIODS	PERIODS OVER 2.0 MG/M³	AVG TONS/ SHIFT
015-0	036	1.3	0.3	3.5	0.920	21	3	320
018-0	036	1.3	0.2	3.1	0.699	30	4	312
022-0	036	1.0	0.1	1.9	0.529	9	0	262
031-0	036	1.1	0.2	2.3	0.658	23	2	308
034-0	036	1.2	0.2	2.3	0.602	25	4	332
035-0	036	1.1	0.2	2.7	0.689	10	1	197
038-0	036	1.0	0.3	2.2	0.571	18	1	311
040-0	036	1.1	0.2	4.2	1.187	10	1	201
042-0	036	1.2	0.4	2.7	0.633	16	1	286

MINE ID: WV-3

MMU	OCC CODE	BIMONTHLY PERIOD DUST LEVEL AVG	LOW	HIGH	STD DEV	TOTAL PERIODS	PERIODS OVER 2.0 MG/M^3	AVG TONS/ SHIFT
001-0	036	1.3	0.9	2.3	0.668	4	1	134
002-0	036	1.2	0.6	1.7	0.421	5	0	180
010-0	036	0.9	0.4	1.5	0.513	5	0	346
012-0	036	1.3	0.2	2.9	0.774	11	2	408
013-0	036	1.9	1.9	1.9	0.000	1	0	371
014-0	036	1.4	0.5	2.5	0.677	6	1	477
038-0	041	2.1	2.1	2.1	0.000	1	1	778
	052	1.8	0.4	3.2	0.838	12	4	782
039-0	036	1.0	0.6	1.6	0.513	3	0	438
041-0	036	1.8	1.0	2.5	0.755	3	1	341
042-0	041	1.6	1.6	1.6	0.000	1	0	908
	052	3.0	2.8	3.3	0.263	4	4	1180
044-0	036	1.6	1.6	1.6	0.000	1	0	131
046-0	036	1.6	1.1	2.7	0.510	8	1	227
047-0	036	1.6	0.3	3.2	0.816	16	4	395
048-0	036	1.6	1.0	2.1	0.424	7	1	282

MINE ID: WV-4

MMU	OCC CODE	BIMONTHLY PERIOD DUST LEVEL AVG	LOW	HIGH	STD DEV	TOTAL PERIODS	PERIODS OVER 2.0 MG/M^3	AVG TONS/ SHIFT
046-0	036	1.3	0.6	2.5	0.586	7	1	152
049-0	036	2.2	0.9	3.5	0.909	6	3	170

MINE ID: WV-5

MMU	OCC CODE	BIMONTHLY PERIOD DUST LEVEL AVG	LOW	HIGH	STD DEV	TOTAL PERIODS	PERIODS OVER 2.0 MG/M^3	AVG TONS/ SHIFT
028-0	036	1.8	0.6	3.2	0.877	8	2	310
029-0	036	1.2	0.2	4.7	1.051	16	1	417
031-0	036	1.4	0.3	2.9	0.898	7	1	301
032-0	036	1.9	1.1	2.9	0.782	5	2	454
033-0	036	1.5	0.8	2.8	0.791	6	2	384