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STOCKPILING ILLINOIS COAL FOR COKE

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ABSTRACT

Illinois No. 6 Coal, stocked in Chicago during the summer and fall months of 1958, was coked at regular intervals in blends with medium-volatile and with mixtures of medium- and high-volatile eastern coals to determine what effects stockpiling might have on the cokes produced. The amount of Illinois No. 6 Coal in the blends ranged from 25 to 70 percent.

Test results showed no significant change in coke properties due to weathering of the Illinois coal over the six-month period. We have concluded that the No. 6 Coal from southern Illinois may be safely stockpiled throughout the summer period if it is to be coked in blends with "fluid" coals such as those used in these tests.

INTRODUCTION

In 1956 the Illinois State Geological Survey conducted extensive weathering tests on Illinois No. 5 and No. 6 Coals that were stockpiled at the Survey laboratory and coked at monthly intervals in blends with Pocahontas No. 3 Coal. Examination of the cokes produced throughout the testing period indicated that these Illinois coals could be stocked during the winter months with no effect on their coking properties, but should not be stocked for more than 30 days in warm summer weather (Jackman et al., 1957).

In the 1956 weathering tests, Pocahontas No. 3 Coal was used for blending, following the procedure used in commercial coke plants where Illinois coals were coked. It was recognized that the effect of oxidation during storage probably would be quite pronounced with this type of blend because both Illinois and Pocahontas coals have low fluidities, as measured by the Gieseler plastometer, and their blends often show lower fluidities than either of the component coals. Any appreciable oxidation of the Illinois coal would therefore reduce the fluidity of such a blend below the critical point required to produce satisfactory coke (Reed et al., 1952).

Physical properties of the cokes produced from the three Illinois coals studied showed that the No. 5 Coal was least affected by storage. However, as the No. 6 Coal has the greatest reserves of low sulfur coal, it probably is the most important in terms of future reserves of coking coal. The coal designated as 6B in the 1956 study probably most nearly represents the present reserves and therefore has been chosen for additional weathering studies, this time blended with other types of eastern coal currently being used or considered commercially. In this study the coal is designated simply as Illinois No. 6.

In the 1956 tests both the Illinois and Pocahontas coals were stocked during the testing periods, the Illinois coals in open 3-ton piles and the Pocahontas in a partially enclosed bin. We assumed initially that the Pocahontas coal would not oxidize sufficiently to affect the physical properties of the cokes. This assumption was checked in the summer of 1957 by a series of tests similar to those of 1956. For these tests the Pocahontas was stored under water to prevent oxidation and the Illinois coal was stockpiled as before. Results of the tests verified the original assumption and we felt assured that the progressive deterioration in coke during the summer months was due almost entirely to weathering of the Illinois coals.

A critical study of the weathering tests made it apparent that the production of unsatisfactory coke was related closely to reduction in fluidity of the coal blend being coked. It occurred to us that if Illinois coal were to be blended with coals of higher fluidity than the Pocahontas No. 3, the blend might retain sufficient fluidity to produce good coke even after the Illinois coal had started to weather.

We have shown in previous tests that Illinois coals can be blended satisfactorily with medium-volatile coals of 21 to 24 percent volatile matter and Gieseler fluidities ranging from 500 to 1000 or more dial divisions per minute. Such medium-volatile coals from a number of seams have been tested. The low-fluid Illinois coals and the high-fluid medium-volatile coals complement each other and produce strong, coherent cokes. We decided, therefore, to stock Illinois No. 6 Coal again during the summer months of 1958, and to test its coking properties periodically in blends with medium-volatile coal, and also with mixtures of both medium- and high-volatile eastern coals. We could thus determine whether or not Illinois coal could be stocked during the summer months when it was to be coked in such blends.

Acknowledgments

We wish to express our appreciation to the Inland Steel Company for making available a stockpile of Illinois coal during the summer period, and also for furnishing other coals for this study. We wish also to thank the coal operators in Illinois and West Virginia who furnished other coals used during the test.

PROCEDURE

Method of Stocking and Sampling Coals

The Illinois coals used in the previous series of weathering tests had been stocked near our laboratory in conical piles of about three tons each. Each month sufficient coal was removed to make the desired blends. In the present series of tests we used a 500-ton conical pile of 2-inch by $\frac{3}{4}$-inch Illinois No. 6 Coal stocked for us at the Inland Steel Company coke plant in June 1958. This pile was sampled periodically throughout the summer and fall months with a clamshell bucket that removed a six-ton bite, each time from a different location on the pile. A portion of each sample was brought to our laboratory for testing.

