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(54) **Low temperature rendering process and a plant for rendering animal or vegetable raw material.**

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Description

This invention relates to a low temperature rendering process for separating animal or vegetable raw material into a fat fraction and at least one protein fraction comprising reducing the particle size of the raw material, then feeding the reduced raw material into a rendering vessel, feeding into the rendering vessel recycled tallow and heating the raw material and tallow within the rendering vessel, and moving a flow of the heated material from the rendering vessel into a separator for phase separation.

This invention further relates to a plant for the low temperature rendering of animal or vegetable raw material into a fat fraction and at least one protein fraction comprising means for comminuting raw material, a non-pressurized rendering vessel into which comminuted raw material can be placed, separating means for separating the feed stream into several phases, means for recycling tallow to the rendering vessel, heating means for heating a mixture of raw material and recycle tallow in the vessel, agitating means within the rendering vessel.

The aforementioned materials generally contain two or all of the following phases: fat, fat-free solids, and water. In the case of animal by-products, for example material from slaughter houses, packing houses and the like such as a mixture of beef and mutton offal, the phases after rendering are a liquid phase which consists essentially of fats and oils and a solid phase which consists essentially of meat and bone meal. The solid phase is usually high in protein and processed into animal feed. The liquid phase is separated into tallow and waste process water.

Rendering of animal tissues by heat is carried out presently by two types of processes: dry rendering high temperature (135°C) and low temperature (70—100°C) wet rendering.

In dry rendering, the raw material is heated, separated into the tallow, fat-free solid and water phases and dried in the same operation. This process suffers from several drawbacks: 10—15% residual fat in meal; raw material must be washed thoroughly to ensure that the tallow products is of premium grade; the nutritive value of the meal is downgraded by the high temperature of the process; the process required high grade steam and has a higher energy consumption compared with low temperature rendering systems.

The low temperature rendering systems include: the traditional 'digester' type direct steam injection process which produces high losses of product in the stick-water; the Pfaudler process (US—A—3,519,662) and the Alfa-Laval "Centritherm' and 'Centribone' process. (NZ Patent Specification 186,249). The latter processes are generally regarded as 'wet rendering' as water is introduced into the raw material and live steam is directly injected into the raw material.

The use of steam requires that the processing plant has a facility to raise process steam. In addition the injection of live steam or extra water into the flow of raw material increases the amount of process water and can lead to a high B.O.D. level in the process water so that further separation must take place before the process water can be released into existing sewers and effluent treatment plants.

US—A—3,345,353 describes an apparatus and a method of continuously recovering protein from fatty animal material wherein the raw material is comminuted to a very fine size of particles and the prepared and preheated raw material is fed to a mixing and balancing container provided with a stirring member. The output of the mixing and balancing container is fed to a centrifuge from which the liquid phase is led to a heating apparatus where the fat can be heated to a suitably high temperature of 70°C to 120°C. This hot fat is then re-fed to the mixing and balancing container where it is intimately mixed with the raw material contained therein. In this way it is intended to heat the raw material instantaneously by mixing it with the hot fat added to the contents in the container wherein the medium temperature of the mixture itself should be in the range of 40°C to 50°C and is intended to be lower than 44°C or even 41°C.

It is essential, however, for the process according to US—A—3,345,353 that the temperature limit of about 44°C is not exceeded, that the heating of the raw material is made directly through the addition of hot and recycled fat, and that an intimate mixing of the hot fat and the raw material is carried out in the container using a stirring means rotating with a relatively high speed.

A process according to the US—A—3,345,353 cannot be used for all purposes because the protein fraction of the products has a rather high fat content in the range of 12% to 19%. Such a high fat content, however, is not acceptable in a commercial process.

FR—B—1,062,003 describes an apparatus and a process wherein the raw material is fed by a pump to a rendering vessel which is heated by means of a heating device having a series of tubes mounted parallel to each other. In this process care has to be taken not to exceed a maximum temperature of 70°C. The materials treated in the rendering vessel are then fed to a pending centrifuge followed by a further oil centrifuge. Therefore, only a one way treatment of the materials takes place without any recycling of tallow to the rendering vessel. The temperature is rather low and the range is not higher than 70°C. Moreover, no fluidization of the medium within the rendering vessel takes place.

