

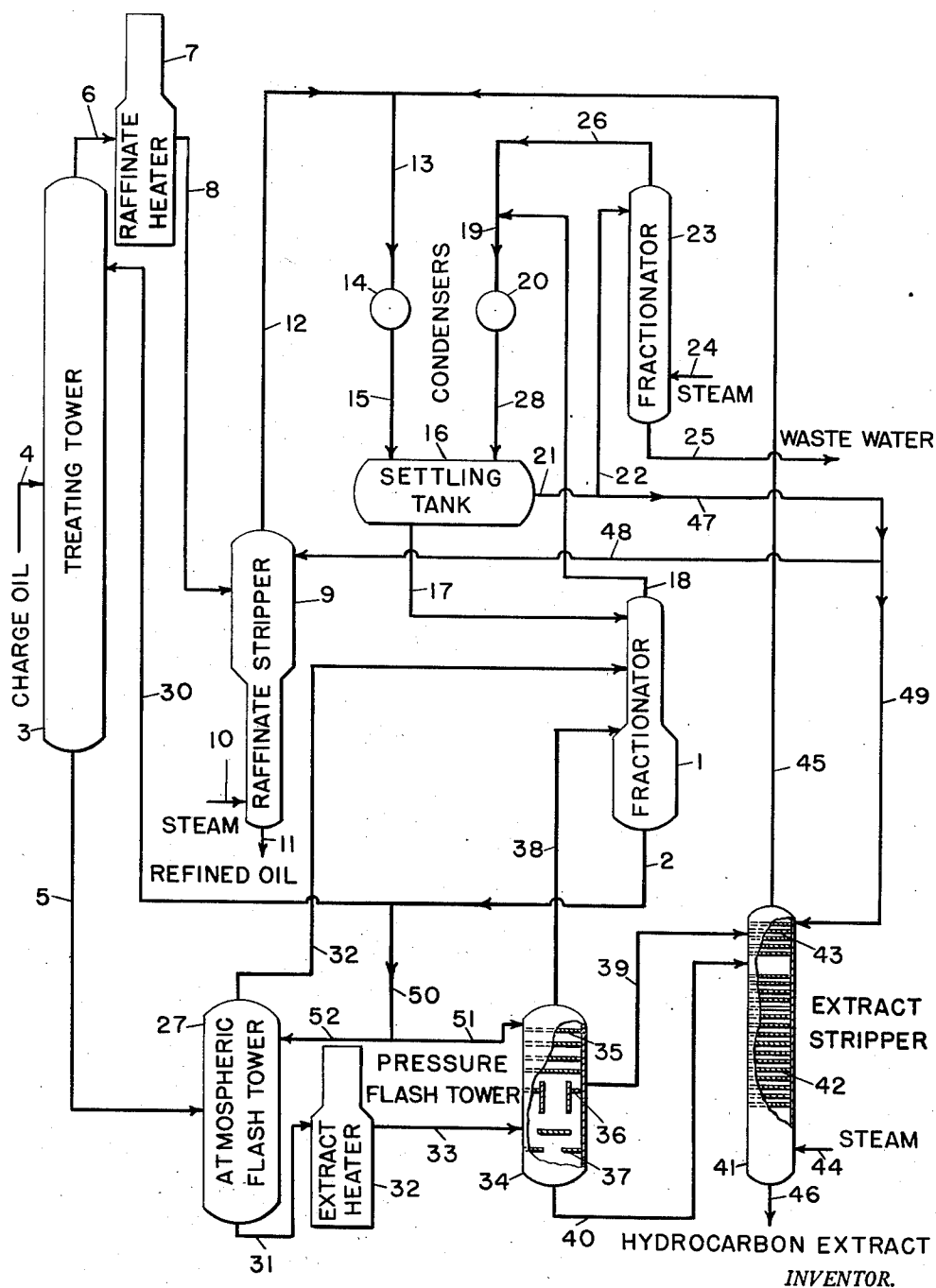
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FURFURAL RECOVERY

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FURFURAL RECOVERY

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This invention relates to the recovery by distillation of furfural from mixtures comprising the same and hydrocarbon material less volatile than furfural. More particularly, it relates to the recovery of furfural from mixtures comprising the same and less volatile constituents which comprise hydrocarbon material and acidic furfural derivatives.

