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Report of Traffic Committee of the League of Iowa Municipalities, on

The Use of Road Oil



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The Use of Road Oil

Report of Traffic Committee of the League of Iowa Municipalities

On account of the general interest in road oiling, the following information on the subject is submitted. Capt. T. R. Agg prepared the discussion of preparation of the street and application of the oil for the Engineering Experiment Station, Iowa State College. The specifications are recommended by the Iowa Highway Commission. These specifications are tentative and subject to change if continued experience in oiling roads renders such change desirable.

Preparation of Road: The principal preservative function performed by road oil is that of partially water proofing the road surface so that storm water will soften the surface but slightly in flowing to the side ditches. A road surface with insufficient cross slope will not be as greatly benefited by oiling as will one that is properly crowned.

In view of the marked superiority of the roads that were well graded before being oiled over those that were oiled before they were graded, it would seem desirable to confine oil surfacing to country roads that have been brought to a permanent grade and to city streets that have been well rounded up so as to insure good drainage.

It is evident that the road that is to be oiled should have ample side ditches with good outlets. If water stands in the ditches it will soften the earth under the oil surface and vehicles will cut through the surface layer of oil-impregnated earth. When this happens the road will deteriorate rapidly, become rutted and uneven. A good rule to follow is to oil only those roads that were graded at least a year prior to the applications of the oil and have had sufficient traffic to thoroughly compact the surface. There should have been sufficient observation on the effect of grading to show that the surface and tile drainage is properly cared for.

The surface of the road at the time the oil is applied should be smooth and dense but not dusty. A road that has just been dragged is not in suitable condition for oiling because of the

loose material that has been thrown into the traveled track but after it has been traveled for a few days the road may be dragged again, moving the loose material out onto the shoulder, thus giving a smooth, hard surface for the oil.

Dust on a road surface precludes the possibility of the oil penetrating into the hard road bed under the dust and the oiled dust will not compact to form a good surface. Unsatisfactory results are certain if oil is spread on top of the dust on a road. Some light soils grind into dust so readily that it is difficult to get them into the proper condition for oiling. On such roads a very fluid oil is more likely to give good results than the heavy, but every possible effort should be made to eliminate all the dust. It is generally said that the road should be dry at the time it is oiled but that does not necessarily mean it should be bone dry. If the surface is moist that will not interfere with the penetration of the oil, in fact there are some indications that it is better to oil on a road that is slightly moist than on one that is very dry.

To sum up then, a road that is in condition for oiling will have perfect drainage, will be free from dust and present a smooth, hard, dense surface. Such a condition will be found on the average rural highway in the months of May and June.

Heating Oils in Tank Cars: The tank cars in which road oils are shipped are generally equipped with steam coils for heating the contents of the car. The steam leads, which are usually of about two-inch pipe, will be found on the under side of the tank. A steam pipe is laid to the car and connection made to one of the steam leads. The other steam lead is fitted with a valve which is opened just enough to let out the water that condenses in the coil.

A tractor engine may be used as a source of steam or the car may be set near a power plant.

The oils will usually require heating to a temperature of about 150 degrees F., but may be heated to about 200 degrees F. without danger. Beyond that point foaming is likely to take place if the coils in the car leak. Nothing is gained by heating beyond 200 degrees F. and the crew that is handling the oil should be provided with a thermometer so that a tem-

perature of at least 50 degrees F. below the flash point of the oil will not be exceeded.

Transferring Oil: Some means of pumping the oil from the tank car to the tank wagon must be provided and any one of a number of types of pump may be used. The ordinary hand operated tank pump furnished with traction engine tanks has such small capacity that the work is tedious but is sometimes employed. Its use is advisable only when a single tank of oil is to be handled each season, and even then is of doubtful economy. If more than one tank is to be handled it will pay to secure a power driven pump. Of these, the rotary type which is used for furnishing pressure on the distributing wagon is best. These can be purchased at small cost and can be belted or geared to a small gas engine.