The blending coal of 22 percent volatile matter was taken from the Jewell Coal in Virginia and was stored under water to avoid any possible oxidation during the period of the tests. Two other eastern coals were used in blends, an Eagle Coal, which we stored in drums, and an Elkhorn Coal, obtained fresh for each test.

As the 500-ton pile of Illinois coal was stocked under actual plant storage conditions, we considered it more representative of commercial storage than our previous small weathering piles. We wished to determine, however, whether tests on coal from the large pile were comparable with the previous tests, so a 3-ton pile of the same Illinois coal was stocked at our laboratory and tests on

Table 1. - Average Analyses of Coals Tested

Coal	Moisture	Moisture-free basis			
		Volatile matter	Fixed carbon	Ash	Sulfur
Illinois No. 6	8.9	38.1	54.4	7.5	0.91
Elkhorn	3.8	39.2	56.9	3.9	1.02
Eagle	3.4	36.1	60.0	3.9	0.69
Medium-volatile	4.1	21.9	72.3	5.8	0.58

this coal were made concurrently with tests on coal from the larger pile. Average analyses of all coals used in this study are shown in table 1.

Blends Tested

Three different blends containing Illinois No. 6 Coal from the 500-ton pile were tested at approximately one-month intervals, from June 12 to December 15. This six-month period included practically all of the hot summer weather and extended into the first cold spell of late fall. All blends contained a relatively large percentage of medium-volatile coal, corresponding to the trend in commercial use. They were as follows:

1) 50% Illinois No. 6
   50% Medium-volatile

2) 25% Illinois No. 6
   25% Elkhorn
   50% Medium-volatile

3) 30% Illinois No. 6
   30% Eagle
   40% Medium-volatile

4) 70% Illinois No. 6
   30% Medium-volatile

Only two tests were made on the fourth blend, one with fresh coals and the other with Illinois coal that had been stocked for six months.

In addition to these tests the Illinois coal from the three-ton pile was coked at two-month intervals blended with 50 percent medium-volatile coal and the results were compared with those from tests of the same blend containing coal from the larger pile. The average analyses of each of the coal blends studied, and of the cokes made from them, are shown in table 2.

Methods of Test

All coking tests were conducted under identical operating conditions in the 17-inch movable-wall pilot coke oven at our laboratory (Jackman et al., 1955). After the coals were sampled they were mixed in the desired proportions and pulverized in the hammer mill to an average of about 84 percent minus 1/8-inch. Each blend was further mixed and then charged to the pilot oven and carbonized in $16\frac{1}{2}$ hours. The cokes as pushed from the oven averaged 1780°F at the center point and had an average volatile-matter content of about 1.2 percent.

Table 2. - Average Analyses of Coal Blends and Cokes

	Moisture	Moisture-free basis: Volatile matter	Fixed carbon	Ash	Sulfur
		50% Illinois No. 6 50% Medium-volatile			
Coal Blend	6.5	30.0	63.4	6.6	0.74
Coke		1.3	89.9	8.8	0.64
		25% Illinois No. 6 25% Elkhorn 50% Medium-volatile			
Coal Blend	5.2	30.3	64.0	5.7	0.77
Coke		1.2	91.2	7.6	0.66
		30% Illinois No. 6 30% Eagle 40% Medium-volatile			
Coal Blend	5.4	31.0	63.3	5.7	0.71
Coke		1.1	91.4	7.5	0.60
		70% Illinois No. 6 30% Medium-volatile			
Coal Blend	7.5	33.2	59.8	7.0	0.81
Coke		1.5	88.8	9.7	0.68

The cokes were water-quenched and heat-dried to less than 1 percent moisture. They were then dropped three times from the shatter box to simulate the breakage occurring during commercial handling in hot car, wharf, and screening systems. Cokes were then sized, sampled for analysis and apparent gravity, and the shatter and tumbler tests made. Dry coke yields were computed and corrected to 3 percent moisture to conform with usual commercial plant yields.

