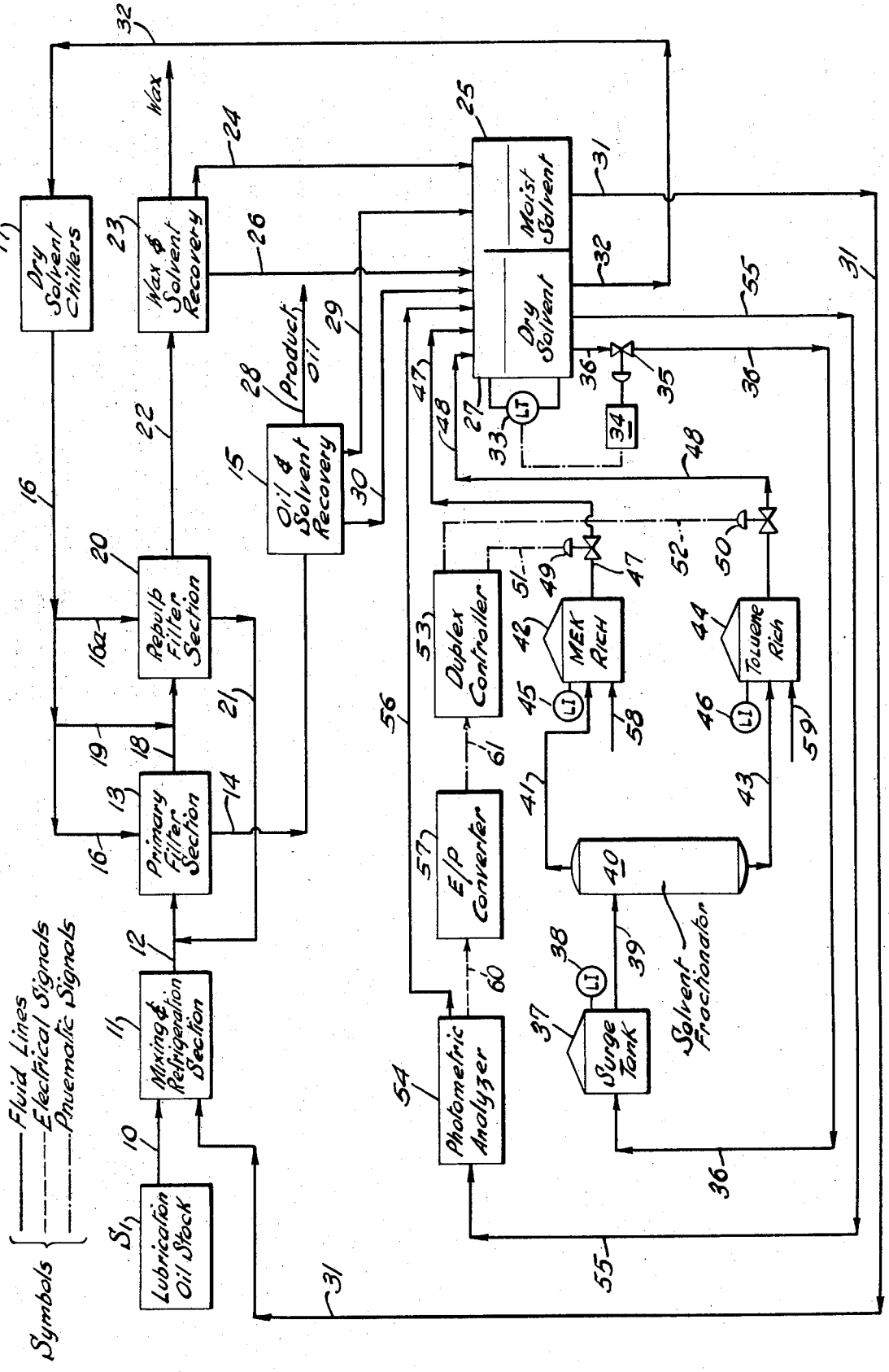
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METHOD AND APPARATUS FOR CONTROLLING
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METHOD AND APPARATUS FOR CONTROLLING THE COMPOSITION OF FLUIDS

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ABSTRACT OF THE DISCLOSURE

Disclosed are methods and apparatus for controlling the composition of a fluid such as the solvent mixture utilized in solvent dewaxing processes. A preferred method for controlling said solvent composition includes the steps of generating a first signal representative of a target value of the concentration of the wax anti-solvent component of the solvent mixture, separating the solvent mixture into two fractions, one of which is richer and the other poorer of the wax anti-solvent component, combining the fractions to re-establish the solvent mixture, sensing the concentration of the anti-solvent component in the re-established solvent mixture and providing a second signal representative thereof, and controlling the aforementioned combining step in response to the first and second signals in a manner tending to reduce the disparity between the concentration second signal and the target value first signal, thereby tending to achieve the target value composition of the re-established solvent mixture. A preferred apparatus for controlling the composition of the aforementioned solvent mixture includes signal generating means for providing a first signal representative of the aforementioned target value, means including a fractionator for separating the solvent mixture into the aforementioned fractions, means including a mixing tank with automatic inlet flow control valves for combining the fractions to re-establish the solvent mixture, means including a photometric analyzer for sensing the concentration of the wax anti-solvent component in the re-established solvent mixture, and means including a duplex controller responsive to the first and second signals for controlling the mixing tank inlet valves in a manner tending to acshieve the target value composition of the re-established solvent mixture.

