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1

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THERMOSTABLE WOOD PRESERVATIVE CONTAINING PENTACHLOROPHENOL

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This invention relates to wood preservatives for treating railway ties, bridge pilings, telephone poles and other structural wood products exposed to weathering.

In particular, it relates to a pentachlorophenol-petroleum oil combination which comprises a highly effective, thermostable, wood preservative.

Various chemicals and petroleum products have been employed in the past for the treatment and impregnation of wood, fiber board and similar fibrous and porous materials. In the treatment of railroad ties and other heavy structural woods the common preservative has been a blend of creosote, a distillate fraction of coal tar containing about 95% aromatics, and a suitable petroleum diluent.

It has been found that small quantities of pentachlorophenol incorporated into a suitable solvent and co-preservative provides a superior preservative for railroad ties and similar structural items. However, the use of this preservative has been greatly limited due to the lack of a suitable carrier and co-preservative. Pentachlorophenol, hereinafter referred to as PCP, forms copious quantities of sludge with most petroleum products and particularly with those petroleum products otherwise suitable for use as a carrier and co-preservative because of their physical and chemical properties. This sludging is most prevalent when PCP-oil compositions are in heated storage and while in use in treating equipment. Concomitantly an increase in pour point occurs, often reaching a point where temperatures necessary to fluidize the solution will also crack the wood products being treated.

PCP may be stored in solution with a low boiling petroleum fraction such as a gas oil without undue sludge formation. However, the preservative qualities of such a fraction in and of itself are quite limited both as to degree and to duration and the value of such a fraction for other uses makes the cost prohibitive for large scale treatment of ties or poles if employed as the sole carriers with PCP.

It now has been discovered that certain phenol extracts of petroleum distillates when combined with PCP provide a superior wood preservative that is thermostable and relatively inexpensive. Such extracts not only provide a PCP carrier that has excellent resistance to sludge formation but also are effective co-preservatives.

Petroleum distillates, preferably from Western Canadian crudes, boiling in the range (atmospheric) of 900° to 1175° F., having a viscosity at 210° F. of 130 to 350 S.S.U. and a mean viscosity at the same temperature of 180 to 190 S.S.U. are particularly preferred sources for the desired extracts. The preferred phenol extracts have the following composition and physical properties:

Boiling point range, ° F.	900-1175
Gravity range, ° API	3-15
Viscosity range, S.S.U., at 210° F.	650-3500
Aromatic, percent	50-100
Pour point range, ° F.	50-120

2

Metals present:

Iron, p.p.m.	0-20
Nickel, p.p.m.	0-10
Vanadium, p.p.m.	0-10

The phenol extracts above described, when blended with a low boiling petroleum fraction to a viscosity at 210° F. of 30 to 100 S.S.U., preferably 50 to 75 S.S.U., provide an excellent carrier for use with PCP which is thermostable with PCP at storage and treating temperatures. Petroleum gas oil fractions boiling in the range of 390 to 850° F. are suitable for use as blending agents with the preferred extracts and when thus employed comprise from 20 to 60 wt. percent of the total treating composition. To the aforesaid blend is added 1 to 18 wt. percent, preferably 2 to 6 wt. percent, PCP based on the total treating composition.

EXAMPLE I

A large scale railroad tie-treating project was instituted to test a heavy oil from the fractionator of a catalytic cracker as the carrier for pentachlorophenol. The product known as catalytic fractionator bottoms is a highly aromatic petroleum fraction consisting of hydrocarbons boiling above 650° F. The catalytic fractionator bottoms, hereinafter referred to as CFB, was blended with a catalytically cracked gas oil, hereinafter referred to as CCGO, having a boiling range of 400 to 650° F. and PCP. The composition and physical properties of this blend are recited in Table I.

Table I

Composition:	
CFB	percent 65
CCGO	do 32
PCP	do 3

Physical properties:

Viscosity range at 210° F., S.S.U.	30 to 50
Pour point range, ° F.	20 to 70
Gravity range, ° API	10 to 15

This treating solution was kept in a storage tank maintained at 100 to 120° F. From this tank the solution was pumped to a charging tank maintained at temperatures up to 325° F. by steam heat exchange tubes. From the charging tank the solution was run to cylinders in which the ties were treated under pressure.