The object underlying the invention is to provide a low temperature rendering process and a

plant for the low temperature rendering of animal or vegetable raw material allowing the production of tallows and meals of especially high quality.

The solution according to the invention resides in that the heating is achieved by using heat exchange means and bringing the medium to be treated to a temperature which is in the range of 75°C to 100°C without adding extra water or steam and in that the reduced raw material is subjected to particulate fluidization within the medium of the tallow within the rendering vessel.

Preferably recycle tallow having a water content of approximately 2% to 10% is fed to the rendering vessel. This recycle tallow can be fed directly from the separator to the rendering vessel or the tallow phase from the separator is subjected to a further separation step following which a polished portion thereof is recycled to the rendering vessel.

The residence time of the raw material and tallow in the rendering vessel is in the range of substantially 2 to 10 minutes. In carrying out the process the viscosity of the raw material and tallow in the rendering vessel is monitored and the ratio of raw material entering the vessel and the rate of addition of recycle tallow is controlled to ensure that complete fluidization of the raw material within the medium of the tallow is continuously maintained.

In one embodiment of the invention the ratio of tallow to raw material is in the range of 0.3/1.0 to 3.0/1.0. The raw material is comminuted to a particle size in the range of substantially 12 mm to 18 mm.

In a preferred form of the invention, acid is added to the raw material prior to being comminuted. The raw material is acidified to a pH value of 3.8 to 4.5. The acid can be anyone or a combination of acids selected from hydrochloric, sulphuric, phosphoric, citric, tannic, oxalic, tartaric, acetic, malic, formic, benzoic and lactic acids and their water soluble salts. The resultant stickwater from the separator can be ultrafiltered to recover solids and fat.

The plant according to the invention is characterized by overflow means connecting the rendering vessel to the separating means for feeding rendered material, heat exchanger means for heating the mixture without adding extra water or steam, sensing means and control means to monitor and control the viscosity of raw material and tallow in the vessel, the construction and arrangement being such that the raw material and tallow mixture within the rendering vessel is subjected to particulate fluidization whereby rendered material can flow through the overflow means.

In one embodiment of the invention the heat exchanger means is in the form of a vertical coil or pipes within the vessel which act as baffles and turbine propeller type means are attached to the agitating means.

Preferably the sensing means sense the current drawn by an electrically powered prime mover of the agitating means and the control means control the ratio of raw material entering the vessel and the rate of addition of recycle tallow for reducing the viscosity in the rendering vessel to ensure satisfactory fluidization.

In the plant according to the invention the separating means is a three phase co-current or countercurrent decanter centrifuge or a two phase decanter centrifuge.

To more fully describe the invention reference will be made to the accompanying drawing which is a schematic flow diagram of one form of the apparatus by which the process of the present invention can be carried out. The raw material which when derived from slaughter houses, packing houses and the like may include fat and oil bearing animal material being tissue, muscle, hide, blood, bone, viscera, offal and the like is fed into a storage bin 1 or directly into a grinder.

In the preferred form of the invention, the plant consists of a raw material holding bin 1 which stores pre-broken raw material of approximately 50 mm×50 mm. By means of a spray nozzle or any other suitable device or method, acid is added to the pre-broken raw material in order to preserve the raw material, reduce odour and to contain the free fatty acid content of the tallow produced. The pre-broken material passes from holding bin 1 through a metal detector 2 and into a grinder 3, which grinds the raw material through a grinding plate of approximately 18 mm or 12 mm hole size. If required, further acid addition can be carried out at this grinding stage. The ground acidified material is passed on to a hopper 4 and is pumped by a suitable pump 5 to a rendering vessel 6.

The preferred rendering vessel is a tall non-pressurized cylindrical vessel with a heating apparatus in the form of a vertical coil or vertical pipe and an agitator 7. The vertical heating apparatus acts as baffles. Turbine propeller type impellers (not shown) are attached to the agitator 7.