BACKGROUND OF THE INVENTION

This invention relates to a method and apparatus for the control of the composition of a fluid mixture associated with chemical processes, and more particularly, to a method and apparatus for control of the solvent composition in a solvent refining process of a lubrication oil stock.

In many chemical processes the accurate control of the composition of such fluid mixtures is of great importance. Such processes include solvent refining and the many blending processes known to the petroleum refining industry. In the general class of solvent refining processes the solvent dewaxing process for the removal of wax from a lubrication oil stock, affords a good example of

a process wherein the composition of a fluid mixture, i.e., the solvent mixture, is of crucial importance. In this process the lubrication oil stock is first mixed with a solvent which is generally a mixture of two or more components and the resulting mixture is chilled to crystallize the wax content thereof. The chilled mixture is then passed through one or more rotary drum filters, which collects the crystallized wax in the form of a waxed cake on the filter. The mixture of solvent and dewaxed oil passes through the filter and is taken to subsequent stages in the process, such as a steam stripping stage for separation of the dewaxed oil from the solvent, and for recovery of the solvent mixture. The recovered solvent is recirculated to the beginning point of the process for reuse.

The solvent used must possess low solvent power for wax, to aid in the crystallization, and a high solvent power for oil, to aid in the filtration. Hence, the solvent is usually a mixture of at least two components, namely, a wax anti-solvent component such as acetone or the ketones including methyl ethyl ketone (MEK), methyl isobutyl ketone, methyl-n-propyl ketone, and an oil solvent component such as toluene, benzene, or other aromatics. For each stock it is preferred that an optimum blend be chosen for best process performance. The heavier, or more viscous the stock the greater is the proportion of the oil-solvent component required in order to provide for optimum filtration resulting in high through-puts at good yields. As the solvent composition is varied from the optimum the process efficiency in terms of both through-put and yield is substantially compromised.

Usually, during operation of the solvent dewaxing process variations of the composition of the solvent mixture are unavoidable due to selective losses of one or another of the solvent components and the occurrence of some fractionation of the solvent mixture leading to redistribution of the components thereof in the system. Also, such variations tend to be accumulative which if not corrected have an accumulative detrimental effect on process performance.

It is to be appreciated that the efficiency and throughput capability of the solvent dewaxing process depends upon a number of other variables in addition to the solvent composition. For the purpose of automatic control, such as by a computer, the variables must be properly related mathematically and the capability of swift and accurate control over the variables, responsive to the computer, must be provided. In accordance with the invention as herein disclosed employing unique and novel methods and apparatus, there is provided the capability of accurate continuous control of the composition of fluid mixtures, which can be used to provide the required solvent composition control in solvent dewaxing processes, and may be used in conjunction with computer control of these and other processes.

SUMMARY

Briefly stated, a preferred aspect of the invention resides in a method for controlling the composition of a fluid associated with hydrocarbon refining processes in accordance with a predetermined target value of the concentration in the fluid of a selected component thereof. The method includes the steps of generating a first signal representative of the predetermined concentration target

value, separating the fluid into at least two fractions, a first fraction of which is richer and a second fraction of which is poorer of the selected component. The method further includes combining the separated fractions to re-establish the fluid, sensing the concentration of the selected component in the re-established fluid and providing a concentration second signal representative thereof, and controlling the fraction combining step in response to the first and second signals in a manner tending to reduce the disparity between the concentration second signal and the target value first signal, thereby tending to achieve the target value composition of the re-established fluid.

In one version the method is adapted to control the composition of the solvent mixture used in a solvent dewaxing process for removing wax from a lubrication oil stock wherein the solvent mixture includes an oil solvent component and a wax anti-solvent component. The method is employed to control the relative proportions of these components in the solvent mixture by controlling the concentration therein of the wax anti-solvent component in accordance with a predetermined target value. The method includes the steps of generating a first signal representative of the predetermined target value of the wax anti-solvent component concentration in the solvent mixture, separating the solvent mixture into at least two fractions one of which is richer, another of which is poorer of the wax anti-solvent component, combining the fractions to re-establish the solvent mixture, sensing the concentration of the wax anti-solvent component in the re-established solvent mixture and providing a second signal representative thereof, and in response to the aforementioned first and second signals controlling the combining step in a manner tending to reduce the disparity between the concentration second signal and the target value first signal thereby tending to achieve the target value of the composition of the re-established solvent mixture.

