United States Patent [19]

Van Tassell

[11] **3,864,244**

[45] **Feb. 4, 1975**

[54] **SOLVENT EXTRACTION WITH INTERNAL PREPARATION OF STRIPPING STEAM**

[75] Inventor: **Harry M. Van Tassell,** Arlington Heights, Ill.

[73] Assignee: **Universal Oil Products Company,** Des Plains, Ill.

[22] Filed: **Nov. 23, 1973**

[21] Appl. No.: **418,698**

[52] **U.S. Cl.** **208/321,** 208/325, 208/333

[51] **Int. Cl.** **C10g 21/28**

[58] **Field of Search** 208/321

[56] **References Cited**

UNITED STATES PATENTS

3,173,966	3/1965	Jones et al.	208/321
3,492,222	1/1970	Van Tassell	208/321
3,714,033	1/1973	Somekh et al.	208/321

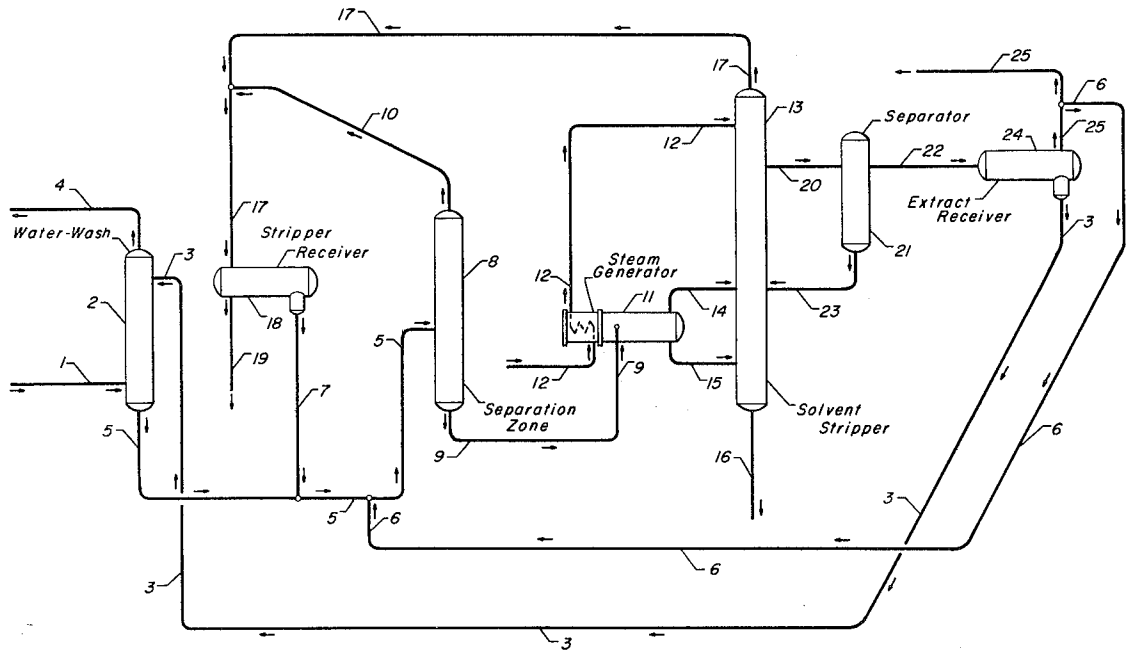
Primary Examiner—Herbert Levine

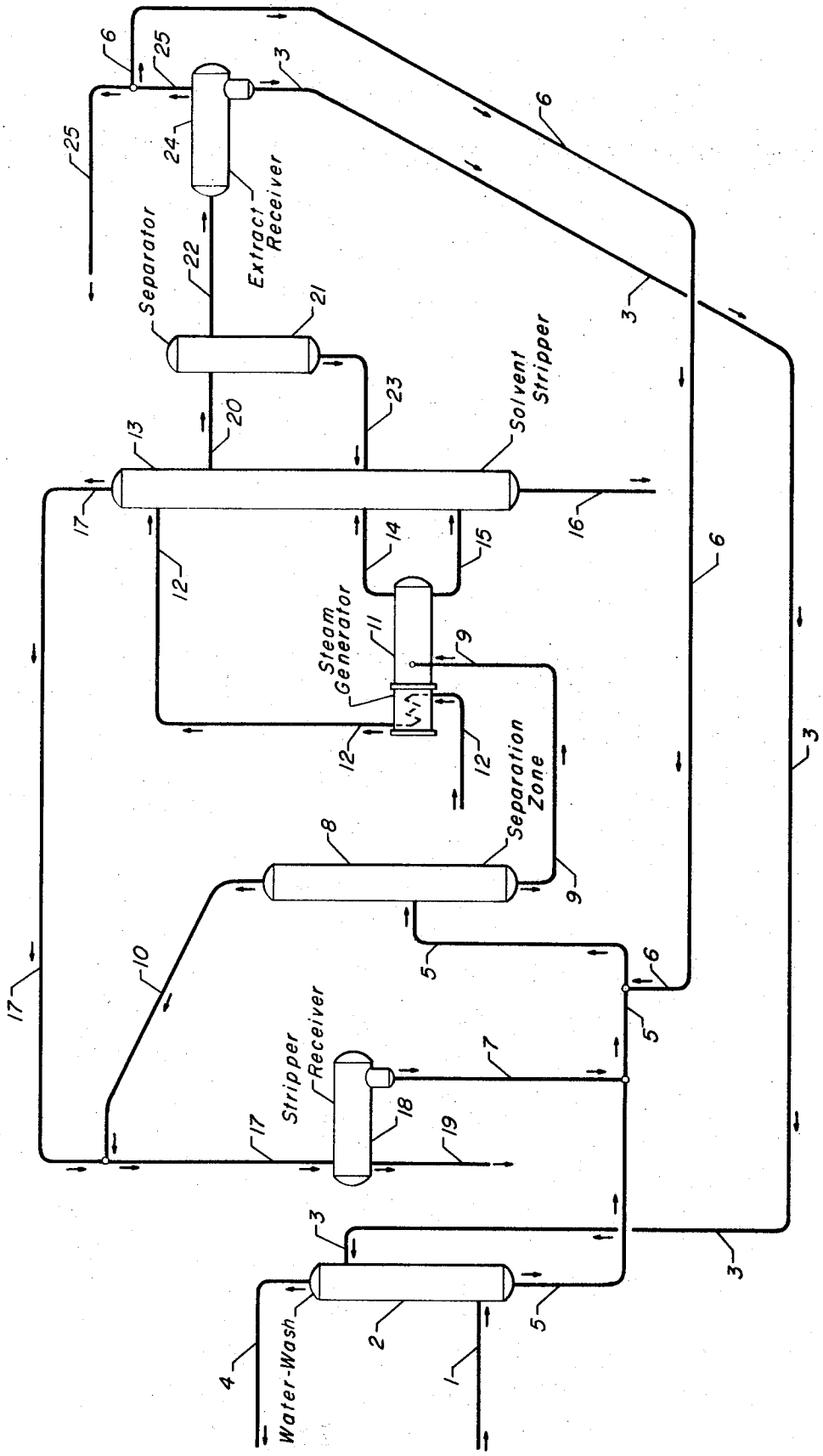
Attorney, Agent, or Firm—James R. Hoatson, Jr.; Robert W. Erickson; William H. Page II

[57] **ABSTRACT**

A solvent extraction process for effecting the separation of polar hydrocarbons from a mixture thereof with non-polar hydrocarbons. Water, from which steam is generated and utilized to strip hydrocarbons from the extract phase, is internally prepared within the process and is substantially free from non-polar hydrocarbons.

8 Claims, 1 Drawing Figure




Water-Wash
Stripper Receiver
Steam Generator
Separation Zone
Solvent Stripper
Extract Receiver
Separator

SOLVENT EXTRACTION WITH INTERNAL PREPARATION OF STRIPPING STEAM

APPLICABILITY OF INVENTION

The invention herein described is adaptable for utilization in the separation, and ultimate recovery of polar hydrocarbons from a mixture thereof with non-polar hydrocarbons, which separation is effected through the use of a solvent characteristically selective for adsorbing the polar hydrocarbons. More specifically, my invention involves the separation and recovery of aromatic hydrocarbons from various mixtures thereof with non-aromatic hydrocarbons, which process utilizes an internally prepared water stream, substantially free from non-aromatic hydrocarbons, to generate the steam which is employed in a solvent-stripping zone for the purpose of recovering an aromatic concentrate substantially free from the selected solvent and non-aromatic hydrocarbons.