Recycle tallow 14 is heated in a heat exchanger 13 in the range of 80°C to 150°C and pumped into the rendering vessel 6 at a specific tallow/raw material ratio. The temperature in the rendering vessel is controlled in the preferred range 75°C to 95°C. By means of an overflow pipe 8 the rendered material passes by gravity or is pumped into a three phase co-current decanter centrifuge 9 which separates the feed stream into: A solids phase 10 with approximately 50—70% water and 6—9% fat; a stickwater phase 11 with approximately 2—3% total solids and 0.04—0.20% fat; and a tallow phase 12 with approximately 2—10% water.

The solids phase 10 is sterilized if required and dried in a dryer to produce a meal with a residual fat content of 6—9% and 6—10% moisture. The stickwater phase 11 is either

dumped to waste or the solids and fat in this stream are recovered by ultrafiltration. Part of tallow phase 12 is recycled as recycle tallow 14 and the other part is polished through a disc-type centrifugal separator and stored as polished tallow 16.

The acid used in the process to preserve the raw material can be any acidic substance which includes the following acids:

Hydrochloric, sulphuric, phosphoric, citric, tannic, oxalic, tartaric, acetic, malic, formic, benzoic, lactic and their water soluble salts. The pH of the raw material by acid addition is adjusted to 3.8 to 4.5. The addition of acid for preservation consequently has a beneficial effect on the separation of the fat in the three phase decanter 9; the fat and protein in the stickwater phase is minimized.

Conveying of material to and from individual processing equipment can be by means of either pump, screw conveyors, belt conveyors, pneumatic conveyors or chutes.

The rendering vessel 6 in addition to the vertical heating apparatus, can be fitted with a heating jacket or a horizontal pan-cake type coil to provide extra heat transfer area.

Instead of the three phase co-current decanter centrifuge a three phase counter-current decanter centrifuge or a two phase decanter centrifuge can be used.

The tallow to raw material ratio (T:RM) varies with the type of raw material; for bone/beef trimmings/soft guts mixture with approximately 50—65% water the T:RM is 0.3 to 0.5. With beef trimmings only the T:RM is 0.5 to 1.0 and with bone only the T:RM is 2.0 to 3.0. If required the recycle tallow 14 stream can be derived from the polished tallow 16 stream.

The residence time in the rendering vessel is in the range of approximately 2 minutes to 10 minutes.

Heating in the rendering vessel 6 and heat exchanger 13 can be carried out by steam or any other suitable heat transfer fluid.

Sterilization of the solids phase 10 is carried out in a pressure vessel and drying is carried out in one of the following type driers: direct fired rotary drier, batch or continuous dry rendering cooker, ring drier, fluidized bed or spouted drier, jet drier.

Instead of drying the solids phase 10, the material can by itself or mixed with other ingredients, be canned frozen or dehydrated to produce a foodstuff for humans or pets.

Control of the rendering process is achieved by sensing the current drawn by the agitator which is indicative of the viscosity of the material in the rendering vessel 6. When the viscosity in the vessel becomes too high for satisfactory fluidization, mixing and heat transfer in the rendering vessel, control means shut off or reduce the rate of the raw material being pumped and increase the tallow rate in order to reduce the viscosity in the rendering vessel.

The plant is illustrated further by the following examples giving operational data:

Example 1

5000 kg/h of beef/mutton mixed offal was rendered with 2500 kg/h of recycle tallow phase (ex-three phase decanter). The products from the three phase decanter centrifuge were 2200 kg/h of solids phase with 65% water and 7—5% fat (dry basis); 3300 kg/h of tallow phase with 2% water and 3% fat-free solids and 2000 kg/h of stickwater with 2.8% total solids and 0.06% fat. The free fatty acid content of the tallow produced was 0.6% and the bleachability of the tallow was 0.2 Red. The steam consumption was 0.14 kg of steam per kg of raw material.

Example 2

3000 kg/h of beef trimmings and mutton soft offal were rendered with 1500 kg/h of polished recycled tallow. The products from the three phase decanter centrifuge were 855 kg/h of solids phase with 69% water and 7% fat (dry basis); 2565 kg/h of tallow phase with 1% fat-free solids; 1080 kg/h of stickwater with 2.3% total solids and 0.40% fat. The free fatty acid content of the tallow produced was 0.5% and the bleachability of the tallow was 0.3 Red. The steam consumption was 0.12 kg of steam per kg of raw material.

