

the oil was being sprayed on the road at the high temperature necessary for spraying.

The physical properties of a road oil are of the greatest importance to the road builder. The following specifications deal directly with the measurement of the important physical properties:

(8) It shall show a float test of not over 1,000 seconds when tested at 90 degrees Fahrenheit. This test is described in Bulletin No. 38 issued by the Office of Public Roads, United States Department of Agriculture.

This float test is the measurement of the viscosity of a road oil. The requirement will prevent the use of excessively viscous road oil, one that is difficult to apply and is slow to absorb the mineral aggregate necessary to the building up of the proper wearing surface.

(9) The oil shall show a specific viscosity of not more than one hundred (100) when tested with the Engler viscosimeter at a temperature of two hundred and twelve (212) degrees Fahrenheit.

This test will prevent the use of an oil that is too viscous to be readily applied to the road surface from the oil-spraying wagon.

(10) It shall show an adhesive test of not less than 300 seconds for three revolutions with the Osborne adhesive machines, when the oil is tested at a temperature of 77 degrees Fahrenheit, the load being 3 kilograms.

This test is the measure of the oil's power to prevent relative motion of two concentric cylinders which the oil acts as a binder between the surfaces of the two cylinders. The inner cylinder is 1.995 in. in diameter, the outer cylinder is 2 in. in diameter, the outer cylinder being in the form of a loose collar 2 in. wide. Its inner surface is coated with the oil to be tested. The outer surface of the inner cylinder is coated with oil and the collar then forced on the inner cylinder, which is maintained in a stationary position.

The outer collar is wound with cord to which a three-kilogram weight is attached; the pull of this weight causes the collar to revolve; the thin film of road oil between the two cylinder surfaces offers a resistance to this turning. The temperature of the oil being tested is maintained at 77° F. by means of water circulating in the inner cylinder. The measurement of the adhesive value of the oil is the length of time required for three complete revolutions of the collar.

Oils containing the same percentage of asphaltum will often show the greatest difference in their binding properties. Oils possessing the same viscosity will likewise often show a wide difference in adhesiveness.

As an example, one oil may be largely made up of heavy lubricating grease, another may be very free from lubricating material but they may both flow through a given-sized orifice at the same rate, when heated to the same temperature, that is, they have the same viscosity. The lubricating oil would lack binding power and be unsatisfactory for road construction; the other would be desirable. The adhesive specification would prevent the use of the unsatisfactory lubricating oil.

The asphalt contained in a road oil is required by some road builders to possess a certain ductility.

(11) The ductility of the asphalt which has been reduced to a penetration between 75 and 85 shall not be less than 110 centimeters.

This test is made with asphalt maintained at 77° F. and the pulling shall be at the rate of 5 cm. per minute, using the Dow ductility machine.

There is a woeful lack of uniform specifications for road oil and uniform methods of performing the tests. In the determination of the asphaltic content of an oil, the temperature for the asphalt oven is specified sometimes at 325° F., and from that to as high as 500° F.

The dish containing the road oil during the reduction is in some laboratories as small as a thimble, and in others, large enough to hold 500 grams; sometimes cylindrical, and others times semispherical in shape. Some tests require the use of an oven, others require heating in the open air. As has been shown, the "asphaltic content of an oil" is, at best, a rather indefinite term, and when we have added to this the different methods used and the wide range of equipment used, the "asphaltic content" becomes even more of a vague description.

The asphaltic road oils are, for the most part, a by-product of the oil refineries. They are a relatively cheap material. This cheapness saves the road oils from being adulterated with other material. It is expensive to add anything to the oil. The natural oil itself rarely carries undesirable material. The tests for water and sediment will take care of foreign materials brought in by the crude oil.

Some road engineers have regarded oil containing sulphur as dangerous to use because the sulphur is supposed to make the product unstable. Many oils and asphalts carrying sulphur have given good service for long periods of time and if sulphur does tend to make the oil unstable, this action is too slow to be of importance in the life of the oil used in the road construction.

MANY EUROPEAN NATIONS TO BE REPRESENTED AT PANAMA EXPOSITION.

In answer to numerous inquiries, President Charles C. Moore of the Panama-Pacific International Exposition, to open in San Francisco on February 20, 1915, has issued the following statement:

"One month ago, the decision of the Panama-Pacific International Exposition management not to postpone was first published. At the time the decision was made no word had been received from any foreign nation as to the effect on its plans caused by the European war, but it was hoped that at least those nations not fighting would go on with their plans. Later developments have proven that hope well founded; in addition, we have definite assurances from France, from Italy, from Turkey and from Japan that their intentions are unchanged. Holland has added \$300,000 to her original appropriation. Italy has ordered work on her building and exhibits rushed. Japan has asked for and received an increase of space. The Argentine Republic has increased its appropriation from \$1,250,000 to \$1,750,000.

"We shall undoubtedly lose some of the promised exhibits from Europe, but not by any means all of them and not by any means the most important of them. Both Germany and Great Britain will be represented by individual exhibitors or by associations thereof.

Another evidence of the growing demand for American steel for South America was shown when orders were received at Pittsburg, Pa., for 100 miles of 80-pound steel rails. The order is the largest that has reached Pittsburg rail mills since the trend of the business to this country from South America began. The contract was placed with the United States Steel Products Company, the export department of the United States Steel Corporation.