RESULTS OF TESTS

Coking tests made in the six-month period during which the Illinois coal was stockpiled showed that there were no consistent changes in structure

Table 3. - Plasticity of Illinois Coal

Days since stockpiling	Gieseler fluidity: Max dial div per min	Gieseler fluidity: Plastic range (°C)	Free-swelling index
	500-Ton Pile		
5	41	73	4
28	13	67	$4\frac{1}{2}$
49	10	71	5
92	13	78	$5\frac{1}{2}$
139	7	81	4
176	8	67	$5\frac{1}{2}$
	3-Ton Pile		
9	41	82	$5\frac{1}{2}$
66	7	65	$4\frac{1}{2}$
114	4	72	$4\frac{1}{2}$
183	3	59	4

or physical properties of the cokes made from any of the blends studied. Although the fluidity of the blends decreased owing to the expected weathering of the Illinois coal, it remained sufficiently high to prevent any significant increase in coke breeze or tendency toward pebbly coke structure. Plasticity data are shown in tables 3 and 4, respectively.

The properties of the cokes and coal blends, including shatter and tumbler indices, apparent gravity, yield of coke breeze, and the expansion pressure exerted on oven walls are shown in figures 1 through 6. All of the figures indicate that, although there are minor variations in coke or coal properties, there are no significant trends indicating changes due to weathering. Each of the blends studied is considered briefly.

Illinois No. 6 from the 500-Ton Storage Pile

Blend - 50% Illinois No. 6
50% Medium-volatile

The blend of 50 percent Illinois and 50 percent medium-volatile coals produced cokes throughout the entire testing period that had essentially the same physical properties. Tumbler and shatter indices and coke sizing were within experimental sampling and operating error. Stability ranged from 60.4 to 62.6 and hardness from 68.8 to 70.2. The yield of coke breeze and the apparent gravity were identical at the start and end of the series. Expansion pressure increased a maximum of 0.2 pound per square inch during the testing period. From all appearances any one of the cokes would have served equally well for blast furnace fuel. (For results of coking tests, see table A, appendix.)

Blend - 25% Illinois No. 6
25% Elkhorn
50% Medium-volatile

The blend containing 25 percent Illinois, 25 percent Elkhorn, and 50 per-

Table 4. - Plasticity of Coal Blends

	Gieseler fluidity		
Days since stockpiling Illinois coal	Max dial div per min	Plastic range (°C)	Free-swelling index
500-Ton Pile			
50% Illinois No. 6, 50% Medium-volatile			
5	79	89	8
28	28	82	7½
49	16	85	7
92	44	86	8
139	41	92	7½
176	21	84	7½
25% Illinois No. 6, 25% Elkhorn, 50% Medium-volatile			
7	316	88	7½
33	104	89	8
54	304	86	7½
96	204	92	8
141	105	89	7½
180	164	92	8
30% Illinois No. 6, 30% Eagle, 40% Medium-volatile			
12	652	87	9
35	204	85	8½
56	620	91	8
98	292	89	9
145	232	87	8
182	280	90	8
70% Illinois No. 6, 30% Medium-volatile			
Fresh	21	76	7
186	11	67	6½
3-Ton Pile			
50% Illinois No. 6, 50% Medium-volatile			
9	65	87	7½
66	23	83	7½
114	39	85	7
183	46	81	7½

cent medium-volatile coals showed that stockpiling the Illinois coal had little effect on the coke properties. There was a slight over-all increase of less than 0.2 pound per square inch in expansion pressure and a gradual increase in coke breeze from 1.9 to 2.5 percent. Tumbler stability ranged from 60.5 to 62.4 and the hardness from 68.9 to 71.0. The yield of minus 1-inch coke ranged from 3.3 to 3.8 percent. These variations in physical properties probably lie within experimental error, considering that different samples of Illinois and Elkhorn coals were obtained for each of the six coking tests. All test results are shown in the appendix, table B.

Blend - 30% Illinois No. 6
30% Eagle
40% Medium-volatile

The blend made up of 30 percent Illinois, 30 percent Eagle, and only 40 percent medium-volatile coals followed the same trends set by the other two blends. Expansion pressure again increased between 0.1 and 0.2 pound per square inch, but the physical properties of the coke remained essentially the same throughout the series. Tumbler and shatter indices actually increased slightly, although not significantly. The yield of small coke (minus 1-inch size) ranged from 3.5 to 3.9 percent. These results are shown in the appendix, table C.

Blend - 70% Illinois No. 6
30% Medium-volatile

The Illinois coal from the 500-ton pile was not coked while fresh in the blend containing 70 percent Illinois and 30 percent medium-volatile coals. This blend was tested only after the coal had remained in stock for six months. For comparison with fresh coal performance, a similar blend was tested using a different sample of freshly mined Illinois coal.