Approximately one million gallons of the blend set forth in Table I were used to treat railroad ties over a two-year period until the difficulties encountered forced an abandonment of the use of PCP preservatives for this purpose.

The difficulties encountered were as follows:

(1) Treated ties did not conform to penetration specifications, i.e., penetration of at least 75% of all tie core-borings to a depth of at least ¾".

(2) The surface of some ties became coated with a heavy sludge and, in other cases, white spots appeared indicating that these areas contained very little of the preservative solution and consequently would decay readily.

(3) The pour point of the blend increased to about 100° F. (higher temperatures would fluidize the oil but would also crack the wooden ties).

(4) Carbonaceous deposits accumulated in the heat exchange tubes.

(5) After three months operation the charging tank was found to contain approximately 1800 gallons of sludge.

(6) After three months operation approximately 6000 gallons of sludge accumulated in the storage tank.

EXAMPLE II

In view of the high sediment values observed with the

CFB blends of Example I, further investigations were conducted to determine whether this sludging tendency was a characteristic of all high boiling petroleum fractions. Various petroleum compositions containing 3% PCP were stored at 210° F. for four weeks. A conventional coal tar creosote tie-treating solution was tested in like manner and the results compared.

The compositions tested exclusive of the PCP component were as follows:

(1) A petroleum fraction having a viscosity range at 210° F. of 180 to 190 S.S.U. distilled from Western Canadian crudes was phenol extracted to obtain an extract which, upon analysis, revealed the following components and physical properties:

Table II

180 TO 190 PHENOL EXTRACT

Gravity, ° API	5
Viscosity, S.S.U., at 210° F.	3300
Aromatic content, percent	83
Metals present:	
Iron, p.p.m.	10.00
Nickel, p.p.m.	0.08
Vanadium, p.p.m.	0.07

This extract was blended in a 65/32 wt. percent ratio with a catalytically cracked gas oil having a boiling range of 400 to 625° F. An analysis of samples of this blend revealed it to have the following physical properties:

Table III

PCP-PHENOL EXTRACT-CCGO BLEND

Viscosity range at 210° F., S.S.U.	50 to 70
Pour point range, ° F.	+30 to +50
Gravity range, ° API	10 to 15

(2) A blend of 65% Dubb's tar and 35% catalytically cracked gas oil, such blend having a pour point in ° F. of -10/-15. Dubb's tar is a residual product formed in the thermal cracking of crude oil. The Dubb's tar gravity range in ° API is about 3 to 15 with a viscosity at 210° F. of about 600 S.S.U. When blended with gas oil having a distillation range of 400 to 650° F. in the proportions above set forth, an oil solution was formed having viscosity at 210° F. of about 48.

(3) Bunker fuel oil fluxed with a catalytically cracked gas oil to a viscosity in the upper part of the range of 40 to 60 S.S.U. at 210° F. The pour point of this composition in ° F. was in the range of 0/-5. Bunker fuel oil is a residual product from refinery processing having the following physical properties:

Flash, P.M.	150 to 170
Pour, ° F.	+25 to 35
Gravity range, ° API	10 to 20
Viscosity at 100° F.	100 to 300

(4) Bunker fuel oil fluxed with a catalytically cracked gas oil to a viscosity in the lower part of the range of 40 to 60 S.S.U. at 210° F. The pour point of this composition in ° F. was in the range of -25/-30.

(5) A blend of 65% catalytic cracker bottoms and 35% catalytically cracked gas oil as described in Example I and having a pour point in ° F. in the range of +20/15.

(6) The coal tar creosote preservative tested was a 50/50 blend of coal tar creosote and a bunker fuel oil fluxed with a catalytically cracked gas oil to a viscosity in the lower part of the viscosity range of 40 to 60 S.S.U. at 210° F. The pour point of this blend in ° F. was in the range of -30/-25. This was the only non-PCP composition tested.

The results of the storage stability tests of the foregoing tie-treating compositions are given in Table IV.