In accordance with another aspect of the invention there is provided apparatus for controlling the composition of a fluid mixture, such as a hydrocarbon mixture, in accordance with a predetermined target value of the concentration in the mixture of a selected fluid component thereof. The apparatus includes means for generating a first signal representative of the predetermined concentration target value. Means, such as a fractionator, are provided for separating the fluid mixture into at least two fractions, one of which is richer, another of which is poorer, of the selected fluid component. Mixing means are provided such as a mixing tank with automatic inlet flow control valves coupled with the separating means, for combining the separated fractions to re-establish the fluid mixture. The apparatus includes sensing means, such as a photometric analyzer, for sensing the concentration in the re-established fluid mixture of the selected component and for providing a second signal representative thereof; and, control means, such as a duplex controller, responsive to the aforementioned first and second signals for controlling the mixing means, such as by issuing control signals to the automatic flow control valves in a manner tending to reduce the disparity between the concentration second signal and the target value first signal, thereby tending to achieve the target value composition of the reestablished fluid mixture.

In view of the foregoing, it is an object of the invention to provide methods for controlling the composition of a fluid mixture.

Another object of the invention is to provide a method for controlling the concentration in a fluid mixture of a selected fluid component thereof.

Another object of the invention is to provide a method for controlling the composition of the solvent mixture utilized in solvent dewaxing processes.

Another object of the invention is to provide a method for controlling the composition of the solvent mixture utilized in solvent dewaxing process by controlling the relative proportions of an oil solvent component, and a wax anti-solvent component, in the solvent mixture, in accordance with a predetermined target value of the concentration in the mixture of the wax anti-solvent component.

These and other objects, advantages and features of the invention, will be more fully understood by referring to the following descriptions and claims taken in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

The single figure of the drawing is a schematic block diagram of a solvent dewaxing system illustrating features of the invention employed to control the composition of the solvent mixture utilized therein.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In order to aid in understanding the invention it shall be described in reference to a particular use thereof, that is, in reference to control of the solvent composition in a solvent dewaxing process. Referring now to the single figure of the drawing, there is shown a solvent dewaxing system, wherein a lubrication oil stock for dewaxing is introduced into the system from a source S1 through a conduit **10** and passes to a mixing and refrigeration section **11** where the oil stock is mixed with a methyl ethyl ketone-toluene solvent mixture. In accordance with the present art the mixing and refrigeration section **11** includes a heater for heating the oil stock and solvent to a temperature which provides complete solution of the mixture, and further includes a refrigeration section for chilling the mixture, to a few degrees below the desired pour point of the lubrication oil for crystallizing the waxy content thereof. This results in a mixture of oil and solvent containing crystallized wax. This mixture passes from the mixing and refrigeration section **11** through a conduit **12** and thence to primary filters **13** which include a group of rotary drum filters arranged in parallel. In the filters the wax content of the inlet mixture is deposited in the form of a wax cake on the drum filters resulting in a mixture of dewaxed oil and solvent which is drawn through the filters. This mixture is removed from the primary filter section **13** and passes through a conduit **14** to an oil and solvent recovery facility **15**. The wax collected on the drums of the primary filters is washed prior to removal therefrom with chilled dry solvent to remove oil entrained in the wax. The chilled dry solvent is introduced into the primary filter section **13** through a conduit **16** which is in turn connected with dry solvent chillers **17**. The dry solvent washed wax is withdrawn from the primary filter section **13** through a conduit **18** where it is re-mixed with dry solvent to form a slurry mixture. The dry solvent is introduced into the conduit **18** through a conduit **19** which is in turn connected with the conduit **16** carrying the chilled dry solvent. The wax slurry mixture in the conduit **18** passes to a group of repulp filters **20** for a second filtration step having the effect of removing any further oil entrained in the wax. The repulp filters **20** are similar in construction and operation to the primary filters **13**. The filtrate passing through the repulp filters **20** is a mixture containing oil and solvent, and is withdrawn therefrom through a conduit **21** which, in turn, is connected with the conduit **12** where the repulp filtrate is mixed with the lubrication oil stock and solvent mixture to be carried to the primary filters. The wax cake deposited on the drums of the repulp filters **20** is washed with solvent withdrawn from the conduit **16** through a conduit **16***a*. The wash solvent passes through the repulp filters along with the filtrate. The wax thus washed is almost completely free of entrained oil, but does contain entrained solvent. This wax and solvent is removed from the repulp filters **20** through a conduit **22** which

carries the mixture to a wax and solvent recovery facility **23** which includes conventional fractionators and steam strippers for separating the solvent from the wax. Two streams of solvent are removed from the wax and solvent recovery facility **23**, a first, which due to the steam stripping operation has small amounts of water in solution therewith, is withdrawn through a conduit **24** and carried to a moist solvent tank **25** for temporary storage. A second stream of solvent which is free of water is withdrawn from the wax and solvent recovery facility **23** through a conduit **26** and carried to a dry solvent tank **27** for temporary storage.

