Use of Kentucky Rock Asphalt for De-slicking Purposes

James H. Havens
Kentucky Highway Materials Research Laboratory
November 16, 1964

MEMORANDUM

TO: W. B. Drake
Assistant State Highway Engineer

FROM: Jas. H. Havens
Director of Research


According to Joe Creason's report appearing in the Courier-Journal June 23, 1957 (copy attached), the Kentucky Rock Asphalt Company elected, June 14, 1957, to liquidate. Among the assets was a stockpile of material which was valued at $197,000 (I recall that the stated price, F.O.B. Sweden, in 1955 was $7.00 per ton); this calculates to be 28,140 tons—which is a small quantity in comparison to the gross production (200,000 to 275,000 tons; $1.2 to $1.75 million) during some prior years. Apparently 1956 was the last year of sales, and I believe that Kentucky was the sole purchaser. Perhaps as much as 100,000 tons was used for re-surfacing in Kentucky during 1956. U.S. 60 and 421 on the east side of Frankfort was one of the last resurfacing projects.

Kyle Vance's report in the Courier-Journal, November 7, 1958, (copy attached) refers to three purchases (a typographical error obscures the details of one of them); he specifically mentions "...28,000 tons or more..." of remaining stock "...for $182,000." That is $6.50 per ton, as was stated in the article.ª

ª The date of this agreement was February 24, 1959; HCT 14032, dated July 1, 1959, covered 14,000 tons, in the amount of $91,000; I do not know whether this covered the first or second half.
I infer from the reporter's reference to acquisitions of April 9, 1958, and August 12, 1958, totaling $71,500 (@ $6.50 per ton), that an additional 11,000 tons preceded the deal for the 28,000 (or more) tons. I am inclined to believe that a total of 39,000 tons was purchased for dispersal amongst the several Highway Districts. Moreover, it is my understanding that each District was to receive an allotment, but the freight costs were to be borne by the Districts; and, apparently, some Districts declined to accept their allotment because the shipping costs alone were overwhelming. Some Districts sent their own trucks for the material; others arranged with the Bowling Green District to load and ship it to them. The stockpile was to be removed from the premises within five years.

The Bowling Green District is able to account for 40,877.84 tons. Between August 26 and September 22, 1958, they shipped 7,287.94 tons; and, between October 1961 through 1963; they shipped 8,915 tons; as follows:

**August 26 - September 22, 1958**

<table>
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<tr>
<th>Destination</th>
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**October 1961 - 1963**

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SubTotal 8,915.90

TOTAL 16,203.84
Bowling Green reports that they have 6,184 tons on hand, hence,

\[
\begin{align*}
40,877.84 & \quad \text{Tons, accountable} \\
-16,203.84 & \quad \text{Tons, shipped to other Districts} \\
24,674.00 & \quad \text{Tons, credited to Bowling Green District} \\
-6,184.00 & \quad \text{Tons, on hand in Bowling Green District} \\
18,490.00 & \quad \text{Tons, presumably used by Bowling Green District}
\end{align*}
\]

The following is an inventory of reserves (estimated by District personnel) presently on hand.

No. 1, Paducah, J. H. Howard \----------200 tons
Approximately 100 tons at Mayfield; Bowling Green accepted some of their allotment (to avoid shipping costs). Commented: good for mopping up fat spots on pavements (a form of de-slicking), has 18 mi. of slurry-seal.

Note: Bowling Green's accounting does not show shipments to District 1.

No. 2, Madisonville, M. G. Gregory \-----1,000 tons
Used 2,000 tons in Christian County, has approximately 1,000 tons (Central City, Calhoun, and Madisonville).

No. 3, (see comments elsewhere) \-----6,184 tons

No. 4, Elizabethtown, H. R. Ditto \-----500 tons
Has used 100 or 150 tons; but had 100 or 150 tons before allotment was received; was used mostly for filling cracks rather than for de-slicking; has a portable heater (McConnaughay).

No. 5, Louisville, W. O. Surgener \-----250 tons
Received approximately 200 tons by rail and 100 tons by truck; used about 50 tons; approximately 250 tons on hand at Jefferson County Maintenance Garage; the 50 tons may have been used on Clark Memorial Bridge for patching.

No. 6, Covington, S. E. Fortner \-----00 tons
None in District; favors slurry-seal for de-slicking.
No. 7, Lexington, John Spurrier --------200 tons
Received 554 tons; used only for de-slicking; has steam heater; 200 tons located at Winchester, Jessamine County, and 5 mi. west of Lawrenceburg on US 62.