A pump of this type should always be set up on the ground so that oil will flow from the tank to the pump by gravity, as the pump will not prime itself.

Sometimes it is possible to set the tank on a siding which is on an embankment high enough that the oil will flow to the tank wagon. This is, of course, the most convenient way of unloading when it is possible to employ it.

Time is an important factor in the cost of applying oil. Delays increase the demurrage charges on tank cars and may cause the work to be held up by bad weather. When all the conditions are favorable a tank car can be unloaded in two days. This is not possible unless the mechanical equipment for handling the oil is adequate and is kept in good condition. A little money spent for a good pumping outfit is an excellent investment.

Oil Distributors: Several satisfactory types of oil distributors are on the market, differing little from each other in essential features. It is desirable that the distributor be equipped with a heating device so that the oil can be kept hot on long hauls or can be heated in the tank wagon if not in the tank car. The spray should preferably be of the force feed type rather than the gravity type. A tank capacity of about 600 gallons is as large as it is advisable to use where teams are employed for hauling. If the motor driven type is used, the

1000 gallon capacity is as large as can be handled satisfactorily on earth roads.

Applying the Oil: When the road surface is in suitable condition for oiling, there will be danger of putting so much oil on the surface that it will flow to the sides of the road and be wasted or at least increase the quantity at the sides of the road beyond what is needed. To make sure this does not happen, the quantity of oil applied at one time should not exceed about 1-4 gallon per square yard of surface. If a heavier treatment is desired, a second application may follow after the first has been absorbed by the road surface. In warm weather this will not be more than 10 hours and often will not be more than 3 or 4 hours.

Covering with Sand: When the oil is applied on city streets, the whole width is covered and vehicles must of necessity use the freshly oiled surface. The oil clings to the wheels of vehicles and is spattered about, soiling clothing, injuring the paint on vehicles and making a disagreeable mess generally. Besides, it is carried on the wheels of vehicles from the street where it is needed. At crossings the oil is carried away on the shoes of pedestrians and finds its way into stores and homes. To eliminate these undesirable features of the use of road oils, the surface should be sanded after the oil has been spread. For this purpose it is best to use good sharp concrete sand in sufficient quantity to absorb the excess oil. One half of the street should be oiled and covered with sand before the other half is oiled. The sand ought not to be applied for 3 or 4 hours after the oil has been spread but if traffic cannot be kept off for that length of time, the sand may be put on immediately after the oil is spread. After the street has been under traffic for a short time it will usually become apparent that a little more sand is needed in some places to keep the oil from picking up. These spots should be covered lightly from time to time until the surface is of uniform appearance and all sticky places have been eliminated. A cubic yard of sand will cover about 350 square yards of surface.

The necessity for the sand covering on rural highways is not so great because the entire width of road is not oiled and ve-

icles may keep off the freshly oiled part of the road until the oil has been entirely absorbed. But as a rule traffic will not avoid the oiled part of the road and vehicles will carry away a part of the oil from the part of the road that needs it most—the middle. The cost of sanding is small as a rule and the benefit derived is substantial.

Maintenance of Oiled Earth Roads: Oiled earth roads need maintenance from the first. The oiled layer will flake off or become rutted and thus the durability of the road will be impaired. These defects can be corrected by dragging and the surface can be kept smooth and properly rounded. It is particularly important that the surface be dragged after rains that continue for sufficient length of time to soften the surface.

Re-oiling will be necessary each year under average conditions.

Cost of Oiling: Under conditions of 1916, with road oil available in tank car lots at a cost of 5 1-2 cents per gallon, the cost of oiling will be about as follows:

Cost of one application consisting of 1-2 gallon of oil per square yard of surface applied on city streets where the haul does not exceed an average of one-half mile and when the surface is sanded, 3 1-2 cents per square yard of surface.

Cost of one application of 1-2 gallon per square yard of surface for a width of 8 feet and 1-4 gallon per square yard for an additional width of 8 feet on a rural highway where the average haul does not exceed two miles, will vary from \$200.00 to \$225.00 per mile.