The oil and solvent recovery facility **15** includes equipment similar to that of the wax and solvent recovery facility **23** and recovers the wax free oil from the filtrate of the primary filter section **13**. Product dewaxed oil is removed from the process through a conduit **28** connected with the oil and solvent recovery facility **15**. Streams of moist and dry solvent are withdrawn from the oil and solvent recovery facility **15** and are respectively carried by conduits **29** and **30** to the solvent tanks **25** and **27** for temporary storage. For reuse in the process, moist and dry solvent is withdrawn from the tanks **25** and **27** through conduits **31** and **32**, respectively. The conduit **31** is in turn connected with the mixing and refrigeration section **11** where the moist solvent is mixed with the inlet lubrication oil stock. The conduit **32** is connected with the dry solvent chillers **17** where the dry solvent is chilled prior to introduction thereof into the conduit **16** from where it is taken for the solvent washing of the filters and for the repulp dilution.

The composition of the dry solvent in the tank **27** is continuously controlled by adjusting the relative proportions of the methyl ethyl ketone and the toluene components in the solvent mixture in accordance with an optimum blend for the particular lubrication oil stock being processed. In order to aid in understanding the manner of controlling the solvent composition an example of the charge stock and solvent flow rates is provided as follows. In a typical installation, as shown herein, the lubrication oil stock contains approximately 18% by weight of removable wax and is charged into the process at a rate of about 64.9 thousand lbs. per hour. The total moist solvent circulation rate is about 18.1 thousand lbs. per hour which is withdrawn from the moist solvent tank **25** for mixing with the lubrication oil stock. An almost equal amount of moist solvent is recovered by the combined recovery facilities **15** and **23**, and is returned to the moist solvent tank **25**. The total dry solvent circulation rate is about 188.5 thousand lbs. per hour withdrawn from the dry solvent tank **27** for washing of the filters and for repulp dilution. This quantity is almost entirely recovered by the combined recovery facilities **15** and **23** and, in turn, is returned to the dry solvent tank **27**. In this example the capacity of the latter tank is about 100,000 lbs of the solvent mixture.

Controlling the quantity of solvent in the tank **27** is a conventional liquid level transmitter **33** coupled with a level controller **34** which, in turn, is coupled to a pneumatically operated level control valve **35**. The valve **35** is connected to the dry solvent tank **27** by a conduit **36** through which is drawn excess dry solvent by a pump not shown. A pre-selected liquid level is to be maintained in the tank **27**, which in this example is approximately 85% of its capacity, is manually entered into the level controller **34**. When the level in the tank **27** rises above the pre-selected level the controller **34** opens the valve **35** permitting dry solvent to be removed from the tank **27** through the conduit **36** until the level in the tank is adjusted and then the valve **35** is returned to its closed position.

To control the composition of the solvent in the dry solvent tank **27** the excess solvent drawn therefrom into the conduit **36** is carried to a surge tank **37** which incorporates a conventional level indicator **38**. In this example the capacity of the surge tank **37** is approximately 100,000 lbs. of solvent. A conduit **39** carries the solvent mixture from the surge tank **37** to a solvent fractionation facility **40** for separation of the dry solvent mixture into two components; a first component thereof being rich in methyl ethyl ketone containing, for example, upwards of methyl ethyl ketone, and a second component being rich in toluene to about an equal extent. The solvent fractionation facility **40** has a capacity of about 100,000 lbs. of solvent per hour and includes conventional fractionation equipment for separating methyl ethyl ketone from toluene such as, a bubble-cap tray type fractionator, a reboiler, and a condenser. The methyl ethyl ketone rich fraction is withdrawn from the solvent fractionator overhead through a conduit **41** connected with a temporary storage tank **42** where this fraction is temporarily stored. The toluene rich fraction is withdrawn from the bottom of the solvent fractionator through a conduit **43** connected with a storage tank **44** for temporary storage of the toluene rich fraction. The storage tanks **42** and **44** have a capacity of about half of the dewaxing systems' dry solvent capacity. Therefore, in this example each of these tanks has a capacity of about 100,000 lbs. Also, the tanks **42** and **44** each include a conventional level indicator **45** and **46**, respectively. The methyl ethyl ketone rich and toluene rich solvent components are withdrawn from the tanks **42** and **44** through conduits **47** and **48**, respectively, which carry the solvent components to the dry solvent tank **27**. To control the flow of the solvent components there is, series connected, in each of the conduits **47** and **48** an automatic valve **49** and **50**, respectively. The valves **49** and **50** are pneumatically operated continuously variable flow control valves which receive pneumatic control signals through conduits **51** and **52** which are connected with a duplex controller **53**.