In the present specification and appended claims, the use of the terms "polar" and "non-polar" is intended to distinguish between classes of hydrocarbons wherein one particular type is more polar while another is less polar. For example, in the extraction of aromatics from a mixture thereof with naphthenes and paraffins, the latter are considered "non-polar" with respect to aromatics which are "polar." In one of its specific applications, the process encompassed by the present inventive concept serves to segregate particular species of aromatic hydrocarbons, such as benzene, toluene and/or C_8 aromatics from other hydrocarbons normally contained in petroleum fractions and/or distillates. The process utilizes a solvent which may be indefinitely recycled within the system, yields the desired hydrocarbon products in high purity, and separates the same substantially in its entirety from the feed stocks charged to the process.

The present invention is particularly directed toward an improvement in the type of separation process wherein a mixture of various classes of hydrocarbons is introduced into a solvent extraction zone, being counter-currently contacted therein with a solvent selective for aromatic hydrocarbons. A raffinate phase, comprising substantially all of the non-aromatic hydrocarbons in the feed stock, is removed from an end portion of the extraction zone, an extract phase comprising the aromatic components of the charge stock is removed from the other end portion of the extraction zone, with the aromatic solute being recovered in a solvent stripping zone through the utilization of steam.

Although my invention is applicable for use with any hydrocarbon feed stock having a sufficiently high aromatic concentration to justify the recovery thereof—i.e., at least about 25.0 percent by volume—significant advantages are afforded when processing those charge stocks having an aromatic hydrocarbon concentration at least about 65.0 percent by volume. The overall carbon number range of suitable charge stocks is from about six to about 10. These charge stocks will generally include, in addition to C_6, C_7 and C_8 aromatics, non-aromatics which predominate in C_8 and C_9 paraffins and naphthenes. Exemplary of various sources of suitable charge stocks are the depentanized effluent from a naphtha catalytic reforming unit, coke oven by-products, wash oils, hydrotreated pyrolysis naphtha, etc.

My inventive concept involves a unique procedure for the internal preparation of a water stream from which steam is generated for utilization in the solvent stripping zone. "Internal preparation" is intended to connote that the water stream is prepared within the physical confines of the solvent extraction process. The present technique has many advantages over currently-practiced prior art procedures. Among these is a decrease in the quantity of non-polar hydrocarbons introduced into the stripping zone, in turn resulting in a polar hydrocarbon product of increased purity. Other advantages are hereinafter discussed, and will become evident to those possessing the requisite skill in the appropriate art.

PRIOR ART

Candor compels recognizing that the prior art is replete with a wide spectrum of solvent extraction processes utilized for the separation of polar and non-polar hydrocarbons. No attempt will be made herein to exhaustively delineate the appropriate published literature; it will suffice to note several examples which are typical of prior art practices and procedures, and to which the present invention is applicable. Solvent extraction processes are generally specifically directed to the recovery of aromatic hydrocarbons from a mixture thereof with non-aromatic hydrocarbons. Furthermore, these processes indicate a distinct preference for a water-soluble solvent containing an oxygenated organic compound. A review of the prior art indicates that the prevalent solvent is either a sulfolane-type organic compound, or an alkylene glycol, and preferably a polyalkylene glycol. Although most prior art processes are intended to be utilized in conjunction with either of these organic solvents, special techniques do exist which are peculiar either to one, or the other.

U.S. Pat. No. 3,173,966 (Cl. 260–674) incorporates rectification of rich solvent side-out vapors, withdrawn from the stripping zone, in order to recover substantially solvent-free water for subsequent utilization within the process.

In U.S. Pat. No. 3,396,101 (Cl. 208–313), a mixture of feed stock and lean solvent is introduced into the stripping column, from which a non-aromatic overhead is withdrawn and introduced into an extraction zone. The resulting rich solvent is passed from the extraction zone to the stripping column as a second feed stream thereto. U.S. Pat. No. 3,436,435 (Cl. 260–674) involves the utilization of an entrainment separator into which the sidecut aromatic stream from the solvent stripping zone is introduced.