These costs will vary with the efficiency of the organization, the weather conditions, the amount of dust to be removed, and with the kind of equipment available. No items for miscellaneous tools or for interest or depreciation on equipment are included.

Results to be Expected: Surface oiling must be considered primarily as a maintenance method, but repeated oiling undoubtedly results in a cumulative benefit. Oiled roads resist the effect of summer rains quite well, but long continued wet weather (a week or more with little sunshine between rains)

will soften the surface enough so that vehicles will cut into the oiled surface. The oil eliminates most of the dust nuisance but if an oiled road is neglected until it does become dusty, the dust will be oily and adhere to everything it touches.

The road or street that is to be oiled must have a good cross slope, and ample ditches or gutters, and must be free from depressions that will hold water. Disappointment is sure to result from oil treatment on roads that are not properly graded.

The surface of a road or street must be dry and hard and free from dust when it is oiled. If the surface requires re-shaping with the grader before oiling, the earth work must be done sufficiently in advance to insure that the surface will be thoroughly compacted before it is oiled.

From results obtained on oiled roads under observation of the Iowa State Highway Commission the following specifications should give good results on the various types of soil prevailing in Iowa:

Specification A—

Road oil for cold application to earth roads (including heavy loam, clay or sandy loam). The road oil shall be homogeneous, free from water, and shall not foam when heated to 125 degrees C., (257 degrees F.). It shall meet the following requirements:

1. The flash point shall not be less than 125 degrees C., (257 degrees F.), as determined by the open cup method.
2. The specific viscosity (Engler) 50 c. c. at 40 degrees C. shall not be greater than 40 degrees.
3. The per cent of asphaltenes, (total bitumen insoluble in 86 degrees B. Naptha), shall not be less than 7.0.
4. The per cent of fixed carbon shall not be less than 4.0.

Specification B—

Road oil for hot application to earth roads (including heavy loam, clay, sandy loam, sand clay or semi-gravel). The oil shall be homogeneous, free from water, and shall not foam when heated to 150 degrees C. (302 degrees F.). It shall meet with the following requirements:

1. The flash point shall not be less than 150 degrees C. (302 degrees F.) as determined by the open cup method.



2. The specific viscosity (Engler) 50 c. c. at 40 degrees C. shall be from 40 degrees to 90 degrees.
3. The per cent of asphaltenes (total bitumen insoluble in 86 degrees B. Naptha) shall not be less than 10.0.
4. The per cent of fixed carbon shall not be less than 6.0.

Specification C—

Road Oil for hot application to gravel, sand clay or macadam. The road oil shall be homogeneous, free from water, and shall not foam when heated to 150 degrees C. (302 degrees F.). It shall meet the following requirements:

1. The flash point as determined by open cup method, shall not be less than 150 degrees C. (302 degrees F.).
2. The specific viscosity (Engler) 50 c. c. at 40 degrees C. shall be from 40 degrees to 90 degrees.
3. The per cent of asphaltenes (total bitumen insoluble in 86 degrees B. Naptha) shall not be less than 12.0.
4. The per cent of fixed carbon shall not be less than 7.0.

Specification D—

Special road oil for broken stone and coarse gravel surfaces. The road oil shall be homogeneous, free from water, and shall not foam when heated to 175 degrees C. (347 degree F.). It shall meet the following requirements:

1. The flash point as determined by open cup method shall not be less than 175 degrees C. (347 degrees F.).
2. The float test at 32 degrees C. shall be from 75 inches to 150 inches.
3. The per cent of asphaltenes (total bitumen insoluble in 86 degrees B. Naptha) shall not be less than 13.0.
4. The per cent of fixed carbon shall not be less than 7.0.

Tests of the physical and chemical properties of the road oil shall be made in accordance with the methods as prescribed in United States Department of Agriculture Bulletin, No. 314.

NOTE—The use of the grade of road oil specified in Section "D" is only warranted on very good macadam surfaces or on gravel surfaces which do not contain an excess of clay or fine material.