Test results shown in table D of the appendix indicate that coke with essentially the same properties was obtained from both the fresh coal and the six-month-old sample. We actually obtained 0.4 percent greater yield of breeze from the older coal, and the stability index dropped from 58 to 56. The hardness index increased from 68 to 70, however, and the expansion pressure was unchanged.

On the basis of these results we believe that the Illinois coal after six months in storage will produce coke of good quality when blended with 30 percent medium-volatile coal of the type tested.

Illinois No. 6 from the Three-Ton Storage Pile

Blend - 50% Illinois No. 6
50% Medium-volatile

The three-ton storage pile of Illinois coal was sampled at bimonthly intervals and coked in a fifty-fifty blend with medium-volatile coal for comparison with the Illinois coal from the larger 500-ton storage pile. Here again, the cokes produced throughout the six-month period showed no significant variation in physical properties due to weathering. Test results are given in table E of the appendix.

Comparison of tables A and E discloses no significant difference between the cokes made from samples taken from the large and small piles of coal. Moreover, coals from both piles showed a similar drop in Gieseler fluidity due to weathering. We believe therefore that results from our current tests on coal from the 500-ton pile are comparable with results from our previous weathering tests on blends of Pocahontas No. 3 and Illinois coal that had been stocked in small piles.

SUMMARY AND CONCLUSIONS

Weathering tests have been made on Illinois No. 6 Coal (2-inch x $\frac{3}{4}$-inch washed) stockpiled through the summer months in a 500-ton pile in the Chicago area. Samples taken at approximately one-month intervals were blended with a medium-volatile coal and with mixtures of medium- and high-volatile coals and coked in the pilot oven. Illinois coal was used as 25, 30, 50, and 70 percent of the total coal in four different blends. The eastern coals used are highly fluid in the plastic state and when blended with the Illinois coal of lower fluidity produce strong coke of metallurgical quality.

The stockpile of Illinois coal showed no visible evidence of deterioration after a six-month period. The pile was tested at intervals for internal heating and an increase of 11°F was noted. Plasticity tests showed that some weathering occurred, and the Gieseler fluidity decreased from an initial 41 dial divisions per minute to 8 dial divisions after six months.

Coke produced in the pilot oven showed no significant change in physical properties throughout the six-month period. Coke produced in commercial ovens from coal stocked for three to four months likewise showed no effect of storage.

A 3-ton pile of Illinois No. 6 Coal was stocked for a similar six-month period at our laboratory. Coal in this pile showed a similar reduction in fluidity to that in the 500-ton pile, and coke produced from its blend with medium-volatile coal also showed no change throughout the period.

We have concluded, therefore, that the weathering results on coal from the 500-ton pile are comparable with those on coal from the 3-ton pile, and may therefore be compared with results of our 1956 and 1957 weathering tests. It follows that Illinois No. 6 Coal, which we had shown previously should not be stocked longer than 30 days in summer weather when it was to be coked in a blend with Pocahontas No. 3 Coal, may be stocked throughout the entire summer period when it is to be blended with the more fluid medium-volatile coals or with a mixture of medium- and high-volatile eastern coals.

REFERENCES

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Jackman, H. W., Helfinstine, R. J., Eissler, R. L., and Reed, F. H., 1955, Coke oven to measure expansion pressure - modified Illinois oven: Illinois Geol. Survey Reprint 1955-E.

Reed, F. H., Jackman, H. W., Rees, O. W., and Henline, P. W., 1952, Some observations on the blending of coals for metallurgical coke: Blast Furnace and Steel Plant, v. 40, no. 3, p. 305-311, 344: Illinois Geol. Survey Circ. 178.

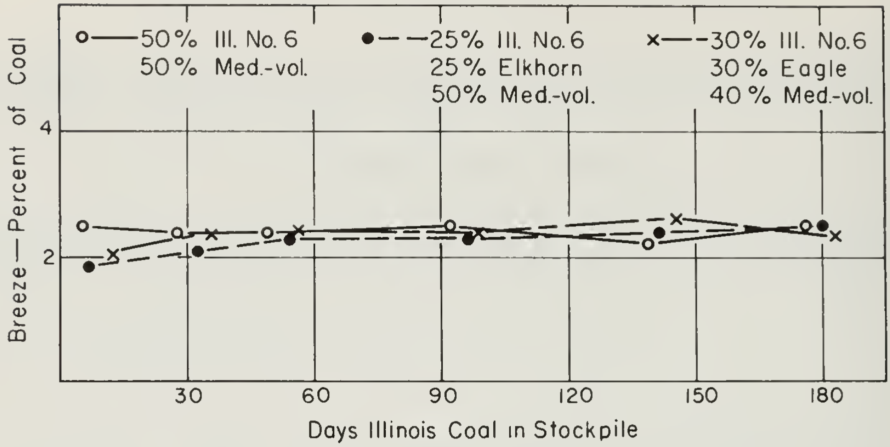

Fig. 1. - Yield of breeze.

