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PROCESS FOR PRODUCING AN IMPROVED ASPHALT

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This application relates to a process for producing an improved asphalt which demonstrates excellent adhesion to a galvanized or other metal surface, and more particularly relates to a process for producing an improved asphalt for use as a pipe or culvert coating material which is able to withstand extreme changes in temperature under severe conditions of use, and which retains over a prolonged period strong adherency to a metal surface onto which it is coated.

For many years it has been conventional to coat metal pipes and particularly galvanized metal culverts and the like with a bituminous or asphaltic material to improve their serviceability and prolong their useful life. Culverts in particular are exposed in use to extreme conditions of temperature and climate, are subjected to the eroding action of the water which they are utilized to carry, and are normally expected to function without significant repair for a life of perhaps forty years. The asphaltic coating is applied to protect the underlying metal from direct contact with its environment, and thereby preserve its structural qualities for a much longer period than would otherwise be possible.

To be satisifactory as a pipe or culvert coating material, an asphalt must possess several qualities which are to a certain extent inconsistent with each other. It is of primary importance, of course, that the asphalt adhere strongly to the metal surface, and that the adhesive bond does not deteriorate greatly over a long period of time under the effects of the severe conditions of use to which the coating is exposed.

In addition to adhesion, another important criteria of the quality of a coating asphalt is its consistency, both as applied and after aging. "Consistency" is quantitatively measured in the industry in terms of penetration and softening point, as determined by means of standard test methods referred to hereinafter. Moreover, the asphalt should display good resistance to softening under the effects of heat, as well as good resistance to the adverse effects of cold.

Pipe or culvert coating asphalt has heretofore been made from crude petroleum by vacuum distilling a reduced crude petroleum, residual oil or comparable material, to yield what is referred to in the industry as a straight run or vacuum reduced asphalt. Generally speaking, straight run asphalt is too soft in consistency for use as a culvert coating material. In the past it has been conventional to harden the soft straight run material to a desired consistency by a process of oxidation. This oxidation process is called "blowing," and is effected by blowing a stream of gas, usually air, through the material to be oxidized, usually at an elevated temperature. The asphalt is thereby gradually made harder, the blowing being terminated when the asphalt attains the desired degree of hardness. Cylinder stock, which is a side stream from an asphalt vacuum tower, can be also blown to produce a synthetic asphalt of desired consistency. The culvert coating asphalts heretofore produced have usually comprised straight run asphalt, cylinder stock, or a mixture or flux of the two which has been blown or oxidized to a desired consistency.

In general, asphalts produced by the conventional

processes of the past have been satisfactory as to consistency but have been deficient or poor in their adhesion to a metal surface, and have not provided a satisfactory longlasting bond to the metal surface. Specifically, asphaltic coating materials of the past have displayed poor adhesion to galvanized metal surfaces, and have tended to chip or crack off from the surface under the effects of climate changes, as a result of which such asphalts have afforded relatively poor protection to the metal onto which they were coated.

This application is directed to an improved process of producing an asphalt for coating pipes and the like which displays much better adhesion than materials heretofore available as well as proper consistency, and which is capable of withstanding severe conditions of use, climatic changes, and erosion.

The process we have discovered and empirically determined is based on the concept of blowing or oxidizing a cylinder stock to a consistency which is harder than ultimately desired, and then fluxing back or blending the overblown stock with a straight run asphalt to yield a product having the desired qualities. Otherwise put, we have found that by blowing a cylinder stock having a viscosity within a specified range to a consistency much harder than normal coating materials, and then mixing this material in certain proportions with a straight reduced asphalt of prescribed consistency, it is possible to produce a blend which is of desirable consistency and which, moreover, displays much greater adherency to metal surfaces than conventional asphalt.

The viscosity of the cylinder stock should be in the range of about 110 to 190 SUS at 210° F., as measured by the standard test procedure defined in ASTM test No. D.–88–44. Preferably, this cylinder stock should be from a petroleum of Mid-Continent origin, tests indicating that the final products made from such stocks are generally of somewhat higher quality. Where an Eastern cylinder stock is employed, it is preferred that its viscosity be in the range of about 120–190 SUS at 210° F.