The invention thus provides a rendering process in which the amount of material lost in process water is reduced. No water or steam is introduced into the rendering process in contrast to known rendering processes. A good level of separation is achieved by use of the three phase decanter after the material has been heated in the rendering vessel.

The process can be carried out in a plant which does not need to have any facility to raise process steam for the purpose of supplying heat to the rendering vessel 6. As disclosed rendering vessel 6 is heated by heat transfer means. The rendering process is carried out at temperatures below 100°C which due to lack of thermal degradation results in the production of high quality tallows and meals.

Claims

1. A low temperature rendering process for separating animal or vegetable raw material into a fat fraction and at least one protein fraction comprising reducing the particle size of the raw material, then feeding the reduced raw material into a rendering vessel, feeding into the rendering vessel recycled tallow and heating the raw material and tallow within the rendering vessel, and moving a flow of the heated material from the rendering vessel into a separator for phase separation, characterized in that the heating is achieved by using heat exchange means and bringing the medium to be treated to a temperature which is in the range

of 75°C to 100°C without adding extra water or steam and in that the reduced raw material is subjected to particulate fluidization within the medium of the tallow within the rendering vessel.

2. The process according to claim 1, characterized in that recycle tallow having a water content of approximately 2% to 10% is fed to the rendering vessel.

3. The process according to claim 1 or 2, characterized in that the recycle tallow is fed directly from the separator to the rendering vessel.

4. The process according to claim 1 or 2, characterized in that the tallow phase from the separator is subjected to a further separation step following which a polished portion thereof is recycled to the rendering vessel.

5. The process according to any of claims 1 to 4, characterized in the residence time of the raw material and tallow in the rendering vessel is in the range of substantially 2 to 10 minutes.

6. The process according to any of claims 1 to 5, characterized in that the viscosity of the raw material and tallow in the rendering vessel is monitored and the ratio of raw material entering the vessel and the rate of addition of recycle tallow is controlled to ensure that complete fluidization of the raw material within the medium of the tallow is continuously maintained.

7. The process according to any of claims 1 to 6, characterized in that the ratio of tallow/raw material is in the range of 0.3/1.0 to 3.0/1.0.

8. The process according to any of claims 1 to 7, characterized in that the raw material is comminuted to a particle size in the range of substantially 12 mm to 18 mm.

9. The process according to any of claims 1 to 8, characterized in that the acid is added to the raw material prior to being comminuted.

10. The process according to any of claims 1 to 9, characterized in that the raw material is acidified to a pH value of 3.8 to 4.5.

11. The process according to claim 10, characterized in that the acid is anyone or a combination of acids selected from hydrochloric, sulphuric, phosphoric, citric, tannic, oxalic, tartaric, acetic, malic, formic, benzoic and lactic acids and their water soluble salts.

12. The process according to any of claims 1 to 11, characterized in that the resultant stickwater is ultrafiltered to recover solids and fat.

13. A plant for the low temperature rendering of animal or vegetable raw material into a fat fraction and at least one protein fraction comprising means (3) for comminuting raw material, a non-pressurized rendering vessel (6) into which comminuted raw material can be placed, separating means (9) for separating the feed stream into several phases, means (12, 13, 14) for recycling tallow to the rendering vessel (6), heating means for heating a mixture of raw material and recycle tallow in the vessel (6), and agitating means (7) within the rendering vessel (6), characterized by overflow means (8) connecting the rendering vessel (6) to the separating means (9) for feeding rendered material, heat exchanger means for heating the mixture without adding extra water or steam, sensing means and control means to monitor and control the viscosity of raw material and tallow in the vessel, the construction and arrangement being such that the raw material and tallow mixture within the rendering vessel (6) is subjected to particulate fluidization whereby rendered material can flow through the overflow means (8).

14. The plant according to claim 13, characterized in that the heat exchanger means is in the form of a vertical coil or pipes within the vessel (6) which act as baffles and in that turbine propeller type means are attached to the agitating means (7).

15. The plant according to claim 13 or 14, characterized in that the sensing means sense the current drawn by an electrically powered prime mover of the agitating means (7) and in that the control means control the ratio of raw material entering the vessel and the rate of addition of recycle tallow for reducing the viscosity in the rendering vessel (6) to ensure satisfactory fluidization.