No. 8, Somerset, J. H. Sturgill -------- 50 tons
Has used allotment and recently borrowed 70 or 80 tons from Bowling Green; would like to have 100 or 200 tons more; 50 tons now on hand in Pulaski County.

No. 9, Flemingsburg, G. H. Jackson --------200 tons
Received approximately 400 tons, has used 200 and has 200 on hand in Greenup and Rowan Counties; used for de-slicking, patching cracks and patching rock asphalt surfaces; has started to use slurry-seal (Flemingsburg-Carlisle Road).

No. 10, Jackson, J. B. Noonan, B. K. Knight -- 00 tons
Received 1057.35 tons ($4,869.65 freight cost); all used in September 1962, on Ky 15 on the north and south sides of Jackson; now de-slicking with limestone-chip seals.

No. 11, Manchester, C. R. Dorsey --------400 tons
Received approximately 1,000 tons about 2 years ago; 600 tons used for de-slicking; has about 200 tons at Williamsburg and about 200 tons at London; would not like to give it up.

No. 12, Pikeville, Wendell Bayes --------160 tons
Received about 600 tons; has about 160 tons at Paintsville and Whitesburg; does not have equipment for applying rock asphalt; needs a standard method for de-slicking.

Total on hand, all Districts, Estimated --------- 9,144 tons
On November 10, 1964, I inspected several roads in the Bowling Green District that had been de-slicked between 1961 and 1964 and was impressed by the degree of success achieved there. Some pictures taken then are attached hereto (labeled Figures 1 thru 4). Mr. Drennan, Principal Assistant District Engineer for Maintenance and Traffic, compiled a list of all projects that had been de-slicked; and this record is also attached.

The Bowling Green District attributes their success with rock asphalt (for de-slicking) to the fact that they apply only about 8 to 10 lbs. per sq. yd. (fanned on, through a Shrunk spinner). They prime the surface with RS-2 (about 0.025 gal. per sq. yd.). This light application seems to be about all that will stick and seems to avoid the ridges and roughness that accompanies heavier applications when they are spread in this manner. The rock asphalt is pre-heated (by steaming). An 8- to 10-ton pneumatic roller, following close behind the spreader, seats the sand; one coverage is sufficient. The most favorable season is between July 1 and September 15.

The rock asphalt discussed above should not be confused with the materials which have been under study recently (produced by the Reynolds' Interests). The earlier material, and the reserves now on hand, were of a higher quality and commanded a higher price.

I am convinced that the Bowling Green District has found the proper technique for applying their rock asphalt. Moreover, their success in that work is wholly in accord with recognized engineering criteria for sand-seal types of surface treatments - as I shall explain in the ensuing discussions. In seal coats, the amount of asphalt or bitumen needed is determined by the size of the aggregate (chips or sand). Chips in the order of 1/2 in. in size require 0.30 gal. of bitumen per square yard; however, 10 lbs./sq. yd. of rock asphalt sand gives a compacted thickness of approximately 1/8 in. Bitumen-free sand would require about 10% bitumen (by weight) to hold this amount of sand: 10% of 10.0 lbs. = 1 lb. of bitumen per sq. yd. or 1/8.34 gal./sq. yd., i.e., 0.12 gal./sq. yd. The rock asphalt already contains about 7% bitumen; hence, the maximum amount of bitumen that could be used as prime (tack) would be about 0.035 gal./sq. yd. This rate of prime could prove to be excessive if the rock asphalt happened to thin out to 5 or 6 lbs./sq. yd. Actually, they (the Bowling Green District) are well on the safe side; that is, by using 0.025 gal. of RS-2 (0.016 gal. net asphalt), they avoid the possibility of asphalt bleeding to the surface and drowning the sand. Much of the success in their work must be attributed to their painstaking effort in applying the RS-2 and the rock asphalt. This meager amount of RS-2

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cannot be more than a fog-coat, but apparently they are able to get rather uniform coverage. Of course, it is very essential that the rock asphalt be spread immediately behind the RS-2. The rock asphalt, since it is a pre-coated sand and since it is pre-heated, should exhibit a high affinity toward the RS-2.