The invention will be described as it relates to processes of furfural solvent extraction of mineral oil, such as lubricating oil. In such processes, as they are conventionally effected, furfural is circulated through separate zones of treating and solvent recovery. In the treating zone, furfural contacts mineral oil, selectively dissolves certain non-paraffinic constituents, and separates by gravity from the undissolved constituents. In the solvent recovery zone, the extract layer from the treating zone, i. e. furfural containing dissolved non-paraffinic constituents which are less volatile than furfural, undergoes a series of operations for recovery of substantially pure furfural, which is then recycled to the treating zone.

Furfural recovery is conventionally effected in a series of operations wherein the extract layer is flash distilled twice, once at atmospheric pressure and once at elevated pressure, furfural vapor being taken overhead from each operation, and the residue from the first flash distillation being charged to the second flash distillation. Prior art practice includes processes in which the atmospheric flash distillation is performed first and processes in which the pressure flash distillation is performed first.

The first of the two flash distillations, whether performed at atmospheric or elevated pressure, is usually performed in such a way as to remove, from a given amount of extract layer charged to that first distillation, approximately half of the furfural contained in that given amount of extract layer. The residue from the first flash distillation, though substantially reduced in furfural content, generally still comprises a major proportion of furfural, for example about 70-90 weight percent and a minor proportion of hydrocarbon material, for example about 10-30 weight percent.

The second of the two flash distillations is usually performed at conditions such that the residue from that second distillation comprises a major proportion of hydrocarbon material, for example about 55-85 weight percent, and only a minor proportion of furfural, for example about 15-45 weight percent. The residue from the sec-

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ond flash distillation is commonly stripped with steam under vacuum at a temperature which is high enough that substantially all the remaining furfural is removed with the overhead steam, leaving a residue which comprises essentially furfural-free hydrocarbon extract.

The greater part of the heat required to conduct the two flash distillations and the steam stripping is usually supplied to the charge to the pressure flash distillation, whether that distillation is performed first or second, by heating that charge in a furnace. The charge to the atmospheric flash distillation is usually heated somewhat by heat exchange with furfural vapors. The charge to the steam stripping operation, i. e. the residue from the second of the two flash distillations, is generally not heated after removal from the flash distillation zone; the usual practice is to heat the charge to the pressure flash distillation to a temperature which is high enough that the residue from the second of the two flash distillations will contain sufficient heat to be able, without further heating, to maintain the steam stripping operation at the required level of furfural recovery.

The temperature required for the steam stripping operation is a function of the proportion of furfural contained in the charge to that operation, higher temperature being required for a greater proportion of furfural. Since, as previously described, the temperature of the stripping operation is a determining factor in the temperatures in the furnace and in the pressure flash distillation, the temperature levels required for the extract layer distillation operations may be lowered by reducing the furfural concentration in the charge to the stripping operation, i. e., by vaporizing more furfural in the flash distillations. The latter may be accomplished at the lowered temperature by reducing the pressure of the pressure flash distillation. The present invention provides, as described subsequently, a method of reducing the furfural concentration in the stripper charge below that which can be obtained practically in operation according to the prior art.

When furfural is subjected to the conditions which normally prevail in a process of the type described, it undergoes certain chemical reactions, under the influence of certain of the conditions, particularly high temperature, with the formation as reaction products of acidic furfural derivatives. The exact natures of these reaction products are not clearly understood and may vary according to the prevailing conditions. It

is recognized, however, that these acidic furfural derivatives have volatilities which vary over a considerable range. The heated extract layer from the treating zone may be thought of, then, as consisting essentially of a major proportion of furfural, a minor proportion of less volatile hydrocarbon extract, and a small proportion of acidic furfural derivatives having a range of volatilities which includes at least a considerable portion of the range between the volatilities of furfural and the hydrocarbon extract.