A representative sample of the dry solvent mixture in the tank **27** is continuously monitored by a photometric analyzer **54** which receives a small side stream of the solvent mixture through a withdrawal conduit **55** which, after passing through the analyzer, is returned to the dry solvent tank **27** through a return conduit **56**. The photometric analyzer **54** measures the relative absorption of a selected wave length of light in a beam which is passed through the solvent sample stream, the absorption being indicative of the methyl ethyl ketone content of the solvent sample. Also, the photometric analyzer **54** is calibrated to provide an electrical signal proportional to the methyl ethyl ketone concentration in the solvent sample stream. A suitable photometric analyzer which can be used is the Du Pont Model 400, manufactured by E. I. Du Pont de Nemours and Company, which provides an electrical voltage signal proportional to the methyl ethyl ketone concentration in the solvent sample stream. The electrical signal from the analyzer is transmitted by electrical circuit means shown diagrammatically as a cable **60** to a conventional transducer, shown as a voltage to air pressure converter **57**, which provides a pneumatic output signal proportional to its input electrical signal. This pneumatic signal is, in turn, transmitted by a suitable pneumatic signal line **61** to the duplex controller **53**. The latter is a conventional duplex pneumatic controller of the type which includes an input and comparator section and a valve controller output section which provides two separate valve control signals. The input section includes provisions for manually entering therein a target value representative of the desired relative proportions in the solvent mixture of the wax anti-solvent component and the oil solvent component. This value is entered in the form of a manual setting corresponding to the desired methyl ethyl ketone concentration in the solvent mixture. A suitable duplex controller which can be used is the model M–40 controller manufactured by the Foxboro Company of Foxboro, Mass. The controller compares the measured or sensed value of the

methyl ethyl ketone concentration in the dry solvent with the target value and in response controls the position of the valves **49** and **50** by pneumatic signals transmitted through the conduits **51** and **52**. The preferred controller action can be summarized as follows:

M_T=the target methyl ethyl ketone concentration,
M=the sensed methyl ethyl ketone concentration,

when $(M-M_T)$ is negative the controller closes the valve **50** and opens the valve **49** to a position which is proportional to the value $(M-M_T)$. When the value $(M-M_T)$ is positive the controller closes the valve **49** and opens the valve **50** to a position which is proportional to the value $(M-M_T)$. When the quantity $(M-M_T)$ is zero the controller closes both the valves **49** and **50**. By this control action the composition of the dry solvent mixture in the tank **27** is continuously adjusted, tending to be maintained at an equilibrium condition corresponding to the predetermined target composition.

At any time when adjustments of the composition of the solvent mixture are thus made the level in the dry solvent tank tends to increase above its predetermined control level set into the level controller **34**. Hence, as amounts are added to the tank **27** for adjusting the solvent composition equal amounts tend to be withdrawn therefrom through the conduit **36** by the action of the level controller **34**. The solvent mixture thus withdrawn is, in turn, carried to the surge tank **37** where it replenishes the amount withdrawn therefrom for fractionation. There is incorporated in the surge tank level indicator **38** a high level alarm set to approximately 66% of the tanks' capacity. This signals the required point in time at which the solvent fractionation facility **40** is to be started up. Following fractionation the methyl ethyl ketone and toluene solvent components are replenished in the tanks **42** and **44**. The level indicators **45** and **46**, on these respective tanks, also incorporate high level alarms which are set to about 85% of their capacity which signal the point in time at which the solvent fractionation facility is to be shut-down. This shut-down occurs with the occurrence of a high level alarm from either the methyl ethyl ketone rich or the toluene rich tanks. In addition to the normal replenishment of the solvent components in the tanks **42** and **44** from fractionation, any make-up of these components which is required to off-set losses thereof in the dewaxing system is added to these respective tanks, from sources not shown, through the conduits **58** and **59**.

The start-up and shut-down procedures of the solvent fractionation facility **40** can be implemented to occur automatically in response to the aforementioned alarm signals or these procedures can be performed manually in response to the signals. In the example given above manual operation is deemed satisfactory since rapid cycling of the solvent fractionation facility **40** is impractical, and unnecessary due to the relatively large capacity of the tanks **42**, **44** and **37**.

In the above description the mode of control of the valves **49** and **50** has been described as a proportional mode of control. It can be appreciated by one skilled in the art that on-off, or step function control, results in a suitably operative version of the invention. In one version of the latter control technique the appropriate valve controlling the flow of the solvent component the concentration of which is to be increased, can be fully opened until the concentration is corrected, while concurrently, the other valve is maintained in the off or closed condition.

