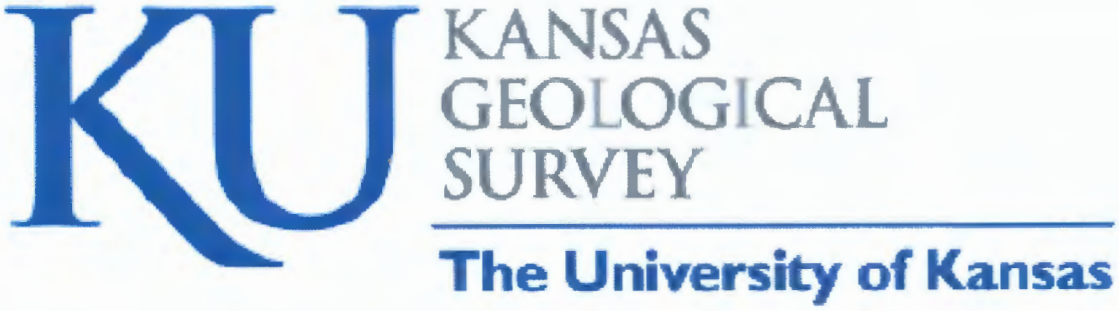
ANALYSIS OF KANSAS CITY, MARMATON, AND CHEROKEE GROUP CUTTINGS SAMPLES FOR GAS CONTENT -- PETROL OIL & GAS #24-1 RAHMEIER; S2 NW NW SW sec. 24-T.20S.-R.16E., COFFEY COUNTY, KANSAS

By
K. David Newell and W. Matthew Brown



Kansas Geological Survey
The University of Kansas
1930 Constant Avenue
Lawrence, KS 66047-3726

August 3, 2004
Kansas Geological Survey Open-File Report 2006-38

SUMMARY

Seven cuttings samples from the Pennsylvanian Kansas City, Marmaton, and Cherokee Groups were collected from the Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-T.20S.-R.16E., in Coffey Co., KS. The samples calculate as having the following gas contents:

- Stark Shale at 804.0' to 807.5' depth (20 scf/ton)
- Hushpuckney Shale at 835.0' to 838.0' depth (20 scf/ton)
- Anna Shale at 1101.0' to 1102.5' depth (11 scf/ton)
- Little Osage Shale at 1158.0' to 1161.0' depth (5 scf/ton)
- Mulky coal at 1182.0' to 1184.0' depth[1] (28 scf/ton)
- Bevier coal at 1250.0' to 1252.0' depth[1] (24 scf/ton)
- Croweburg coal at 1262.0' to 1264.0' depth[1] (16 scf/ton)

Attempts at obtaining cores of the Tebo coal at 1344' depth and the Riverton coal at 1521' depth were not successful because the coal was apparently milled to fine-grained material and washed from the core barrel during the coring process, thus no samples of these coals were recovered. Sampling of Tebo coal was attempted when the hole was being reamed after the coring, but no adequate amount of coal was obtained:

- Tebo coal at 1344.0' to 1345.5' depth[2] (-- scf/ton)[2]

Fragments of carbonaceous underclay and coal were obtained from the Riverton core, but no significant amount of gas was desorbed from this material:

- Riverton coal fragments/underclay at 1521.0 to 1522.5' depth (9 scf/ton)

[1]assuming accompanying dark shales in sample desorb 3 scf/ton
[2]no results due to negligible amount of coal in sample

BACKGROUND

The Petrol Oil & Gas #24-1 Rahmeier well, S2 NW NW SW, 24-20S-16E in Coffey Co., KS, was selected for cuttings desorption tests in association with an on-going coalbed gas research project at the Kansas Geological Survey. The samples were gathered January 18, 19, and 20, 2004, by K.D. Newell and W.M. Brown of the Kansas Geological Survey. Cuttings samples were obtained during normal drilling of the well, with brief cessation of drilling before zones of interest (i.e., coals and dark shales in the Pennsylvanian Kansas City, Marmaton, and Cherokee Groups) were penetrated. The well was drilled using a mud rotary rig ("Rig #9") owned by Coconut Drilling.

Lag times for samples to reach the surface (important for assessing lost gas) were determined by periodic carbide tests.

Eight cuttings samples were collected:

- Stark Shale at 804.0' to 807.5' depth (101 grams dry wt.)
- Hushpuckney Shale at 835.0' to 838.0' depth (205 grams dry wt.)

- Anna Shale at 1101.0' to 1102.5' depth (432 grams dry wt.)
- Little Osage Shale at 1158.0' to 1161.0' depth (1275 grams dry wt.)
- Mulky coal at 1182.0' to 1184.0' depth (319 grams dry wt.)
- Bevier coal at 1250.0' to 1252.0' depth (335 grams dry wt.)
- Croweburg coal at 1262.0' to 1264.0' depth (678 grams dry wt.)
- Tebo coal at 1344.0' to 1345.5' depth (797 grams dry wt.)

One core-fragment sample from the was also collected:

- Riverton coal fragments/underclay at 1521.0' to 1522.5' depth (493 grams dry wt.)

The cuttings were placed in kitchen strainers after they were shoveled from a settling box in the mud stream situated immediately before the mud emptied into the mud pit. After catching the cuttings samples, the samples were then washed in water while in the kitchen strainers to rid them of as much drilling mud as possible. The cuttings were then placed in desorption canisters.

The Tebo coal cuttings sample was also obtained from this settling box, but its sampling took place during the reaming of the hole after coring. The coring for this coal was unsuccessful because the coal was likely milled into fine-grained material that washed out of the core barrel during coring. Similarly, most of the Riverton coal was also likely milled and lost during coring. Some small core chunks of coaly material were placed in a canister in an attempt to salvage some information about the Riverton interval, but upon examination after decanistering, much of this material was considered underclay.

Five cuttings samples (Stark Shale, Hushpuckney Shale, Anna Shale, Mulky coal, Bevier coal) were place in "Stoeckinger" desorption canisters, which average 38 cubic inches internal volume (620 cm^3). The Little Osage Shale sample was placed in a canister having 106 cubic inches internal volume (1740 cm^3) (i.e., "Brady" canister). The Croweburg and Tebo samples were placed in canisters having 182 cubic inches internal volume (2985 cm^3) (i.e., "Maggy" canisters). The Riverton coal sample was placed in a canister having 153 cubic inches internal volume (2985 cm^3). With this latter sample, a concrete plug was also placed in the desorption canister to decrease the volume of free space within the canister. The volume of this plug was 77 cubic inches (1262 cm^3).

The"Stoeckinger" desorption canisters were obtained from Bill Stoeckinger, consulting geologist to Petrol Oil and Gas. The "Maggy" and "Brady" canisters were made in-house at the Kansas Geological Survey. The canister used for the Riverton sample was obtained from SSD, Inc., in Grand Junction, CO.

Temperature baths for the desorption canisters were on site, with temperature kept at approximately 75 °F for the Croweburg and shallower samples. The Tebo and Riverton samples were placed in an 80 °F temperature bath. The canistered samples were transported to the laboratory at the Kansas Geological Survey in Lawrence, KS, on January 20, 2004, and desorption measurements were continued at approximately the

same temperature. Desorption measurements were periodically made until the canisters produced negligible gas with daily testing for at least two successive days.

DESORPTION MEASUREMENTS

The equipment and method for measuring desorption gas is that prescribed by McLennan and others (1995). The volumetric displacement apparatus is a set of connected dispensing burettes, one of which measures the gas evolved from the desorption canister. The other burette compensates for the compression that occurs when the desorbed gas displaces the water in the measuring burette. This compensation is performed by adjusting the cylinders so that their water levels are identical, then figuring the amount of gas that evolved by reading the difference in water level using the volumetric scale on the side of the burette.

The desorbed gas that collected in the desorption canisters was periodically released into the volumetric displacement apparatus and measured as a function of time, temperature, and atmospheric pressure.

The time and atmospheric pressure were measured in the field using a portable weather station (model BA928) marketed by Oregon Scientific (Tualatin, OR). The atmospheric pressure was displayed in millibars on this instrument, however, this measurement was not the actual barometric pressure, but rather an altitude-compensated barometric pressure automatically converted to a sea-level-equivalent pressure. To translate this measurement to actual atmospheric pressure, a regression correlation was determined over several weeks by comparing readings from the Oregon Scientific instrument to that from a pressure transducer in the Petrophysics Laboratory in the Kansas Geological Survey in Lawrence, KS (Figure 1). The regression equation shown graphically in Figure 1 was entered into a spreadsheet and was used to automatically convert the millibar measurement to barometric pressure in pounds per square inch (psi).

A spreadsheet program written by K.D. Newell (Kansas Geological Survey) was used to convert all gas volumes at standard temperature and pressure. Conversion of gas volumes to standard temperature and pressure was by application of the perfect-gas equation, obtainable from basic college chemistry texts:

$$n = PV/RT$$

where n is moles of gas, T is degrees Kelvin (i.e., absolute temperature), V is in liters, and R is the universal gas constant, which has a numerical value depending on the units in which it is measured (for example, in the metric system R = 0.0820 liter atmosphere per degree mole). The number of moles of gas (i.e., the value n) is constant in a volumetric conversion, therefore the conversion equation, derived from the ideal gas equation, is:

$$(P_{stp}V_{stp})/(RT_{stp}) = (P_{rig}V_{rig})/(RT_{rig})$$

Customarily, standard temperature and pressure for gas volumetric measurements in the oil industry are 60 °F and 14.7 psi (see Dake, 1978, p. 13), therefore P_{stp}, V_{stp}, and T_{stp}, respectively, are pressure, volume, and temperature at standard temperature and pressure, where standard temperature is degrees Rankine (°R = 460 + °F). P_{rig}, V_{rig}, and T_{rig}, respectively, are ambient pressure, volume and temperature measurements taken at the rig site or in the desorption laboratory.

The universal gas constant R drops out as this equation is simplified and the determination of V_{stp} becomes:

$$V_{stp} = (T_{stp}/T_{rig})\,(P_{rig}/P_{stp})\,V_{rig}$$

The conversion calculations in the spreadsheet were carried out in the English metric system, the customary measure system used in American coal and oil industry. V is therefore converted to cubic feet; P is psia; T is °R. The desorbed gas was summed over the time period for which the coal samples evolved all of their gas.

Lost gas (i.e., the gas lost from the sample from the time it was drilled, brought to the surface, to the time it was canistered) was determined using the direct method (Kissel and others, 1975; also see McLennan and others, 1995, p. 6.1-6.14) in which the cumulative gas evolved is plotted against the square root of elapsed time. Time zero is assumed to be the moment that the rock is cut and its cuttings circulated off bottom. Characteristically, the cumulative gas evolved from the sample, when plotted against the square root of time, is linear for a short time period after the sample reaches ambient surface pressure conditions, therefore lost gas is determined by a line projected back to time zero. The period of linearity generally is about an hour for cuttings samples.

LITHOLOGIC ANALYSIS

Upon removal from the canisters, the cuttings were washed of drilling mud, and dried in air for several days. After drying, the cuttings were weighed and then dry sieved into 5 size fractions: >0.0930", >0.0661", >0.0460", >0.0331", and <0.0331". For large sample sizes, the cuttings were run through a sample splitter and a lesser portion (approximately 75 grams) were sieved and weighed, and the derived size-fraction ratios were applied to the entire sample.

The size fractions were then inspected and sorted by hand under a dissecting microscope. Three major lithologic categories were differentiated: coal, dark shales (generally Munsell rock colors N3 [dark gray], N2 [grayish black], and N1 [black] on dry surface), and lighter-colored lithologies and/or dark and light-colored carbonates. The lighter-colored lithologies are considered to be incapable of generating significant amounts of gas. After sorting, and for every size class, each of these three lithologic categories was weighed and the proportion of coal dark shale and light-colored lithologies were determined for the entire cuttings sample based on the weight percentages.

DATA PRESENTATION

Data and analyses accompanying this report are presented in the following order: 1) data tables for the desorption analyses, 2) lost-gas graphs, 3) "lithologic component sensitivity analyses" showing the interdependence of gas evolved from dark shale versus coal in each cuttings sample, 4) a summary component analysis for all samples showing relative reliability of the data from all the samples, and 5) a desorption graph for all the samples.

Data Tables of the Desorption Analyses (Table 1)
These are the basic data used for lost-gas analysis and determination of total gas desorbed from the cuttings samples. Basic temperature, volume, and barometric measurements are listed at left. Farther to the right, these are converted to standard temperature, pressure, and volumes. The volumes are cumulatively summed, and converted to scf/ton based on the total weight of coal *and* dark shale in the sample. At the right of the table, the time of the measurements are listed and converted to hours (and square root of hours) since the sample was drilled.

Lost-Gas Graphs (Figures 2-10)
Gas lost prior to the canistering of the sample was estimated by extrapolation of the first few data points after the sample was canistered. The linear characteristic of the initial desorption measurements is usually lost within the first hour after the cuttings leave the bottom of the hole, thus data for cuttings are presented in the lost-gas graphs for only up to one hour after cuttings were off bottom. Lost-gas for the Riverton coal fragments/underclay was posted for a 9-hour period after the core was pulled off bottom. The lost-gas volumes derived from these graphs are incorporated in the data tables described above.

"Lithologic Component Sensitivity Analyses" (Figures 11-18)
Collection of pure lithologies from relatively thin-bedded strata is rather difficult using cuttings. Mixed lithologies are more the norm rather than the exception. Some of this mixing is due to cavings from strata farther up hole. The mixing may also be due to collection of two or more successively drilled lithologies in the kitchen sieve at the exit line, or differential lifting of relatively less-dense coal compared to other lithologies, all of which are more dense than coal.

The total gas evolved from the sample is due to gas being desorbed from both the coal and dark shale. Both lithologies are capable of generating gas, albeit the coal will be richer in gas than the dark-colored shale. Even though dark-colored shale is less rich in sorbed gas than coal, if a sample has a large proportion of dark, organic-rich shale and only a minor amount of coal, the total volume of gas evolved from the dark-shale component may be considerable. The lighter-colored lithologies are considered to be incapable of generating significant amounts of gas.

The total amount of gas evolved from a cuttings sample can be expressed by the following equation:

$$\text{Total gas } (cm^3) = [\text{weight}_{coal} \text{ (grams) X gas content}_{coal} (cm^3/\text{gram})] + [\text{weight}_{\text{dark shale}} \text{ (grams) X gas content}_{\text{dark shale}} (cm^3/\text{gram})]$$

A unique solution for *gas content*$_{coal}$ in this equation is not possible because *gas content*$_{dark\ shale}$ is not known exactly. An answer can only be expressed as a linear solution to the above equation. The richer in gas the dark shales are, the poorer in gas the admixed coal has to be, and vice versa. If there is little dark shale in a sample, a relatively well constrained answer for *gas content*$_{coal}$ can be obtained. Conversely, if considerable dark shale is in a sample, the gas content of a coal will be hard to precisely determine.

The lithologic-component-sensitivity-analysis diagram therefore expresses the bivariant nature inherent in the determination of gas content in mixed cuttings. The gas content of dark shales in Kansas can vary greatly. Proprietary desorption analyses of dark shales in cores from southeastern Kansas have registered as much as 50 scf/ton, but can be as low as 2-4 scf/ton.

A value of 3 scf/ton for average dark shale is based on the assay of the gas content of cores of dark shales in wells in southeastern Kansas. However, high-gamma-ray shales (such as the Excello Shale), also colloquially known as "hot shales", typically have more organic matter and associated gas content than dark shales displaying no excessive gamma-ray level. Determination of gas content for a coal associated with a "hot" shale therefore carries more uncertainty than if the coal were associated with a shale without a high gamma-ray value.

In general, the assumed shale gas content does not have to be very much greater than 10 scf/ton before the associated coal starts to have a gas content less than that of the dark shale. In all the lithologic-component-sensitivity-analysis diagrams, a “break-even” point is therefore noted where the gas content of the coal is equal to that of the dark shale. This “break-even” point corresponds to the minimum gas content assignable to the coal and maximum gas content assignable to the dark shale. It can also be thought of the scf/ton gas content of the cuttings sample minus the weight of any of the lighter-colored lithologies, which are assumed to have no inherent gas content. Conversely though, to assume that all the gas evolved from a cuttings sample is derived solely from the coal would result in an erroneously high gas content for the coal.

Summary Component Analysis for all Cuttings Samples (Figure 19)
This diagram is a summary of the individual “lithologic component sensitivity analyses” for each sample, all set at a common scale. The steeper the angle of the line for a sample, the more uncertainty is attached to the results (i.e., *gas content*$_{coal}$) for that sample. If the coal content is miniscule (i.e., < approximately 5%), the results are a better reflection of the *gas content*$_{dark\ shale}$.

Desorption Graph (Figure 20)
This is a desorption graph (gas content per weight vs. square root of time) for all the samples. The rate at which gas is evolved from the samples is thus comparable at a common scale.

ASHING and DENSITY EXPERIMENTS

Simple ashing of the samples was carried out in a muffle furnace at the Kansas Geological Survey in which the samples were first weighed and then subjected to 110 °C until their weight stabilized. This first firing approximates moisture content. A second firing at 750 °C for three to four days essentially ashed the sample. Two crucibles of sample were utilized for both the 110 °C and 750 °C firings. Each crucible was filled with approximately 1.5 grams of pulverized coal (i.e., < 0.0460" sieve size). Results were accepted if the difference in weight loss for each sample was less than 2%.

unit	*depth*	*moisture*	*ash*	*moisture-free ash*
Stark Shale	804'	1.17%	77.75%	78.66%
Hushpuckney Shale	835'	0.72%	73.93%	74.46%
Anna Shale	1101'	3.42%	70.22%	72.70%
Little Osage Shale	1158'	0.93%	72.51%	73.19%
Excello Shale	1182'	1.82%	66.94%	68.18%
Mulky coal	1182'	0.78%	7.84%	7.90%
Bevier coal	1250'	0.79%	9.77%	9.84%
Croweburg coal	1162'	0.72%	7.83%	7.89%
Riverton underclay	1521'	1.17%	14.40%	14.57%

Using the equation from McLennan and others (1995):

$G_c = G_{pc} (1-a_d)$

where:
G_c = gas content, scf/ton
G_{pc} = "pure coal", gas content, scf/ton
a_d = dry ash content, weight fraction

the gas content of the samples converts to:

unit	*depth*	*moisture-free ash*	G_c	G_{pc}
Stark Shale	804'	78.66%	20.1 scf/ton	94.2 scf/ton
Hushpuckney Shale	835'	74.46%	20.4 scf/ton	79.9 scf/ton
Anna Shale	1101'	72.70%	10.8 scf/ton	39.6 scf/ton
Little Osage Shale	1158'	73.19%	4.6 scf/ton	17.2 scf/ton
Excello Shale	1182'	68.18%	3 (?) scf/ton	9.4 (?) scf/ton
Mulky coal	1182'	7.90%	27.6 scf/ton	30.0 scf/ton

Bevier coal	1250'	9.84%	23.8 scf/ton	26.4 scf/ton
Croweburg coal	1162'	7.89%	16.8 scf/ton	17.8 scf/ton
Riverton underclay	1521'	14.57%	9.2 scf/ton	10.7 scf/ton

Coal samples were also tested for their density. Cuttings samples (4 to 5 grams) were weighed and then placed in water in a 10-cc graduated cylinder to determine the volume of the sample. The Riverton coal/underclay samples were weighed and immersed in water in a beaker filled to its brim. The displaced water was spilled from the beaker and subsequently weighed. The volume of the sample is thus easily converted to volume using 1 gram/cc for the density of the water. The following density measurements were calculated:

unit	*depth*	*density and uncertainty*
Stark Shale	804'	2.08 g/cc ± 0.07
Hushpuckney Shale	835'	2.11 g/cc ± 0.07
Anna Shale	1101'	2.11 g/cc ± 0.07
Little Osage Shale	1158'	2.12 g/cc ± 0.07
Excello Shale	1182'	2.01 g/cc ± 0.07
Mulky coal	1182'	1.68 g/cc ± 0.07
Bevier coal	1250'	1.29 g/cc ± 0.07
Croweburg coal	1162'	1.31 g/cc ± 0.07
Riverton underclay	1521'	1.69 g/cc ± 0.05

RESULTS and DISCUSSION

According to the summary diagram for the sensitivity analyses (Figure 19), the Mulky, Bevier, and Croweburg coals all have nearly identically constrained (in which the resultant coal gas content varies almost identically with shale gas content). The rest of the samples are shales, and thus there is no variation the gas content of coal vs. shale in these samples.