Since the distillation of furfural from hydrocarbon extract to produce a residue having low furfural concentration inevitably involves the application of heat sufficient to form substantial amounts of acidic furfural derivatives, the residue from such a distillation contains a substantial proportion of acidic furfural derivatives, even in cases where the charge to the distillation, or to the heating operation which precedes the distillation, is substantially free of acidic furfural derivatives.

In the first flash distillation previously described, from which a residue is withdrawn which still contains a major proportion of furfural, the acidic furfural derivatives remain with the residue, no substantial amount of those acidic materials being taken overhead with the furfural vapors. In the second flash distillation, however, from which a residue is withdrawn which contains only a minor proportion of furfural, the vaporization conditions are more severe, and certain of the acidic furfural derivatives have high enough partial pressure relative to the furfural partial pressure to be removed in substantial amount with the overhead furfural vapors, unless measures are taken to prevent such occurrence. Not all of the acidic furfural derivatives less volatile than furfural will ordinarily go overhead from the second flash distillation. Generally, a major proportion of such acidic furfural derivatives are sufficiently less volatile than furfural that they remain in the residue; however, the other, relatively more volatile acidic materials require special handling for exclusion from the circulating furfural, because they are highly corrosive to metals and, if allowed to accumulate in the circulating furfural, will build up in concentration to the point where corrosion of metal in the system becomes a serious problem.

Previous attempts have been made to exclude acidic furfural derivatives from the circulating furfural by preventing those acidic furfural derivatives from going overhead with the furfural vapors from the second flash distillation. For example, it is known in the prior art to perform the atmospheric flash distillation first and to conduct the pressure flash distillation with removal, separately from the furfural overhead and from the hydrocarbon extract residue, of a sidestream comprising a major proportion of furfural, a minor proportion of hydrocarbon extract, and a substantial proportion of certain acidic furfural derivatives. The acidic furfural derivatives contained in this sidestream are mainly those having volatilities less than that of furfural but closer to that of furfural than to the average volatility of the hydrocarbon extract. Removal of such a sidestream from the pressure flash distillation operation is disclosed by Brown et al., in a journal article in "Petroleum Processing," volume 2, page 557 (1947).

The above journal article further discloses introducing the withdrawn sidestream into a settling tank (CBM receiver) containing fur-

fural and water introduced from other operations in the process. In the CBM receiver, an aqueous layer and a furfural layer are formed, the latter by virtue of its higher specific gravity collecting at the bottom of the CBM receiver. The above article states that the acidic materials contained in the sidestream introduced into the CBM receiver are finally discharged in waste water solution.

There are certain disadvantages to the above-described disposition of the sidestream from the pressure flash distillation. First, the presence of hydrocarbon extract and acidic furfural derivatives in the CBM receiver favors the formation of emulsions therein, thus hindering the efficient separation of layers. Secondly, such emulsions cause increased furfural concentration in the aqueous layer, with the eventual result that substantial amounts of furfural are discarded with the waste water. Thirdly, it has been found that even in the absence of emulsions, a substantial proportion, sometimes as much as 50 weight percent, of the acidic furfural derivatives in the sidestream dissolve in the furfural layer which is formed in the CBM receiver and, after distillation for removal of dissolved water from the furfural layer, are recirculated with that layer to the oil treating operation. Therefore, although the introduction of the sidestream into the CBM receiver decreases the proportion of acidic furfural derivatives in the circulating furfural, such operation does not eliminate them, and in some cases it does not reduce that proportion to within tolerable limits.

I have discovered that an unexpectedly advantageous disposition of an acidic sidestream from distillation of a furfural extract layer is to strip that sidestream with steam in order to separate furfural from the acidic furfural derivatives. It has been found that such steam stripping, preferably with rectification of the vapors, produces an overhead comprising essentially furfural and water and containing no substantial proportion of acidic furfural derivatives.

The sidestream may be separately steam stripped or it may be steam stripped in the presence of the hydrocarbon extract residue from the distillation of the extract layer. Such residue is commonly stripped with steam in an extract stripper containing stripping and rectifying zones; and the sidestream may be introduced into the extract stripper, preferably intermediate of the ends of the rectifying zone, as a stream separate from the hydrocarbon extract residue.