Still another variation is that found in U.S. Pat. No. 3,723,256 (Cl. 203–43). Initially, the aromatic hydrocarbon feed is introduced into a distillation column from which is recovered a light fraction and a heavier bottoms fraction. The former is passed into an extractive distillation tower, while the latter is introduced into a liquid extraction unit. The extract from the liquid extraction unit is stripped of non-aromatic hydrocarbons to produce a non-aromatics free fraction and a non-aromatics containing fraction. The aromatics recovered in admixture with the solvent, from the extractive distillation tower, are passed to a recovery section in admixture with the aromatic-containing fraction from the stripping zone. The overhead stream from the extractive distillation column and the non-aromatics from the stripping zone are passed in admixture to the bot-

tom section of the solvent extraction zone, to function therein as a reflux stream.

Upon perusal of the foregoing illustrations of prior art solvent extraction processes, it will be noted that the improvements afforded thereby result primarily from a variety of modifications with respect to the internal flow of various process streams. That is, a common characteristic of the multitude of solvent extraction processes is the utilization of at least a solvent extraction zone and a solvent stripping zone. For a given solvent extraction unit, designed to process a given quantity of mixed hydrocarbon feed, these two vessels, and the required manifolding and vessels appurtenant thereto, are the principal factors contributing to both erection and operating costs. It may be said, therefore, that economically attractive innovations relate to various techniques utilized with respect to the internal flow of various process streams. The resulting economical enhancement generally stems from improved and/or simplified unit operation, lower operating and utility costs, improved product purity, increased solvent recovery, lower overall initial capital investment, etc. The technique encompassed by my inventive concept is applicable to the foregoing described processes, and affords the indicated advantages therein.

OBJECTS AND EMBODIMENTS

A principal object of my invention is to simplify the internal flow of various process streams in a solvent extraction unit.

Another object is directed toward the in-process production of steam, substantially free from non-polar hydrocarbons, for internal utilization in the solvent stripping zone. A corollary objective resides in an improvement in the purity of the desired polar hydrocarbon product.

Specifically, my invention affords significant economic advantages when integrated into currently practiced solvent extraction systems for the separation and recovery of polar hydrocarbons from mixtures thereof with non-polar hydrocarbons.

Therefore, in one embodiment, my invention involves a process for the recovery of polar hydrocarbons from a mixture thereof with non-polar hydrocarbons, wherein: (i) said mixture is contacted with a water-soluble, oxygen-containing solvent, selective for the extraction of said polar hydrocarbons; (ii) there is recovered an extract stream containing polar hydrocarbons and a major proportion of said water-soluble solvent, and a raffinate stream containing non-polar hydrocarbons and a minor proportion of said water-soluble solvent; (iii) said raffinate stream is contacted with water to recover said solvent and to provide a hydrocarbon concentrate substantially free from said solvent; and, (iv) said extract stream is contacted with steam, in a solvent stripping zone, to remove hydrocarbons from said water-soluble solvent and to recover substantially solvent-free polar hydrocarbons, in which process the method of internally preparing steam, substantially free from non-polar hydrocarbons, for use in said solvent stripping zone, comprises the steps of: (a) contacting said raffinate stream with a first water stream to provide a second raffinate stream, substantially free from solvent, and a second water stream containing solvent and a minor quantity of non-polar hydrocarbons; (b) admixing said second water stream with a first polar hydrocarbon-rich stream and separating the resulting mixture to provide a second polar hydrocarbon stream containing non-polar hydrocarbons and a third water stream substantially free from non-polar hydrocarbons; (c) introducing said extract stream into the upper portion of said solvent stripping zone; (d) generating steam into a lower portion of said solvent stripping zone; and, (e) recovering, from said stripping zone, an overhead stream comprising hydrocarbons, steam and solvent, an aqueous extract stream rich in polar hydrocarbons and a bottoms solvent-rich stream.

These, as well as other objects and embodiments of my invention, will become evident from the following detailed description thereof. With respect briefly, however, to other such other embodiments, these involve operating conditions, particular solvents for utilization in the extraction zone, in-process separations and stream flows, etc. For example, the aqueous extract, rich in polar hydrocarbons, recovered from the solvent stripping zone, is separated to provide a water concentrate and a polar hydrocarbon concentrate, and said raffinate stream is contacted with at least a portion of the water concentrate as the first water stream.