Estimates for gas content for the three coal samples, assuming the admixed dark shale in the samples desorb 3 scf/ton, are presented on their sensitivity diagrams. Air rigs typically produce cuttings samples having only about 10% coal, or less, but more coal in the sample (60% - 75%) is obtainable with a mud rig.

The Riverton sample registered a poor gas content due to its poor sample quality. True Riverton coal was not recovered from the core, thus this zone was not adequately tested for its gas content.

REFERENCES

Dake, L.P., 1978, Fundamentals of Reservoir Engineering, Elsevier Scientific Publishing, New York, NY, 443 p.

Kissel, F.N., McCulloch, C.M., and Elder, C.H., 1975, The direct method of determining methane content of coals for ventilation design: U.S. Bureau of Mines, Report of Investigations, RI7767.

McLennan, J.D., Schafer, P.S., and Pratt, T.J., 1995, A guide to determining coalbed gas content: Gas Research Institute, Chicago, IL, Reference No. GRI-94/0396, 180 p.

FIGURES and TABLES

Correlation of Field Barometer to KGS Petrophysics Lab Barometer

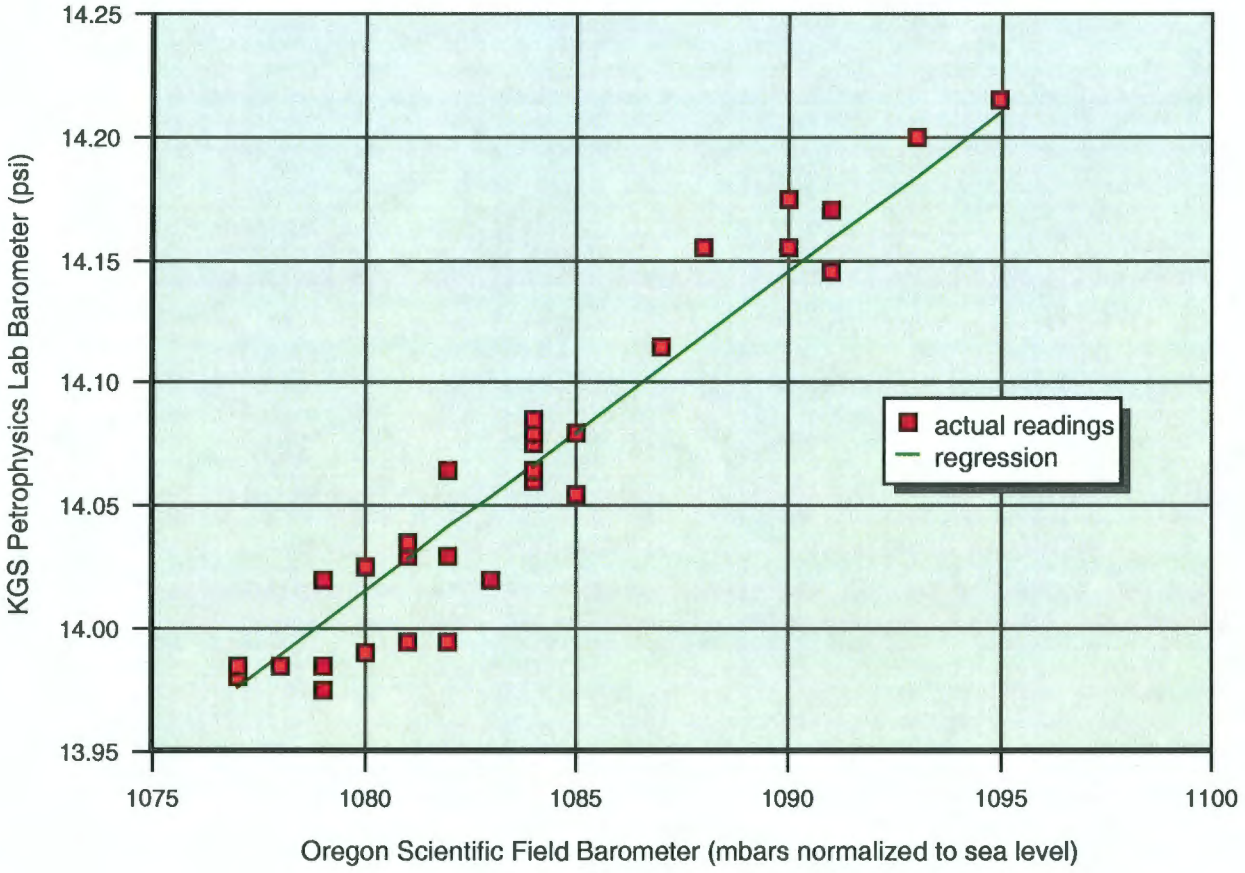


FIGURE 1.

TABLE 1 -- Desorption measurements for Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-20S-16E, Coffey Co., KS

SAMPLE: 804.0'-807.5' (Stark Shale) cuttings in canister Stoeckinger 6

	lbs.	grams
dry sample weight:	0.197	89.49

est. lost gas (cc) = 11

TIME OF:	off bottom	at surface	in canister
	1/18/04 11:35	1/18/04 11:42	1/18/04 11:45

elapsed time (off bottom to canistering): 10.0 minutes; 0.167 hours; 0.408248290 SQRT (hrs)

RIG/LAB MEASUREMENTS			CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi)					CUMULATIVE VOLUMES (@STP)		SCF/TON	SCF/TON		TIME SINCE			
measured cc	measured T (F)	measured P	cubic ft	absolute T (F)	psia	cubic ft (@STP)	cc (@STP)	cubic ft	cc	without lost gas	with lost gas	TIME OF MEASURE	off bottom	at surface	in canister	SQRT hrs. (since off bottom)
19	77	1078	0.0007	537	13.992	0.000618445	17.51	0.000618445	17.51	6.27	10.21	1/18/04 12:44	1:09:00	1:02:00	0:59:00	1.072380529
6	77	1078	0.0003	537	13.992	0.000260398	7.37	0.000878843	24.89	8.91	12.85	1/18/04 14:09	2:34:00	2:27:00	2:24:00	1.602081979
0	74	1080	0	534	14.018	0	0.00	0.000878843	24.89	8.91	12.85	1/18/04 17:42	6:07:00	6:00:00	5:57:00	2.473189574
5	75	1081	0.0002	535	14.031	0.000163812	4.64	0.001042655	29.52	10.57	14.51	1/18/04 20:21	8:46:00	8:39:00	8:36:00	2.960655732
7	77	1082	0.0002	537	14.044	0.000228694	6.48	0.001271349	36.00	12.89	16.83	1/18/04 23:09	11:34:00	11:27:00	11:24:00	3.400980251
0	75	1082	0	535	14.044	0	0.00	0.001271349	36.00	12.89	16.83	1/19/04 2:29	14:54:00	14:47:00	14:44:00	3.860051813
1	76	1083	4E-05	536	14.057	3.27617E-05	0.93	0.001304111	36.93	13.22	17.16	1/19/04 7:46	20:11:00	20:04:00	20:01:00	4.492586488
3	78	1082	0.0001	536	14.044	9.76294E-05	2.77	0.00140194	39.70	14.21	18.15	1/19/04 12:41	25:06:00	24:59:00	24:56:00	5.00999002
6	79	1081	0.0002	539	14.031	0.000195115	5.53	0.001597055	45.22	16.19	20.13	1/19/04 15:21	27:46:00	27:39:00	27:36:00	5.269408569
-8	75	1081	-0.0003	535	14.031	-0.000262099	-7.42	0.001334956	37.80	13.53	17.47	1/19/04 22:39	35:04:00	34:57:00	34:54:00	5.921711464
1	75	1082	4E-05	535	14.044	3.27927E-05	0.93	0.001367749	38.73	13.67	17.80	1/20/04 10:55	47:20:00	47:13:00	47:10:00	6.87992248
-4	75	1089	-0.0001	535	14.135	-0.000132019	-3.74	0.00123573	34.99	12.53	16.47	1/21/04 10:19	70:44:00	70:37:00	70:34:00	8.410311132
-5	75	1095	-0.0002	535	14.213	-0.000165933	-4.70	0.001069797	30.29	10.85	14.78	1/22/04 11:46	96:11:00	96:04:00	96:01:00	9.807310199
0	75	1077	0	535	13.979	0	0.00	0.001069797	30.29	10.85	14.78	1/23/04 12:38	121:03:00	120:56:00	120:53:00	11.00227249

DECANISTERED 1/23/2004; sample dried 6 days in air

SAMPLE: 835.0'-838.0' (Hushpuckney Shale) cuttings in canister Stoeckinger 7

	lbs.	grams
dry sample weight:	0.715	324.10

est. lost gas (cc) = 42

TIME OF:	off bottom	at surface	in canister
	1/18/04 12:47	1/18/04 12:56	1/18/04 12:59

elapsed time (off bottom to canistering): 11.5 minutes; 0.192 hours; 0.437797518 SQRT (hrs)

RIG/LAB MEASUREMENTS			CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi)					CUMULATIVE VOLUMES (@STP)		SCF/TON	SCF/TON		TIME SINCE			
measured cc	measured T (F)	measured P	cubic ft	absolute T (F)	psia	cubic ft (@STP)	cc (@STP)	cubic ft	cc	without lost gas	with lost gas	TIME OF MEASURE	off bottom	at surface	in canister	SQRT hrs. (since off bottom)
1	77	1079	4E-05	537	14.005	3.25799E-05	0.92	3.25799E-05	0.92	0.09	4.24	1/18/04 13:04	0:16:45	0:08:15	0:05:15	0.52836225
0	77	1079	0	537	14.005	0	0.00	3.25799E-05	0.92	0.09	4.24	1/18/04 13:09	0:22:15	0:13:45	0:10:45	0.608960864
0	77	1079	0	537	14.005	0	0.00	3.25799E-05	0.92	0.09	4.24	1/18/04 13:14	0:27:00	0:18:30	0:15:30	0.670820393
0	77	1079	0	537	14.005	0	0.00	3.25799E-05	0.92	0.09	4.24	1/18/04 13:16	0:29:00	0:20:30	0:17:30	0.695221787
12	78	1078	0.0004	538	13.992	0.000389871	11.04	0.000422451	11.96	1.18	5.33	1/18/04 13:30	0:43:15	0:34:45	0:31:45	0.849019042
2	78	1078	7E-05	538	13.992	6.49785E-05	1.84	0.000487429	13.80	1.36	5.52	1/18/04 13:32	0:45:00	0:36:30	0:33:30	0.866025404
2	78	1078	7E-05	538	13.992	6.49785E-05	1.84	0.000552408	15.64	1.55	5.70	1/18/04 13:34	0:46:30	0:38:00	0:35:00	0.880340843
0	78	1078	0	538	13.992	0	0.00	0.000552408	15.64	1.55	5.70	1/18/04 13:35	0:47:45	0:39:15	0:36:15	0.892094913
1	78	1078	4E-05	538	13.992	3.24893E-05	0.92	0.000584897	16.56	1.64	5.79	1/18/04 13:36	0:48:45	0:40:15	0:37:15	0.901387819
1	78	1078	4E-05	538	13.992	3.24893E-05	0.92	0.000617386	17.48	1.73	5.88	1/18/04 13:37	0:49:45	0:41:15	0:38:15	0.910585892
4	78	1078	0.0001	538	13.992	0.000129957	3.68	0.000747343	21.16	2.09	6.24	1/18/04 13:40	0:52:45	0:44:15	0:41:15	0.937638879
1	78	1078	4E-05	538	13.992	3.24893E-05	0.92	0.000779833	22.08	2.18	6.33	1/18/04 13:42	0:54:45	0:46:15	0:43:15	0.955248659
2	78	1078	7E-05	538	13.992	6.49785E-05	1.84	0.000844811	23.92	2.36	6.52	1/18/04 13:43	0:56:15	0:47:45	0:44:45	0.968245837
2	78	1078	7E-05	538	13.992	6.49785E-05	1.84	0.00090979	25.76	2.55	6.70	1/18/04 13:46	0:59:00	0:50:30	0:47:30	0.991631652
1	78	1078	4E-05	538	13.992	3.24893E-05	0.92	0.000942279	26.68	2.64	6.79	1/18/04 13:47	1:00:15	0:51:45	0:48:45	1.002081168
1	78	1078	4E-05	538	13.992	3.24893E-05	0.92	0.000974768	27.60	2.73	6.88	1/18/04 13:48	1:01:00	0:52:30	0:49:30	1.008298897
1	78	1078	4E-05	538	13.992	3.24893E-05	0.92	0.001007257	28.52	2.82	6.97	1/18/04 13:49	1:02:15	0:53:45	0:50:45	1.018577439
1	78	1078	4E-05	538	13.992	3.24893E-05	0.92	0.001039747	29.44	2.91	7.06	1/18/04 13:50	1:03:15	0:54:45	0:51:45	1.026726189
1	78	1078	4E-05	538	13.992	3.24893E-05	0.92	0.001072236	30.36	3.00	7.15	1/18/04 13:52	1:04:45	0:56:15	0:53:15	1.03882947
2	78	1078	7E-05	538	13.992	6.49785E-05	1.84	0.001137214	32.20	3.18	7.33	1/18/04 13:53	1:06:15	0:57:45	0:54:45	1.050793351
1	78	1078	4E-05	538	13.992	3.24893E-05	0.92	0.001169704	33.12	3.27	7.43	1/18/04 13:55	1:07:45	0:59:15	0:56:15	1.062622542
1	78	1078	4E-05	538	13.992	3.24893E-05	0.92	0.001202193	34.04	3.37	7.52	1/18/04 13:58	1:09:15	1:00:45	0:57:45	1.074321491
2	78	1078	7E-05	538	13.992	6.49785E-05	1.84	0.001267171	35.88	3.55	7.70	1/18/04 13:59	1:11:45	1:03:15	1:00:15	1.093541647
3	78	1078	0.0001	538	13.992	9.74678E-05	2.76	0.001364639	38.64	3.82	7.97	1/18/04 14:02	1:14:30	1:06:00	1:03:00	1.114300977
2	78	1078	7E-05	538	13.992	6.49785E-05	1.84	0.001429618	40.48	4.00	8.15	1/18/04 14:05	1:17:30	1:09:00	1:06:00	1.136515141
1	78	1078	4E-05	538	13.992	3.24893E-05	0.92	0.001462107	41.40	4.09	8.24	1/18/04 14:08	1:20:30	1:12:00	1:09:00	1.158303357
2	78	1078	7E-05	538	13.992	6.49785E-05	1.84	0.001527085	43.24	4.27	8.43	1/18/04 14:10	1:23:15	1:14:45	1:11:45	1.177921899
45	74	1080	0.0016	534	14.018	0.0014757	41.79	0.003002788	85.03	8.41	12.56	1/18/04 17:42	4:55:15	4:46:45	4:43:45	2.218295141
17	75	1081	0.0006	535	14.031	0.00055696	15.77	0.003559746	100.80	9.96	14.12	1/18/04 20:19	7:31:30	7:23:00	7:20:00	2.743173345
12	77	1082	0.0004	537	14.044	0.000392046	11.10	0.003951792	111.90	11.06	15.21	1/18/04 23:11	10:23:30	10:15:00	10:12:00	3.223610812
8	75	1082	0.0003	535	14.044	0.000262341	7.43	0.004214134	119.33	11.80	15.95	1/19/04 2:30	13:42:30	13:34:00	13:31:00	3.702476649
5	75	1082	0.0002	535	14.044	0.000163963	4.64	0.004378097	123.97	12.25	16.41	1/19/04 4:37	15:49:30	15:41:00	15:38:00	3.978064856
5	76	1083	0.0002	536	14.057	0.000163809	4.64	0.004541906	128.61	12.71	16.86	1/19/04 7:47	18:59:30	18:51:00	18:48:00	4.35794294
8	78	1082	0.0003	538	14.044	0.000260878	7.39	0.004802784	136.00	13.44	17.60	1/19/04 12:40	23:52:30	23:44:00	23:41:00	4.888205071
6	79	1081	0.0002	539	14.031	0.000195115	5.53	0.004997899	141.52	13.99	18.14	1/19/04 15:19	26:31:30	26:23:00	26:20:00	5.150242713
2	75	1081	7E-05	535	14.031	6.55247E-05	1.86	0.005063424	143.38	14.17	18.32	1/19/04 22:39	33:51:30	33:43:00	33:40:00	5.818791398
0 5	75	1082	2E-05	535	14.044	1.63963E-05	0.46	0.00507982	143.84	14.22	18.37	1/20/04 10:54	46:06:30	45:58:00	45:55:00	6.790311728
8	73	1089	0.0002	533	14.135	0.000198772	5.63	0.005276592	149.47	14.78	18.93	1/21/04 10:20	69:32:30	69:24:00	69:21:00	8.339164626
4	76	1089	0.0001	536	14.135	0.000131773	3.73	0.005410365	153.20	15.14	19.30	1/22/04 11:46	94:58:30	94:50:00	94:47:00	9.745511787
6	75	1077	0.0002	535	13.979	0.000195847	5.55	0.005606212	158.75	15.69	19.84	1/23/04 12:37	119:49:30	119:41:00	119:38:00	10.94846082
3	75	1078	0.0001	535	13.992	9.80143E-05	2.78	0.005704228	161.53	15.97	20.12	1/24/04 17:32	148:44:30	148:36:00	148:33:00	12.19596928
3	76	1069	0.0001	536	13.875	9.6654E-05	2.74	0.00580068	164.26	16.24	20.39	1/25/04 16:23	171:35:30	171:27:00	171:24:00	13.09930024

-1	75	1078	-4E-05	535	13.992	-3.26714E-05	-0.93	0.005768209	163.34	16.15	20.30	1/26/04	15:26	194:38:30	194:30:00	194:27:00	13.95140375
-2	75	1091	-7E-05	535	14.161	-6.61309E-05	-1.87	0.005702078	161.46	15.96	20.11	1/27/04	9:58	213:10:30	213:02:00	212:59:00	14.60051369
0	73	1091	0	533	14.161	0	0.00	0.005702078	161.46	15.96	20.11	1/28/04	10:28	237:40:30	237:32:00	237:29:00	15.41671171
1	76	1085	4E-05	536	14.063	3.28222E-05	0.93	0.0057349	162.39	16.05	20.20	1/29/04	9:34	260:46:30	260:38:00	260:35:00	16.14852934

