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CORE OIL

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This invention relates to a core oil composition.

In the manufacture of cores in the foundry, core sand is mixed with a suitable bonding material so that the prepared core sand can be rammed to shape in a suitable core box and the core removed from the core box without distortion to be baked in an oven in preparation for its ultimate use in the mold. The core must maintain its shape and integrity when placed in a mold for such a length of time after the molten metal has been poured to permit the metal to set or cool to solidity about the core. The bonding materials employed usually burn or vaporize, giving out gas during the metal casting. If this gas is particularly voluminous, and if the core is not porous, difficulty in releasing it from the mold arises and gas pockets or holes occur in the casting. In some instances, where the release of gas has been particularly restricted and the gas has been quite voluminous, it is not uncommon for the core to explode, spattering molten metal about, damaging property and harming workmen nearby. In other instances, some bonding materials, when burned or vaporized, give off noxious, harmful and unwholesome gases which are quite objectionable. The bonding material, after baking, should therefore provide a core which is porous and yet strong.

Because of the competitive nature of foundry operations today, it is necessary that the core be relatively inexpensive and, at the same time, possess a certain degree of strength. Further, it is important that the bonding material "wet" each sand particle quickly and thoroughly to the end that the mulling time be kept as short as possible.

In accordance with this invention I provide a core oil composition which can be employed in foundry practice and which possesses the distinct advantage that it wets the core sand quickly and thoroughly, thus providing a very short mulling time. Further, the core oil of the present invention, when employed in a core, possesses sufficient green strength, the core bakes satisfactorily and, when the baked core is employed in a mold, releases a relatively small volume of gas when the casting is made. The gas released is not of an obnoxious nature, so that it is not objectionable to the workmen. At the same time, the core is so porous that the gas is readily released. Further, the core oil of the present invention provides sufficient bonding strength to the core sand, but yet, upon the metal having been cast in the mold, the core shrinks satisfactorily as the metal cools and, when the metal is cold, the core readily breaks up; the core sand is released into individual small particles whereby the core can be readily removed, "falls out," from within the mass of metal.

The present invention involves the use of, what I believe to be, a novel additive material. This additive is employed with any of the usual core bonding oils, such as fish oil, linseed oil, tung oil, perilla oil, soy bean oil, or other oils possessing relatively high unsaturate content and which are commonly classed as drying oils and which are suitable core oil materials. The additive material of the present invention, to be presently described in detail, imparts to the fish oil or linseed oil, the property of fast sand wetting. For example, a material including about 50% of the additive of this invention wets more than twice as fast as does ordinary linseed oil, the standard of comparison for core oils. Further, a composition including the additive of this invention does not give off obnoxious or toxic gases and, after the core has been used in the mold, the molten metal poured, each particle of the sand is releasable, all particles thereof being substantially uniformly coated but the bond between individual particles being sufficiently weak to permit the sand to "fall out" from within the mass of metal readily. The "falling out" occurs properly; the core permits the metal to shrink as it cools.

The additive material of the present invention imparts additional strength to the drying oil. The following table gives the results on bars 1" x 1" x 8" tested on 6" centers in a testing machine; the load was applied intermediate the centers to effect a fracture of the bar. A Del Monte core sand was employed in the ratio of 75 parts of sand to 1 of the core oils by weight:

Parts of fish oil	Parts of additive	Breaking strength
		Pounds
20	80	36.0
30	70	57.3
40	60	55.3
45	55	56.0
50	50	72.0
100	0	30.6

A proprietary composition, recognized in the art as one of the best in the market, and made up according to the same procedure and tested under the same conditions, gave an average

breaking value of 57.8 pounds. Bars made up employing linseed oil as the additive, and linseed is recognized as one of the best core oil materials in the market, gave an average breaking value of 40 pounds.

The core oil additive of the present invention can be employed in the composition in various ratios, but I have found that it can be suitably used in relatively high percentages and I prefer to use at least 50% and as high as 80% of this material in a composition. Less of the additive of this invention can be employed, but since the drying oils are relatively much more expensive than the additive material, there is no reason for employing a relatively small amount of the additive and a larger portion of the drying oil, and thus increasing the expense, because core oils are sold under quite competitive conditions. Ordinarily, therefore, one can consider that the ratio of 50% to 80% of the additive material will suffice. Above the minimum of 20% drying oil the strength appears to vary proportionately with the drying oil content, although the strength imparted by the composition is higher than with the drying oil alone. For example, fish oil, when employed without the additive, under similar conditions as those outlined above, gave a breaking value of only 29.9 and 31.3 pounds, an average of 30.6 pounds.