SUMMARY OF INVENTION

As hereinafter set forth, the technique encompassed by my inventive concept is intended to be integrated into a solvent extraction process for the selective separation and recovery of polar hydrocarbons from a mixture thereof with non-polar hydrocarbons. Although thus applicable to a multitude of hydrocarbon mixtures, further discussion will be limited to the separation and recovery of aromatic hydrocarbons from a mixture thereof with paraffins and/or naphthenes. Initially, the mixture of hydrocarbons is contacted with a water-soluble, oxygen-containing solvent particularly selective for the extraction of the polar hydrocarbons. There is recovered, from the solvent extraction zone, an extract stream containing aromatic hydrocarbons and a major proportion of the water-soluble solvent, and a raffinate stream containing non-aromatic hydrocarbons and a relatively minor proportion of the water-soluble solvent. The raffinate stream is generally contacted, in countercurrent flow, with water to recover the solvent and to provide a hydrocarbon concentrate substantially free from solvent. The extract stream is countercurrently contacted with steam in a solvent stripping zone, to remove hydrocarbons from the water-soluble solvent and to recover substantially solvent-free aromatic hydrocarbons. As hereinbefore set forth, the present invention encompasses a method of internally preparing the steam utilized in the solvent stripping zone, said steam being substantially free from non-aromatic hydrocarbons.

In accordance with the terminology employed in describing and claiming the present invention, the raffinate stream recovered from the solvent extraction zone is sometimes herein referred to as a first raffinate stream. The first raffinate stream, containing a minor proportion of both water-soluble solvent and aromatic hydrocarbons, is introduced into a lower portion of a water-wash column wherein it is contacted with a first water stream in countercurrent flow. This water-wash step provides a second raffinate stream which is substantially free from water-soluble solvent, and contains only a minor proportion of aromatic hydrocarbons. The first water stream is substantially free from solvent, but contains some entrained aromatic hydrocarbons. A

second water stream containing solvent and non-aromatic hydrocarbons is withdrawn from a lower portion of the water-wash zone, admixed with a substantially pure first aromatic-rich stream (at least about 95.0 mol. percent) and introduced into a separation zone. Separation is effected to provide a second aromatic stream containing non-aromatic hydrocarbons and a third water stream containing solvent and a minor quantity of aromatic hydrocarbons, but being substantially free from non-aromatic hydrocarbons (less than about 0.05 mol. percent). It is this third water stream which is utilized to generate the steam employed in the solvent stripping zone.

As in prior art processes, some of which have been previously described, the solvent recovered from the lower portion of the solvent stripping zone is recycled within the process to the solvent extraction zone. The overhead stream from the solvent stripping zone, principally comprising hyrocarbons, steam and solvent vapors, is preferably admixed with the aforesaid second aromatic stream, the mixture being introduced into a so-called stripper receiver. A hydrocarbon stream is withdrawn from the stripper receiver and utilized as backwash in the solvent extraction zone. Also withdrawn from the stripper receiver is a fourth water stream containing some solvent and a minor proportion of hydrocarbons. In a preferred embodiment, this fourth water stream is admixed with the aforesaid second water stream and introduced into the separation zone in admixture with the first, substantially pure aromatic stream.

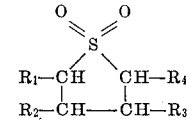
The comparatively solvent-free, aromatic-rich extract phase is withdrawn, as a principally vaporous phase from a central portion of the solvent stripping zone, and is generally subjected to entrainment separation for the purpose of removing a greater proportion of the entrained liquid phase, rich in solvent, therefrom. The entrainment separation zone may be mechanically arranged within the solvent stripping column, or take the form of a separate vessel externally. The separated entrained liquid phase is returned to the solvent stripping zone; the balance of the extract phase is condensed and introduced into an extract receiver for the separation thereof into an aromatic-rich product stream and a water concentrate. In preferred embodiments, as hereinafter indicated in the description of the accompanying drawing, at least a portion of the aromatic-rich product stream is utilized as the first aromatic stream in admixture with the second water stream. Also, the water concentrate is recycled within the process as the first water stream introduced into the raffinate water-wash zone. Principal among the multitude of advantages, attendant the foregoing described technique, is the production of a high purity steam, substantially free from non-aromatic hydrocarbons, thereby significantly reducing the utility requirements of the overall process. A corollary advantage resides in the fact that a lesser quantity of non-aromatic hydrocarbons is introduced into the solvent stripping zone and, therefore, the aromatic purity of the ultimate product is increased. The overall process enjoys a simplified flow scheme resulting in lower capital investment and subsequent operating cost.