It can be seen from the foregoing description that the solvent components are withdrawn from the tanks **42** and **44** for composition adjustments only when there is a sensed error, e.g., a deviation from the predetermined target value of the solvent composition. Likewise, the solvent mixture is fractionated only when there is a a sensed error of the composition resulting in a high level in the surge tank **37**. It can also be seen that control of the composition of the dry solvent in the tank **27** also operates to control the composition of the moist solvent in the tank **25** since there is an intermixing of the solvents in the process upstream of the wax and oil recovery facilities.

In the foregoing description the solvent composition is controlled by controlling the mixing of both the methyl ethyl ketone and toluene rich fractions. It will be appreciated by those skilled in the art that an operative control system results in a modified version, wherein, during the corrections of the solvent composition the flow of either fraction could be maintained constant, at a relatively low rate, while the flow of the other fraction is varied by the controller to off-set the composition error. Therefore, control over the flow of one fraction, of the other, or of both fractions, comprise operative embodiments. Also to be appreciated by those skilled in the art is that the fractionation step can include fractionation into more than two components. Thus, if the mixture includes more than two key components, the fractionation can be performed to separate the solvent mixture into two or more components which can then be mixed in a manner in accordance with the above.

While the invention has been disclosed in reference to control of the solvent composition in solvent dewaxing processes it will be readily appreciated by those skilled in the art that the invention can be applied to control the composition of other fluids. Also, it can be seen by the examples hereinabove set forth that many modifications and variations of the invention may be made without departing from the spirit and scope thereof.

We claim:

1. A method for controlling the concentration of a first component in a fluid in accordance with a predetermined target value thereof, comprising the steps of:

(a) generating a first signal representative of said target value of the concentration of said first component in said fluid;

(b) separating said fluid into at least two fractions one of said fractions being richer of said first component than said fluid, a second of said fractions being thereby poorer of said first component than said fluid;

(c) sensing a physical property of said fluid related to the concentration therein of said first component and providing a second signal representative thereof; and

(d) combining said fractions of said fluid in response to said first and second signals to re-establish said fluid having a concentration therein of said first component tending to achieve said target value thereof.

2. A method for controlling the concentration of a first fluid component in a stream of a fluid mixture in accordance with a predetermined target value thereof comprising the steps of:

(a) generating a first signal representative of said target value of the concentration of said first fluid component in said fluid mixture;

(b) separating said stream of said fluid mixture into at least two fractions, a first of said fractions being richer of said first fluid component than said fluid mixture, a second of said fractions being thereby poorer of said first fluid component than said fluid mixture;

(c) sensing the concentration of said first fluid component in said fluid mixture by sensing a physical property of said fluid mixture related to the concentration therein of said first fluid component and providing a concentration second signal representative thereof;

(d) combining said fractions to re-establish said fluid mixture by joining a stream of said first fraction with at least one stream of the balance of said fractions; and

(e) controlling the flow of at least one of said fractions of said combining step (d) in response to said target value first signal and said concentration second signal in a manner tending to reduce the disparity be-

tween said concentration second signal and said target value first signal thereby tending to achieve said target value of the concentration of said first fluid component in said re-established fluid mixture.

3. The method of claim 2 wherein said controlling step (e) comprises the steps of:

(ea) comparing said concentration second signal with said target value first signal and providing an error third signal representative of the error of the concentration of said first fluid component in said re-established fluid mixture; and

(eb) controlling the flow rate of at least one of said streams of said fractions of said combining step (d) in response to said error third signal in a manner tending to reduce said error third signal thereby tending to achieve said target value of the concentration of said first fluid component in said re-established fluid mixture; and

4. In a solvent dewaxing process for the removal of wax from a lubrication oil stock wherein is employed a solvent mixture comprising a first fluid component characterized as a wax anti-solvent and a second fluid component characterized as an oil solvent, the method of controlling the concentration of said wax anti-solvent first fluid component in a stream of said solvent mixture in accordance with a predetermined target value thereof comprising the steps of:

(a) generating a first signal representative of said target value of the concentration of said anti-solvent first fluid component in said solvent mixture;

(b) separating said stream of said solvent mixture into at least two fractions, a first of said fractions being richer of said anti-solvent first fluid component than said solvent mixture, a second of said fractions being thereby poorer of said anti-solvent first fluid component than said solvent mixture;

(c) sensing the concentration of said anti-solvent first fluid component in said solvent mixture by sensing a physical property of said solvent mixture related to the concentration therein of said anti-solvent first fluid component and providing a concentration second signal representative thereof;

(d) combining said fractions to re-establish said solvent mixture by joining a stream of said first fraction with at least one stream of the balance of said fractions; and

(e) controlling the flow of at least one of said streams of said fractions of said combining step (d) in response to said target value first signal and said concentration second signal in a manner tending to reduce the disparity between said concentration second signal and said target value first signal thereby tending to achieve said target value of the concentration of said anti-solvent first fluid component in said re-established solvent mixture.