16. The plant according to any of claims 13 to 15, characterized in that the separating means (9) is a three phase co-current or countercurrent decanter centrifuge or a two phase decanter centrifuge.

Patentansprüche

1. Niedrigtemperaturausschmelzverfahren zum Trennen von tierischem oder pflanzlichem Ausgangsmaterial in eine Fettfraktion und mindestens eine Proteinfraktion, mit einer Reduzierung der Teilchengröße des Ausgangsmaterials, einer anschließenden Zuführung des zerkleinerten Ausgangsmaterials in einen Ausschmelzbehälter, einer Zuführung von zurückgeführtem Talg in den Ausschmelzbehälter und der Aufheizung des Ausgangsmaterials und des Talgs innerhalb des Ausschmelzbehälters, und mit der Zuführung einer Strömung des aufgeheizten Materials aus dem Ausschmelzbehälter in einen Separator zur Phasentrennung, dadurch gekennzeichnet, daß die Aufheizung dadurch vorgenommen wird, daß ein Wärmeaustauscher verwendet und das zu behandelnde Medium auf eine Temperatur im Bereich von 75°C bis 100°C gebracht wird, ohne zusätzliches Wasser oder Dampf hinzuzufügen, und daß das zerkleinerte Ausgangsmaterial in dem Medium des Talgs innerhalb des Ausschmelzbehälters einer Teilchenverflüssigung unterworfen wird.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß aufbereiteter Talg mit einem Wassergehalt von ungefähr 2% bis 10% in den Ausschmelzbehälter eingeleitet wird.

3. Verfahren nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der aufbereitete Talg vom Separator direkt in den Ausschmelzbehälter eingeleitet wird.

4. Verfahren nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Talgphase vom Separator einem weiteren Trennungsschritt unterworfen wird, im Anschluß an welchen ein blankfiltrierter Anteil davon zum Ausschmelzbehälter zurückgeführt wird.

5. Verfahren nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß die Verweilzeit des Ausgangsmaterials und des Talgs im Ausschmelzbehälter im wesentlichen in der Größenordnung von 2 bis 10 Minuten liegt.

6. Verfahren nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß die Viskosität des Ausgangsmaterials und des Talgs im Ausschmelzbehälter überwacht und das Verhältnis von Ausgangsmaterial, das in dem Behälter eingefüllt wird, und der Zusatzanteil von rückgeführtem bzw. aufbereitetem Talg kontrolliert wird, um zu gewährleisten, daß eine vollständige Verflüssigung des Ausgangsmaterials innerhalb des Talgmediums kontinuierlich aufrechterhalten wird.

7. Verfahren nach einem der Ansprüche 1 bis 6, dadurch gekennzeichnet, daß das Verhältnis von Talg/Ausgangsmaterial im Bereich von 0,3/1,0 bis 3,0/1,0 liegt.

8. Verfahren nach einem der Ansprüche 1 bis 7, dadurch gekennzeichnet, daß das Ausgangsmaterial auf eine Teilchengröße im wesentlichen im Bereich von 12 mm bis 18 mm zerkleinert wird.

9. Verfahren nach einem der Ansprüche 1 bis 8, dadurch gekennzeichnet, daß dem Ausgangsmaterial vor der Zerkleinerung Säure hinzugeführt wird.

10. Verfahren nach einem der Ansprüche 1 bis 9, dadurch gekennzeichnet, daß das Ausgangsmaterial auf einen pH-Wert von 3,8 bis 4,5 angesäuert wird.

11. Verfahren nach Anspruch 10, dadurch gekennzeichnet, daß die Säure irgendeine Säure oder eine Kombination von Säuren ist, die aus Salzsäure, Schwefelsäure, Phosphorsäure, Zitronensäure, Gerbsäure, Oxalsäure, Weinsäure, Essigsäure, Apfelsäure, Ameisensäure, Benzoesäure und Milchsäure sowie ihren wasserlöslichen Salzen gewählt ist.

12. Verfahren nach einem der Ansprüche 1 bis 11, dadurch gekennzeichnet, daß die resultierende wässrige Phase einer Ultrafiltrierung unterworfen wird, um Feststoffe un Fett zurückzugewinnen.