SOLVENTS AND OPERATING CONDITIONS

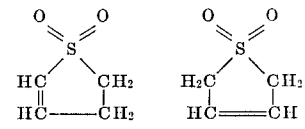
Generally accepted solvents, having solubility selectivity for aromatic hydrocarbons, are water-soluble, oxygen-containing organic compounds. Thus, one particularly preferred category of suitable solvents are those containing, in general, at least one molar substituent selected from such radicals as hydroxyl, amino, cyano, carboxyl or nitro radicals. In order to be effective in a system of extraction such as the process provided by the present invention, the solvent component having the polar radical must have a boiling point substantially greater than the boiling point of water, added to the solvent composition for enhancing its selectivity, and, in general, must also have a boiling point substantially greater than the end boiling point of the hydrocarbon feed stock. In most instances, the solvent composition has a greater density than the hydrocarbon feed stock and is accordingly introduced into the uppermost portion of the solvent extraction zone, thereafter flowing downwardly, countercurrent to the rising hydrocarbon feed stock introduced into the extraction zone at its mid-point or in the lower portion thereof.

Organic compounds suitable as the solvent component of the solvent composition may be selected from the relatively large group of compounds characterized generally as oxygen-containing compounds, particularly the aliphatic and cyclic alcohols, the glycols and glycol ethers, as well as the glycol esters and glycol ether-esters. The mono- and polyalkylene glycols in which the alkylene group contains from 2 to 4 carbon atoms, such as ethylene glycol, diethylene glycol, triethylene glycol and tetraethylene glycol, propylene glycol, dipropylene glycol, and tripropylene glycol, as well as the methyl, ethyl, propyl and butyl ethers of the glycol hydroxyl groups, and the acetic acid esters thereof, constitute a particularly preferred class of organic solvents useful in admixture with water as the solvent composition of the present process. Various phenols such as phenol and resorcinol and their alkyl ethers, such as para-cresol, etc., are also effective solvents for aromatic hydrocarbons. Certain aliphatic nitriles, cyano-substituted ethers and amines, such as acetonitrile, and the diethers and polyalkylene polyamines constitute another group of useful solvents.

Another particularly suitable class of selective solvents are those commonly referred to as the sulfolane-type. By this, I intend a solvent having a 5-membered ring, one atom of which is sulfur, the other four being carbon and having two oxygen atoms bonded to the sulfur atom. Many of these solvents may be illustrated by the following structural formula:



wherein R_1, R_2, R_3 and R_4 are independently selected from the group consisting of a hydrogen atom, an alkyl group having up to 10 carbon atoms, an alkoxy radical having up to 8 carbon atoms and an arylalkyl radical having up to 12 carbon atoms. Other solvents preferably included are the sulfolenes such as 2-sulfolene or 3-sulfolene which have the following structure:



The sulfolane solvents may be made by condensing a conjugated diolefin with sulfur dioxide and then subjecting the resulting product to hydrogenation, alkylation, hydration and/or other substitution or addition reactions. Other solvents which have high selectivity for separating aromatics from non-aromatic hydrocarbons are 2-methylsulfolane, 2,4-dimethylsulfolane, methyl 2-sulfonyl ether, n-aryl-3-sulfonyl amine, 2-sulfonyl acetate.

The aromatic selectivity of the selected solvents can be further enhanced by the addition of water. Preferably, the solvent contains a small amount of water dissolved therein to increase the selectivity of the solvent phase for aromatic hydrocarbons over non-aromatic hydrocarbons without reducing substantially the solubility of the solvent phase for aromatic hydrocarbons. The presence of water in the solvent composition provides a relatively volatile material therein which is distilled from the fat solvent in the extractive stripper to vaporize the last traces of non-aromatic hydrocarbon from the fat solvent stream by steam distillation. The solvent composition contains from about 0.5 percent to about 25.0 percent by weight of water, and preferably from about 3.0 percent to about 15.0 percent depending on the particular solvent utilized and the process conditions under which the extractor and solvent stripper are operated. By the inclusion of water in the solvent composition, the solubility of aromatic hydrocarbons in the solvent, although somewhat reduced in comparison with a non-aqueous solvent, greatly decreases the solubility of raffinate components in the solvent and also reduces the solubility of solvent in the raffinate stream. Although the quantity of solvent in the raffinate at any instant is relatively small, the cumulative effect of such small amounts of solvent in a stream removed from the process flow and thus otherwise lost, greatly reduces the efficiency and economy of the solvent extraction process. Accordingly, it is essential that the solvent dissolved in the raffinate stream be recovered therefrom. Such recovery can be accomplished efficiently by countercurrently washing the raffinate with water in a separate washing zone from which an aqueous wash effluent is recovered containing the solvent recovered from the raffinate.