Table IV

STORAGE STABILITY TESTS OF TIE TREATING COMPOSITIONS

Composition	Storage Interval (Days)	Pour Pt. (° F.)	Hot Filtration Sediment at 210° F. (mg./100 ml. oil)
Coal tar creosote+Bunker fuel oil+(6) CCGO.	(Initial)	-30/-25	53
	9	-10/-15	70
	19	0/-5	83
	23	+5/0	95
Catalytic fractionator bottoms+CCGO+(5) PCP.	(Initial)	+20/15	65
	8	+30/25	71
	14	+50/45	97
	23	Solid at 94°	267
Bunker fuel oil+(4) CCGO+PCP.	(Initial)	-25/-30	72
	9		418
	18	-15/-20	1,072
	27	-15/-20	1,723
Bunker fuel oil+(3) CCGO+PCP.	(Initial)	0/-5	70
	9	+30/25	718
	19	+50/45	823
	23	+45/35	1,689
Dubb's tar+(2) CCGO+PCP.	(Initial)	+10/5	415
	8	-10/-15	298
	14	5/0	1,230
	23	0/-5	(*)
Phenol extract+(1)CCGO+PCP.	(Initial)	+50/45	11
	9	+52/+50	8
	18	+40/35	19
	27	+45/40	19

*Sediment precipitated and adhered to bottom of storage container and could not be dispersed.

() Numbers in parentheses refer to test compositions included in the foregoing description of compositions tested.

EXAMPLE III

Railroad ties are treated under elevated pressures and temperatures in conventional tie treating equipment as in Example I except that the treating solution consists of 3 wt. percent pentachlorophenol and 97% of a phenol extract-gas oil blend as described in Example II which has a viscosity at 210° F. of about 60 S.S.U. and an initial pour point of about 50° F. After a conventional treating time the treated ties will be found to be impregnated with the treating solution and to conform to preservative penetration specifications. The treated ties will possess outstanding decay resistance. The tanks and other equipment employed in this treating operation will be found to possess a greatly reduced sludge content as compared to treatments employing conventional tie treating solutions.

Unless otherwise designated, all percentages referred to herein refer to weight percents.

The term "phenol extraction" as used herein refers to a conventional refinery solvent extraction process wherein phenol is employed to separate a petroleum distillate into an extract and a raffinate. Phenol extraction is described in detail in numerous literature sources among which are "Phenol Extraction of Lubricating Oils," by R. K. Stratford in "The Science of Petroleum," volume III, pages 1910-1914 (1938), Oxford University Press; "The Chemistry of Petroleum Hydrocarbons," volume I, page 233 (1954), Reinhold Pub. Corp., New York 22, New York; "Modern Methods of Refining Lubricating Oils" (see index), Reinhold Pub. Corp. (1938), New York 22, New York.

The term "phenol extract" as used herein refers to the portion of a petroleum distillate which is soluble in the phenol solvent as contrasted to the raffinate.

What is claimed is:

1. A thermostable wood preservative composition comprising in combination 1 to 18 wt. percent pentachlorophenol and 82 to 99 wt. percent of a petroleum-comprising co-preservative containing 40 to 80 wt. percent of a phenol extract from a petroleum distillate, said extract boiling in the range of about 900° to 1175° F. and having an aromatic content of between 50 and 100 wt. percent and 20 to 60 wt. percent of a petroleum gas oil fraction boiling in the range of about 390° to 850° F.
2. A thermostable wood preservative composition

5

which comprises in combination 1 to 18 wt. percent of pentachlorophenol and 82 to 99 wt. percent of a petroleum-comprising co-preservative containing 40 to 80 percent wt. of a phenol extract from a petroleum distillate, said extract boiling in the range of about 900° to 1175° F. and having an ° API gravity range of 3 to 15, a viscosity at 210° F. of 650 to 3500 S.S.U. and an aromatic content of between 50 and 100 wt. percent, and 20 to 60 wt. percent of a petroleum gas oil fraction boiling in the range of about 390° to 850° F., said composition having a viscosity at 210° F. of 30 to 100 S.S.U.