I wish to emphasize, now, that it should be possible to utilize ordinary, bitumen-free sands in the same way as the rock asphalt. There is an established procedure whereby sands may be heated and pre-coated with 1 to 2% bitumen in a regular hot-mix plant and spread by means of a spinner; of course, a heavier application of the primer would be needed to compensate for the difference in total bitumen content. Here again, painstaking workmanship would be an essential part of the procedure. Perfection of this procedure could provide an expedient but somewhat standard method of de-slicking which would not be dependent in any way upon rock asphalt. This type of surface treatment might suffice for most roads carrying medium volumes of traffic; whereas chip-seals might be preferred for low volume roads. I am inclined to favor hot-mixed, paver-laid, sand-asphalt surfacing for our highest types of roads; and, as you know, we have been working on that idea for several years. Slurry-seals should not be excluded from this picture at all; they have been already perfected to the operational stage by the Maintenance Division. I would make one other distinction among these alternatives: it seems to me that sand-seals and slurry-seals are more of a do-it-yourself operation than the hot-mixed sand-asphalt is.

My discussion would not be complete if I failed to mention an earlier experience with a sand-seal on U.S. 25, south of Mt. Vernon, applied August 1, 1961. Several severe curves there had been de-slicked from time to time with rock asphalt. We suggested informally that they try a sand-seal using conglomeratic sand being produced by the Kentucky Stone Company from a source north of Livingston. The asphalt was applied through a distributor, and a great abundance of the sand was spread over it. There was considerable unevenness in the application of asphalt, and some unwanted ridges developed after the excess of sand was blown onto the shoulders by the traffic. Never-the-less, the surface gradually ironed out smooth, and, except for a tendency toward bleeding and fatness, the surface has persisted and is in good condition at the present time. I am not at all confident that it is as skid-resistant as we might wish it to be; certainly, it is not equal to a hot-mixed sand-asphalt in that respect. Figure 8, in the attached report on "Pavement Slipperiness Studies", dated February 1962, shows the early appearance of one of the sand-seal sections. Now the surface is quite black.
There is a technicality regarding skid-resistance which I wish to inject here. Although we are really seeking a sand-paper texture in these surfaces, we know that at high speeds (even at 40 to 50 m.p.h., during heavy rains) tires tend to hydroplane on wet pavement; in fact, the leading edge of the tire tends to ride up on the water; and, at 70 m.p.h., as much as 50% of the normal, tire imprint may be out of contact with the pavement. Many drivers seem to be unaware of this loss of traction and of the dangers accompanying it. The simplest explanation for hydroplaning is that the water can't get out of the way fast enough. On a glassy surface, the tire has to squeeze all of the water away before safe contact is established. We have pledged some faith in sand-asphalts as a partial solution to this problem; in fact, we learned this lesson from our old rock asphalt surfaces. I have observed that a car preceding me on a wet, rock asphalt pavement leaves a relatively dry tire-print behind it. Rock asphalt surfaces are notoriously porous (about 15% voids), and we believe that this relieves some of the water pressure under the tires - by providing a downward escape route. We have sought to preserve this feature in our design of sand-asphalt surfaces. A feature like this is more amenable to precise control in hot-mixed sand-asphalt than in any of the other types of surface treatments mentioned.

It is my opinion that we should strive to utilize rock asphalt, in the forms now available, for de-slicking, surfacing, or base construction--at least on minor roads--in the area where it is economical and feasible. I am convinced, however, that we should not rely solely upon this material for de-slicking on a state-wide basis. In fact, I am convinced that we can accomplish de-slicking with any angular, quartz sand obtained from rivers, sand deposits, or by crushing sandstones. We believe that hot-mixed sand-asphalt, such as that used in various resurfacing projects in Logan County a few weeks ago, can reliably and economically supplant rock asphalt for surfacing and, in doing so, provide a skid-resistant surface which is equal to or superior to rock asphalt. We have confidence in sand-slurry seals--except on the very highest traffic-volume roads. Sand-seals, such as those tried on U.S. 25, south of Mt. Vernon, which utilized the Rockcastle Conglomerate Sand are probably equal to rock-asphalt seals and are at least as economical.

You will note that the quantity of rock asphalt used for de-slicking on a state-wide basis has not been very great. In other words, it would not offer a very attractive market to a producer.

When the present stocks of rock asphalt are exhausted, it is likely that the material then available will not be as
rich in asphalt; however, the Bowling Green District might continue to use the product by modifying the present procedure to provide a heavier application of RS-2.

I am in sympathy with Mr. Bayes' comment concerning the need for a standard method of de-slicking roads. My first preference, of course, would be hot-mixed, paver-laid sand-asphalt (Special Provision, 8-6-64); my second choice would be a sand-slurry; my third choice would be a sand-seal or rock-asphalt seal; chip-seals would fall at the bottom of the list. My first preference, as far as the Bowling Green District is concerned, would be to continue their present practice - at least, until the supply of rock asphalt is exhausted.