DECANISTERED 01/29/2004; sample dried 8 days in air

SAMPLE: 1101.0'-1102.5' (Anna Shale) cuttings in canister Stoeckinger 4

	lbs.	grams
dry sample weight:	0.126	57.13

est. lost gas (cc) = 9

TIME OF: off bottom 1/18/04 23:21; at surface 1/18/04 23:32; in canister 1/18/04 23:47

elapsed time (off bottom to canistering): 26.0 minutes; 0.433 hours; 0.658280589 SQRT (hrs)

RIG/LAB MEASUREMENTS measured cc	measured T (F)	measured P	CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi) cubic ft	absolute T (F)	psia	cubic ft (@STP)	cc (@STP)	CUMULATIVE VOLUMES (@STP) cubic ft	cc	SCF/TON without lost gas	SCF/TON with lost gas	TIME OF MEASURE		TIME SINCE off bottom	at surface	in canister	SQRT hrs. (since off bottom)
0	77	1082	0	537	14.044	0	0.00	0	0.00	0.00	5.05	1/18/04	23:50	0:29:00	0:18:00	0:03:00	0.695221787
1	77	1082	4E-05	537	14.044	3.26705E-05	0.93	3.26705E-05	0.93	0.52	5.57	1/18/04	23:57	0:36:00	0:25:00	0:10:00	0.774596669
2	77	1082	7E-05	537	14.044	6.53411E-05	1.85	9.80116E-05	2.78	1.56	6.60	1/19/04	0:09	0:48:00	0:37:00	0:22:00	0.894427191
2	77	1082	7E-05	537	14.044	6.53411E-05	1.85	0.000163353	4.63	2.59	7.64	1/19/04	0:22	1:01:30	0:50:30	0:35:30	1.012422837
1	77	1082	4E-05	537	14.044	3.26705E-05	0.93	0.000196023	5.55	3.11	8.16	1/19/04	0:29	1:08:00	0:57:00	0:42:00	1.064581295
2	77	1082	7E-05	537	14.044	6.53411E-05	1.85	0.000261364	7.40	4.15	9.20	1/19/04	0:46	1:25:30	1:14:30	0:59:30	1.193733639
2	77	1082	7E-05	537	14.044	6.53411E-05	1.85	0.000326705	9.25	5.19	10.23	1/19/04	2:04	2:43:00	2:32:00	2:17:00	1.648231375
1	77	1082	4E-05	537	14.044	3.26705E-05	0.93	0.000359376	10.18	5.71	10.75	1/19/04	2:26	3:07:30	2:56:30	2:41:30	1.767766953
-2	75	1082	-7E-05	535	14.044	-6.55853E-05	-1.86	0.000293791	8.32	4.67	9.71	1/19/04	3:26	4:05:00	3:54:00	3:39:00	2.020725942
1	76	1083	4E-05	536	14.057	3.27617E-05	0.93	0.000326552	9.25	5.19	10.23	1/19/04	7:48	8:27:00	8:16:00	8:01:00	2.908888371
0	78	1082	0	538	14.044	0	0.00	0.000326552	9.25	5.19	10.23	1/19/04	12:36	13:15:00	13:04:00	12:49:00	3.640054945
1	79	1081	4E-05	539	14.031	3.25192E-05	0.92	0.000359071	10.17	5.70	10.75	1/19/04	15:17	15:56:00	15:45:00	15:30:00	3.991657968
-3	75	1081	-0.0001	535	14.031	-9.82871E-05	-2.78	0.000260784	7.38	4.14	9.19	1/19/04	22:37	23:16:00	23:05:00	22:50:00	4.823553324
-1	75	1082	-4E-05	535	14.044	-3.27927E-05	-0.93	0.000227992	6.46	3.62	8.67	1/20/04	10:54	35:33:00	35:22:00	35:07:00	5.962362074
-5	75	1089	-0.0002	535	14.135	-0.000165024	-4.67	6.29677E-05	1.78	1.00	6.05	1/21/04	10:21	59:00:00	58:49:00	58:34:00	7.681145748
-5	75	1095	-0.0002	535	14.213	-0.000165933	-4.70	-0.00010297	-2.92	-1.64	3.41	1/22/04	11:47	84:26:00	84:15:00	84:00:00	9.188761251
11	75	1077	0.0004	535	13.979	0.000359052	10.17	0.000256087	7.25	4.07	9.11	1/23/04	12:36	109:15:00	109:04:00	108:49:00	10.45227248
-1	75	1078	-4E-05	535	13.992	-3.26714E-05	-0.93	0.000223415	6.33	3.55	8.59	1/24/04	17:33	138:12:00	138:01:00	137:46:00	11.75584961

DECANISTERED 1/24/2004; sample dried 14 days in air

SAMPLE: 1156.0'-1161.0' (Little Osage Shale) cuttings in canister Brady 27

	lbs.	grams
dry sample weight:	1.625	737.09

est. lost gas (cc) = 39

TIME OF: off bottom 1/19/04 1:58; at surface 1/19/04 2:10; in canister 1/19/04 2:34

elapsed time (off bottom to canistering): 35.8 minutes; 0.596 hours; 0.771902412 SQRT (hrs)

RIG/LAB MEASUREMENTS measured cc	measured T (F)	measured P	CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi) cubic ft	absolute T (F)	psia	cubic ft (@STP)	cc (@STP)	CUMULATIVE VOLUMES (@STP) cubic ft	cc	SCF/TON without lost gas	SCF/TON with lost gas	TIME OF MEASURE		TIME SINCE off bottom	at surface	in canister	SQRT hrs. (since off bottom)	
4	75	1082	0.0001	535	14.044	0.000131171	3.71	0.000131171	3.71	0.16	1.88	1/19/04	2:40	0:42:15	0:30:45	0:06:30	0.639146392	
1	75	1082	4E-05	535	14.044	3.27927E-05	0.93	0.000163963	4.64	0.20	1.90	1/19/04	2:44	0:46:15	0:34:45	0:10:30	0.677971148	estimate
2	75	1082	7E-05	535	14.044	6.55853E-05	1.86	0.000229549	6.50	0.28	1.98	1/19/04	2:47	0:48:45	0:37:15	0:13:00	0.901387819	
3	75	1082	0.0001	535	14.044	9.8378E-05	2.79	0.000327927	9.29	0.40	2.10	1/19/04	2:54	0:56:15	0:44:45	0:20:30	0.968245837	
5	75	1082	0.0002	535	14.044	0.000163963	4.64	0.00049189	13.93	0.61	2.30	1/19/04	3:04	1:05:45	0:54:15	0:30:00	1.048620583	
6	75	1082	0.0002	535	14.044	0.000196756	5.57	0.000688646	19.50	0.85	2.54	1/19/04	3:24	1:26:00	1:14:30	0:50:15	1.197219	
15	75	1082	0.0005	535	14.044	0.00049189	13.93	0.001180536	33.43	1.45	3.15	1/19/04	4:35	2:36:30	2:25:00	2:00:45	1.615033539	
12	76	1083	0.0004	536	14.057	0.000393141	11.13	0.001573677	44.56	1.94	3.63	1/19/04	7:49	5:50:30	5:39:00	5:14:45	2.416954006	
13	78	1082	0.0005	538	14.044	0.000423927	12.00	0.001997604	56.57	2.46	4.15	1/19/04	12:37	10:38:30	10:27:00	10:02:45	3.262156751	
3	78	1081	0.0001	538	14.031	9.7739E-05	2.77	0.002095343	59.33	2.56	4.27	1/19/04	15:05	13:06:30	12:55:00	12:30:45	3.620543237	
0	80	1081	0	540	14.031	0	0.00	0.002095343	59.33	2.56	4.27	1/19/04	17:19	15:20:30	15:09:00	14:44:45	3.916643968	
0	75	1081	0	535	14.031	0	0.00	0.002095343	59.33	2.58	4.27	1/19/04	22:35	20:36:30	20:25:00	20:00:45	4.539640221	
0	75	1082	0	535	14.044	0	0.00	0.002095343	59.33	2.58	4.27	1/20/04	10:53	32:54:30	32:43:00	32:18:45	5.736578539	
-4	75	1089	-0.0001	535	14.135	-0.000132019	-3.74	0.001963324	55.59	2.42	4.11	1/21/04	10:21	56:22:30	56:11:00	55:46:45	7.508328709	
-4	75	1095	-0.0001	535	14.213	-0.000132747	-3.76	0.001830577	51.84	2.25	3.95	1/22/04	11:48	81:49:30	81:38:00	81:13:45	9.045717219	
11	75	1077	0.0004	535	13.979	0.000359052	10.17	0.00218963	62.00	2.69	4.39	1/23/04	12:35	106:36:30	106:25:00	106:00:45	10.32513115	
1	75	1078	4E-05	535	13.992	3.26714E-05	0.93	0.002222301	62.93	2.74	4.43	1/24/04	17:34	135:35:30	135:24:00	134:59:45	11.64438348	
4	79	1069	0.0001	539	13.875	0.000128633	3.64	0.002350934	66.57	2.89	4.59	1/25/04	16:27	158:28:30	158:17:00	157:52:45	12.5886854	
-5	73	1078	-0.0002	533	13.992	-0.00016397	-4.64	0.002186964	61.93	2.69	4.39	1/26/04	15:27	181:28:30	181:17:00	180:52:45	13.47128572	
-8	71	1091	-0.0003	531	14.161	-0.000266518	-7.55	0.001920446	54.38	2.36	4.06	1/27/04	9:59	200:00:30	199:49:00	199:24:45	14.14243025	

DECANISTERED 01/27/2004; sample dried 8 days in air

SAMPLE: 1182.0'-1184.0' (Mulky coal) cuttings in canister Stoeckinger 1

	lbs.	grams
dry sample weight:	0.663	300.71

est. lost gas (cc) = 40

TIME OF: off bottom 1/19/04 2:46; at surface 1/19/04 2:58; in canister 1/19/04 3:04

elapsed time (off bottom to canistering): 18.0 minutes; 0.300 hours; 0.547722558 SQRT (hrs)

RIG/LAB MEASUREMENTS measured cc	measured T (F)	measured P	CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi) cubic ft	absolute T (F)	psia	cubic ft (@STP)	cc (@STP)	CUMULATIVE VOLUMES (@STP) cubic ft	cc	SCF/TON without lost gas	SCF/TON with lost gas	TIME OF MEASURE		TIME SINCE off bottom	at surface	in canister	SQRT hrs. (since off bottom)
7	75	1082	0.0002	535	14.044	0.000229549	6.50	0.000229549	6.50	0.89	4.95	1/19/04	3:09	0:23:45	0:11:45	0:05:45	0.62915287
2	75	1082	7E-05	535	14.044	6.55853E-05	1.86	0.000295134	8.36	0.89	5.15	1/19/04	3:11	0:25:30	0:13:30	0:07:30	0.651920241
2	75	1082	7E-05	535	14.044	6.55853E-05	1.86	0.000360719	10.21	1.09	5.35	1/19/04	3:14	0:28:30	0:16:30	0:10:30	0.689202438
4	75	1082	0.0001	535	14.044	0.000131171	3.71	0.00049189	13.93	1.46	5.75	1/19/04	3:20	0:34:30	0:22:30	0:16:30	0.758287544
3	75	1082	0.0001	535	14.044	9.8378E-05	2.79	0.000590268	16.71	1.78	6.04	1/19/04	3:23	0:37:30	0:25:30	0:19:30	0.790569415
3	75	1082	0.0001	535	14.044	9.8378E-05	2.79	0.000688646	19.50	2.06	6.34	1/19/04	3:28	0:42:30	0:30:30	0:24:30	0.841625412

2	75	1082	7E-05	535	14.044	6.55853E-05	1.86	0.000754231	21.36	2.28	8.54	1/19/04	3:33	0:47:15	0:35:15	0:29:15	0.667411967
3	75	1082	0.0001	535	14.044	9.6376E-05	2.79	0.000852809	24.14	2.57	8.83	1/19/04	3:40	0:54:30	0:42:30	0:36:30	0.95306523
17	75	1082	0.0006	535	14.044	0.000557475	15.79	0.001410085	39.93	4.25	8.52	1/19/04	4:26	1:42:00	1:30:00	1:24:00	1.303640461
30	76	1083	0.0011	536	14.057	0.000982852	27.83	0.002392937	67.76	7.22	11.46	1/19/04	7:25	4:39:00	4:27:00	4:21:00	2.156365885
5	77	1083	0.0002	537	14.057	0.000183504	4.83	0.00255844	72.39	7.71	11.97	1/19/04	8:37	5:51:00	5:39:00	5:33:00	2.418677324
8	79	1083	0.0003	539	14.057	0.000260635	7.38	0.002817075	79.77	8.50	12.78	1/19/04	9:53	7:07:00	6:55:00	6:49:00	2.86770813
8	78	1082	0.0003	536	14.044	0.000260678	7.39	0.003077954	87.18	9.29	13.55	1/19/04	12:35	9:49:00	9:37:00	9:31:00	3.133156023
9	79	1081	0.0003	539	14.031	0.000292873	8.29	0.003370827	95.45	10.17	14.43	1/19/04	15:18	12:30:00	12:18:00	12:12:00	3.535533906
8	80	1081	0.0002	540	14.031	0.000194754	5.51	0.003585361	100.98	10.76	15.02	1/19/04	17:18	14:32:00	14:20:00	14:14:00	3.812280921
2	75	1081	7E-05	535	14.031	6.55247E-05	1.86	0.003630905	102.82	10.95	15.22	1/19/04	22:34	19:46:00	19:38:00	19:30:00	4.449719092
10	75	1082	0.0004	535	14.044	0.000327927	9.29	0.003958832	112.10	11.94	16.20	1/20/04	10:52	32:08:00	31:54:00	31:46:00	5.86586619
11	73	1089	0.0004	533	14.135	0.000364415	10.32	0.004323247	122.42	13.04	17.30	1/21/04	10:22	55:36:00	55:24:00	55:16:00	7.456540753
10	78	1095	0.0004	536	14.213	0.000331247	9.36	0.004654495	131.80	14.04	18.30	1/22/04	11:48	81:02:00	80:50:00	80:44:00	9.001651881
14	75	1077	0.0005	535	13.979	0.000458978	12.94	0.00511147	144.74	15.42	19.68	1/23/04	12:35	105:49:00	105:37:00	105:31:00	10.28672283
7	75	1078	0.0002	535	13.992	0.0002287	6.46	0.00534017	151.22	16.11	20.37	1/24/04	17:35	134:49:00	134:37:00	134:31:00	11.61105795
6	78	1069	0.0002	536	13.675	0.000193308	5.47	0.005533479	156.69	16.69	20.98	1/25/04	16:28	157:42:00	157:30:00	157:24:00	12.55786606
1	75	1078	4E-05	535	13.992	3.26714E-05	0.93	0.00556815	157.62	16.79	21.05	1/26/04	15:28	180:42:00	180:30:00	180:24:00	13.44247001
-2	75	1091	-7E-05	535	14.161	-6.61309E-05	-1.87	0.005500019	155.74	16.59	20.85	1/27/04	10:00	199:14:00	199:02:00	198:56:00	14.11500384
2	73	1091	7E-05	533	14.161	6.6379E-05	1.86	0.005586398	157.62	16.79	21.05	1/26/04	10:29	223:43:00	223:31:00	223:25:00	14.95716105
4	78	1085	0.0001	536	14.063	0.000131289	3.72	0.005697887	161.34	17.19	21.45	1/29/04	9:35	246:49:00	246:37:00	246:31:00	15.71039995
-3	73	1089	-0.0001	533	14.135	-9.9386E-05	-2.81	0.005596301	158.53	16.89	21.15	1/30/04	10:35	271:49:00	271:37:00	271:31:00	16.48686346
9	79	1081	0.0003	539	14.031	0.000292873	8.29	0.005890974	166.81	17.77	22.03	1/31/04	12:35	297:49:00	297:37:00	297:31:00	17.25736558
-2	74	1080	-7E-05	534	14.018	-6.55867E-05	-1.86	0.005825367	164.96	17.57	21.84	2/1/04	14:49	324:03:00	323:51:00	323:45:00	18.00136884
-1	73	1085	-4E-05	533	14.063	-3.3007E-05	-0.93	0.00579236	164.02	17.47	21.74	2/2/04	15:33	348:47:00	348:35:00	348:29:00	18.67574184
0	77	1094	0	537	14.200	0	0.00	0.00579236	164.02	17.47	21.74	2/3/04	12:18	369:32:00	369:20:00	369:14:00	19.22324981
2	75	1087	7E-05	535	14.109	6.56684E-05	1.87	0.005856269	165.89	17.67	21.94	2/4/04	16:22	397:36:00	397:24:00	397:18:00	19.93990973
2	75	1080	7E-05	535	14.018	6.54641E-05	1.85	0.005923733	167.74	17.87	22.13	2/5/04	14:36	419:50:00	419:38:00	419:32:00	20.48983488
-1	75	1088	-4E-05	535	14.096	-3.29139E-05	-0.93	0.005890819	166.81	17.77	22.03	2/6/04	9:30	438:44:00	438:32:00	438:26:00	20.94596222
-3	74	1095	-0.0001	534	14.213	-9.97464E-05	-2.62	0.005791073	163.98	17.47	21.73	2/7/04	13:33	466:47:00	466:35:00	466:29:00	21.60516913
4	74	1083	0.0001	534	14.057	0.000131536	3.72	0.00592261	167.71	17.87	22.13	2/8/04	12:15	489:29:00	489:17:00	489:11:00	22.12427023
-1	74	1091	-4E-05	534	14.161	-3.31274E-05	-0.94	0.005869483	166.77	17.77	22.03	2/9/04	10:22	511:36:00	511:24:00	511:18:00	22.81657844
0	75	1092	0	535	14.174	0	0.00	0.005869483	166.77	17.77	22.03	2/10/04	10:16	535:30:00	535:16:00	535:12:00	23.14087293

DECANISTERED 2/10/2004; sample dried 10 days in air

SAMPLE: 1250.0'-1252.0' (Bevier coal) cuttings in canister Stoecklnger 5

	lbs.	grams
dry sample weight:	0.670	304.04

est. lost gas (cc) = 38

TIME OF: off bottom 1/19/04 5:23 | at surface 1/19/04 5:36 | in canister 1/19/04 5:46

elapsed time (off bottom to canistering): 22.5 minutes = 0.375 hours

TIME SINCE 0.612372438 SQRT (hrs)