As the additive material I have successfully employed a polymerized olefin, particularly a polymerized olefin mixture which has been so treated that some content of solids is formed. Such a material can be formed, for example, by polymerizing refinery gases having a high olefin content, or consisting only of one or more olefins, with a suitable catalyst as phosphoric acid, sulfuric acid, a radio-active material, with or without simultaneous or delayed oxidation, until the olefins have polymerized to form at least a good size fraction, 10% or more, of black solids, or by treating a liquid fraction so formed further with these catalysts with or without air, but preferably with air. For example, 120 pounds of the liquid fraction remaining after removal of an ordinary gasoline of about 415° F. end point were subjected to 305 to 340 pounds pressure for two hours and the catalytic presence of a monazite sand containing radio-active thorium dioxide. During this period 100 pounds of air were blown slowly through the fraction while the fraction was maintained at a temperature of about 280° F. The liquid fraction contained about 10% solids. Another fraction was treated, under the same catalytic conditions, for two hours at 300–330 pounds, 200 pounds of air were used, and the temperature was raised gradually to 290° F. The materials recovered had ultimate analyses as follows:

	I	II
Carbon	86.25	87.58
Hydrogen	9.65	7.60
Sulfur	3.34	3.38
Oxygen	0.68	0.30

The material initially treated was formed by polymerization of refinery still gases by the Universal Oil Products solid phosphoric acid catalytic process. It contained about 40% by weight of olefins and 40% of aromatics prior to the above treatment. The material formed was evidently a polymerized hydrocarbon based on approximately a C_7H_7 basis but polymerized to a solid form.

The so formed solid fraction, with or without the accompanying liquid fraction, is thinned or dissolved in a suitable solvent. I have successfully employed a mineral oil paint thinner fraction having a boiling point range approaching and approximating that of kerosene. Only sufficient solvent is employed to dissolve the solid, usually about 30% of the solvent sufficing, although this can vary.

The drying oil content can be varied between 20% and 50% depending on the strength desired. The solvent can be varied—any material can be employed which is (1) non-reactive with the drying oil, (2) a solvent, (3) has such a boiling point that, upon baking of the core the solvent does not immediately evaporate or evaporate rapidly, and (4) is soluble in the drying oil or the oil is soluble in it.

I claim:

1. A core oil comprising a solution containing from 20% to 50% of a drying oil and the balance polymerized solid hydrocarbons dissolved in a solvent compatible with the drying oil.

2. A core oil comprising a solution containing from 20% to 50% of a drying oil and the balance polymerized solid hydrocarbons dissolved in a solvent having boiling point characteristics approximating those of kerosene, said solvent being compatible with the drying oil.

3. A core oil comprising—

	Per cent
A drying oil	20 to 50
Solid polymerized hydrocarbons	80 to 50

And sufficient solvent for said solids to carry them in solution.

4. A core oil comprising from 20% to 50% of a drying oil selected from the class consisting of a fish oil and linseed oil, and the balance solid polymerized hydrocarbons carried in a mutual solvent for said drying oil and the solids.

5. A core sand binding composition comprising from 20% to 50% of a drying oil and the balance of a polymerized petroleum constituent carried in a solvent therefor miscible with said oil.

6. A core sand binding composition comprising from 20% to 50% of a drying oil and the balance of a polymerized and an oxidized petroleum constituent normally solid at atmospheric temperature carried in a solvent therefor miscible with said oil.

7. A composition for use as a core oil comprising at least fifty per cent (50%) of solid polymerized hydrocarbon, a drying oil and a solvent which is non-reactive with the drying oil.

8. A composition for use as a core oil comprising at least fifty per cent (50%) of solid polymerized hydrocarbon, a drying oil, and a solvent for said solid polymerized hydrocarbon which upon baking in use will not immediately evaporate.

9. A composition for use as a core oil comprising twenty per cent (20%) to fifty per cent (50%) of a drying oil and the balance a solid polymerized olefin dissolved in a solvent compatible with the drying oil.

10. A composition for use as a core oil comprising twenty per cent (20%) to fifty per cent (50%) of a drying oil and the remainder a solid polymerized olefin dissolved in a solvent material with the said drying oil.

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