13. Anlage zum Ausschmelzen von tierischem oder pflanzlichem Ausgangsmaterial in eine Fettfraktion und mindestens eine Proteinfraktion, mit einer Einrichtung (3) zur Zerkleinerung des Ausgangsmaterials, mit einem drucklosen Ausschmelzbehälter (6), in den zerkleinertes Ausgangsmaterial einbringbar ist, mit einer Trenneinrichtung (9) zur Trennung des Zuflußstromes in mehrere Phasen, mit einer Einrichtung (12, 13, 14) zur Rückführung von Talg in den Ausschmelzbehälter (6), mit einer Heizeinrichtung zur Aufheizung einer Mischung von Ausgangsmaterial und rückgeführtem Talg in dem Behälter (6), und mit einer Rühreinrichtung (7) in dem Ausschmelzbehälter (6), gekennzeichnet durch eine Überlaufeinrichtung (8), die den Ausschmelzbehälter (6) mit der Trenneinrichtung (9) für die Zuführung von ausgeschmolzenem Material verbindet, durch einen Wärmeaustauscher zur Aufheizung der Mischung ohne die Hinzufügung von zusätzlichem Wasser oder Dampf, durch eine Abtasteinrichtung und eine Steuereinrichtung zur Überwachung und Steuerung der Viskosität von Ausgangsmaterial und Talg in dem Behälter, wobei der Aufbau und die Anordnung so getroffen sind, daß die Ausgangsmaterial- und Talg-Mischung innerhalb des Ausschmelzbehälters (6) einer Teilchenverflüssigung unterworfen wird, so daß ausgeschmolzenes Material durch die Überlaufeinrichtung (8) fließen kann.

14. Anlage nach Anspruch 13, dadurch gekennzeichnet, daß der Wärmeaustauscher in Form einer vertikalen Schlange oder von Rohren innerhalb des Behälters (6) ausgebildet ist, welche als Pralloder Umlenkflächen wirken, und daß an der Rühreinrichtung (7) eine turbinenpropellerartige Einrichtung angebracht ist.

15. Anlage nach Anspruch 13 oder 14, dadurch gekennzeichnet, daß die Abtasteinrichtung den Strom mißt, der von einer elektrisch angetriebenen Antriebsmaschine der Rühreinrichtung (7) gezogen wird, und daß die Steuerungseinrichtung den Anteil von in den Behälter eingeführtem Ausgangsmaterial und dem Zusatzanteil von rückgeführtem Talg steuert, um die Viskosität im Ausschmelzbehälter zu reduzieren, um eine zufriedenstellende Verflüssigung zu gewährleisten.

16. Anlage nach einem der Ansprüche 13 bis 15, dadurch gekennzeichnet, daß die Trenneinrichtung (9) als Dreiphasen-Gleichstrom- oder Gegenstrom-Dekanterzentrifuge oder als Zweiphasen-Dekanterzentrifuge ausgebildet ist.

Revendications

1. Procédé de fonte à basse température de la graisse pour séparer une matière première animale ou végétale en une fraction de graisse et au moins une fraction de protéines comprenant la diminution de la taille des particules de la matière première, puis l'introduction de la matière première fragmentée dans un récipient de fonte de la graisse, l'introduction dans le récipient de fonte de la graisse de suif recyclé et le chauffage de la matière première et du suif dans le récipient de fonte de la graisse et le déplacement d'un courant de la matière chauffée du récipient de fonte de la graisse dans un séparateur pour la séparation des phases, caractérisé en ce que le chauffage est

effectué par emploi d'un dispositif d'échange de chaleur et chauffage du milieu à traiter à une température qui est dans la gamme de 75°C à 100°C sans addition d'eau complémentaire ni de vapeur d'eau et en ce que la matière première fragmentée est soumise à une fluidification particulaire dans le milieu constitué du suif dans le récipient de fonte de la graisse.

2. Le procédé selon la revendication 1, caractérisé en ce que du suif de recyclage ayant une teneur en eau d'environ 2% à 10% est introduit dans le récipient de fonte de la graisse.

3. Procédé selon la revendication 1 ou 2, caractérisé en ce que le suif de recyclage est introduit directement à partir du séparateur dans le récipient de fonte de la graisse.