RIG/LAB MEASUREMENTS			CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi)					CUMULATIVE VOLUMES (@STP)		SCF/TON	SCF/TON					
measured cc	measured T (F)	measured P	cubic ft	absolute T (F)	psia	cubic ft (@STP)	cc (@STP)	cubic ft	cc	without lost gas	with lost gas	TIME OF MEASURE		off bottom	at surface	in canister	SQRT hrs. (since off bottom)
2	75	1082	7E-05	535	14.044	6.55853E-05	1.86	6.55853E-05	1.86	0.20	4.20	1/19/04	5:48	0:24:30	0:12:00	0:02:00	0.639009851
3	75	1082	0.0001	535	14.044	9.6376E-05	2.79	0.000163983	4.64	0.49	4.49	1/19/04	5:53	0:29:30	0:17:00	0:07:00	0.701189486
5	75	1082	0.0002	535	14.044	0.000163983	4.64	0.000327927	9.29	0.98	4.98	1/19/04	5:59	0:36:15	0:23:45	0:13:45	0.777261588
9	75	1082	0.0003	535	14.044	0.000295134	8.36	0.000823061	17.64	1.86	5.86	1/19/04	6:14	0:51:15	0:38:45	0:28:45	0.924211378
9	75	1082	0.0003	535	14.044	0.000295134	8.36	0.000918195	26.00	2.74	6.74	1/19/04	6:31	1:06:15	0:55:45	0:45:45	1.08653845
23	78	1083	0.0008	536	14.057	0.00075352	21.34	0.001671714	47.34	4.99	8.99	1/19/04	7:52	2:26:30	2:18:00	2:08:00	1.573213272
10	77	1083	0.0004	537	14.057	0.000327007	9.26	0.001998722	56.60	5.98	9.97	1/19/04	8:35	3:11:30	2:59:00	2:49:00	1.786523628
12	79	1083	0.0004	539	14.057	0.000390953	11.07	0.002389874	67.67	7.13	11.13	1/19/04	9:52	4:26:30	4:16:00	4:06:00	2.11541958
16	78	1082	0.0006	538	14.044	0.000521757	14.77	0.002911431	82.44	8.69	12.69	1/19/04	12:34	7:10:30	6:58:00	6:48:00	2.678619047
13	79	1081	0.0005	539	14.031	0.00042275	11.97	0.003334181	94.41	9.95	13.95	1/19/04	15:16	9:52:30	9:40:00	9:30:00	3.142451273
7	80	1081	0.0002	540	14.031	0.000227213	6.43	0.003561394	100.85	10.63	14.63	1/19/04	17:18	11:52:30	11:40:00	11:30:00	3.448012188
5	75	1081	0.0002	535	14.031	0.000163812	4.64	0.003725206	105.49	11.12	15.12	1/19/04	22:33	17:09:30	16:57:00	16:47:00	4.142281682
10	75	1082	0.0004	535	14.044	0.000327927	9.29	0.004053132	114.77	12.09	16.10	1/20/04	10:50	29:26:30	29:14:00	29:04:00	5.42601757
10	73	1089	0.0004	533	14.135	0.000331267	9.36	0.004384419	124.15	13.08	17.09	1/21/04	10:22	52:56:30	52:46:00	52:36:00	7.27839288
7	78	1095	0.0002	536	14.213	0.000231673	6.57	0.004816292	130.72	13.77	17.78	1/22/04	11:49	76:25:30	76:13:00	76:03:00	8.655789087
9	75	1077	0.0003	535	13.979	0.00029377	8.32	0.004910082	139.04	14.65	18.65	1/23/04	12:34	103:10:30	102:58:00	102:48:00	10.15750954
5	75	1078	0.0002	535	13.992	0.000163357	4.63	0.00507342	143.66	15.14	19.14	1/24/04	17:35	132:11:30	131:59:00	131:49:00	11.49746349
5	78	1089	0.0002	536	13.675	0.00016109	4.56	0.00523451	148.22	15.62	19.62	1/25/04	16:29	155:05:30	154:53:00	154:43:00	12.45356048
0	75	1078	0	535	13.992	0	0.00	0.00523451	148.22	15.62	19.62	1/26/04	15:28	176:04:30	177:52:00	177:42:00	13.34447451
-4	75	1091	-0.0001	535	14.161	-0.000132282	-3.75	0.005102248	144.48	15.22	19.23	1/27/04	10:00	198:36:30	196:24:00	198:14:00	14.02170936
-3	73	1091	-0.0001	533	14.161	-9.95685E-05	-2.82	0.005002879	141.66	14.93	18.93	1/28/04	10:29	221:05:30	220:53:00	220:43:00	14.88915151
0	78	1085	0	536	14.063	0	0.00	0.005002879	141.66	14.93	18.93	1/29/04	9:35	244:11:30	243:59:00	243:49:00	15.82683325

DECANISTERED 01/29/2004; sample dried 5 days in air

SAMPLE: 1262.0'-1264.0' (Croweburg coal) cuttings in canister Maggy 3

	lbs.	grams
dry sample weight:	1.350	612.31

est. lost gas (cc) = 58

TIME OF: off bottom 1/19/04 5:57 | at surface 1/19/04 6:10 | in canister 1/19/04 6:24

elapsed time (off bottom to canistering): 27.2 minutes = 0.454 hours

TIME SINCE 0.673918667 SQRT (hrs)

RIG/LAB MEASUREMENTS			CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi)					CUMULATIVE VOLUMES (@STP)		SCF/TON	SCF/TON					
measured cc	measured T (F)	measured P	cubic ft	absolute T (F)	psia	cubic ft (@STP)	cc (@STP)	cubic ft	cc	without lost gas	with lost gas	TIME OF MEASURE		off bottom	at surface	in canister	SQRT hrs. (since off bottom)
10	75	1082	0.0004	535	14.044	0.000327927	9.29	0.000327927	9.29	0.49	3.52	1/19/04	6:34	0:36:30	0:24:00	0:09:15	0.779957264
5	75	1082	0.0002	535	14.044	0.000163983	4.64	0.00049189	13.93	0.73	3.76	1/19/04	6:39	0:42:15	0:29:45	0:15:00	0.839146392
5	75	1082	0.0002	535	14.044	0.000163983	4.64	0.000655853	18.57	0.97	4.01	1/19/04	6:45	0:47:30	0:35:00	0:20:15	0.889758521
5	75	1082	0.0002	535	14.044	0.000163983	4.64	0.000819817	23.21	1.21	4.25	1/19/04	6:51	0:54:15	0:41:45	0:27:00	0.950676768

3	75	1082	0.0001	535	14.044	9.8378E-05	2.79	0.000918195	26.00	1.36	4.40	1/19/04	6:57	0:59:45	0:47:15	0:32:30	0.997914492
4	75	1082	0.0001	535	14.044	0.000131171	3.71	0.001049365	29.71	1.55	4.59	1/19/04	7:03	1:05:30	0:53:00	0:36:15	1.044828535
4	75	1082	0.0001	535	14.044	0.000131171	3.71	0.001180536	33.43	1.75	4.78	1/19/04	7:09	1:11:30	0:59:00	0:44:15	1.09163486
5	75	1083	0.0002	535	14.057	0.000164115	4.65	0.001344651	38.08	1.99	5.03	1/19/04	7:17	1:19:30	1:07:00	0:52:15	1.151086443
4	75	1083	0.0001	535	14.057	0.000131292	3.72	0.001475943	41.79	2.19	5.22	1/19/04	7:26	1:28:30	1:16:00	1:01:15	1.21449578
3	76	1083	0.0001	536	14.057	9.82652E-05	2.78	0.001574228	44.56	2.33	5.37	1/19/04	7:32	1:34:30	1:22:00	1:07:15	1.25499004
4	76	1083	0.0001	536	14.057	0.000131047	3.71	0.001705275	48.29	2.53	5.56	1/19/04	7:39	1:41:30	1:29:00	1:14:15	1.300640868
2	76	1083	7E-05	536	14.057	6.55235E-05	1.86	0.001770798	50.14	2.62	5.66	1/19/04	7:44	1:46:30	1:34:00	1:19:15	1.332291259
5	77	1083	0.0002	537	14.057	0.000163504	4.63	0.001934302	54.77	2.87	5.90	1/19/04	7:54	1:56:30	1:44:00	1:29:15	1.393436998
5	76	1083	0.0002	536	14.057	0.000163809	4.64	0.00209811	59.41	3.11	6.14	1/19/04	8:07	2:09:30	1:57:00	1:42:15	1.469126725
12	77	1083	0.0004	537	14.057	0.000392409	11.11	0.002490519	70.52	3.69	6.72	1/19/04	8:34	2:36:30	2:24:00	2:09:15	1.615033539
22	79	1083	0.0008	539	14.057	0.000716746	20.30	0.003207266	90.82	4.75	7.79	1/19/04	8:51	2:53:30	2:41:00	2:26:15	1.700490125
30	78	1082	0.0011	538	14.044	0.000978294	27.70	0.00418556	118.52	6.20	9.24	1/19/04	12:33	6:35:30	6:23:00	6:08:15	2.567424131
30	78	1081	0.0011	538	14.031	0.00097739	27.68	0.00516295	146.20	7.65	10.68	1/19/04	15:05	9:07:30	8:55:00	8:40:15	3.020761493
12	80	1081	0.0004	540	14.031	0.000389508	11.03	0.005552458	157.23	8.23	11.28	1/19/04	17:13	11:15:30	11:03:00	10:48:15	3.355343998
5	76	1081	0.0002	536	14.031	0.000162898	4.61	0.005715356	161.84	8.47	11.50	1/19/04	19:05	13:07:30	12:55:00	12:40:15	3.622844187
-3	75	1081	-0.0001	535	14.031	-9.82671E-05	-2.78	0.005617089	159.06	8.32	11.36	1/19/04	22:31	16:33:30	16:21:00	16:06:15	4.069193204
5	76	1081	0.0002	536	14.031	0.000163506	4.63	0.005780575	163.69	8.56	11.60	1/20/04	1:26	19:28:30	19:16:00	19:01:15	4.413046833
1	75	1082	4E-05	535	14.044	3.27927E-05	0.93	0.005813368	164.62	8.61	11.65	1/20/04	10:50	28:52:30	28:40:00	28:25:15	5.373546315
8	73	1089	0.0003	533	14.135	0.000265029	7.50	0.006078397	172.12	9.01	12.04	1/21/04	10:23	52:25:30	52:13:00	51:58:15	7.240511032
-4	76	1095	-0.0001	536	14.213	-0.000132499	-3.75	0.005945898	168.37	8.81	11.84	1/22/04	11:49	77:51:30	77:39:00	77:24:15	8.823736926
21	75	1077	0.0007	535	13.979	0.000685484	19.41	0.006631382	187.78	9.82	12.86	1/23/04	12:33	102:35:30	102:23:00	102:08:15	10.12875445
-2	75	1077	-7E-05	535	13.979	-6.52823E-05	-1.85	0.00656608	185.93	9.73	12.78	1/24/04	17:36	131:38:30	131:26:00	131:11:15	11.47352024
10	76	1069	0.0004	536	13.875	0.00032218	9.12	0.00688828	195.05	10.21	13.24	1/25/04	16:29	154:31:30	154:19:00	154:04:15	12.4308085
-10	75	1078	-0.0004	535	13.992	-0.000326714	-9.25	0.006561545	185.80	9.72	12.76	1/26/04	15:29	177:31:30	177:19:00	177:04:15	13.32385079
-16	75	1091	-0.0006	535	14.161	-0.000529047	-14.98	0.006032498	170.82	6.94	11.97	1/27/04	10:01	196:03:30	195:51:00	195:36:15	14.00208318

DECANISTERED 01/27/2004; sample dried 5 days in air

SAMPLE: 1344.0'-1345.5' (Tebo coal) cuttings in canister Maggy 4

	lbs.	grams	est. lost gas (cc) =	TIME OF:			elapsed time (off bottom to canistering)
			24	off bottom	at surface	in canister	37.5 minutes
dry sample weight:	1.087	492.94		1/19/04 9:32	1/19/04 9:46	1/19/04 10:10	0.625 hours
							0.790569415 SQRT (hrs)

RIG/LAB MEASUREMENTS			CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi)					CUMULATIVE VOLUMES (@STP)		SCF/TON	SCF/TON			TIME SINCE			
measured cc	measured T (F)	measured P	cubic ft	absolute T (F)	psia	cubic ft (@STP)	cc (@STP)	cubic ft	cc	without lost gas	with lost gas	TIME OF MEASURE		off bottom	at surface	in canister	SQRT hrs. (since off bottom)
1	79	1083	4E-05	539	14.057	3.25794E-05	0.92	3.25794E-05	0.92	0.06	1.62	1/19/04	10:14	0:42:00	0:28:30	0:04:30	0.836660027
2	79	1083	7E-05	539	14.057	6.51588E-05	1.85	9.77382E-05	2.77	0.18	1.74	1/19/04	10:17	0:44:45	0:31:15	0:07:15	0.863616427
0	80	1083	0	540	14.057	0	0.00	9.77382E-05	2.77	0.18	1.74	1/19/04	10:19	0:46:30	0:33:00	0:09:00	0.880340843
0	80	1083	0	540	14.057	0	0.00	9.77382E-05	2.77	0.18	1.74	1/19/04	10:21	0:49:00	0:35:30	0:11:30	0.903696114
1	80	1083	4E-05	540	14.057	3.25191E-05	0.92	0.000130257	3.69	0.24	1.80	1/19/04	10:23	0:50:45	0:37:15	0:13:15	0.919691977
1	80	1083	4E-05	540	14.057	3.25191E-05	0.92	0.000162776	4.61	0.30	1.86	1/19/04	10:35	1:03:00	0:49:30	0:25:30	1.024695077
0	80	1083	0	540	14.057	0	0.00	0.000162776	4.61	0.30	1.86	1/19/04	10:41	1:09:00	0:55:30	0:31:30	1.072380529
4	80	1082	0.0001	540	14.044	0.000129956	3.68	0.000292732	8.29	0.54	2.10	1/19/04	12:29	2:56:30	2:43:00	2:19:00	1.715126761
2	80	1082	7E-05	540	14.044	6.49781E-05	1.84	0.00035771	10.13	0.66	2.22	1/19/04	12:30	2:57:30	2:44:00	2:20:00	1.71998062
1	80	1082	4E-05	540	14.044	3.2489E-05	0.92	0.000390199	11.05	0.72	2.26	1/19/04	12:32	2:59:30	2:46:00	2:22:00	1.729843509
4	80	1081	0.0001	540	14.031	0.000129836	3.68	0.000520035	14.73	0.96	2.52	1/19/04	15:01	5:28:30	5:15:00	4:51:00	2.339871791
-3	75	1081	-0.0001	535	14.031	-9.82671E-05	-2.78	0.000421748	11.94	0.78	2.34	1/19/04	22:31	12:58:30	12:45:00	12:21:00	3.602082731
-8	75	1082	-0.0003	535	14.044	-0.000262341	-7.43	0.000159407	4.51	0.29	1.85	1/20/04	10:50	25:17:30	25:04:00	24:40:00	5.02906209
-8	73	1089	-0.0003	533	14.135	-0.000265029	-7.50	-0.00010562	-2.99	-0.19	1.37	1/21/04	10:23	48:50:30	48:37:00	48:13:00	6.988681325
-9	76	1095	-0.0003	536	14.213	-0.000298123	-8.44	-0.00040374	-11.43	-0.74	0.82	1/22/04	11:49	74:16:30	74:03:00	73:39:00	8.618294495
-1	75	1077	-4E-05	535	13.979	-3.26411E-05	-0.92	-0.00043639	-12.36	-0.80	0.76	1/23/04	12:31	98:58:30	98:45:00	98:21:00	9.948617994

DECANISTERED 01/24/2004; sample dried 8 days in air

SAMPLE: 1521.0'-1522.5' (Riverton coal underclay) core chips in canister I

	lbs.	grams		lbs.	grams	moisture %	est. lost gas (cc) =	TIME OF:			elapsed time (off bottom to canistering)
dry sample weight:	1.088	493.34	wet sample weight:	1.118	506.95	2.68%	58	off bottom	at surface	in canister	160.0 minutes
								1/20/04 13:04	1/20/04 14:30	1/20/04 15:44	2.667 hours
											1.632993162 SQRT (hrs)

RIG/LAB MEASUREMENTS			CONVERSION OF RIG/LAB MEASUREMENTS TO STP (@60 deg F; 14.7 psi)					CUMULATIVE VOLUMES (@STP)		SCF/TON	SCF/TON			TIME SINCE			
measured cc	measured T (F)	measured P	cubic ft	absolute T (F)	psia	cubic ft (@STP)	cc (@STP)	cubic ft	cc	without lost gas	with lost gas	TIME OF MEASURE		off bottom	at surface	in canister	SQRT hrs. (since off bottom)
2	86	1080	7E-05	546	14.018	6.41452E-05	1.82	6.41452E-05	1.82	0.12	3.75	1/20/04	15:48	2:44:00	1:18:00	0:04:00	1.653279569
2	85	1080	7E-05	545	14.018	6.42629E-05	1.82	0.000128408	3.64	0.24	3.87	1/20/04	15:54	2:50:00	1:24:00	0:10:00	1.683250823
1	85	1080	4E-05	545	14.018	3.21315E-05	0.91	0.00016054	4.55	0.30	3.93	1/20/04	15:58	2:54:00	1:28:00	0:14:00	1.702938637
2	84	1080	7E-05	544	14.018	6.43811E-05	1.82	0.000224921	6.37	0.41	4.05	1/20/04	16:07	3:03:00	1:37:00	0:23:00	1.74642492
3	84	1080	0.0001	544	14.018	9.65716E-05	2.73	0.000321492	9.10	0.59	4.23	1/20/04	16:21	3:17:00	1:51:00	0:37:00	1.811997057
1	83	1080	4E-05	543	14.018	3.22498E-05	0.91	0.000353742	10.02	0.65	4.29	1/20/04	16:29	3:25:00	1:59:00	0:45:00	1.848422751
3	83	1080	0.0001	543	14.018	9.67494E-05	2.74	0.000450491	12.76	0.83	4.46	1/20/04	16:55	3:51:00	2:25:00	1:11:00	1.962141687
1	82	1080	4E-05	542	14.018	3.23093E-05	0.91	0.000482801	13.67	0.89	4.52	1/20/04	17:07	4:03:00	2:37:00	1:23:00	2.01246118
27	80	1089	0.001	540	14.135	0.000882879	25.00	0.00136568	38.67	2.51	6.15	1/21/04	10:24	21:20:00	19:54:00	18:40:00	4.618802154
5	79	1095	0.0002	539	14.213	0.000164702	4.66	0.001530381	43.34	2.81	6.45	1/22/04	11:50	46:46:00	45:20:00	44:06:00	6.838615844
32	83	1077	0.0011	543	13.979	0.001029127	29.14	0.002559509	72.48	4.71	8.34	1/23/04	12:30	71:26:00	70:00:00	68:46:00	8.451824261
2	80	1076	7E-05	540	13.992	6.47376E-05	1.83	0.002624247	74.31	4.83	8.46	1/24/04	17:38	100:34:00	99:08:00	97:54:00	10.02829331
12	81	1069	0.0004	541	13.875	0.000384472	10.89	0.003008719	85.20	5.53	9.17	1/25/04	16:31	123:27:00	122:01:00	120:47:00	11.11080555
-3	79	1078	-0.0001	539	13.992	-9.72869E-05	-2.75	0.002911432	82.44	5.35	8.99	1/26/04	15:29	146:25:00	144:59:00	143:45:00	12.10027548

-16	80	1091	-0.0006	540	14.161	-0.000524146	-14.84	0.002387283	67.60	4.39	8.03	1/27/04	10:01	164:57:00	163:31:00	162:17:00	12.84328618
-28	82	1085	-0.001	542	14.083	-0.000908649	-25.74	0.001478435	41.86	2.72	6.36	2/2/04	15:55	314:51:00	313:25:00	312:11:00	17.74401307
-40	84	1091	-0.0014	544	14.161	-0.001300736	-36.83	0.000177899	5.03	0.33	3.96	2/9/04	10:47	477:43:00	476:17:00	475:03:00	21.85873047