5. In a solvent dewaxing process for removing wax from a lubrication oil stock including the steps of mixing said oil stock with a solvent mixture including a first fluid component characterized as a wax anti-solvent and a second fluid component characterized as an oil solvent said mixing being performed under conditions effecting crystallization of said wax, from the resulting mixture removing crystallized wax, and from the resulting dewaxed mixture stripping said solvent resulting in solvent stripped dewaxed product oil, by-product wax, and reuseable solvent mixture, a stream of which is recirculated to the beginning point of said process for reuse thereof by mixing with said lubrication oil stock, said process being of a nature such that the composition of said reusable solvent mixture as stripped from said dewaxed mixture differs from the composition of said solvent mixture prior to mixing with said lubrication oil stock due, at least in part, to loss of said solvent mixture in said process selectively affecting one of said fluid components of said solvent mixture to a greater extent than such loss affects the other of said fluid components thereof, a method for controlling the composition of said reusable solvent mixture in accordance with a predetermined target value of the concentration of said anti-solvent first fluid component in said solvent mixture comprising the steps of:

(a) generating a first signal representative of said target value of the concentration of said anti-solvent first fluid component in said solvent mixture;

(b) separating a stream of said reusable solvent mixture into two fractions, the first of said fractions being richer of said anti-solvent first fluid component than said solvent mixture, the second of said fractions being thereby poorer of said anti-solvent first fluid component than said solvent mixture;

(c) sensing the concentration of said anti-solvent first fluid component in said solvent mixture by sensing a physical property of said solvent mixture related to the concentration therein of said anti-solvent first fluid component and providing a concentration second signal representative thereof;

(d) combining said fractions to re-establish said reusable solvent mixture by joining a stream of said first fraction with at least one stream of the balance of said fractions, and

(e) controlling the flow of said anti-solvent rich first fraction, of said combining step (d), in response to said target value first signal and said concentration second signal in a manner tending to reduce the disparity between said concentration second signal and said target value first signal thereby tending to achieve said target value of the concentration of said anti-solvent first fluid component in said re-established solvent mixture for reuse.

6. The method of claim 5 wherein said solvent mixture consists essentially of said wax anti-solvent first fluid component and said oil solvent second fluid component, and wherein said controlling step (e) comprises:

(e) controlling the flow rate of said oil solvent rich second fraction of said combining step (d) in response to said target value first signal and said concentration second signal in a manner tending to reduce the disparity between said concentration second signal and said target value first signal by increasing said second fraction flow rate when said concentration second signal exceeds said target value thereof, and by decreasing said second fraction flow rate when said concentration second signal is smaller than said target value thereof, thereby tending to achieve said target value of the concentration of said anti-solvent first fluid component in said re-established solvent mixture.

7. The method of claim 5 wherein said wax anti-solvent first fluid component of said solvent mixture is selected from the group consisting of methyl ethyl ketone, methyl isobutyl ketone, methyl n-propyl ketone, and acetone, wherein said oil solvent second fluid component of said solvent mixture is selected from the group consisting of toluene and benzene, wherein said first signal is an electrical signal and wherein said sensing step comprises:

(c) sensing the concentration of said anti-solvent first fluid component in said solvent mixture by spectrophotometric analysis by passing a sample of said re-established solvent mixture through a spectrophotometer calibrated for analysis of said wax anti-solvent component of said solvent mixture, said spectrophotometer providing an electrical signal proportional to said concentration.

8. Apparatus for controlling the concentration of a first fluid component in a fluid mixture from a source thereof in accordance with a predetermined target value of said concentration comprising:

(a) signal generating means for generating a first signal representative of said target value of the concentration of said first fluid component in said fluid mixture;

(b) separating means, coupled with said source of said

fluid mixture, for separating said fluid mixture into at least two fractions one of said fractions being richer of said first fluid component than said fluid mixture, a second of said fractions being thereby poorer of said first fluid component than said fluid mixture;

(c) sensing means for sensing the concentration of said first fluid component in said fluid mixture and for providing a second signal representative thereof; and

(d) combining means, coupled with said signal generating means (a), coupled with said separating means (b), and with said sensing means (c), for combining said fractions of said fluid mixture in response to said first and second signals to re-establish said fluid mixture having a concentration therein of said first fluid component tending to achieve said target value thereof.