The invention provides a novel and unexpectedly advantageous method for recovering furfural from the extract layer from the treating zone of a furfural solvent extraction system. According to the invention, such recovery is effected while suppressing the formation of acidic furfural derivatives, preventing excessive accumulation in the circulating furfural of such acidic furfural derivatives as are formed, and overcoming the previously mentioned disadvantages of the prior art.

The method of the invention involves, first, the distillation of the extract layer to reduce its furfural content to a degree such that furfural is present in the residue from the distillation in only a minor proportion.

In such distillation, it has been found that if, under practical operating conditions, only a furfural overhead stream and a hydrocarbon residue steam are removed from the distillation zone, the

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overhead stream will contain substantial amounts of acidic furfural derivatives, because of the severe vaporization conditions which are required to obtain a residue which contains only a minor proportion of furfural. Therefore, it is generally necessary, in order to obtain the desired separation of furfural from hydrocarbon extract and to obtain a furfural overhead which contains no substantial amount of acidic furfural derivatives, to remove a sidestream comprising furfural and acidic furfural derivatives. It is preferred that this sidestream contain a major proportion of furfural, a minor proportion of hydrocarbon material, and a substantial proportion of acidic furfural derivatives.

The method of the invention further involves the steam stripping of the above sidestream to separate the furfural therefrom. In this step, the sidestream is subjected, without previous change in its composition, to steam stripping to obtain overhead vapors comprising essentially water and furfural and a residue comprising acidic furfural derivatives and also comprising hydrocarbon extract, when the sidestream contains hydrocarbon extract or when the sidestream is steam stripped in the presence of the residue from the distillation of the extract layer.

According to the invention, the steam stripping may be preceded by only one distillation, or it may be preceded by a plurality of distillations, from the last of which a residue is obtained which contains only a minor proportion of furfural. In the latter case, the distillations may all be performed at atmospheric pressure, or all at elevated pressure, or some at atmospheric and some at elevated pressure. It is preferred, however, that two flash distillations be performed, the first at atmospheric pressure and the second at elevated pressure, because such operation usually results in more economical use of the heat which is supplied to the system. The atmospheric distillation is preferably conducted at a temperature of about 300° F. to 350° F.; the pressure distillation is preferably conducted at a temperature of about 400° F. to 450° F. and a pressure of about 30-45 pounds per square inch absolute. Other operating conditions are within the scope of the invention.

The invention will now be explained with reference to the attached drawing, which is a schematic flow diagram of a process for the furfural solvent extraction of hydrocarbon oil, such as lubricating oil.

Furfural is withdrawn from a furfural surge tank which conveniently may be the bottom of fractionator 1, is passed through lines 2 and 30, and is continuously introduced into treating tower 3 adjacent the top thereof. Preheated charge oil is continuously introduced into treating tower 3 through line 4. The furfural and oil are intimately contacted within treating tower 3 by any suitable means known to the art, and the furfural selectively dissolves certain relatively non-paraffinic constituents of the oil. An extract material, comprising furfural and dissolved constituents of the oil, collects at the bottom of treating tower 3 by virtue of its relatively high specific gravity, and is continuously withdrawn through line 5. A raffinate material, comprising mainly undissolved constituents of the oil charge, collects at the top of the treating tower 3 and is withdrawn through line 6.

The raffinate stream contains a small amount of furfural dissolved therein and is therefore heated in raffinate heater 7 and passed through

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line 8 into raffinate stripper 9, where it is subjected to fractional distillation in the presence of steam introduced through line 10. The residue from the distillation comprises essentially refined oil and is withdrawn through line 11 as a product of the process. The overhead vapors from the distillation, comprising essentially a mixture of furfural and water, are removed from still 9 through line 12 and passed through line 13 into condenser 14. Liquid condensate from condenser 14 is passed through line 15 into settling tank (CBM receiver) 16, wherein that condensate stratifies to form an aqueous layer and a furfural layer.