DECANISTERED 2/10/2004; sample dried for 11 days in air

804.0'-807.5' (Stark Shale) cuttings in canister Stoeckinger 6

Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-20S-16E, Coffey Co., KS

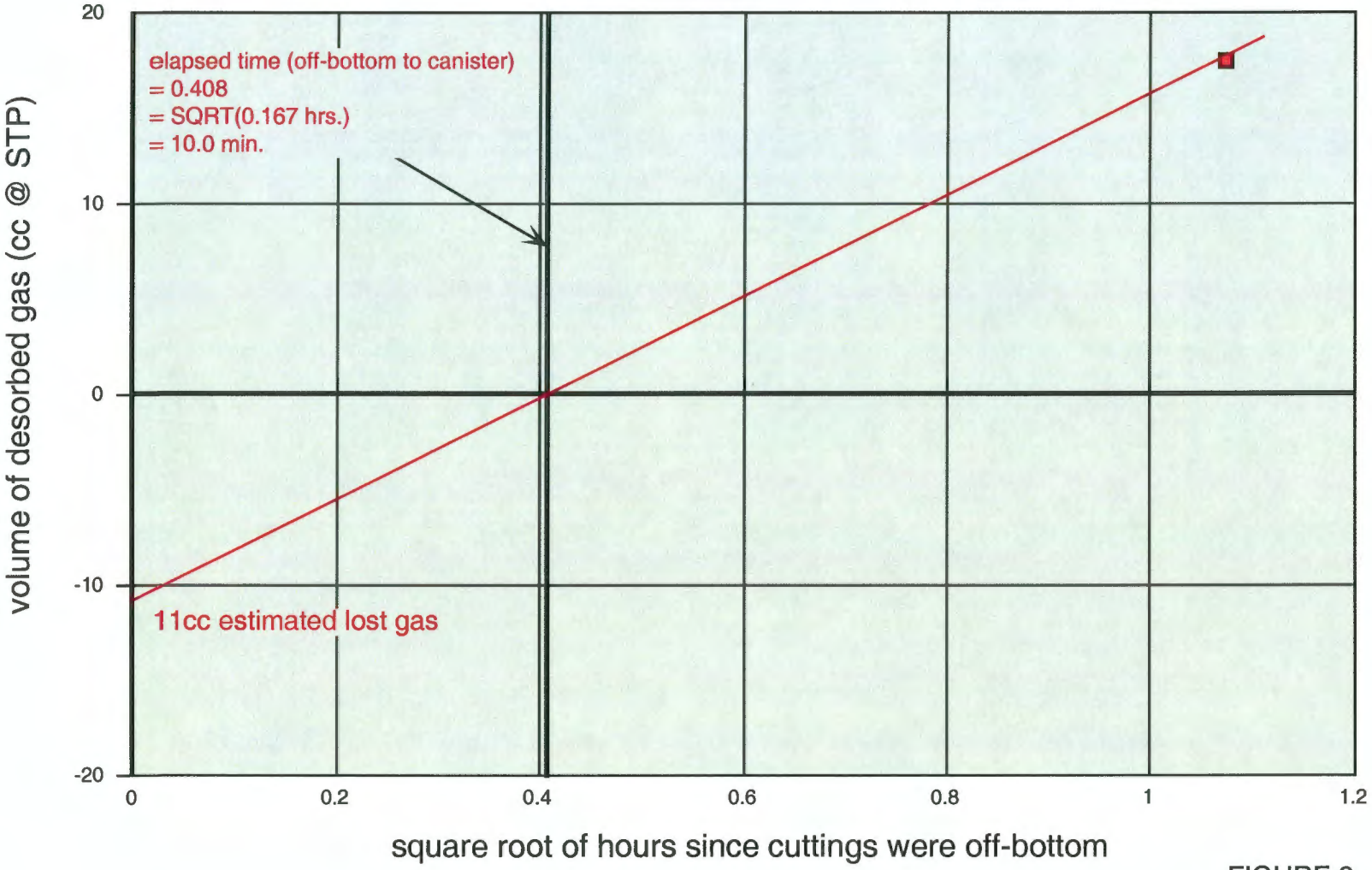


FIGURE 2.

835.0'-838.0' (Hushpuckney Shale) cuttings in canister Stoeckinger 7

Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-20S-16E, Coffey Co., KS

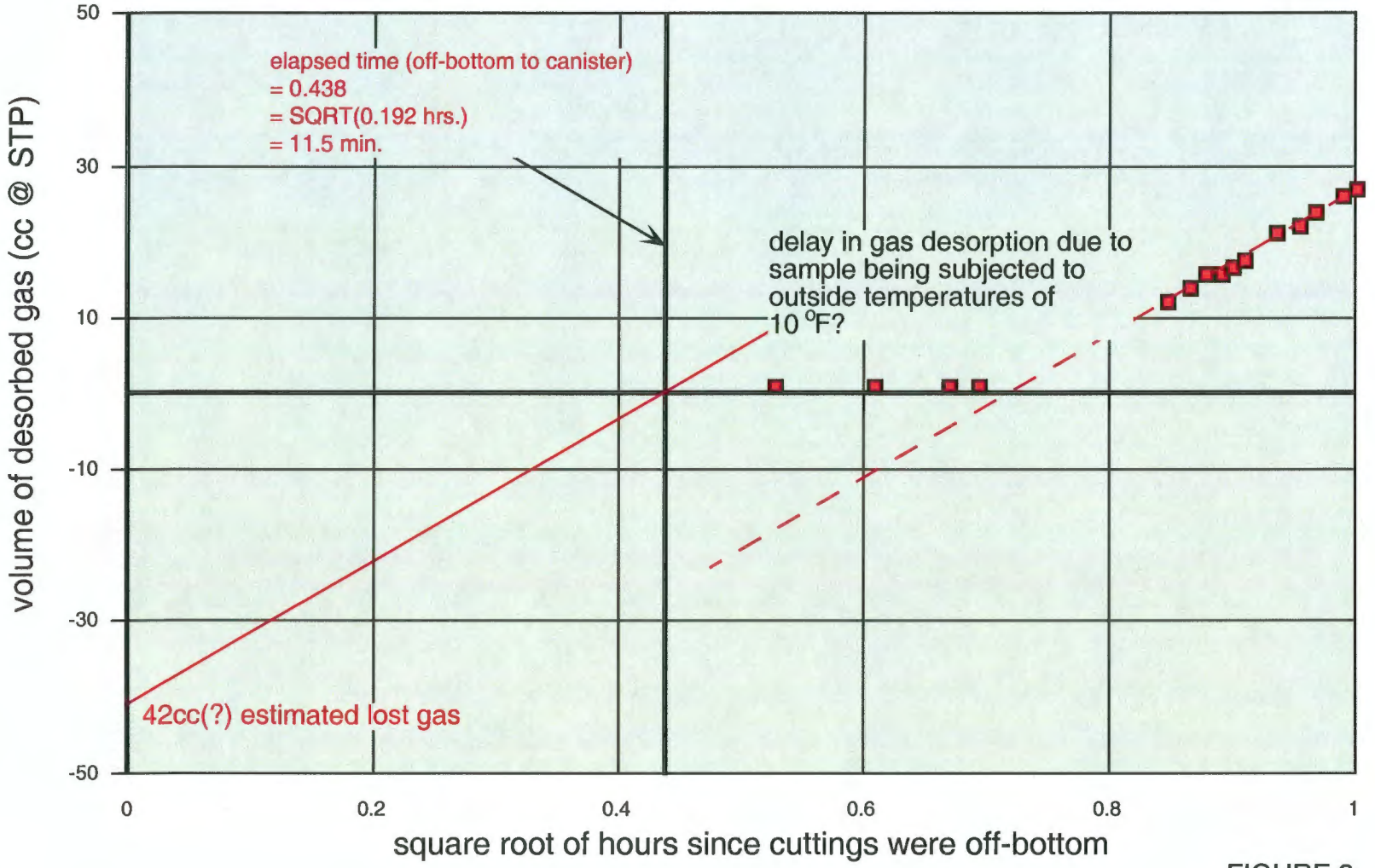


FIGURE 3.

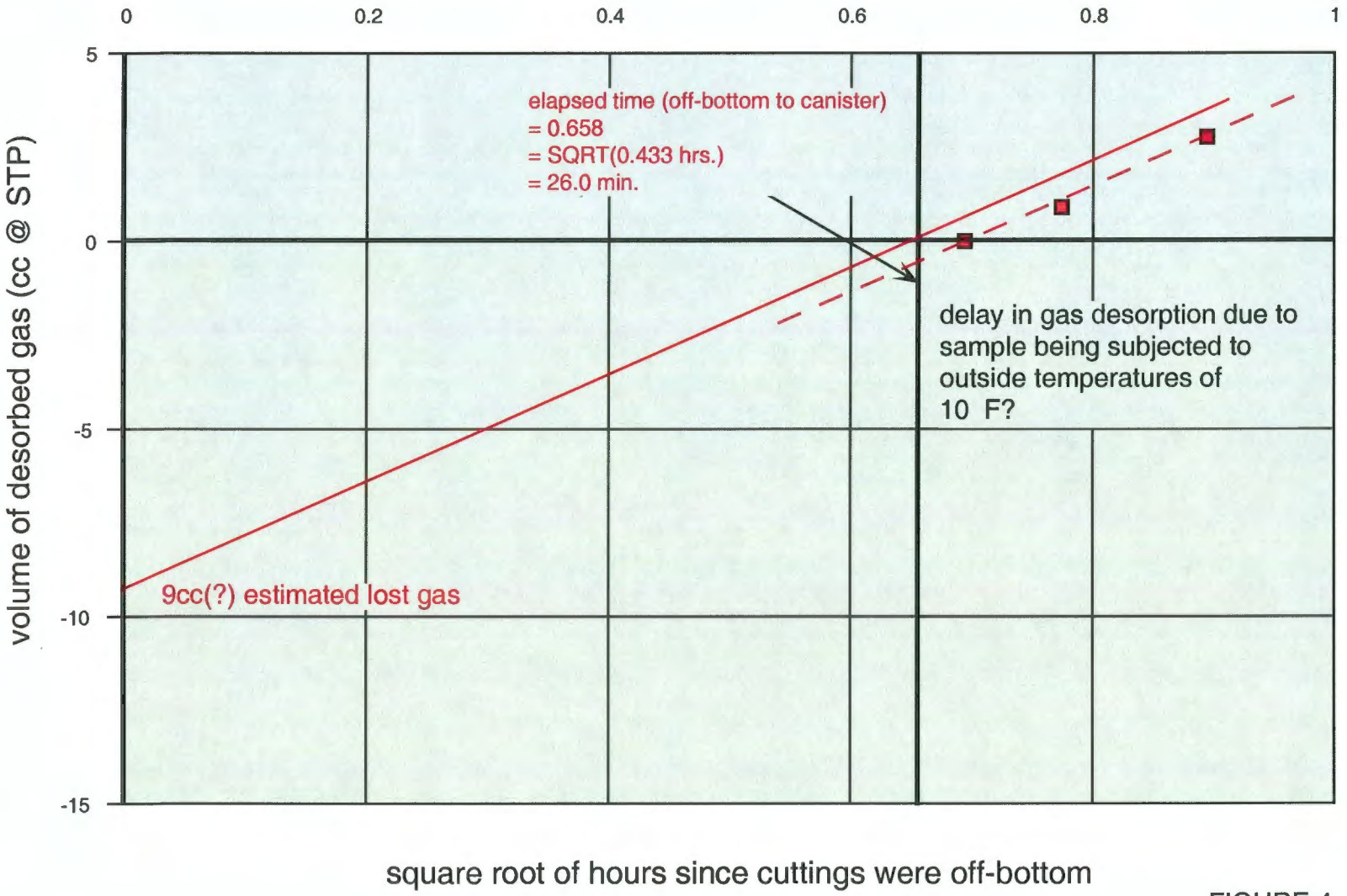

1101.0'-1102.5' (Anna Shale) cuttings in canister Stoeckinger 4
Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-20S-16E, Coffey Co., KS
0
0.2
0.4
0.6
0.8
1
5
0
-5
-10
-15
volume of desorbed gas (cc @ STP)
elapsed time (off-bottom to canister)
= 0.658
= SQRT(0.433 hrs.)
= 26.0 min.
delay in gas desorption due to sample being subjected to outside temperatures of 10 F?
9cc(?) estimated lost gas
square root of hours since cuttings were off-bottom

FIGURE 4.

1158.0'-1161.0' (Little Osage Shale) cuttings in canister Brady 27

Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-20S-16E, Coffey Co., KS

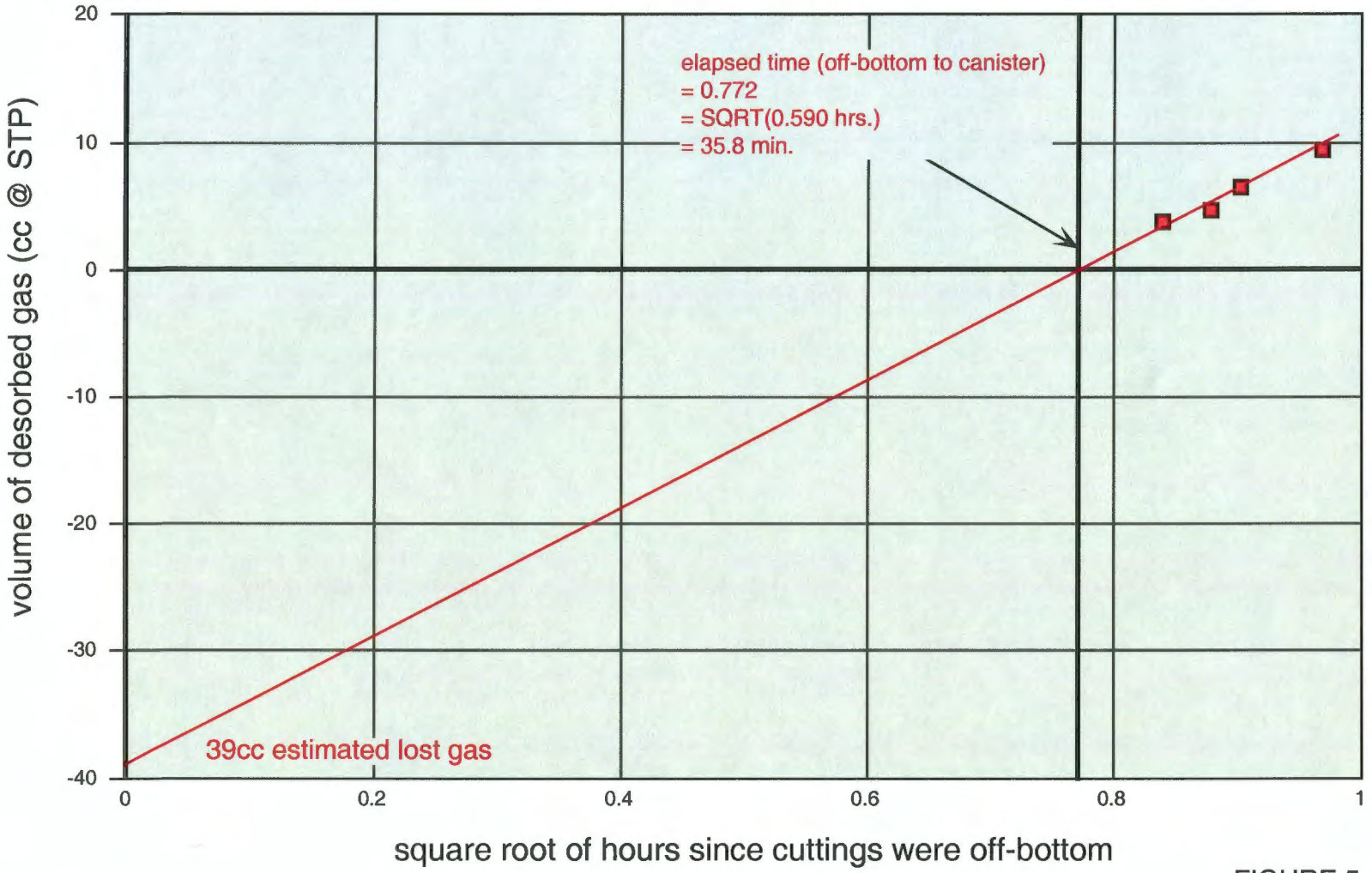


FIGURE 5.

1182.0'-1184.0' (Mulky coal) cuttings in canister Stoeckinger 1

Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-20S-16E, Coffey Co., KS

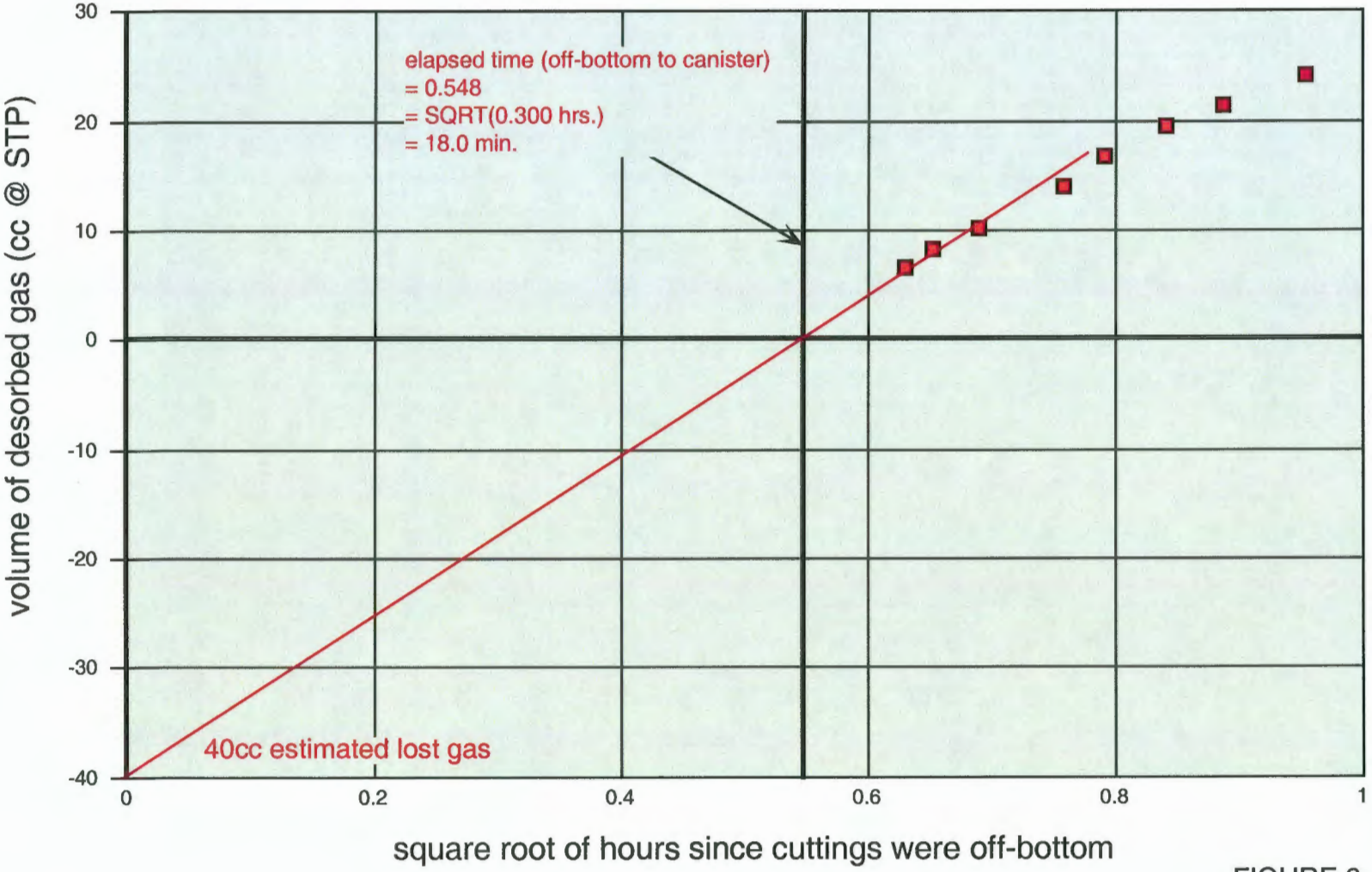


FIGURE 6.