4. Le procédé selon la revendication 1 ou 2, caractérisé en ce que la phase de suif du séparateur est soumise à un stade complémentaire de séparation après lequel une portion purifiée en est recyclée dans le récipient de fonte de la graisse.

5. Le procédé selon l'une quelconque des revendications 1 à 4, caractérisé en ce que la durée de séjour de la matière première et du suif dans le récipient de fonte de la graisse est dans la gamme de pratiquement 2 à 10 minutes.

6. Le procédé selon l'une quelconque des revendications 1 à 5, caractérisé en ce qu'on suit la viscosité de la matière première et du suif dans le récipient de fonte de la graisse et on ajuste le taux de matière première entrant dans le récipient et le débit d'addition du suif de recyclage pour assurer le maintien continu de fluidification complète de la matière première dans le milieu constitué du suif.

7. Le procédé selon l'une quelconque des revendications 1 à 6, caractérisé en ce que le rapport du suif à la matière première est dans la gamme de 0,3/1,0 à 3,0/1,0.

8. Le procédé selon l'une quelconque des revendications 1 à 7, caractérisé en ce que la matière première est fragmentée en particules ayant une taille comprise dans la gamme de pratiquement 12 mm à 18 mm.

9. Le procédé selon l'une quelconque des revendications 1 à 8, caractérisé en ce qu'on ajoute un acide à la matière première avant de la fragmenter.

10. Le procédé selon l'une quelconque des revendications 1 à 9, caractérisé en ce que la matière première est acidifiée à un pH de 3,8 à 4,5.

11. Le procédé selon la revendication 10, caractérisé en ce que l'acide est l'un quelconque des acides chlorhydrique, sulfurique, phosphorique, citrique, tannique, oxalique, tartrique, acétique, malique, formique, benzoïque et lactique et leurs sels solubles dans l'eau ou une de leurs combinaisons.

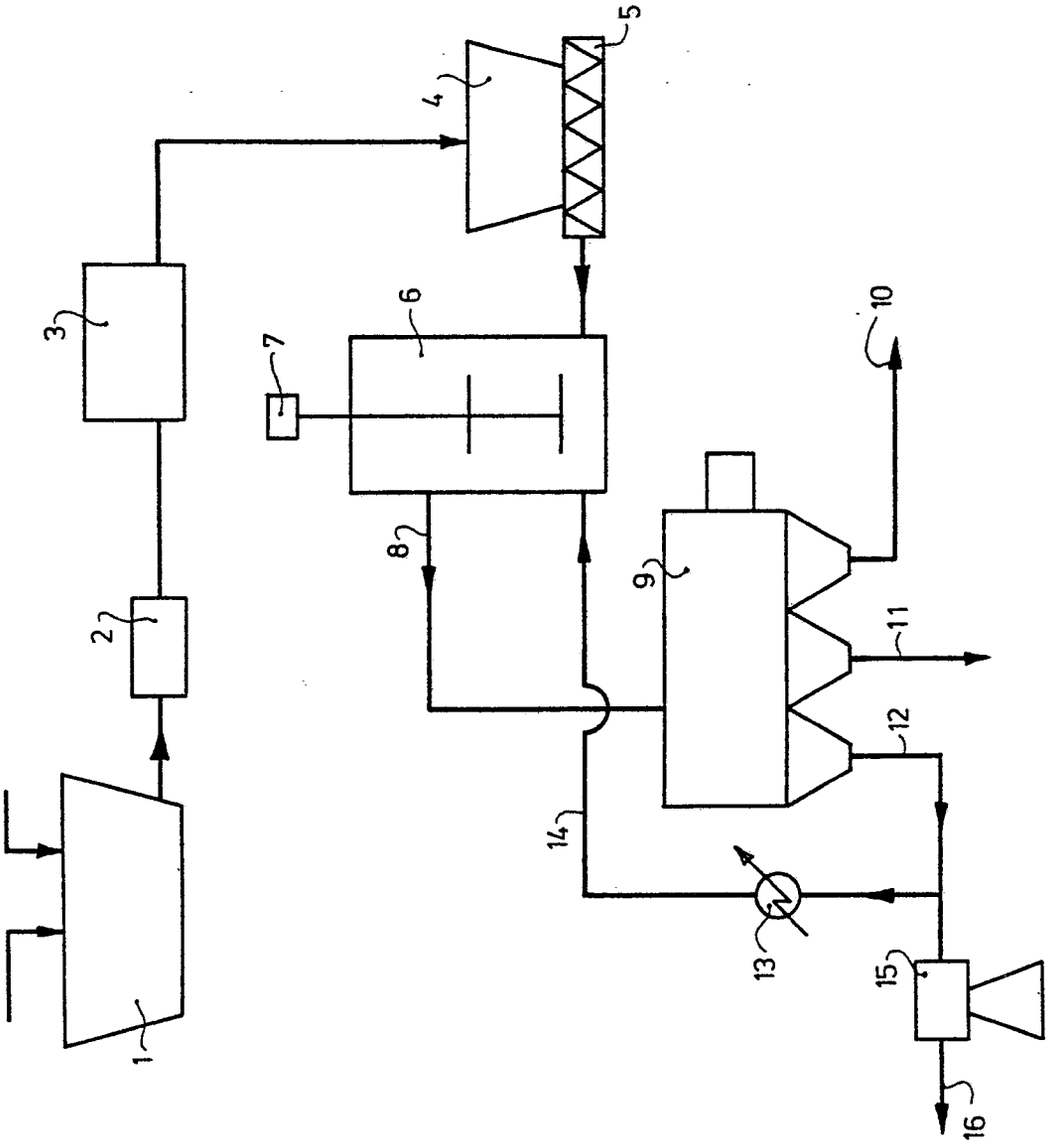
12. Le procédé selon l'une quelconque des revendications 1 à 11, caractérisé en ce que l'eau résiduaire obtenue est soumise à une ultrafiltration pour récupérer les solides et la graisse.