The technique of blowing is well known to those skilled in the art, for which reason it is believed unnecessary to describe it in detail herein. The cylinder stock is blown in accordance with conventional practice, preferred conditions being a temperature of 440–470° F. and an air flow of 0.02–0.05 cubic feet per minute per gallon of cylinder stock.

The cylinder stock is blown until it has a penetration, as measured by the standard test defined in ASTM test No. D–5–49, in the range of 35–50 at test conditions of 77° F., 100 grams weight, and five seconds time, and until it has a softening point, as measured by the standard test procedure defined in ASTM test No. D–36–26 (ring and ball method), of 230–260° F. A cylinder stock blown to these conditions would, according to past practice, be deemed far too hard to be suitable as a culvert coating material.

The asphalt to be blended with the blown cylinder stock should be a straight run asphalt having a penetration in the range of 70–100, and is admixed with the blown cylinder stock in the amount of about 5 to 20% by volume. It appears preferable from present evidence that this asphalt be of the same geographical origin as the cylinder stock.

Following are examples of the practice of the process we have discovered:

Example I

A cylinder stock having a viscosity of 160 SUS at 210° F. is produced by the vacuum distillation of reduced crude petroleum.

This material is blown until it has a penetration of 45 and a softening point of 234° F. To the blown cylinder

stock is added 15% by volume of a straight reduced asphalt having a penetration of about 75. The mixing or fluxing step may be carried out in any conventional manner. The resulting product has a penetration of 50 and a softening point of 208° F., demonstrates exceptionally good adhesion to a metal surface, and is an excellent coating asphalt.

Example II

An Eastern cylinder stock having a viscosity of 121 SUS at 210° F. was blown to a softening point of 245° F. and a penetration of 43. With this oxidized product was fluxed 8% by volume of a straight run asphalt having a penetration of 85, yielding an asphalt having a softening point of 206° F. and a penetration of 48, and demonstrating excellent adhesion to a galvanized metal surface.

Example III

An Illinois cylinder stock having a viscosity of 150 SUS at 210° F. was blown to a softening point of 242 and a penetration of 40. This material was blended with 15% straight run asphalt having a penetration of 73. The resulting product had a softening point of 208 and a penetration of 43, and exhibited excellent adhesive properties and weathering characteristics.

Example IV

An Illinois cylinder stock having a viscosity of 185 at 210° F. was blown to a softening point of 244 and a penetration of 39. Blending with 20% straight run asphalt having a penetration of 90 gave a material having a softening point of 201 and a penetration of 48 which showed excellent adhesion and weathering properties.

Example V

A Louisiana cylinder stock having a viscosity of 152 at 210° F. was blown to a softening point of 240 and a penetration of 40. This material blended with 20% Louisiana straight run asphalt of 85 penetration resulted in a blend having a softening point of 204 and a penetration of 46 which showed very good adhesive properties.

Example VI

A Louisiana cylinder stock having a viscosity of 184 at 210° F. was blown to a softening point of 240 and a penetration of 36. When blended with 20% Louisiana straight run asphalt of 85 penetration, an asphalt was produced with a softening point of 200 and a penetration of 41. This blend had good adhesive properties.

Example VII

An Eastern cylinder stock having a viscosity of 174 at 210° F. was blown to a softening point of 230 and a penetration of 45. It was blended with 10% straight run asphalt of 70/80 penetration, resulting in a material with a softening point of 205 and a penetration of 50 which displayed excellent adhesive properties.

Example VIII

An Eastern cylinder stock having a viscosity of 117 at 210° F. was blown to a softening point of 244 and a penetration of 43. This material was blended with 12% straight run asphalt of 70/80 penetration, giving a material of 210 softening point and 47 penetration with excellent adhesive properties.

The foregoing examples are not to be considered as limiting examples, but rather are given as specific examples of the practice of the invention.

What is claimed is:

1. A process for producing an asphalt which demonstrates high adhesion to a metal surface, said process comprising, blowing a cylinder stock having a viscosity of about 110 to 190 SUS at 210° F. to a softening point of about 230° F. to 260° F. and a penetration of about 35 to 50, and fluxing the blown cylinder stock with about 5 to 20% by volume of a straight reduced asphalt having a penetration of about 70 to 100.