The solvent extraction zone is operated at elevated temperature and at a sufficiently elevated pressure to maintain the feed stock, solvent and backwash streams in the liquid phase. Suitable temperatures are within the range of from 80° to about 400°F. and preferably at an intermediate level from about 175° to about 300°F. Suitable pressures are within the range of about atmospheric pressure up to about 400 psig. and preferably from about 50 psig. to about 150 psig. Generally, the volume of backwash introduced into the lower point in the extractor is at least 10 percent by volume of the extract phase leaving the extractor.

The solvent stripper is operated at moderate pressures and sufficiently high reboiler temperatures to drive all the backwash non-aromatic components and some of the aromatics, water and solvent overhead. Typical stripper pressures are from atmospheric to about 100 psig., although the top of the stripper is generally maintained at from about 1.0 psig. up to about 20 psig. The reboiler temperature is primarily dependent upon the composition of the solvent, including its water content. Generally, stripper bottom temperatures of from 275° to about 360°F. are satisfactory.

Other operating conditions will be given in conjunction with the description of several embodiments of the present invention as illustrated in the accompanying drawing. Miscellaneous appurtenances, not believed required, by those possessing the requisite expertise in the appropriate art, have been eliminated from the drawing. The use of details such as pumps, compressors, controls and instrumentation, heat-recovery circuits, valving, start-up lines and similar hardware, etc., is well within the purview of one skilled in the art. It is understood that the illustration does not limit my invention beyond the scope and spirit of the appended claims.

DESCRIPTION OF DRAWING

With reference now to the drawing, it will be noted that the solvent extraction zone has been eliminated. As is well-known in solvent extraction processes, several examples of which have been previously set forth, the selected solvent (in aqueous solution) countercurrently contacts the mixed hydrocarbon feed and produces a solvent-rich extract phase predominating in aromatic hydrocarbons and a solvent-lean raffinate phase rich in non-aromatic hydrocarbons. With reference now to the drawing, the extract phase is introduced via line **12**, and the raffinate phase, containing minor quantities of solvent and aromatics is introduced via line **1**. The solvent content of the raffinate phase is typically in the range of **1.0** percent to **5.0** percent, by weight.

For the purposes of illustration, the feed to the solvent extraction zone will be considered a hexane-plus concentrate resulting from the catalytic reforming of a naphtha boiling range fraction. The solvent, containing about 6.0 percent by weight of water, is tetraethylene glycol. The charge stock contains, on a weight bases, 53.0 percent of aromatic hydrocarbons, 42.0 percent of paraffins and 5.0 percent of naphthenes. The resulting raffinate phase contains 2.1 percent by weight of solvent and 2.3 percent aromatics, while the extract phase contains 80.8 percent solvent and 19.2 percent hydrocarbons.

The raffinate from the extraction column, herein referred to as the first raffinate stream, is introduced, via line **1**, into a water-wash column **2**, wherein it countercurrently contacts a first water stream in line **3**. A second raffinate stream containing some aromatic hydrocarbons, about 2.35 percent by weight, and substantially free from tetraethylene glycol, is recovered via line **4**. The use of the term "substantially free," with reference to the second raffinate stream, is intended to connote that the same contains less than about 0.05 percent by weight of solvent. A second water stream, containing solvent and non-aromatics, in amounts of 12.3 percent and about 0.2 percent, respectively, is removed from the lower portion of water-wash column **4** via line **5**, is admixed with a substantially pure, first aromatic concentrate from line **6**, and continues via line **5** into separation zone **8**.

A second aromatic-rich stream, containing virtually all the non-aromatics which had been introduced into separation zone **8** with the second water stream in line **5**, is withdrawn by way of line **10**. A third water stream containing 12.3 percent solvent, 0.05 percent aromatic hydrocarbons, and substantially completely free (less than 0.01 percent by weight) from non-aromatic hydrocarbons, is removed via line **9** and introduced thereby into steam generator **11**. Steam is generated

from the third water stream through the utilization of the extract phase, withdrawn from the initial solvent extraction zone, as the heat-exchange medium in line **12**. The extract phase continues through line **12** into the upper portion of solvent stripper **13**. Steam, along with a minor amount of solvent, is introduced into a lower portion of the solvent stripper via line **14**, and water and solvent enter by way of line **15**. Recovered solvent is recycled to the solvent extraction zone via line **16**. In a typical unit, at least a portion of the recovered solvent is diverted to a solvent regeneration facility. It is understood that such a technique is not an essential feature of my inventive concept.