9. Apparatus for controlling the concentration of a first fluid component in a fluid mixture from a source carrying a stream of said fluid mixture, said controlling being in accordance with a predetermined target value of said concentration, comprising:

(a) signal generating means for generating a first signal representative of said target value of the concentration of said first fluid component in said fluid mixture;

(b) separating means, coupled with said source of said fluid mixture, for separating said stream thereof into at least two fractions one of said fractions being richer of said first fluid component than said fluid mixture, a second of said fractions being thereby poorer of said first fluid component than said fluid mixture;

(c) sensing means for sensing the concentration of said first fluid component in said fluid mixture and for providing a second signal representative thereof;

(d) mixing means, coupled with said separating means (b), for combining said fractions to re-establish said fluid mixture by joining a stream of said first fraction with at least one stream of the balance of said fractions; and

(e) flow control means, coupled with said mixing means (d), coupled with said signal generating means (a), and with said sensing means (c), for controlling the flow rate of at least one of said fraction streams, combined by said mixing means (d), in response to said target value first signal and said concentration second signal in a manner tending to reduce the disparity between said concentration second signal and said target value first signal thereby tending to achieve said target value of the concentration of said first fluid component in said re-established fluid mixtures.

10. In a solvent dewaxing system for removing wax from a lubrication oil stock including mixing means for mixing said oil stock with a solvent mixture comprised of a first fluid component characterized as a wax anti-solvent and a second fluid component characterized as an oil solvent, said mixing being performed under conditions effecting crystallization of said wax, separating means for removing crystallized wax from the resulting mixture, stripping means for stripping said solvent from the resulting dewaxed mixture resulting in dewaxed product oil, by-product wax and reusable solvent mixture, and recirculation means for recirculating said reusable solvent mixture to said mixing means for reuse thereof by mixing with said lubrication oil stock, said dewaxing system being of a nature such that the composition of said reusable solvent mixture as stripped from said dewaxed mixture differs from the composition of said solvent mixture prior to mixing with said lubrication oil stock due, at least in part, to loss of said solvent mixture in said process selectively affecting one of said fluid components of said solvent mixture to a greater extent than such loss affects the other of said fluid components thereof, apparatus for controlling the composition of said reusable solvent mixture in accordance with a predetermined target value of the concentration of said anti-solvent first fluid component in said solvent mixture, comprising:

(a) signal generating means for generating a target value first signal representative of said target value of the concentration of said anti-solvent first fluid component in said solvent mixture;

(b) separating means, coupled with said stripping means for separating said reusable solvent mixture into two fractions, the first of said fractions being richer of said anti-solvent first fluid component than said solvent mixture, the second of said fractions being thereby poorer of said anti-solvent first fluid component than said solvent mixture;

(c) sensing means for sensing the concentration of said anti-solvent first fluid component in said solvent mixture and for providing a second signal representative thereof;

(d) mixing means, coupled with said separating means (b), for combining said fractions to re-establish said reusable solvent mixture by joining a stream of said first fraction with at least one stream of the balance of said fractions; and

(e) flow control means, coupled with said mixing means (d), coupled with said signal generating means (a), and with said sensing means (c), for controlling the flow rate of at least one of said fraction streams combined by said mixing means (d) in response to said target value first signal and said concentration second signal in a manner tending to reduce the disparity between said concentration second signal and said target value first signal thereby tending to achieve said target value of the concentration of said anti-solvent first fluid component in said re-established solvent mixture for reuse.

11. The apparatus of claim **10** wherein said separating means (b) comprises:

(b) means including a fractionation column for separating said reusable solvent mixture into two fractions, the first of said fractions being richer of said anti-solvent first fluid component than said solvent mixture, the second of said fractions being thereby poorer of said anti-solvent first fluid component than said solvent mixture; and wherein said sensing means (c) comprises:

(c) means including a photomeric analyzer, connected with said mixing means (d) in a manner so as to receive a sample stream of said solvent mixture, for sensing the concentration of said anti-solvent first fluid component in said solvent mixture by passing a beam of light through said stream, the concentration of said anti-solvent first fluid component in said solvent mixture being related to the absorption of a selected wave length of said light by said stream, and for providing a concentration second signal corresponding to said concentration.

12. The apparatus of claim **11** wherein said mixing means (d) comprises:

(d) means including a temporary storage tank, coupled with said means including a fractionator in a manner so as to receive a stream of said first fraction and a stream of said second fraction therefrom, for combining said fractions to re-establish said reusable solvent mixture by joining said streams in said temporary storage tanks;

wherein said flow control means (e) comprises:

(ea) means including a pair of continuously variable automatic flow control valves interposed between said means including a fractionator and said temporary storage tank in a manner such that passing through the first of said valves is said stream of said first fraction and passing through the second of said valves is said stream of said second fraction, for controlling the flow of said first and second fractions into said temporary storage tank; and

(eb) means including a valve controller coupled to said valves, coupled to said signal generating means (a) and to said means including a photometric analyzer (c), for comparing said target value first signal with said concentration second signal and in response for controlling said valves for controlling the flow of said streams of said first and second fractions therethrough in a manner tending to reduce the disparity between said concentration second signal of said re-established solvent mixture and said target value first signal thereby tending to achieve said target value of the concentration of said anti-solvent first fluid component in said re-established solvent mixture.

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