1250.0'-1152.0' (Bevier coal) cuttings in canister Stoeckinger 5

Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-20S-16E, Coffey Co., KS

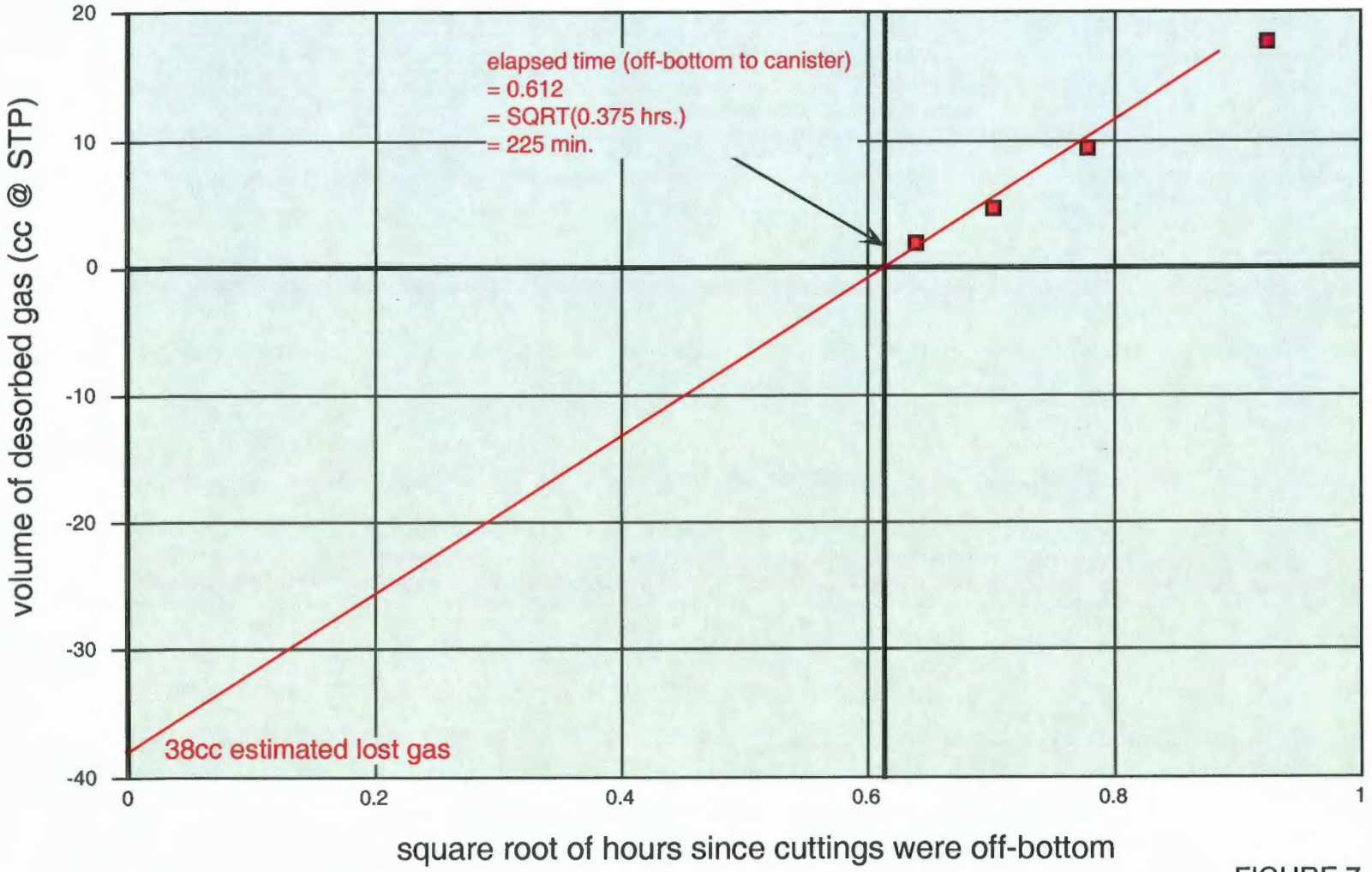


FIGURE 7.

1262.0'-1164.0' (Croweburg coal) cuttings in canister Maggy 3

Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-20S-16E, Coffey Co., KS

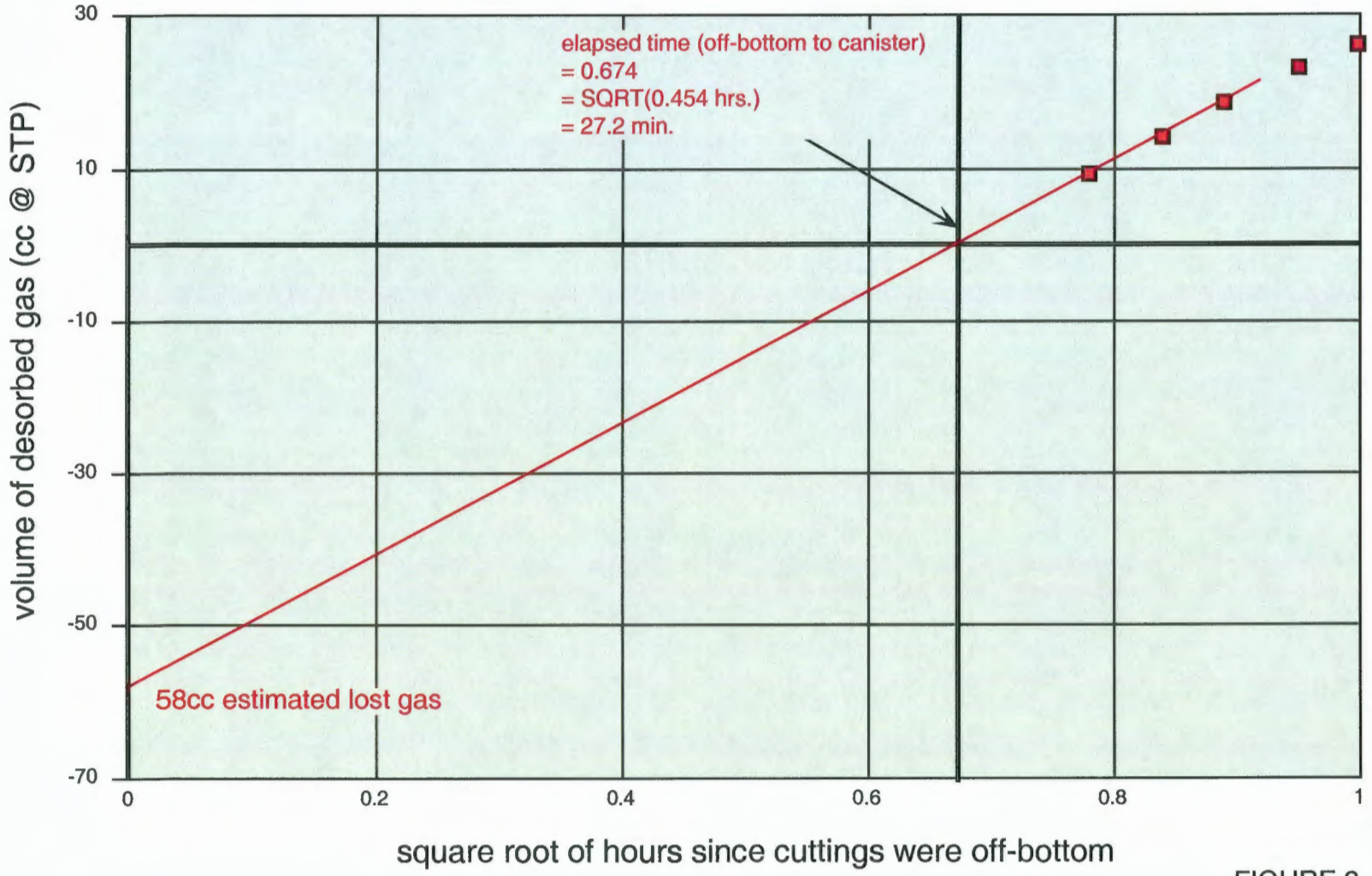


FIGURE 8.

1344.0'-1345.5' (Tebo coal) cuttings in canister Maggy 4

Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-20S-16E, Coffey Co., KS

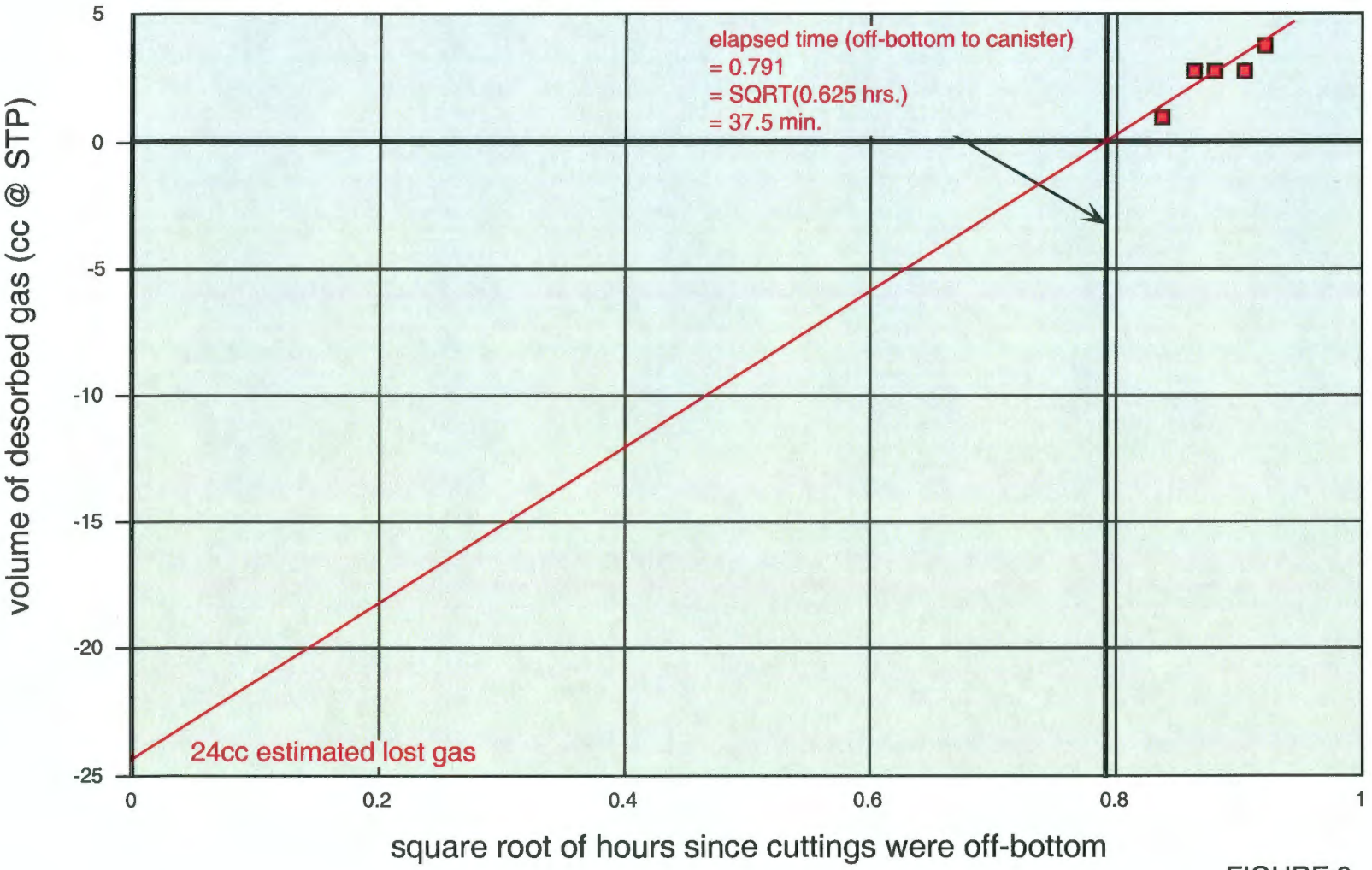


FIGURE 9.

1521.0'-1522.5' (Riverton coal underclay) core chips in canister I

Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-20S-16E, Coffey Co., KS

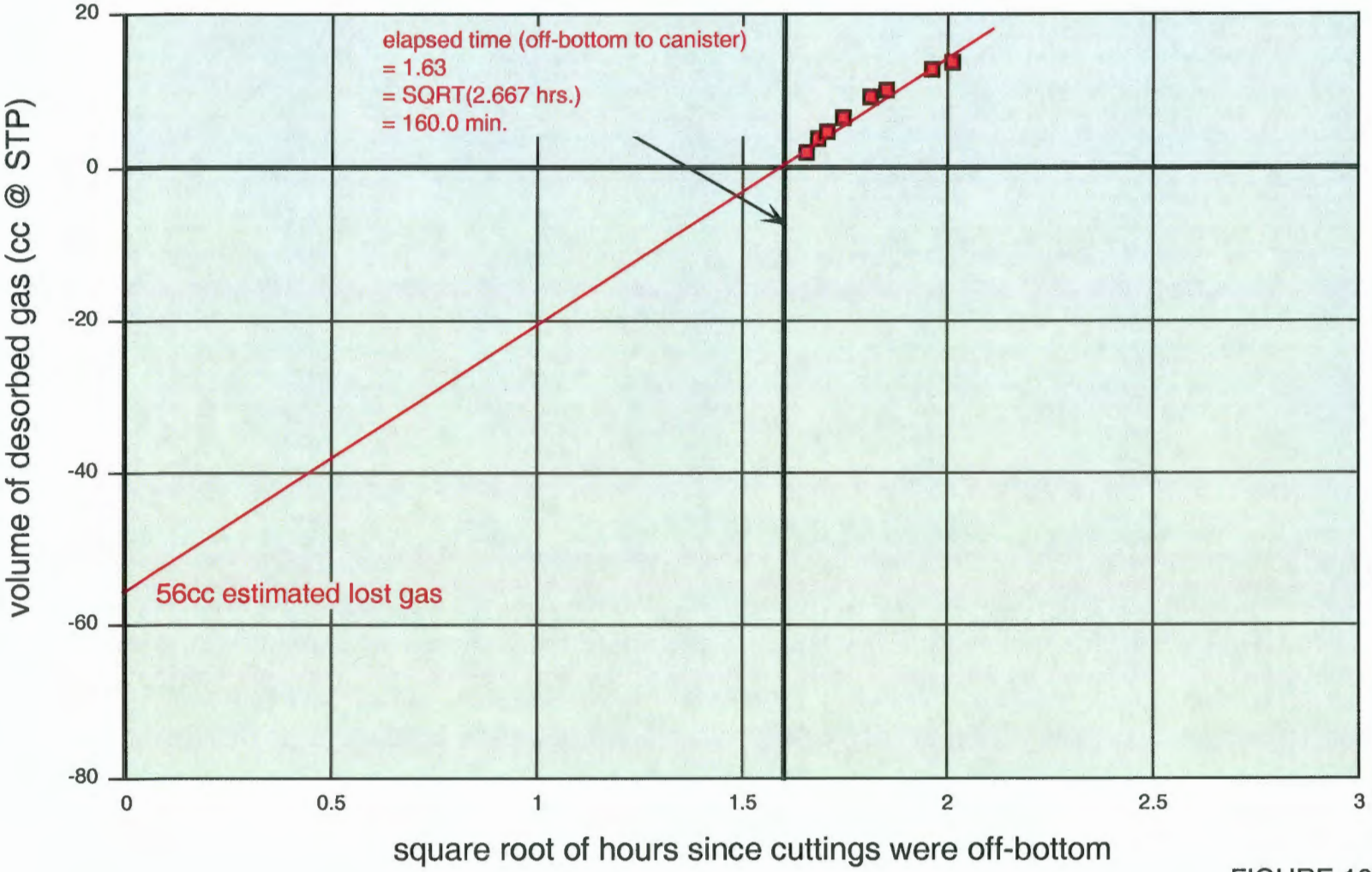


FIGURE 10.

Desorption Characteristics of Cuttings Samples

Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-20S-16E, Coffey Co., KS

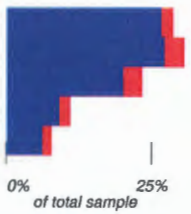
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Stark Shale from 804.0'-807.5'

$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{dark\ shale}) * (\text{weight}_{dark\ shale}))}{\text{weight}_{coal}}$$

total gas desorbed = 56.2 ccs

TOTAL DRY WEIGHT OF SAMPLE = 101.55 grams
$\text{weight}_{light\text{-}colored\ lithologies}$ = 12.06 grams (12.1%)
$\text{weight}_{dark\ shale}$ = 89.49 grams (88.1%)
weight_{coal} = 0.00 grams (0.0%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	28.83	0.00% / 93.00% / 7.00%
>0.0661"	30.79	0.00% / 88.87% / 11.13%
>0.0460"	23.46	0.00% / 86.20% / 13.80%
>0.0331"	10.74	0.00% / 82.86% / 17.14%
<0.0331"	7.57	0.00% / 80.00% / 20.00%
	101.55 TOTAL	



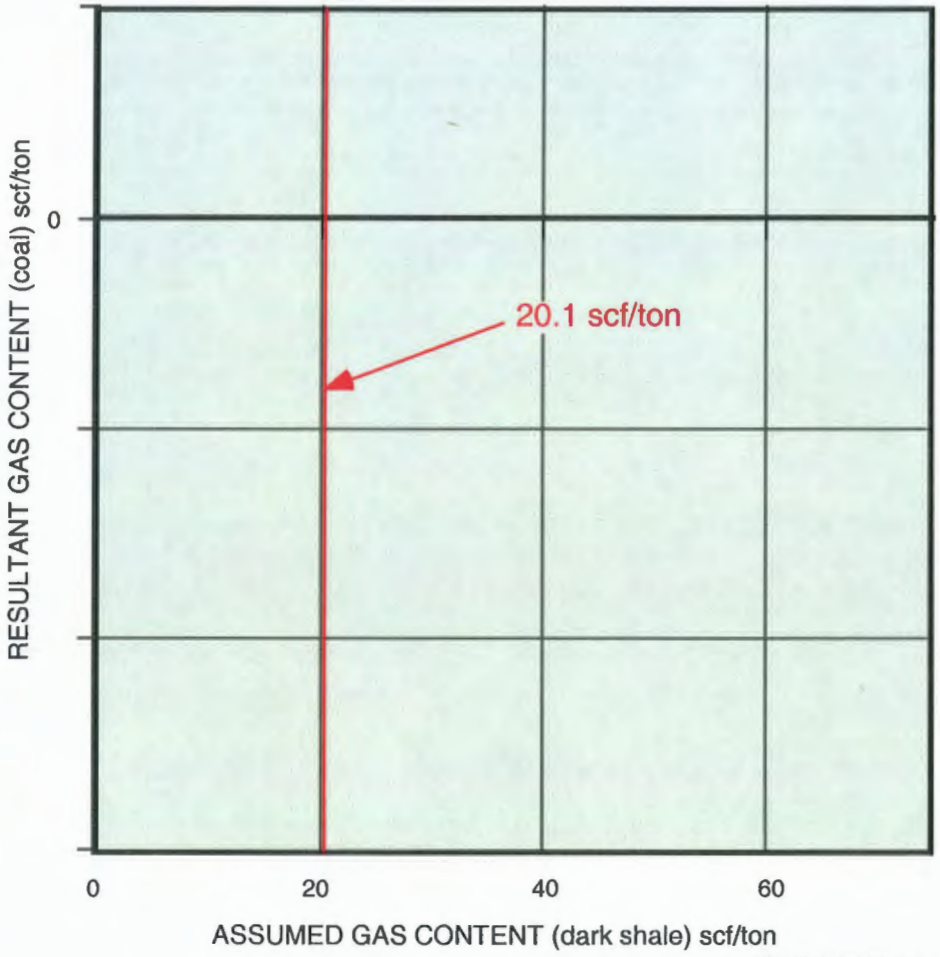


FIGURE 11.

