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ADDITIONAL DISTILLATION TESTS OF SOME KANSAS OIL SHALES

by

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Short Papers on Research

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Within the borders of Kansas are a number of shales having latent product development possibilities. The characteristics of these shales that contribute to this possibility are (1) they contain oil, (2) they are capable of yielding substantial quantities of combustible gas, (3) they contain nodules high in phosphate value and, (4) they can have significant uranium contents.

The shales examined for this study were all from the Pennsylvanian System and occur stratigraphically from the top of the Cabiness Formation in the Cahokia Group to the top of the Tachett Formation of the Pleasanton Group and were sampled in southeastern Kansas where they are exposed. The specific shales investigated included the following: Little Osage, Little Anna, Pleasanton, and Excello. Previous work on these shales are described in various bulletins of the Kansas Geological Survey. (1) (2) (3)

It has been known for some time that some black shale deposits in Kansas contain obtainable oil. Most of these shales also generate a large quantity of gas when distilled. Based on shale deposits of at least three feet in thickness, under less than 100 feet of overburden and with an average yield of 5 gallons of oil per ton of shale it has been estimated there are 3 billion barrels of recoverable oil. Coupled with the fact these shales also contain nodules with reported nodule average composition of 30.2 percent P_2O_5 and 0.017 percent U_3O_8, and with increasing energy and fertilizer shortage lends considerable weight to re-examining these and considering methods of commercial extraction of oil, uranium, phosphate, and gas.

The samples of shale were distilled in an iron retort arranged according to figure 1. An air dried, 200 gram sample was charged into the retort which was then heated to 1,000°-1,200°F for 60 minutes. The shale oil was collected in a graduated cylinder. A condenser was attached to remove additional oil. Any vapor gas not condensed in this system was flared at the end of the condenser.(4)

The results of this procedure are summarized in Table 1. The Little Osage Shale consistently yielded the larger quantities of oil with yield increased by finer crusting. Anna shale produced a large amount of gas as evidenced by a very large flame at the flare point.

The Little Osage shale yielded the equivalent of 55 litres of oil per metric ton of shale (15 gallons per ton).

(1) Runnels, Russel T., Kulstad, Robert O., McDuffee, Clinton, and Schleecher, John A.: Oil Shale in Kansas, State Geological Survey of Kansas, Bulletin 96, part 3, 1952. University of Kansas, Lawrence, Kansas

(2) Runnels, Russel T., Preliminary Report on Phosphate-Bearing Shales in Eastern Kansas, State Geological Survey Bulletin 82, part 2, 1949, University of Kansas, Lawrence, Kansas.

(3) Runnels, Russell T., Schleider, John A, VenNortwich, H. S., Composition of Five Uranium-Bearing Phosphate Nodules from Kansas Shales, State Geological Survey of Kansas Bulletin 102, Part 3, 1953, University of Kansas, Lawrence, Kansas.

(4) Karrich, Lewis C., Manual of Testing Methods for Oil Shale and Shale Oil, U. S. Bureau of Mines Bulletin 249, 1926, U.S. Department of Interior, Washington, D. C.

TABLE 1: Results from Retorting Some Kansas Shales

	Sample	Temp	WTS Original	Final	Diff	Distilled Product (cc) Oil	Water	Flame
1.	Little Osage Shale -8 mesh Upper Sample	1,000°F 1,200°F	200	175	25	11	8	
2.	Excello Shale -8 Mesh	1,000°F 1,200°F	200	187	13	3.5	8	
3.	Pleasanton Shale -8 Mesh	1,000°F 1,200°F	200	173	27	8	11	
4.	Little Osage Shale -8 Mesh Lower Sample	1,000°F 1,200°F	200	175	25	11	8	
5.	Pleasanton Shale Crusher Run All - 3/4"	1,080°F	200	180	20	5	9	Small
6.	Cherokee Shale Below Verdigris Crusher Run All - 3/4" N-3 N-6	1,340°F	200	180	20	4	8	Long Flame @1,040°F
7.	Top of Cherokee Crusher Run All - 3/4" N-12 N-13	1,000°F	200	185	15	8	5	Very Small
8.	Mulky Crusher Run -3/4" N-10, N-11, N-17	1,250°F	200	180	20	6	7	Very Large

Shale Retorting
Table 1 Continued

	Sample	Temp	WTS Original	WTS Final	WTS Diff	Distilled Product (cc) Oil	Distilled Product (cc) Water	Flame
9.	Anna Shale Crusher Run - 3/4" N-14, N-15, N-16	1,250°F	200			7	8	Extra Large
10.	Little Osage-Rock Quarry Crusher Run - 3/4" N-1, N-2	N.D.	200	170	30	5	5	Small
11.	Little Osage Crusher Run - 3/4" N-14, N-5	N.D.	200	185	15	4	3	Large
12.	HB-1 -8 Mesh Little Osage Shale (Lower portion)	1,290°F	192	165	27	10	5	Very Large
13.	HB-2 -8 Mesh Little Osage Shale (Upper portion)	1,290°F	265	237	28	2	10	Very Small
14.	N-23 -8 Mesh Shale above Weir-Pittsburg Coal	1,210°F	205	150	55	0	31	Very Small