The aromatic-rich stream, containing about 2.5 percent of entrained solvent and about 0.2 percent by weight of vaporized solvent, 9.3 percent water vapor, is withdrawn from an intermediate section of solvent stripper **13** by way of line **20** and, following removal of entrained liquid in entrainment separator **21**, through line **23**, is introduced through line **22** into extract receiver **24**. The final aromatic product stream, greater than 99.5 percent pure, is recovered in line **25**. Preferred techniques include utilizing at least a portion of the water removed in extract receiver **24** as the first water stream to water-wash column **2**, and at least a portion of the aromatic product as the first substantially pure aromatic stream in line **6**.

The overhead stream from solvent stripper **13** is introduced via line **17** into stripper receiver **18**, in admixture with the second aromatic stream in line **10**. A hydrocarbon stream, containing 87.2 percent aromatics and 12.8 percent non-aromatics, is recovered in line **19**, and is suitable for use as the "backwash" stream in the solvent extraction zone. A fourth water stream is recovered in line **7**, and is preferably admixed with the second water stream in line **5** for introduction into separation zone **8**.

The foregoing specification, and especially the description of the accompanying drawing, clearly illustrates the method by which the present invention is put to advantageous use in the solvent extraction process.

I claim as my Invention:

1. In a process for the recovery of polar hydrocarbons from a mixture thereof with non-polar hydrocarbons, wherein:

i. said mixture is contacted with a water-soluble, oxygen-containing solvent, selective for the extraction of said polar hydrocarbons;

ii. there is recovered an extract stream containing polar hydrocarbons and a major proportion of said water-soluble solvent, and a raffinate stream containing non-polar hydrocarbons and a minor proportion of said water-soluble solvent;

iii. said raffinate stream is contacted with water to recover said solvent and to provide a hydrocarbon concentrate substantially free from said solvent; and,

iv. said extract stream is contacted with steam, in a solvent stripping zone, to remove hydrocarbons from said water-soluble solvent and to recover substantially solvent-free polar hydrocarbons;

the method of internally preparing steam, for use in said solvent stripping zone, substantially free from non-polar hydrocarbons, which method comprises the steps of:

a. contacting said raffinate stream with a first water stream to provide a second raffinate stream, substantially free from solvent, and a second water stream containing solvent and a minor quantity of non-polar hydrocarbons;

b. admixing said second water stream with a first polar hydrocarbon-rich stream and separating the resulting mixture to provide a second polar hydrocarbon stream containing non-polar hydrocarbons and a third water stream substantially free from non-polar hydrocarbons;

c. introducing said extract stream into the upper portion of said solvent stripping zone;

d. generating steam from said third water stream and introducing said steam into a lower portion of said solvent stripping zone;

e. recovering, from said stripping zone, an overhead stream comprising hydrocarbons, steam and solvent, an aqueous extract stream rich in polar hydrocarbons and a bottoms solvent-rich stream;

f. commingling said overhead stream with said second polar hydrocarbon stream and separating the resulting mixture to provide a fourth water stream and a hydrocarbon-rich stream; and

g. commingling said fourth water stream with said second water stream and said first polar hydrocarbon-rich stream.

2. The method of claim **1** further characterized in that said water-soluble solvent is a sulfolane-type organic compound.

3. The method of claim **1** further characterized in that said water-soluble solvent is a polyalkylene glycol.

4. The method of claim **1** further characterized in that said aqueous extract stream is separated to provide a water concentrate and a polar hydrocarbon concentrate.

5. The method of claim **4** further characterized in that said raffinate stream is contacted with at least a portion of said water concentrate as said first water stream.

6. The method of claim **4** further characterized in that at least a portion of said polar hydrocarbon concentrate is admixed with said second water stream as said first polar hydrocarbon-rich stream.

7. The method of claim **1** further characterized in that said polar hydrocarbons are aromatic.

8. The method of claim **1** further characterized in that said non-polar hydrocarbons comprise naphthenes.

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