13. Une installation pour la fonte à basse température de la graisse d'une matière première animale ou végétale en une fraction de graisse et au moins une fraction de protéines comprenant un dispositif (3) pour fragmenter la matière première, un récipient (6) de fonte de la graisse qui n'est pas sous pression dans lequel la matière première fragmentée peut être placée, un dispositif de séparation (9) pour séparer le courant d'alimentation en plusieurs phases, des dispositifs (12, 13, 14) pour recycler la suif dans le récipient de fonte de la graisse (6), un dispositif de chauffage pour chauffer un mélange de matière première et du suif de recyclage dans le récipient (6) et un dispositif d'agitation (7) dans le récipient (6) de fonte de la graisse, caractérisée par un dispositif de débordement (8) raccordant le récipient de fonte de la graisse (6) au dispositif de séparation (9) pour conduire la matière qui a été soumise à la fonte de la graisse, un dispositif d'échange de chaleur pour chauffer le mélange sans addition d'eau complémentaire ni de vapeur d'eau, un dispositif de détection et un dispositif de régulation pour suivre et ajuster la viscosité de la matière première et du suif dans le récipient, la structure et la disposition étant telles que le mélange de matière première et de suif dans le récipient de fonte de la graisse (6) est soumis à une fluidification particulaire, si bien que la matière ayant été soumise à la fonte de la graisse peut s'écouler à travers le dispositif de débordement (8).

14. L'installation selon la revendication 13, caractérisée en ce que le dispositif d'échange de chaleur est sous forme d'un serpentin ou de tubes verticaux dans le récipient (6) agissant comme des chicanes et en ce que des dispositifs de type turbines sont fixés au dispositif d'agitation (7).

15. L'installation selon la revendication 13 ou 14, caractérisé en ce que le dispositif de détection détecte le courant traversant un moteur électrique du dispositif d'agitation (7) et en ce que le dispositif de régulation règle le taux de la matière première pénétrant dans le récipient et le débit d'addition du suif de recyclage pour réduire la viscosité dans le récipient de fonte de la graisse (6) afin d'assurer une fluidification satisfaisante.

16. L'installation selon l'une quelconque des revendications 13 à 15, caractérisée en ce que le dispositif de séparation (9) est un centrifugeur-décanteur à trois phases à courants parallèles ou à contre-courant ou un décanteur-centrifugeur à deux phases.


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