The heavier furfural layer, which contains some water, is withdrawn from the lower portion of settling tank 16 through line 17 and introduced into fractionator 1 where it is subjected to distillation in the presence of furfural streams introduced from elsewhere in the process, as described subsequently. The overhead vapors from fractionator 1 comprise essentially furfural and water and are removed through line 18 and passed through line 19 into condenser 20. Liquid condensate from condenser 20 is passed through line 21 into settling tank 16. Furfural accumulates in the surge tank constituted by the bottom of fractionator 1 and is withdrawn through line 2 as needed.

The lighter aqueous layer in settling tank 16 contains some furfural and is withdrawn from the upper portion of settling tank 16 through line 21. Part of this aqueous layer is then introduced through line 22 into fractionator 23, where it is subjected to stripping by steam introduced through line 24. The residue from the distillation, comprising mainly water, is removed from fractionator 23 through line 25 and becomes a waste product of the process. The overhead vapors from the distillation comprise essentially furfural and water and are removed from fractionator 23 through line 26 and passed through line 19 into condenser 20.

The extract stream from treating tower 3 is removed through line 5, heated in a conventional manner (by means not shown) to about 330° F., and subjected to a series of operations for separation of furfural from the hydrocarbon materials dissolved therein. Line 5 discharges the extract layer into extract atmospheric flash tower 27, wherein partial vaporization of furfural from the extract layer occurs. The residue is removed from atmospheric flash tower 27 through line 31. The overhead vapors are removed through line 32 and introduced into fractionator 1.

The residue from atmospheric flash tower 27 is withdrawn through line 31, heated in extract heater 32 to a temperature of about 430° F. and introduced through line 33 into extract pressure flash tower 34 containing rectifying trays 35, retaining tray 36, and baffles 37. Line 33 discharges below retaining tray 36. Partial vaporization occurs, and the evolved vapors pass upwardly through retaining tray 36 and are rectified at a pressure of about 40 pounds per square inch absolute. The overhead vapors comprising essentially furfural are removed through line 38, partially condensed, and introduced into fractionator 1 above the accumulated furfural residue therein. Condensate from rectifying trays 35 accumulates on retaining tray 36. A side stream is withdrawn from retaining tray 36 in pressure flash tower 34 and is withdrawn through line 39. This side stream comprises a major proportion of furfural, a minor proportion of hydrocarbon

extract, and a substantial proportion of acidic furfural derivatives.

Residue is withdrawn from the bottom of pressure flash tower 34 through line 40 and introduced into extract stripper 41 near the top thereof. Extract stripper 41 contains stripping trays 42 and rectifying trays 43. The residue is subjected in extract stripper 41 to rectification and stripping in the presence of steam introduced through line 44 and in the presence of the side stream from pressure flash tower 34, which sidestream is introduced through line 39 onto the third rectifying tray 43 from the top of the rectifying zone in extract stripper 41.

Overhead vapors, comprising essentially furfural and water, and containing no substantial amount of acidic furfural derivatives, are removed from extract stripper 41 through line 45, combined with the vapors in line 12, and passed through line 13 into condenser 14. Residue comprising essentially furfural-free hydrocarbon extract is withdrawn from extract stripper 41 through line 46.

Part of the furfural removed from fractionator 1 through line 2 passes through lines 50 and 52 to atmospheric flash tower 27 where it is introduced as reflux. Another part of that furfural passes through lines 50 and 51 to pressure flash tower 34 where it is introduced as reflux.

Part of the aqueous layer removed from settling tank 16 through line 21 passes through lines 47 and 48 to raffinate stripper 9 where it is introduced as reflux. Part of the aqueous layer passes through lines 47 and 49 to extract stripper 41, where it is introduced as reflux.

Important novel features of the above-described process include the introduction of the sidestream from pressure flash tower 34 into extract stripper 41 and the subjection of that sidestream to the rectification and stripping with steam which takes place therein. The furfural content of the sidestream is vaporized and removed as overhead from extract stripper 41 through line 45. The hydrocarbon extract content of the sidestream becomes a residue of the operation and is withdrawn through line 46. The acidic furfural derivatives contained in the sidestream also become a residue and are withdrawn with the hydrocarbon extract through line 46.