3. A thermostable wood preservative composition which comprises an admixture of 2 to 6 wt. percent of pentachlorophenol and 94 to 98 wt. percent of a petroleum-comprising co-preservative containing 40 to 80 wt. percent of a phenol extract from a petroleum distillate, said distillate having a viscosity at 210° F. of 130 to 350 S.S.U. and a mean viscosity at 210° F. of 180 to 190 S.S.U., said extract boiling in the range of about 900° to 1175° F. and having an ° API gravity range of 3 to 15, a viscosity at 210° F. of 650 to 3500 S.S.U., an aromatic content of between 50 and 100 wt. percent, a pour point range of 50 to 120° F., and a metal content in the range of 10 to 40 p.p.m., and 20 to 60 wt. percent of a petroleum gas oil fraction boiling in the range of about 390° to 850° F., said composition having a viscosity at 210° F. of 50 to 70 S.S.U., a pour point range of 30° to 50° F. and an ° API gravity of 10 to 15.

4. A composition according to claim 3 wherein said metal is a metal selected from the group consisting of iron, nickel and vanadium.

5. A composition according to claim 3 wherein said gas oil fraction is a catalytically cracked gas oil having a boiling range of about 400° to 625° F.

6. A composition according to claim 3 wherein said distillate is derived from a Western Canadian crude oil.

7. A method of preparing a thermostable wood preservative composition containing pentachlorophenol and a petroleum-comprising co-preservative which comprises blending 40 to 80 wt. percent of a phenol extract from a petroleum distillate, said extract boiling in the range of about 900° to 1175° F. and having an aromatic content of between 50 and 100 wt. percent and a mean viscosity at 210° F. of 180 to 190 S.S.U., with 20 to 60 wt. percent of a petroleum gas oil fraction boiling in the range of 390° to 850° F. to a viscosity at 210° F. of 30 to 100

6

S.S.U. and adding thereto 1 to 18 wt. percent of pentachlorophenol.

8. A method of preparing a thermostable wood preservative composition having a viscosity at 210° F. of 30 to 100 S.S.U. which comprises admixing pentachlorophenol, a phenol extract of a petroleum distillate, said extract boiling in the range of about 900° to 1175° F. and having an ° API gravity range of 3 to 15, a viscosity at 210° F. of 650 to 3500 S.S.U., and an aromatic content of between 50 and 100 wt. percent, and a petroleum gas oil fraction boiling in the range of 390° to 850° F., in such proportions that said pentachlorophenol comprises 1 to 18 wt. percent of said composition and the ratio of said extract to said gas oil is in the range of 4:1 to 2:3.

9. A process for preserving wood comprising impregnating wood with a thermostable composition comprising in combination 1 to 18 wt. percent pentachlorophenol and 82 to 99 wt. percent of a petroleum-comprising co-preservative containing 40 to 80 wt. percent of a phenol extract from a petroleum distillate, said extract boiling in the range of about 900° to 1175° F. and having an aromatic content of between 50 and 100 wt. percent and 20 to 60 wt. percent of a petroleum gas oil fraction boiling in the range of about 390° to 850° F.

10. A process for preserving wood comprising treating said wood at elevated temperatures and pressures with a wood preservative composition which comprises in combination 1 to 18 wt. percent of pentachlorophenol and 82 to 99 wt. percent of a petroleum-comprising co-preservative containing 40 to 80 wt. percent of a phenol extract from a petroleum distillate, said extract having an ° API gravity range of 3 to 15, a viscosity at 210° F. of 650 to 3500 S.S.U. and an aromatic content of between 50 and 100 wt. percent, and 20 to 60 wt. percent of a petroleum gas oil fraction boiling in the range of about 390° to 850° F., said composition having a viscosity at 210° F. of 30 to 100 S.S.U.

11. A process according to claim 10 wherein said pentachlorophenol comprises 2 to 6 wt. percent of said composition.

12. A process according to claim 10 wherein said composition has a viscosity at 210° F. of 50 to 70 S.S.U.

References Cited in the file of this patent

UNITED STATES PATENTS

2,182,081 Hatfield ----- Dec. 5, 1939