2. The process which comprises, oxidizing a cylinder stock having a viscosity of about 110 to 190 SUS at 210° F. to a softening point of about 230° F. to 260° F. and a penetration of about 35 to 50, and blending the oxidized cylinder stock with about 5 to 20% by volume of a straight reduced asphalt having a penetration of about 70 to 100 to yield an asphalt having a softening point of about 200° F. to 220° F. and a penetration of about 38 to 52.

3. A process in accordance with claim 2 in which said cylinder stock is a straight run cylinder stock.

4. A process in accordance with claim 2 in which said cylinder stock is from a crude petroleum of Mid-Continent origin.

5. A process in accordance with claim 2 in which said cylinder stock and said straight reduced asphalt are from crude petroleum of the same geographical origin.

6. A process in accordance with claim 2 in which said oxidation is effected by blowing air through said cylinder stock, said cylinder stock being at a temperature of about 440° F. to 470° F.

7. A process in accordance with claim 2 in which said oxidation is effected by blowing air through said cylinder stock at a rate of about 0.02 to 0.05 cubic foot per minute per gallon of cylinder stock, said cylinder stock being at a temperature of about 440° F. to 470° F.

8. A process for producing an asphalt which demonstrates high adhesion to a metal surface, said process comprising, blowing a cylinder stock having a viscosity of about 110 to 190 SUS at 210° F. to a softening point of about 230° F. to 260° F. and a penetration of about 35 to 50, and fluxing the blown cylinder stock with about 5 to 10% by volume of a straight reduced asphalt having a penetration of about 70 to 100.

9. A process for producing an asphalt which demonstrates high adhesion to a metal surface, said process comprising, blowing a cylinder stock having a viscosity of about 110 to 190 SUS at 210° F. to a softening point of about 230° F. to 260° F. and a penetration of about 35 to 50, and fluxing the blown cylinder stock with about 10 to 20% by volume of a straight reduced asphalt having a penetration of about 70 to 100.

10. A process for producing an asphalt which demonstrates high adhesion to a metal surface, said process comprising, blowing a cylinder stock having a viscosity of about 150 to 190 SUS at 210° F. to a softening point of about 230° F. to 260° F. and a penetration of about 35 to 50, and fluxing the blown cylinder stock with about 5 to 20% by volume of a straight reduced asphalt having a penetration of about 70 to 100.

11. A process for producing an asphalt which demonstrates high adhesion to a metal surface, said process comprising, blowing a cylinder stock having a viscosity of about 110 to 190 SUS at 210° F. to a softening point of about 230° F. to 260° F. and a penetration of about 35 to 45, and fluxing the blown cylinder stock with about 5 to 20% by volume of a straight reduced asphalt having a penetration of about 70 to 100.

12. A process for producing an asphalt which demonstrates high adhesion to a metal surface, said process comprising, blowing a cylinder stock having a viscosity of about 110 to 190 SUS at 210° F. to a softening point of about 230° F. to 260° F. and a penetration of about 35 to 50, and fluxing the blown cylinder stock with about 5 to 20% by volume of a straight reduced asphalt having a penetration of about 70 to 90.

13. A process for producing an asphalt which demonstrates high adhesion to a metal surface, said process comprising, blowing a cylinder stock having a viscosity of about 110 to 190 SUS at 210° F. to a softening point of about 230° F. to 245° F. and a penetration of about 35 to 50, and fluxing the blown cylinder stock with about

5 to 20% by volume of a straight reduced asphalt having a penetration of about 70 to 100.

14. The process which comprises, blowing a straight run cylinder stock at a temperature of about 440° F. to 470° F. and having a viscosity of about 110 to 190 SUS at 210° F. with air at a rate of about 0.025 cubic foot per minute per gallon of cylinder stock until said cylinder stock has a softening point of about 230° F. to 260° F. and a penetration of about 35 to 50, and blending the oxidized cylinder stock with about 5 to 20% by volume of a straight reduced asphalt from crude petroleum of the same geographical origin as said cylinder stock and having a penetration of about 70 to 100, to yield an asphalt having a softening point of about 200° F. to 230° F., a penetration of about 38 to 52, and demonstrating strong adhesion to a metal surface.

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