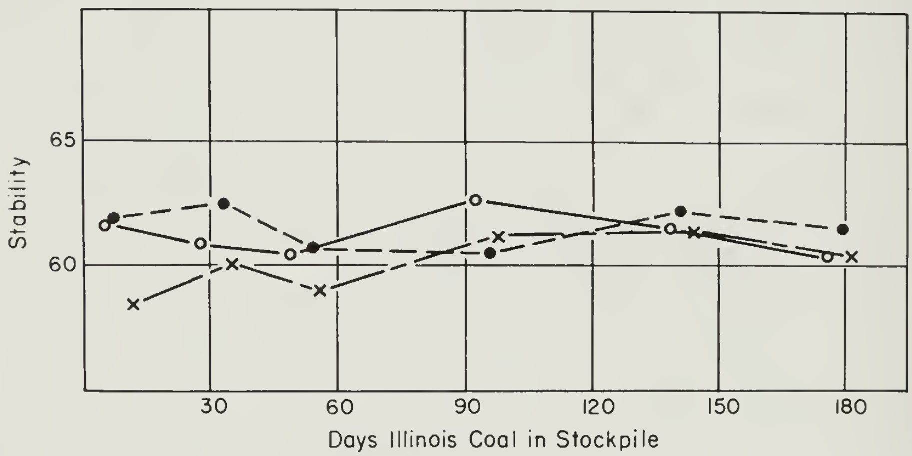

Fig. 2. - Tumbler stability (key shown on figure 1).

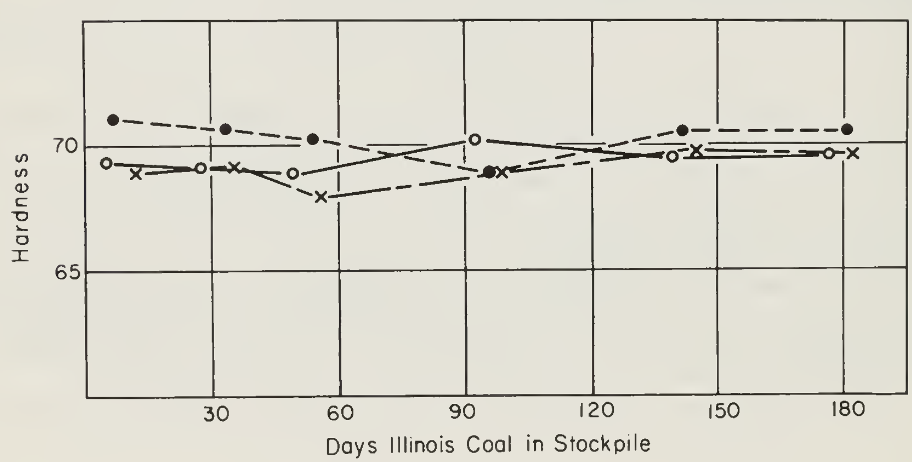

Fig. 3. - Tumbler hardness (key shown on figure 1).

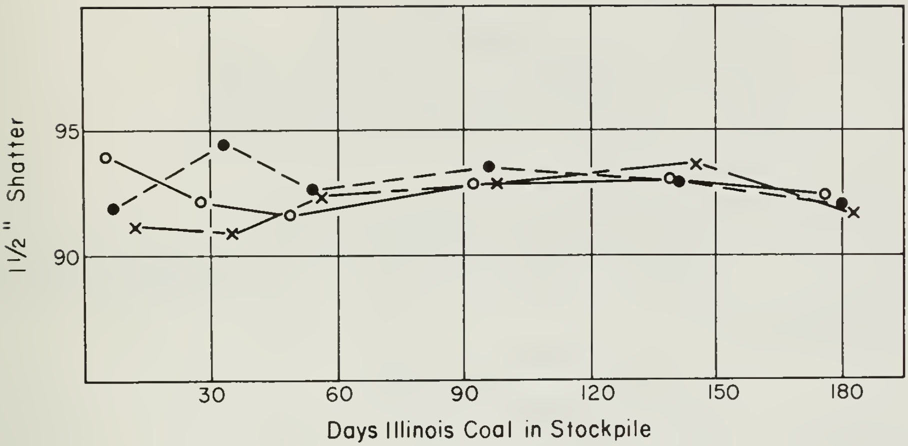

Fig. 4. - Shatter test (key shown on figure 1).