Shale Retorting
Table 1 Continued

	Sample	Temp	WTS Original	WTS Final	WTS Diff	Distilled Product (cc) Oil	Distilled Product (cc) Water	Flame
15.	N-25 -8 Mesh Stark Shale Member	1,160°F	270	231	39	2	15	Small
16.	N-26 -8 Mesh	1,140°F	345	295	50	5	27	Large
17.	Pleasanton Shale N-27 -8 Mesh Little Osage Shale	1,200°F	292	250	42	13	17	Medium

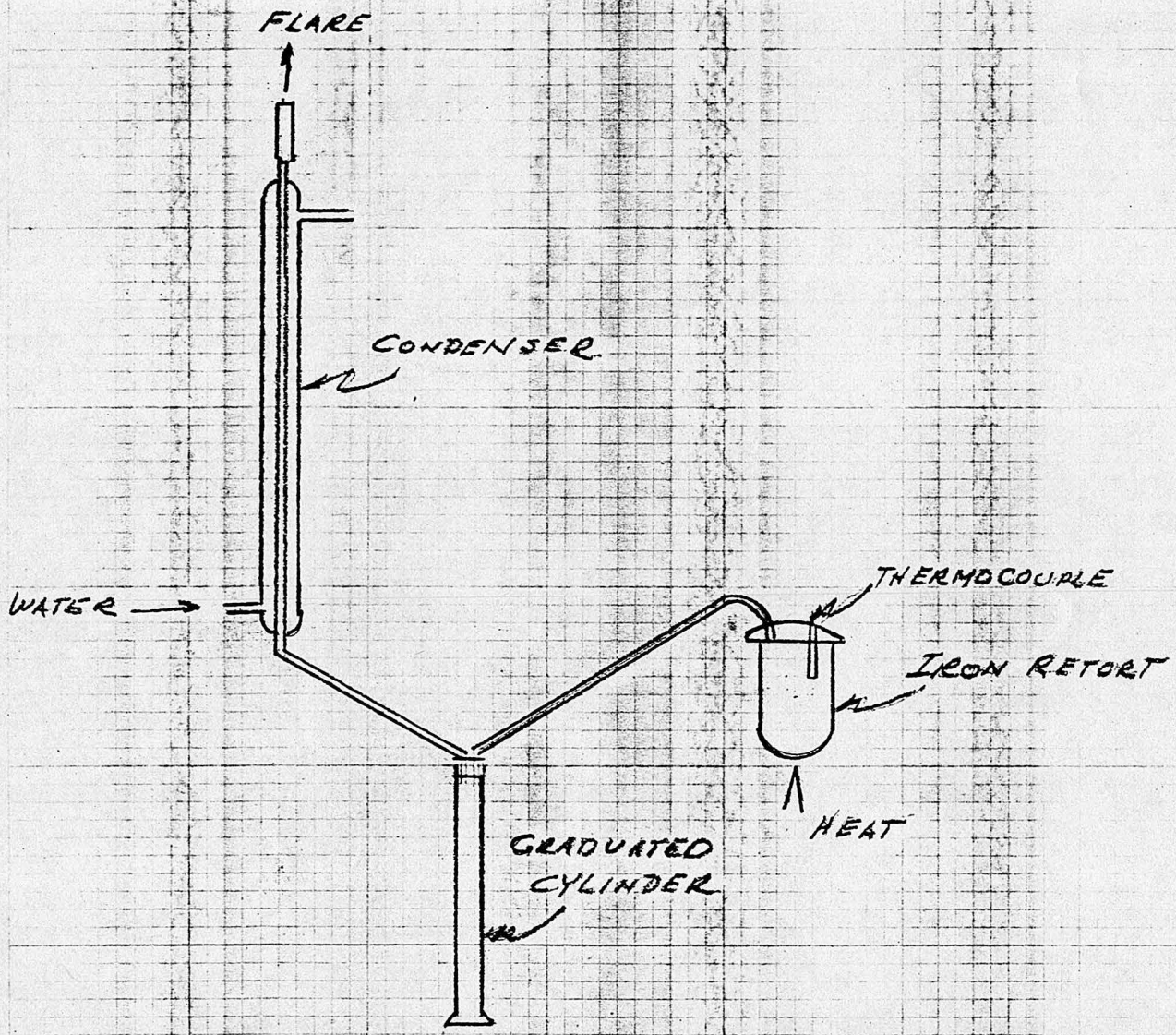

FIG: 1 – LABORATORY DISTILLATION SYSTEM FOR OIL SHALES