Desorption Characteristics of Cuttings Samples

Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-20S-16E, Coffey Co., KS

LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Hushpuckney Shale from 835.0'-838.0'

$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{dark\ shale}) * (\text{weight}_{dark\ shale}))}{\text{weight}_{coal}}$$

total gas desorbed = 205.3 ccs

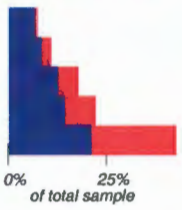
TOTAL DRY WEIGHT OF SAMPLE = 517.77 grams

$\text{weight}_{light\text{-}colored\ lithologies}$ = 193.67 grams (37.4%)

$\text{weight}_{dark\ shale}$ = 324.10 grams (62.6%)

weight_{coal} = 0.00 grams (0.0%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	37.12	0.00% / 91.31% / 8.69%
>0.0661"	55.05	0.00% / 78.35% / 21.65%
>0.0460"	91.16	0.00% / 70.97% / 29.03%
>0.0331"	114.07	0.00% / 64.45% / 35.55%
<0.0331"	220.37	0.00% / 49.40% / 50.60%
	517.77 TOTAL	



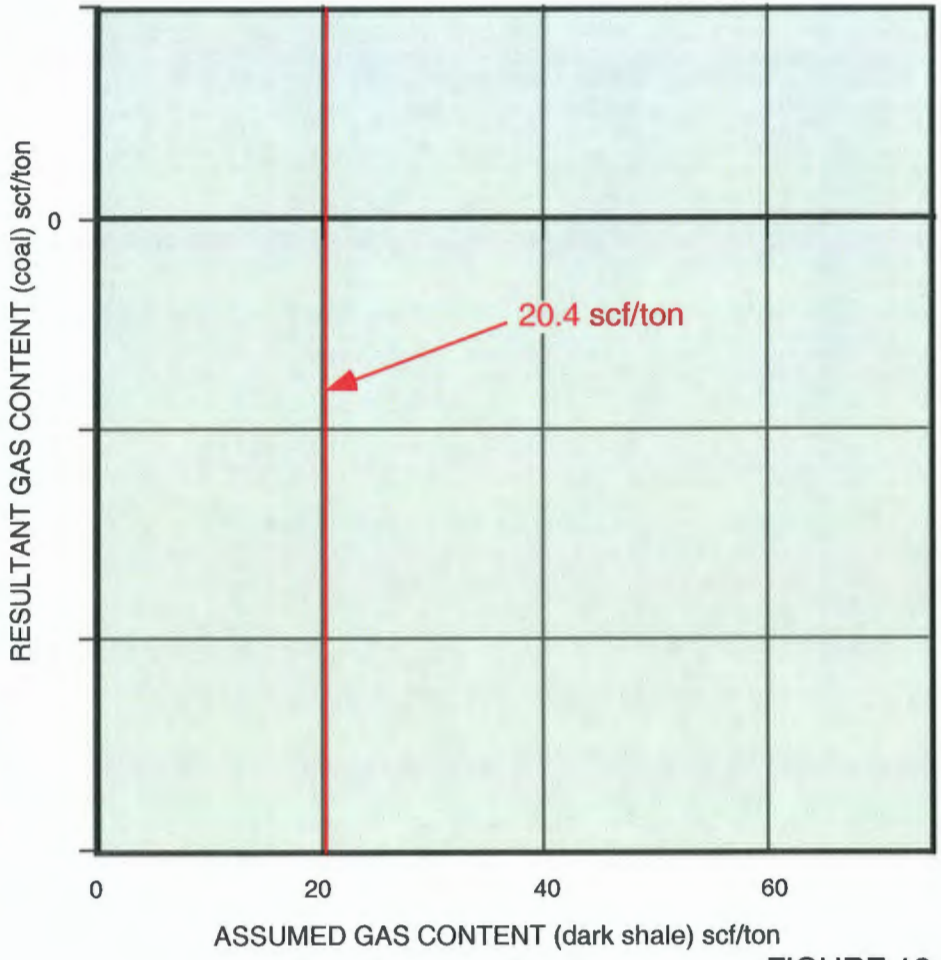


FIGURE 12.

Desorption Characteristics of Cuttings Samples

Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-20S-16E, Coffey Co., KS

LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Anna Shale from 1101.5'-1102.5'

$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{dark\ shale}) * (\text{weight}_{dark\ shale}))}{\text{weight}_{coal}}$$

total gas desorbed = 19.2 ccs

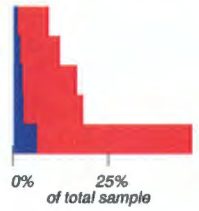
TOTAL DRY WEIGHT OF SAMPLE = 432.29 grams

$\text{weight}_{light\text{-}colored\ lithologies}$ = 375.16 grams (86.8%)

$\text{weight}_{dark\ shale}$ = 57.13 grams (13.2%)

weight_{coal} = 0.00 grams (0.0%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	38.22	0.00% / 10.73% / 89.27%
>0.0661"	50.40	0.00% / 13.34% / 86.66%
>0.0460"	70.12	0.00% / 15.33% / 84.67%
>0.0331"	76.29	0.00% / 13.60% / 86.40%
<0.0331"	197.27	0.00% / 12.77% / 87.23%
	432.29 TOTAL	



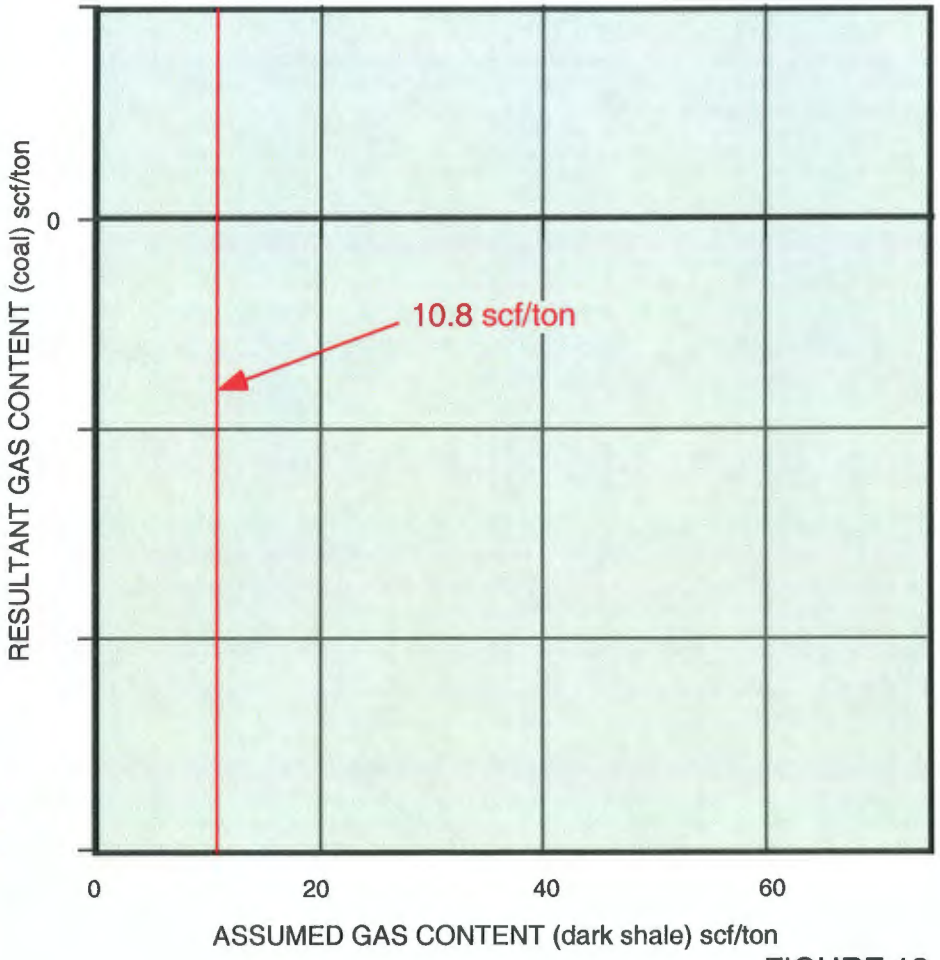


FIGURE 13.

Desorption Characteristics of Cuttings Samples

Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-20S-16E, Coffey Co., KS

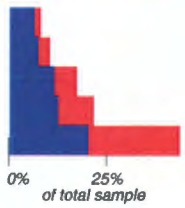
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Little Osage Shale from 1158.0'-1161.0'

$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{dark\ shale}) * (\text{weight}_{dark\ shale}))}{\text{weight}_{coal}}$$

total gas desorbed = 105.6 ccs

TOTAL DRY WEIGHT OF SAMPLE = 1275.48 grams
$\text{weight}_{light\text{-}colored\ lithologies}$ = 538.39 grams (42.2%)
$\text{weight}_{dark\ shale}$ = 737.09 grams (57.8%)
weight_{coal} = 0.00 grams (0.0%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	99.26	0.00% / 81.07% / 18.33%
>0.0661"	130.13	0.00% / 71.25% / 28.75%
>0.0460"	217.99	0.00% / 67.11% / 32.89%
>0.0331"	273.24	0.00% / 58.33% / 41.67%
<0.0331"	554.87	0.00% / 46.43% / 53.57%
	1275.48 TOTAL	



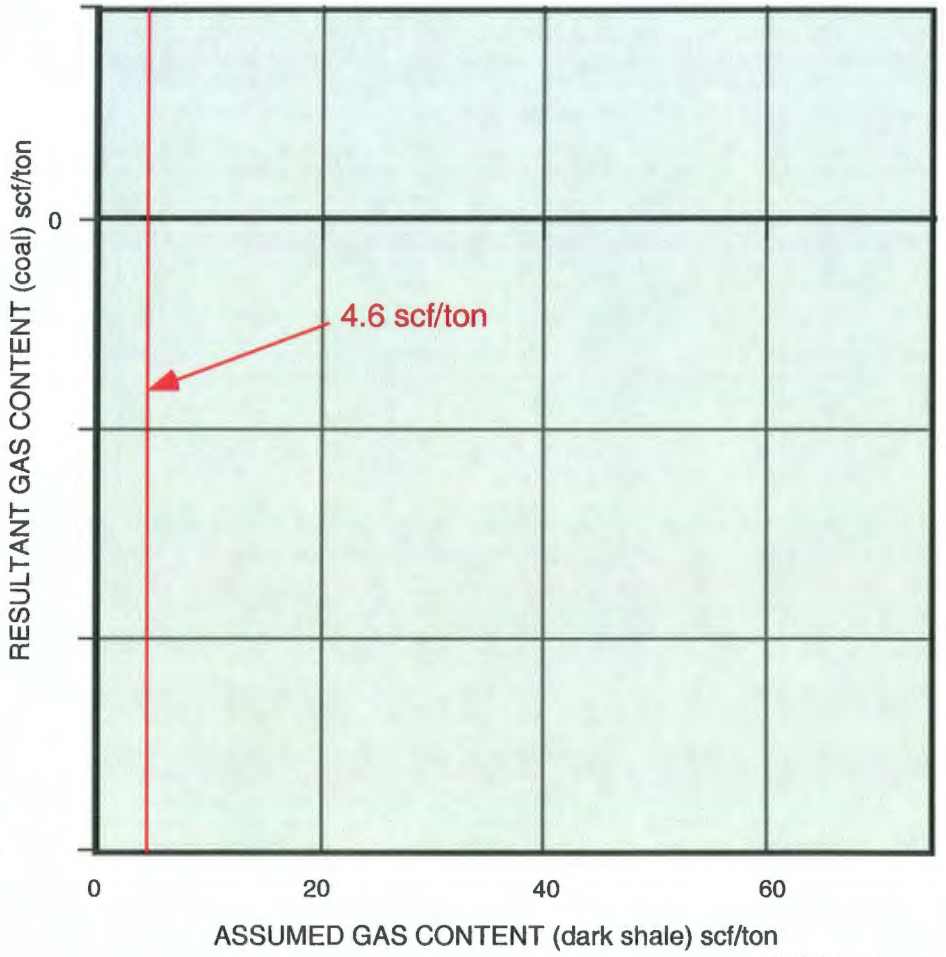


FIGURE 14.

Desorption Characteristics of Cuttings Samples

Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-20S-16E, Coffey Co., KS

LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Mulky coal from 1182.0'-1184.0'

$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{dark\ shale}) * (\text{weight}_{dark\ shale}))}{\text{weight}_{coal}}$$

total gas desorbed = 207.7 ccs

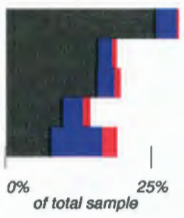
TOTAL DRY WEIGHT OF SAMPLE = 319.09 grams

$\text{weight}_{light\text{-}colored\ lithologies}$ = 18.38 grams (5.8%)

$\text{weight}_{dark\ shale}$ = 66.85 grams (21.0%)

weight_{coal} = 233.86 grams (73.3%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	93.68	86.59% / 12.22% / 1.19%
>0.0661"	59.27	83.65% / 12.60% / 3.75%
>0.0460"	61.50	79.77% / 14.89% / 5.34%
>0.0331"	45.05	67.20% / 24.34% / 8.47%
<0.0331"	59.59	40.00% / 46.67% / 13.33%
	319.09 TOTAL	



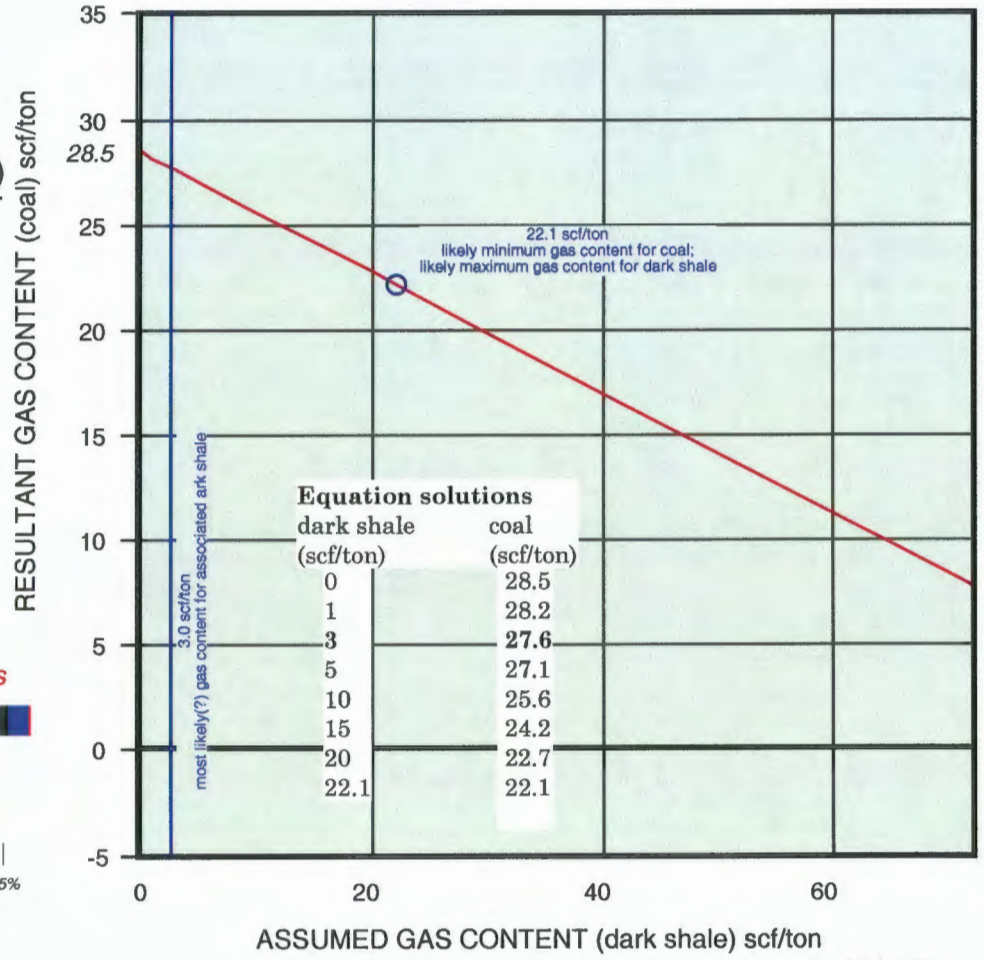


FIGURE 15.