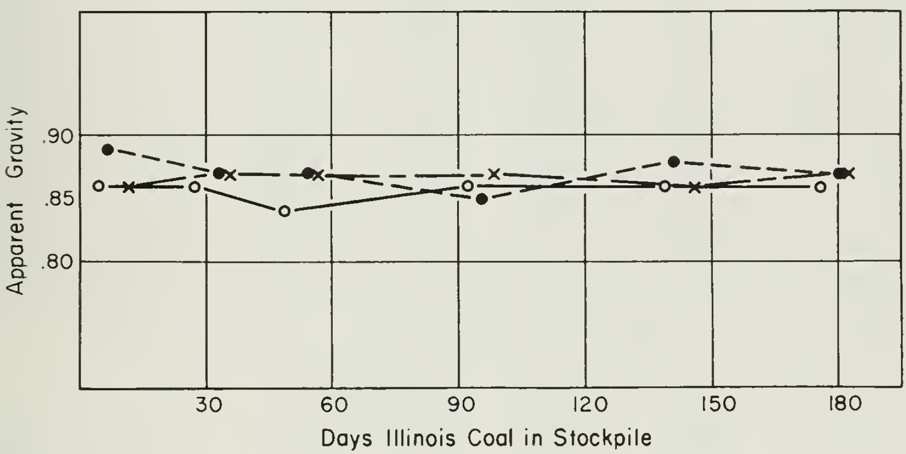

Fig. 5. - Apparent gravity (key shown on figure 1).

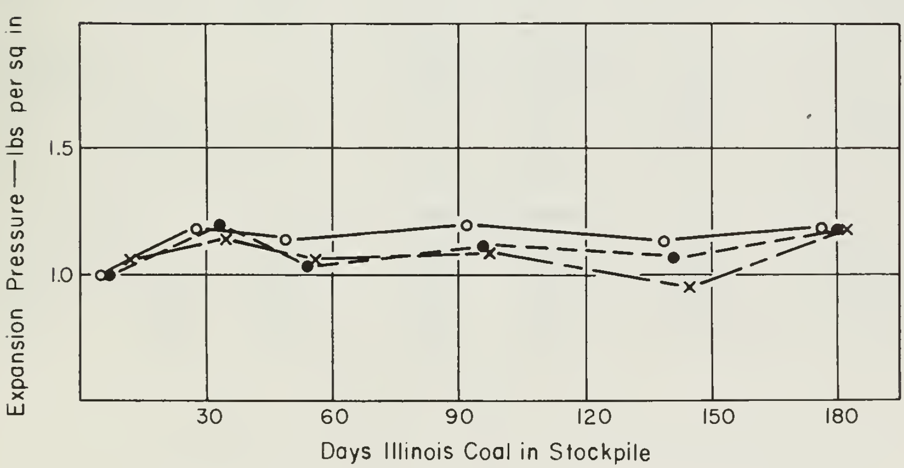

Fig. 6. - Expansion pressure (key shown on figure 1).

APPENDIX
COKING TESTS RESULTS

Table A. - Coking Test Results for Coal Blend of
50% Illinois No. 6 (from 500-ton stockpile)
50% Medium-volatile