As previously mentioned, it is known in the prior art to remove from pressure flash tower 34 a sidestream containing a substantial proportion of acidic furfural derivatives and to introduce that sidestream into settling tank 16. In such operation, it has been found that a substantial proportion of the acidic furfural derivatives dissolves in the furfural layer in settling tank 16 and is passed therewith to fractionator 1. Most of the acidic furfural derivatives introduced into fractionator 1 accumulate with the furfural in the bottom of fractionator 1 and are withdrawn with the recovered furfural through line 2. Since, in the operation of the present invention, acidic furfural derivatives are substantially excluded from the settling tank and the two water-furfural fractionators, the acidity of the recovered furfural is substantially less than that obtained in the operation of the prior art.

In the drawing, the sidestream from the pressure flash tower is shown removed from the retaining tray of that tower. The sidestream therefore contains, in addition to furfural reflux, the condensed constituents of the vapors evolved from the charge. Since, under the conditions which ordinarily prevail in the pressure flash tower, a

substantial proportion of acidic furfural derivatives is evolved as vapor from the charge, and since rectification of the evolved vapors results in condensation of substantially all of the acidic furfural derivatives therefrom, the sidestream from the pressure flash tower contains a substantial proportion of acidic furfural derivatives. Although the method shown in the drawing for removal of the sidestream is preferred, other methods are within the scope of the invention.

In the drawing, the sidestream from the pressure flash tower is shown introduced onto the third tray from the top of the rectifying zone of the extract stripper. It is to be understood that it is within the scope of the invention to introduce the sidestream into the extract stripper at any point; however, it is preferred that the sidestream be introduced intermediate of the ends of that rectifying zone at the level in that zone where the liquid composition is closest to the composition of the sidestream. Such operation provides maximum efficiency in the rectification. It has been found that, although the preferred level for introduction of the sidestream is relatively high in the extract stripper, no substantial amounts of acidic furfural derivatives are carried overhead when the sidestream is introduced at that preferred level.

The following example illustrates the invention:

2500 bbl./day of a fraction from West Texas crude, which fraction has a boiling range of 700° F. to 820° F., are charged to the treating tower of a process system like that illustrated in the drawing. 5200 bbl./day of furfural are introduced into the treating tower to contact that charge oil. 5300 bbl./day of extract containing 90 weight percent furfural and 10 weight percent hydrocarbon extract are removed from the bottom of the treating tower, heated to a temperature of 330° F., and introduced into the atmospheric flash tower.

From the atmospheric flash tower, 2800 bbl./day of residue containing about 81 weight percent furfural are withdrawn, heated to 430° F., and introduced into the pressure flash tower. The pressure flash tower operates at about 40 pounds per square inch absolute pressure. From the pressure flash tower, 660 bbl./day of residue containing about 20 weight percent furfural are withdrawn and introduced between the stripping and rectifying zones of the extract stripper, which operates at a reduced pressure averaging about 4 pounds per square inch absolute. From the retaining tray in the pressure flash tower, 50 bbl./day are removed of a sidestream containing about 10 weight percent hydrocarbon extract and about 0.1 weight percent acidic furfural derivatives, measured as acetic acid equivalent, the rest of the sidestream comprising essentially furfural. This sidestream is introduced onto the third tray from the top of the rectifying zone of the extract stripper.

From the extract stripper, 530 bbl./day of hydrocarbon extract residue are withdrawn. This residue contains no substantial amount of furfural. The overhead vapors from the extract stripper comprise essentially furfural and water and contain no substantial amount of acidic furfural derivatives. They are condensed and introduced into the settling tank (CBM receiver).

In stabilized operation as described above, a clean break between phases is obtained in the settling tank, no emulsion trouble being encountered. This results in the advantage that

the waste water stream derived from the aqueous layer in the settling tank contains no substantial amount of furfural.

The furfural charge to the treating tower is not completely acid-free, but its acidity (0.02) is within the limits of toleration and is substantially reduced below that ordinarily obtained in operation according to the prior art.