Desorption Characteristics of Cuttings Samples

Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-20S-16E, Coffey Co., KS

LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Bevier coal from 1250.0'-1252.0'

$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{dark\ shale}) * (\text{weight}_{dark\ shale}))}{\text{weight}_{coal}}$$

total gas desorbed = 182.5 ccs

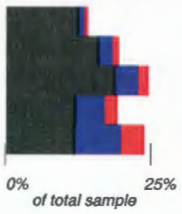
TOTAL DRY WEIGHT OF SAMPLE = 334.95 grams

$\text{weight}_{light\text{-}colored\ lithologies}$ = 30.91 grams (9.2%)

$\text{weight}_{dark\ shale}$ = 66.57 grams (19.9%)

weight_{coal} = 237.47 grams (70.9%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	46.70	89.58% / 6.60% / 3.82%
>0.0661"	64.29	83.00% / 12.09% / 4.91%
>0.0460"	81.41	77.01% / 16.05% / 6.94%
>0.0331"	63.58	63.06% / 25.68% / 11.26%
<0.0331"	78.96	50.00% / 33.33% / 16.67%
	334.95 TOTAL	



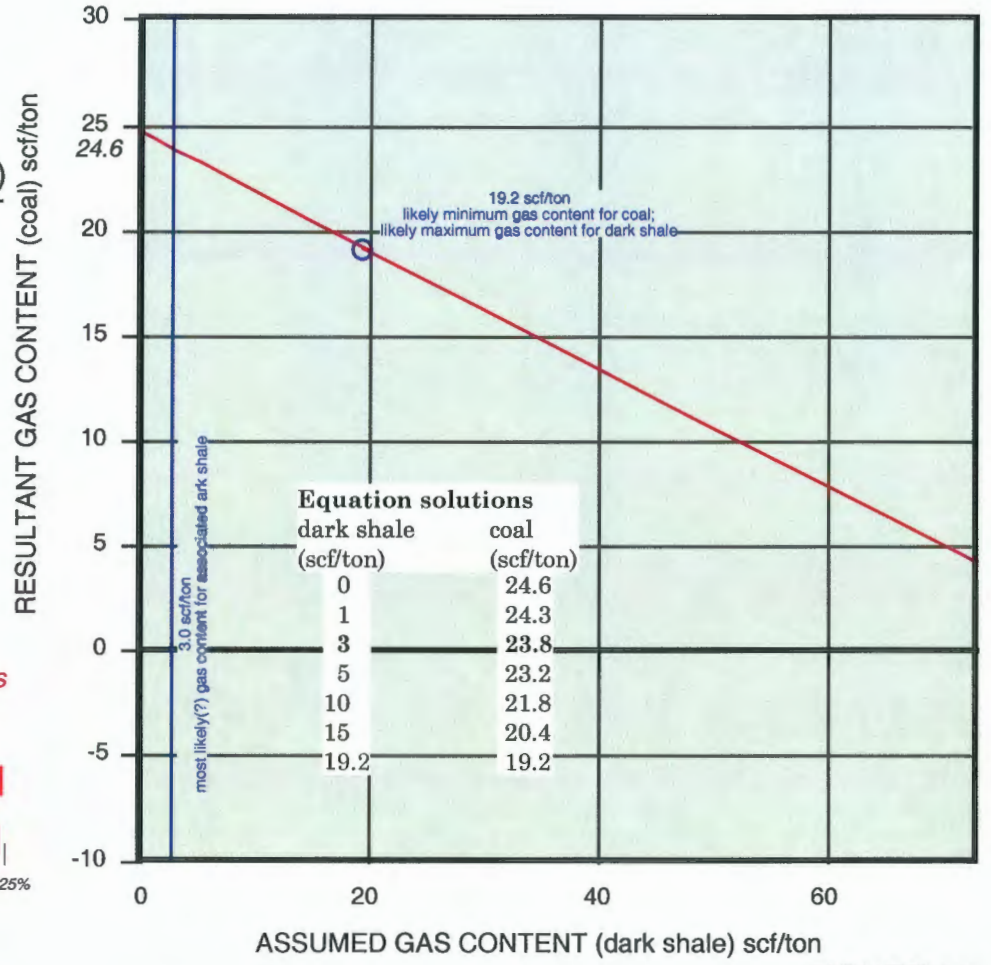


FIGURE 16.

Desorption Characteristics of Cuttings Samples

Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-20S-16E, Coffey Co., KS

LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Croweburg coal from 1262.0'-1264.0'

$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{dark\ shale}) * (\text{weight}_{dark\ shale}))}{\text{weight}_{coal}}$$

total gas desorbed = 253.1 ccs

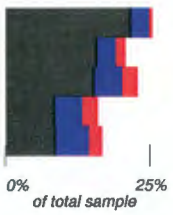
TOTAL DRY WEIGHT OF SAMPLE = 678.48 grams

$\text{weight}_{light\text{-}colored\ lithologies}$ = 66.17 grams (9.8%)

$\text{weight}_{dark\ shale}$ = 144.09 grams (21.1%)

weight_{coal} = 468.22 grams (69.0%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	169.70	85.64% / 12.27% / 2.09%
>0.0661"	138.62	76.60% / 15.45% / 7.95%
>0.0460"	152.50	67.18% / 21.23% / 11.60%
>0.0331"	106.49	53.30% / 29.25% / 17.45%
<0.0331"	111.17	51.72% / 34.48% / 13.79%
	678.48 TOTAL	



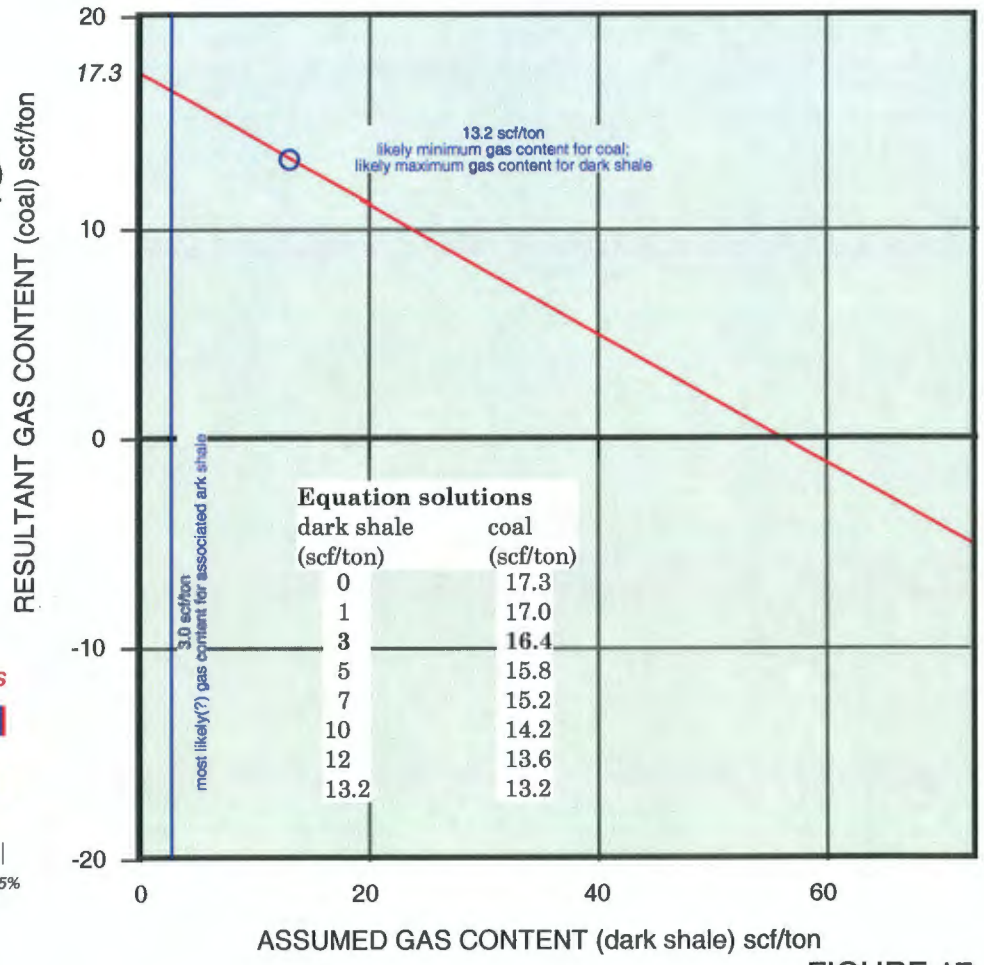


FIGURE 17.

Desorption Characteristics of Cuttings Samples

Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-20S-16E, Coffey Co., KS

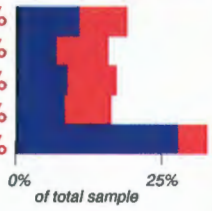
LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for calculation of gas content of Tebo coal from 1344.0'-1345.5'

$$\text{GAS CONTENT}_{coal} = \frac{\text{total gas desorbed} - ((\text{gas content}_{dark\ shale}) * (\text{weight}_{dark\ shale}))}{\text{weight}_{coal}}$$

total gas desorbed = 38.7 ccs

TOTAL DRY WEIGHT OF SAMPLE = 797.12 grams
$\text{weight}_{light\text{-}colored\ lithologies}$ = 304.18 grams (38.2%)
$\text{weight}_{dark\ shale}$ = 485.33 grams (60.9%)
weight_{coal} = 7.60 grams (1.0%)

sieve size	*grams*	*% coal / % dark shale / % light-colored liths*
>0.0930"	150.18	1.57% / 55.17% / 43.26%
>0.0661"	123.98	1.02% / 42.39% / 56.60%
>0.0460"	135.79	1.34% / 49.33% / 49.33%
>0.0331"	128.04	0.60% / 50.10% / 49.30%
<0.0331"	259.14	0.54% / 84.44% / 15.03%
	797.12 TOTAL	



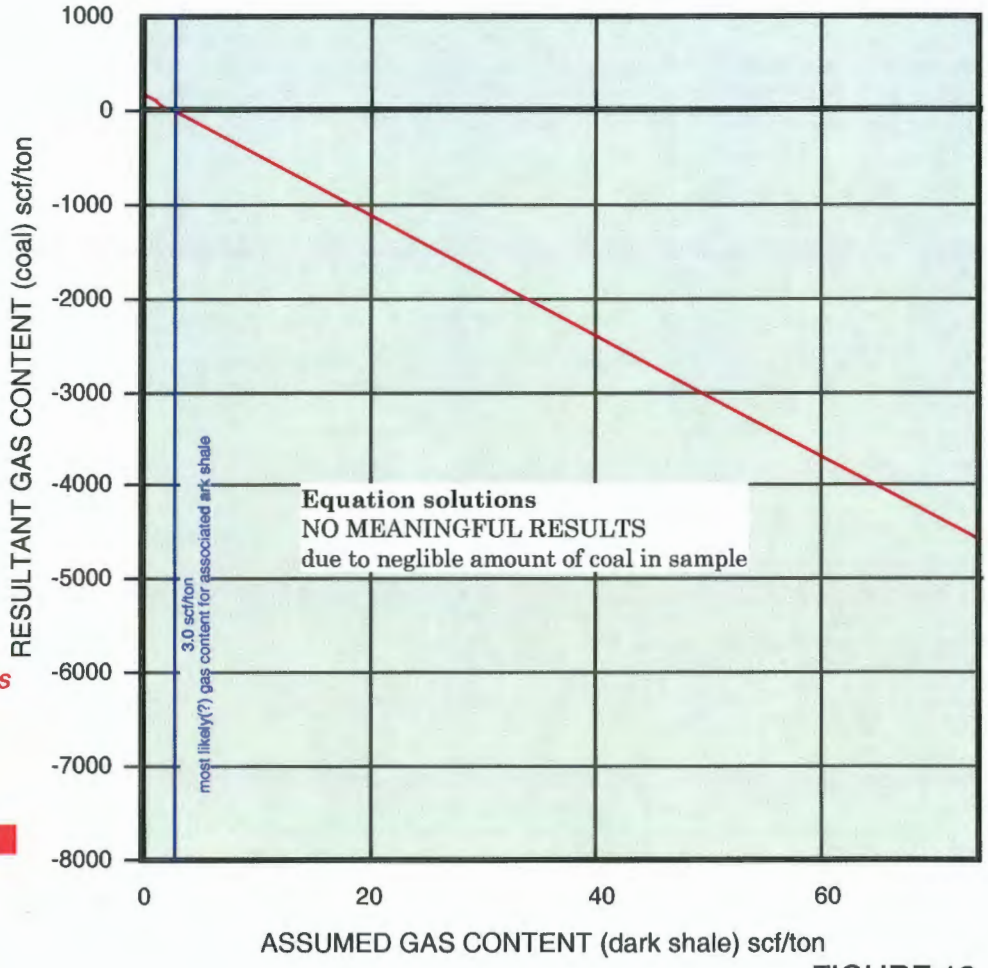


FIGURE 18.

800'
804'-808' Stark
635'-838' Hushpuckney

900'

1000'

1100'
1101'-1103' Anna Sh.

1158'-1161' Little Osage Sh.
1182'-1184 Mulky

1250'-1252' Bevier
1262'-1264' Croweburg

1300'

1344'-1346' Tebo

1400'

1500'

1521'-1523' Riverton

1600'

Desorption Characteristics of Cuttings Samples

Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-20S-16E, Coffey Co., KS

LITHOLOGIC COMPONENT SENSITIVITY ANALYSIS for all cuttings samples

UNIT	coal in sample	maximum scf/ton	scf/ton w/ shale @ 3 scf/ton	minimum scf/ton
Stark Sh.	0%	-----	**20.1**	-----
Hushpuckney Sh.	0%	-----	**20.4**	-----
Anna Sh.	0%	-----	**10.8**	-----
Little Osage Sh.	0%	-----	**4.6**	-----
Mulky	73%	28.5	**27.6**	22.1
Bevier	71%	24.6	**23.8**	19.2
Croweburg	69%	17.3	**16.4**	13.2
Tebo	1%	-----	-----	-----
Riverton u/clay	(core sample)			

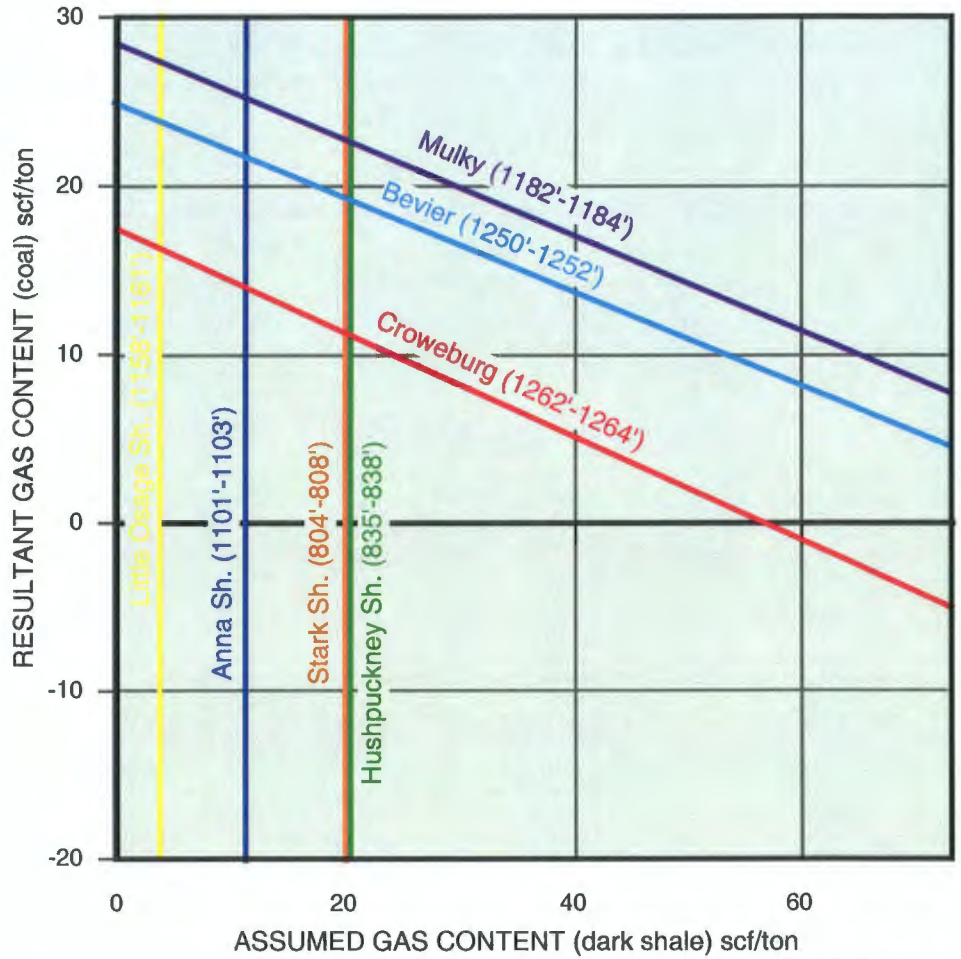


FIGURE 19.

800'
804'-808' Stark
835'-838' Hushpuckney
900'
1000'
1100'
1101'-1103' Anna Sh.
1158'-1161' Little Osage Sh.
1182'-1184 Mulky
1250'-1252' Bevier
1262'-1264' Croweburg
1300'
1344'-1346' Tebo
1400'
1500'
1521'-1523' Riverton
1600'

Desorption Characteristics of Cuttings Samples

based on total weight of gas-generating lithologies (i.e., coal and dark shale) in sample
Petrol Oil & Gas #24-1 Rahmeier, S2 NW NW SW 24-20S-16E, Coffey Co., KS

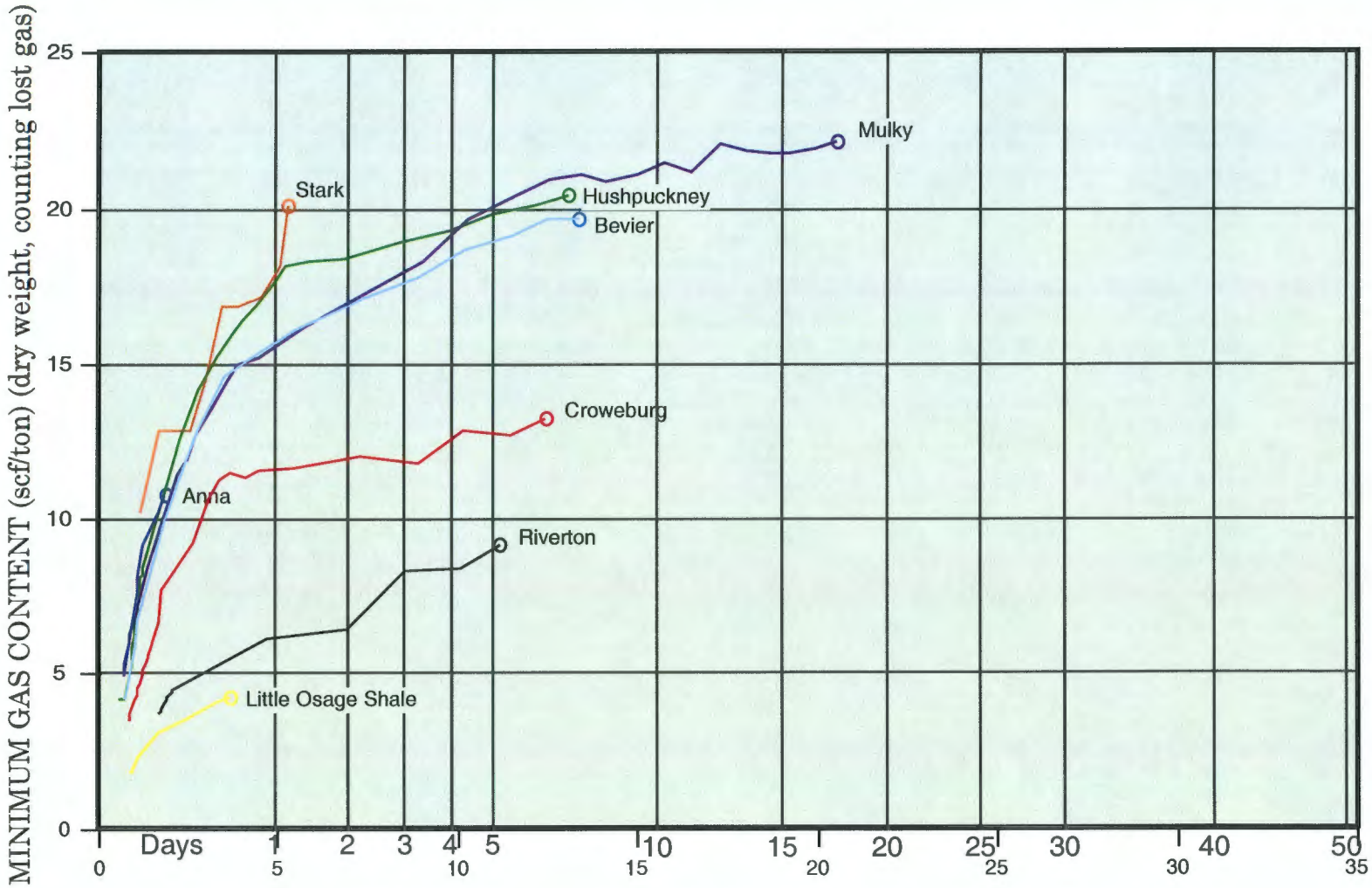


FIGURE 20.