JHH:skb

Attachments:

Copy, Joe Creason's Article, *Courier-Journal*, 6-23-57
Copy, Kyle Vance's Article, *Courier-Journal*, 11-7-58
Figures 1 thru 4
List of de-slicking treatment, District 3, 1961-1964
MEMORANDUM

TO: James H. Havens, Director
    Division of Research

FROM: W. B. Drake
      Asst. State Highway Engineer

SUBJECT: Research Report on Ky. Rock
         Asphalt for Deslicking Purposes

October 15, 1964

Commissioner Ward, in his memo of October 13 which is attached, instructed that certain information be assembled and a report prepared on the use of Ky. Rock Asphalt for deslicking purposes. Please note that he also has requested an inventory of the Ky. Rock Asphalt presently owned by the Department of Highways.

Please proceed with this at your earliest convenience.

nj

attachment
MEMORANDUM

TO: W. B. Drake
   Assistant State Highway Engineer

FROM: Henry Ward
   Commissioner

SUBJECT: Research Report on use of Ky. Rock Asphalt for deslicking purposes

My understanding is that the Bowling Green District has made extensive use of Kentucky Rock Asphalt in deslicking, and has experimented on the use of various amounts, particularly on US 68. I will appreciate it if you will get for me, at the earliest possible time, a report on the use of Kentucky Rock Asphalt for this and other purposes, and include in that report an estimate of the amount of the Kentucky Rock Asphalt owned by the Department of Highways which is left for Highway Department uses.

[Signature]
Commissioner

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EXIT KYROCK

Decision to dissolve the company hints hard times for employees and for all of Edmonson County

By JOE CREASON, Courier-Journal Staff Writer

SWEENY, Ky., June 22—No doubt about it, June 14 will be remembered as Black Friday in this little, oddly spelled ridge-country village in North-Central Edmonson County.

On that day, the stockholders of Kentucky Rock Asphalt Company voted to dissolve the company and go out of business after 40 years of supplying natural asphalt for road-building throughout the nation.

That action by the owners of the company was easy to understand. The company had been in business since 1940. But in addition, natural rock asphalt, which had gained favor in the past, had lost some of its luster as other road materials became more widely used.

Rock Applied Cold

One main factor has been the inability to price the company's natural rock asphalt as low as competitors price asphalt obtained as a residue from petroleum.

Another has been the illness of G. H. Roebuck, the man who has run the company since 1940.

But in addition, natural rock asphalt offered no other advantage as well as other road materials under the weight of the government's tremendous expenses now paying for the highways.

That marked the beginning of the end, the stockholders were told.

At the June 14 meeting, it was reported that company assets were valued at $1,177,000, of which $940,000 was liquid assets, $228,000 in physical assets, and $137,000 in stocks tied up in a small mountain of rock at the crushing plant here.

Liquidation Voted

Rather than possibly dissipate the assets, the stockholders—many of them with extreme reluctance—voted for the liquidation.

And so Kentucky Rock Asphalt Company officially came to the end of its operation, and the unsold, quite unattractive rock-asphalt field in the United States was a thing of the past.

In earlier days, the rock asphalt, a dense black substance impregnated with pure natural asphalt, was in great demand for road building. It was used in every state and some foreign countries.

Towns Constructed

Those were the good days when the company employed more than 600 men in the April-to-October melting season, and kept perhaps a third that many working the year around.

A company-owned town, called Kyrock, the trade name of the product, was built 2 miles east of Nolin, which is the crushing plant then located.

When the crushing plant was 50 miles from the sources of road rock, the road was transported out by river barge and moved to a central distribution point in Bowling Green.

In the years that followed, bad times set in. The introduction of rubber-tired road building, the development of cheaper road materials, as well as improved roads, were the causes of the company's decline.

Rock Proved Highly Successful

The rock proved highly successful as a sealant, but the market was too limited within 200 or 250 miles radius to keep the company going on the strength of such sales.

The liquidation is expected to take place in the next few weeks, as the opinion of the directors, the only possible course.
This is Kentucky Rock Asphalt Company's crushing plant at Sweeden, which is off the picture to the left. The plant was moved here from the company town of Kyrock, about 2 miles away, back in 1946. Employment had dropped from about 600 to 200 during the peak mining season when it was decided to liquidate the firm.
State Buying Defunct Company's Rock Asphalt To 'Deslick' Roads

Product Failed In Paving Trials

By KYLE VANCE
The Courier-Journal
Frankfort, Ky., Nov. 7.—A small mountain of rock asphalt, mined before Kentucky Rock Asphalt Company went out of business, is being bought by the State Highway Department for $253,500.