The invention has been described in detail as it relates to a process in which two distillations precede the steam stripping operation, the first of those distillations being conducted at atmospheric pressure and the second at elevated pressure with removal from the latter of a sidestream according to the invention. In cases where only one distillation is performed, a sidestream according to the invention is withdrawn from that distillation. In cases where a plurality of distillations are performed, regardless of the manner in which atmospheric or pressure distillations follow one another, the invention contemplates the removal of a sidestream from the last of the series of distillations or from the last of the series and any of the preceding distillations wherein the vaporization conditions are severe enough that acidic furfural derivatives will ordinarily go with the furfural overhead unless a sidestream is removed.

In some cases, it may be desired to remove acidic sidestreams from all of a plurality of distillations. Such operation is particularly likely to be advantageous in systems where a pressure distillation is performed first, because in such systems the extract layer is generally heated more before introduction into the first distillation than in a system where an atmospheric distillation is performed first. This higher initial heating results in a higher concentration of acidic materials in the first distillation and therefore greater likelihood of such materials going overhead from the first distillation.

Operation according to the invention has several important advantages over prior art methods of operation. For example, the invention provides a method for reducing the acidity of the circulating furfural, thereby limiting corrosion. Also, the problems of emulsion formation in the settling tank and of furfural loss to the waste water stream, which problems frequently arose in the prior practice of introducing an acidic sidestream from a flash distillation into the settling tank, are overcome by the invention.

A further advantage of operation according to the present invention over the prior art operation of passing the sidestream from the pressure flash tower to the settling tank, resides in the fact that it is possible according to the invention to widely vary the amount of hydrocarbon extract withdrawn in the sidestream. In the prior art operation, the amount of hydrocarbon extract in the sidestream is limited to the very small amount which can be tolerated in the settling tank.

Therefore, if desired, in operation according to the invention, the furfural content of the charge to the extract stripper can be maintained at a lower level, because more furfural can be taken overhead from the flash distillation, the additional hydrocarbon extract, which is vaporized with the additional furfural, being removed with the sidestream.

Since, as previously mentioned, the temperature at which the pressure flash distillation is conducted can be reduced when the proportion of furfural in the stripper charge is lower, the

above permissible reduction in furfural content provides a means for further reducing the rate of formation of acidic furfural derivatives, the latter being formed less readily at lower temperatures.

Operation according to the invention results in slightly higher acidity of the hydrocarbon extract residue from the extract stripper than is obtained with the prior art operation wherein the sidestream goes to the settling tank. This increased acidity is, however, usually not a detriment to that extract in the uses to which it is put. In cases where it is a detriment, the increased acidity can be avoided by steam stripping the side stream in apparatus separate from the extract steam stripper.

From the above discussion, it will be seen that the present invention provides a method for maintaining the acidity of the circulating furfural within tolerable limits while reducing operating temperatures in the extract solvent-recovery operations and overcoming other disadvantages of prior practice in disposing of the side stream from the pressure flash tower, without impairing the efficiency of the solvent recovery nor the amount or utility of the hydrocarbon extract.

I claim:

1. The method of recovering furfural from a mixture comprising a major proportion of furfural and a minor proportion of hydrocarbon material less volatile than furfural which comprises: supplying heat to said mixture, thereby forming acidic furfural derivatives; distilling said mixture in a distillation zone; removing from said distillation zone an overhead fraction comprising essentially furfural and containing no substantial amount of acidic furfural derivatives, a sidestream comprising furfural and acidic furfural derivatives, and a residue comprising a major proportion of hydrocarbon material and a minor proportion of furfural; introducing said residue between the stripping and rectifying zones of a steam stripping zone containing a stripping zone and a rectifying zone; introducing said sidestream into said rectifying zone of said steam stripping zone at a level intermediate of the ends of said rectifying zone; stripping said sidestream and said residue with steam in said steam stripping zone; and removing as vapor from said steam stripping zone a mixture comprising essentially furfural and water and containing no substantial amount of acidic furfural derivatives.