	Run 356E	Run 363E	Run 369E	Run 373E	Run 387E	Run 398E
Date of test	6-17-58	7-10-58	7-31-58	9-12-58	10-29-58	12-5-58
Days since stockpiling Illinois coal	5	28	49	92	139	176
Coke Physical Properties						
Tumbler test						
Stability	61.6	60.8	60.4	62.6	61.5	60.4
Hardness	69.3	69.1	68.8	70.2	69.5	69.6
Shatter test						
+2"	80.9	80.1	85.4	79.4	79.0	78.8
+1½"	93.9	92.2	91.6	92.8	93.0	92.4
Coke sizing						
+4"	3.9	5.7	4.3	3.6	5.8	5.3
4" x 3"	20.8	20.0	22.5	18.2	19.1	21.0
3" x 2"	47.7	47.9	49.6	49.9	47.2	45.1
2" x 1"	22.2	20.8	18.0	22.8	23.1	23.5
1" x ½"	2.0	2.3	2.3	2.1	1.6	1.7
-½"	3.4	3.3	3.3	3.4	3.2	3.4
Average size (in)	2.45	2.49	2.52	2.41	2.48	2.47
Apparent gravity	0.86	0.86	0.84	0.86	0.86	0.86
Coke Yields (% of coal) (Coke at 3% M; coal as received)						
Total	72.6	73.2	71.8	73.1	72.1	72.1
Furnace (+1")	68.7	69.1	67.7	69.1	68.7	68.4
Nut (1" x ½")	1.4	1.7	1.7	1.5	1.2	1.2
Breeze (-½")	2.5	2.4	2.4	2.5	2.2	2.5
Expansion Pressure						
Lbs per sq in	1.00	1.18	1.14	1.20	1.14	1.19
Bulk density (lbs per cu ft)	53.9	55.0	53.5	54.2	55.1	55.2
Operating Data						
Pulverization (% - 1/8")	83.6	84.5	82.1	84.9	83.5	82.0
Flue temp (°F)	1950	1950	1950	1950	1950	1950
Coking time (hr : min)	16:30	16:30	16:30	16:30	16:30	16:30

Table B. - Coking Test Results for Coal Blend of
25% Illinois No. 6 (from 500-ton stockpile)
25% Elkhorn
50% Medium-volatile

	Run 357E	Run 364E	Run 370E	Run 374E	Run 388E	Run 399E
Date of test	6-19-58	7-15-58	8-5-58	9-16-58	10-31-58	12-9-58
Days since stockpiling Illinois coal	7	33	54	96	141	180
Coke Physical Properties						
Tumbler test						
Stability	61.8	62.4	60.7	60.5	62.2	61.5
Hardness	71.0	70.6	70.2	68.9	70.5	70.6
Shatter test						
+2"	76.4	80.4	81.5	79.6	79.1	77.0
+1½"	91.9	94.4	92.6	93.5	92.9	92.1
Coke sizing						
+4"	3.5	3.0	3.9	3.3	2.9	5.3
4" x 3"	19.1	17.9	18.0	16.9	20.1	16.1
3" x 2"	48.2	50.8	51.3	51.5	46.1	45.8
2" x 1"	24.3	23.7	22.0	23.2	25.9	27.6
1" x ½"	2.2	1.7	1.8	2.0	1.8	1.8
-½"	2.7	2.9	3.0	3.1	3.2	3.4
Average size (in)	2.42	2.41	2.44	2.40	2.40	2.38
Apparent gravity	0.89	0.87	0.87	0.85	0.88	0.87
Coke Yields (% of coal) (Coke at 3% M; coal as received)						
Total	73.3	73.7	73.7	73.2	73.8	73.1
Furnace (+1")	69.8	70.4	70.1	69.5	70.1	69.3
Nut (1" x ½")	1.6	1.2	1.3	1.4	1.3	1.3
Breeze (-½")	1.9	2.1	2.3	2.3	2.4	2.5
Expansion Pressure						
Lbs per sq in	1.0	1.2	1.03	1.12	1.07	1.18
Bulk density (lbs per cu ft)	55.3	55.3	54.5	53.9	55.7	55.6
Operating Data						
Pulverization (% - 1/8")	83.7	86.0	81.5	-	82.6	82.6
Flue temp (°F)	1950	1950	1950	1950	1950	1950
Coking time (hr : min)	16:30	16:30	16:30	16:30	16:30	16:30

Table C. - Coking Test Results for Coal Blend of
30% Illinois No. 6 (from 500-ton stockpile)
30% Eagle
40% Medium-volatile