Les Dawson, business manager of the department, said the material will be used exclusively for “deslicking” Kentucky roads. Kyrock, trade name of the defunct Edmonson County firm, was liquidated in June, 1937.

Its decline from a thriving operation followed two developments:

1. Failure of rock asphalt to stand up as a highway paving material.
2. An inability to compete in cost with asphalt obtained as a residue from petroleum.

Dawson and Highway Commissioner Ward J. Oates explained, however, that department engineers are convinced the natural asphalt is superior for deslicking.

Kentucky’s purchase of the rock is being carried out in three stages. In each transaction the State is paying $5.50 a ton. A total of 10,000 tons were acquired August 12. The same contract covered both deliveries and totaled $71,500.

1. To Use Barges, Rails

A second contract, approved but not yet signed, calls for acquisition of the remaining stock, estimated at 29,000 or more tons for $132,000.

All prices are F.O.B. Sweeden, Ky. Transportation of the rock throughout the state will be arranged and financed by the department.

Dawson said the State plans to use river barges and railroads to ship the material out of Sweeden, an Edmonson County community, for stockpiling in the various highway districts.

The contract provides that the materials shall be removed within five years.

Department records indicate the decision to make the purchase started with a routine memorandum in February, 1957, from J. A. Spears, director of maintenance.

Material Called Bargain

J. F. Stigers, assistant engineer, passed Spears’ recommendation along to engineer Dwight Bray with the comment that rock asphalt was an “excellent deslicking material.”

Bray sent Stigers’ memo to James W. Martin, then commissioner, with the added comment that natural rock asphalt “undoubtedly is the best possible deslicking material.”

Martin started the negotiations leading up to the present agreement.

Oates, who succeeded Martin July 1, said he followed through on the recommendation of engineers who said the material was usable and the recommendations of Dawson, who said it was a bargain.

Kyrock Lone Bidder

The department went through the routine process of advertising for bids, but Kyrock was the lone bidder because it is the sole

State Buying Asphalt For ‘Deslicking’ Roads

Continued from First Page

producer of asphaltic limestone in the United States.

Kentucky thus becomes owner of the last domestic natural asphalt likely to be used in the United States. Trinidad is a source of high-quality natural asphalt being sold in this country, but that, like the Kentucky product, is expensive to apply.

The Kentucky asphalt will be practical only on low-traffic roads. Efforts to make it stick on high-traffic routes have been unsuccessful.

Experiments Failed

One experiment was made on East Main Street Hill in Frankfort to provide a deslicking surface, but the rock asphalt wouldn’t hold up. The same result was obtained in an experiment on much-traveled U. S. 31-W near Tipple.

B. L. Parker, an engineer on special assignment with Bray and an expert in road surfaces, said the material is unbeatable for less-traveled routes.

“Rock asphalt approaches the texture of concrete,” he said. “It can be applied at 10 pounds to the square yard whereas crushed limestone is applied at about 15 to 20 pounds a square yard.”

Even so, rock asphalt is apparently substantially more expensive for deslicking. The $6.80-per-ton price being paid by the State compares with an average of about $1.50 a ton for crushed limestone or slag.

Formally Paid $3

Dawson said Kentucky formally paid an average $3 a ton for rock asphalt at the Sweeden plant.

At the height of its operation, Kentucky Rock Asphalt Com-
Fig. 1: U.S. 31-W, North of Bowling Green; Urban Section, Facing Northward. De-slicked in 1961 and again in 1963; photographed 11-10-64.

Fig. 2: U.S. 31-W, South of Bowling Green; Facing Northward toward Overpass over L & N R. R. De-slicked in 1963; photographed 11-10-64. Note: Damage claim emanating from skidding accident which occurred here prior to de-slicking is pending in court.
Fig. 3: Ky. 100, West of Scottsville; Facing Westward from near Western Extremity of De-slicking Treatment. De-slicked surface is in foreground. Treated in 1961; photographed 11-10-64.

Fig. 4: U.S. 231, North of Scottsville; Facing Northward, near Allen Springs. Treated in 1962; photographed 11-10-64.
# ROCK ASPHALT SEALS: De-Slicking Treatments; District 3

(Compiled by J. F. Drennon)

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