2. Method according to claim 1 wherein said sidestream comprises a major proportion of furfural, a minor proportion of hydrocarbon material, and a substantial proportion of acidic furfural derivatives.

3. The method for recovering furfural from a mixture comprising a major proportion of furfural, a minor proportion of hydrocarbon material less volatile than furfural and a small proportion of acidic furfural derivatives which comprises: distilling said mixture in a first distillation zone; removing from said first distillation zone an overhead fraction comprising essentially furfural and a residue comprising a major proportion of furfural, a minor proportion of hydrocarbon material, and a small proportion of acidic furfural derivatives; distilling said residue in a second distillation zone; removing from said second distillation zone an overhead fraction comprising essentially furfural and containing no substantial amount of acidic furfural derivatives, a sidestream comprising a major proportion of furfural, a minor proportion of hydrocarbon ma-

terial, and a substantial proportion of acidic furfural derivatives, and a second residue comprising a major proportion of hydrocarbon material and a minor proportion of furfural; introducing said residue between the stripping and rectifying zones of a steam stripping zone containing a stripping zone and a rectifying zone; introducing said sidestream into said rectifying zone of said steam stripping zone at a level intermediate of the ends of said rectifying zone; stripping said sidestream and said second residue with steam in said steam stripping zone; and removing from said steam stripping zone as vapor a mixture comprising essentially furfural and water and containing no substantial amount of acidic furfural derivatives.

4. Method according to claim 3 wherein said first-named distillation zone is maintained at atmospheric pressure, and said second distillation zone is maintained at elevated pressure.

5. The method of recovering furfural from a mixture comprising about 70-90 weight percent furfural, about 10-30 weight percent hydrocarbon material less volatile than furfural, and a small proportion of acidic furfural derivatives less volatile than furfural which comprises: vaporizing said mixture in a vaporizing zone to evolve from said mixture vapors comprising furfural, hydrocarbon material, and acidic furfural derivatives; rectifying said vapors in a first rectifying zone at about 400° F. to 450° F. and about 30-45 pounds per square inch absolute pressure; removing from said first rectifying zone a liquid fraction comprising a major proportion of furfural and containing substantially all the hydrocarbon material and acidic furfural derivatives contained in said vapors, and an overhead fraction comprising essentially furfural and containing no substantial amounts of hydrocarbon material or acidic furfural derivatives; removing from said vaporizing zone a residue comprising about 15-45 weight percent furfural and about 55-85 weight percent hydrocarbon material; introducing said residue between the stripping and rectifying zones of a steam stripping zone containing a stripping and a second rectifying zone; introducing said liquid fraction into said second rectifying zone of said steam stripping zone at a level intermediate of the ends of said second

rectifying zone; stripping said residue and said liquid fraction with steam in said steam stripping zone; removing as overhead from said steam stripping zone vapors comprising essentially furfural and water; and removing as residue from said steam stripping zone a residue comprising essentially hydrocarbon material and acidic furfural derivatives.

6. The method of recovering furfural from a mixture comprising the same and less volatile constituents including hydrocarbon material and acidic furfural derivatives which comprises: distilling said mixture in a flash distillation zone to obtain vapors comprising a major proportion of furfural and minor proportions of hydrocarbon material and of acidic furfural derivatives; rectifying the evolved vapors in a rectifying zone to obtain a sidestream comprising a portion of the furfural in the evolved vapors, substantially all of the hydrocarbon material in the evolved vapors, and at least a portion of the acidic furfural derivatives in the evolved vapors, said sidestream containing a minor proportion, at least about ten percent, of hydrocarbon material; removing from said distillation zone a residue comprising hydrocarbon material and furfural; removing said sidestream from said rectifying zone; steam stripping said residue and said sidestream to obtain distillate material comprising furfural and water and substantially free from hydrocarbon material; condensing said distillate material; introducing the condensed distillate material into a settling zone; and separately removing from said settling zone a furfural-rich layer and a water-rich layer, each substantially free from hydrocarbon material.

7. Method according to claim 6 wherein said sidestream and said residue are steam stripped together in a common steam stripping zone.

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