	Run 358E	Run 365E	Run 371E	Run 375E	Run 389E	Run 400E
Date of test	6-24-58	7-17-58	8-7-58	9-18-58	11-4-58	12-11-58
Days since stockpiling Illinois coal	12	35	56	98	145	182
Coke Physical Properties						
Tumbler test						
Stability	58.5	60.0	59.0	61.2	61.4	60.5
Hardness	68.9	69.2	67.9	68.9	69.8	69.7
Shatter test						
+2"	75.2	82.0	81.0	78.5	82.0	76.4
+1½"	91.2	90.9	92.3	92.8	93.6	91.7
Coke sizing						
+4"	2.5	3.5	3.3	3.5	4.7	2.5
4" x 3"	16.5	18.4	15.9	15.4	20.9	18.3
3" x 2"	51.5	48.0	53.5	51.0	46.9	48.1
2" x 1"	24.6	24.8	21.8	24.8	22.0	25.8
1" x ½"	2.0	2.1	2.4	1.9	2.1	2.1
-½"	2.9	3.2	3.1	3.4	3.6	3.2
Average size (in)	2.37	2.40	2.40	2.37	2.46	2.37
Apparent gravity	0.86	0.87	0.87	0.87	0.86	0.87
Coke Yields (% of coal) (Coke at 3% M; coal as received)						
Total	72.6	73.0	73.8	72.5	72.8	71.9
Furnace (+1")	69.1	69.1	69.5	68.8	68.7	68.0
Nut (1" x ½")	1.4	1.5	1.7	1.3	1.5	1.5
Breeze (-½")	2.1	2.4	2.4	2.4	2.6	2.4
Expansion Pressure						
Lbs per sq in	1.06	1.15	1.06	1.10	0.96	1.19
Bulk density (lbs per cu ft)	53.1	55.2	53.5	53.2	54.5	55.5
Operating Data						
Pulverization (% - 1/8")	84.2	81.9	80.3	81.9	80.5	82.1
Flue temp (°F)	1950	1950	1950	1950	1950	1950
Coking time (hr : min)	16:30	16:30	16:30	16:30	16:30	16:30

Table D. - Coking Test Results for Coal Blend of
70% Illinois No. 6 (from 500-ton stockpile)
30% Medium-volatile

	Run 411E	Run 401E
Date of test	1-27-59	12-15-58
Days since stockpiling Illinois coal	Fresh	186
Coke Physical Properties		
Tumbler test		
Stability	58.6	56.4
Hardness	67.9	70.2
Shatter test		
+2"	78.4	75.6
+1½"	92.8	92.4
Coke sizing		
+4"	3.0	3.3
4" x 3"	16.0	19.9
3" x 2"	48.8	46.4
2" x 1"	26.0	23.4
1" x ½"	2.3	2.4
-½"	3.9	4.6
Average size (in)	2.33	2.39
Apparent gravity	0.79	0.82
Coke Yields (% of coal) (Coke at 3% M; coal as received)		
Total	69.9	69.0
Furnace (+1")	65.5	64.2
Nut (1" x ½")	1.6	1.6
Breeze (-½")	2.8	3.2
Expansion Pressure		
Lbs per sq in	1.20	1.23
Bulk density (lbs per cu ft)	53.5	54.8
Operating Data		
Pulverization (% - 1/8")	81.5	81.4
Flue temp (°F)	1950	1950
Coking time (hr : min)	16:30	16:30

Table E. - Coking Test Results for Coal Blend of
50% Illinois No. 6 (from 3-ton stockpile)
50% Medium-volatile

	Run 352E	Run 367E	Run 372E	Run 393E
Date of test	5-28-58	7-24-58	9-10-58	11-18-58
Days since stockpiling Illinois coal	9	66	114	183
Coke Physical Properties				
Tumbler test				
Stability	62.5	63.5	63.1	62.0
Hardness	70.2	70.8	70.5	69.0
Shatter test				
+2"	79.9	81.7	81.5	80.0
+1½"	93.0	93.7	93.1	94.2
Coke sizing				
+4"	3.7	3.1	3.6	3.5
4" x 3"	25.3	16.6	19.7	21.8
3" x 2"	47.2	51.9	50.4	47.7
2" x 1"	19.0	23.1	21.4	21.7
1" x ½"	1.8	1.7	1.7	1.7
-½"	3.0	3.6	3.2	3.6
Average size (in)	2.54	2.39	2.43	2.46
Apparent gravity	0.85	0.83	0.84	0.84
Coke Yields (% of coal) (Coke at 3% M; coal as received)				
Total	72.3	72.7	72.6	71.9
Furnace (+1")	68.9	68.9	69.1	68.1
Nut (1" x ½")	1.3	1.2	1.2	1.2
Breeze (-½")	2.1	2.6	2.3	2.6
Expansion Pressure				
Lbs per sq in	0.99	1.30	1.11	1.26
Bulk density (lbs per cu ft)	54.3	54.1	54.2	53.5
Operating Data				
Pulverization (% - 1/8")	84.4	88.4	86.5	83.6
Flue temp (°F)	1950	1950	1950	1950
Coking time (hr : min)	16:30	16:30	16:30	16:30

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