

【DESCRIPTION】

【Invention Title】

OIL-WATER SEPARATION AND PURIFICATION SYSTEM AND OIL-WATER
SEPARATION AND PURIFICATION METHOD USING SAME

5 **【Technical Field】**

The present invention relates to an oil-water separation
and purification system and an oil-water separation and
purification method using the same, which provides a step-by-
step oil-water separation and treatment process in contaminated
10 water with water and oil mixed therein, so as to efficiently
separate and discharge water and oil to purify the same, and
also automatically guide a flow of the oil-water according to
the oil-water separation and treatment process in a natural
falling manner, thereby providing work efficiency and automation
15 of the process.

【Background Art】

In general, an oil-water separation device separates oil
and water, and there is a device which separates industrial oil
generated from various machines, or separates oil from
20 wastewater containing animal oil discharged from homes and
restaurants, outdoor camping sites, factories handling animal
oil, and the like.

As such, when wastewater (hereinafter, this may be simply

referred to as oil-water) with oil and water mixed therein is discharged as it is without going through a separate purification treatment, it causes great damage to the natural ecosystem. In order to solve this problem, a process of
5 collecting oil-water and pretreating the collected wastewater is inevitably required.

Methods mainly used for separating water and oil from wastewater containing water and oil include a specific gravity treatment method, a hydraulic separation method, a filter
10 separation method, and the like.

First, a specific gravity separation method is a method for floating oil on water and then removing the oil by clearing away the same with an oil skimmer. For example, in the specific gravity separation method, oil-water is stagnated in a
15 separation tank or flows along a plurality of guide plates, and oil floating on a water surface due to a difference in specific gravity is collected by an oil skimmer. The specific gravity separation method has a disadvantage in that it may be applied only to large-scale facilities such as a sewage treatment plant
20 capable of allowing oil to stagnate or slowly flow down as an installation space and power are required to float oil and operate an oil skimmer, and maintenance is somewhat inconvenient.

The hydraulic separation method is a method for separating oil and water by centrifugal force and gravity by forming a
25 specific flow pattern such as a vortex in a limited space.

However, the hydraulic separation method is a method for sucking and removing oil floating on an upper portion, and thus has a fundamental limitation that it is difficult to completely remove oil.

5 The filter separation method is a method for filtering oil and passing water using a filter cloth such as a nonwoven fabric. The filter separation method is difficult to continuously treat oil-water because oil is likely to leak if a large amount of oil accumulates in oil-water, and filter replacement or cleaning is
10 regularly required.

 In particular, there is a problem in that it is difficult to smoothly separate wastewater containing animal oil due to a phenomenon in which the animal oil hardens in a process of separating the oil, and this hardened animal oil blocks a portion
15 from which the oil is separated and discharged, as well as an inner wall of a sewage pipe.

 In addition, the animal oil hardened on the inner wall of the sewage pipe decays to cause secondary problems such as odor, a backflow of odor along the sewage pipe, and the like.

20 Related arts on oil and water separation recently released will be described.

 Utility model No. 0432702 (oil-water separator) discloses a configuration including: a container body having an inner space filled with a predetermined amount of water; a

partitioning plate provided in the container body to partition the inner space into a plurality of spaces, in which a lower end thereof is disposed to be spaced apart from a bottom surface of the container body and an upper end thereof is disposed to be
5 higher than a water level of the water so that the filled water may flow into and out of the plurality of inner spaces; a water discharge portion formed on a wall surface of the container body where any one of the plurality of inner spaces is located to constantly maintain the water level of the filled water; an oil
10 discharge portion formed on the wall surface of the container body where the other one of the plurality of inner spaces is located while being disposed to be higher than a position of the water discharge portion; and an oil-water mixture supply portion for supplying an oil-water mixture having oil and water mixed
15 therein toward the inner space where the oil discharge portion is located.

The related art has a simple structure in which water is discharged to an water outlet beyond the partitioning plate by the partitioning plate and the oil which has not passed through
20 the partitioning plate is discharged through an oil outlet, so that when an amount of introduced oil-water rapidly increases and the water level rises, an oil layer is formed to be higher than the oil discharge portion, thus causing a problem in which water is discharged to the oil discharge portion as it is, and
25 a problem of blocking the oil discharge portion due to the

hardened animal oil may not be solved at all.

Utility model No. 0442571 (kettle for oil-water separation) discloses a configuration including: a kettle body having a predetermined height; a first spout protruding from an upper portion of the kettle body in a horizontal direction; and a second spout protruding from a lower portion of the kettle body and extending in a curved or oblique shape to a height lower than a discharge port of the first spout.

Since the related art has a simple structure of a kettle shape in which oil and water are separated, so that an oil layer positioned above water is discarded toward one side, and thus there is a problem in that the introduced oil-water is overflowed as it is or oil-water is difficult to be separated when the introduced oil-water is not constant, and this related art may not also solve the problem of blocking the portion from which the oil is discharged due to hardening of animal oil.

Korean Registered Patent No. 1270222 (oil-water separator) discloses an oil-water separator provided to be capable of adjusting a height of a plug sliding along an upper end of a vertical pipe, so as to effectively respond to oil layers having different heights, but the related art has a problem in that it is difficult to effectively respond to oil layers that respectively vary according to a water level simply through a configuration of adjusting the height of the plug, and the height of the plug is hindered by the hardening of animal oil.

As described above, the conventional oil-water separator has a problem in that, due to the structure in which the water level of the oil layer needs to be accurately adjusted to a portion from which the oil is discharged, when a flow rate and
5 a flow velocity of the introduced oil-water are high, the oil layer is changed, and thus the oil is not separated and discharged alone, but is discharged together with water.

In addition, although a filthy/waste water and sewage oil-water separation system and the like have been proposed, basic
10 facilities according to a purification process for each stage of the system are very complicated, and a purification system according to oil-water separation suitable for a limited installation place may not be provided to cause various factors that deteriorate work efficiency.

15 Accordingly, there is a need for an oil-water separation and purification system and a purification method therefor, which provides a step-by-step oil-water separation and treatment process suitable for a field, so as to efficiently separate and discharge water and oil and enable a customized construction
20 suitable for an installation site of basic facilities, thereby improving work efficiency and oil-water separation and purification performance.

【Disclosure】

【Technical Problem】

Thus, to solve the above-described problems, an object of the present invention is to provide an oil-water separation and purification system which provides a step-by-step oil-water separation and treatment process in contaminated water with water and oil mixed therein, so as to efficiently separate and discharge water and oil, thereby purifying the same.

Another object of the present invention is to provide an oil-water separation and purification system which automatically guides a flow of oil-water according to the oil-water separation and treatment process in a natural falling manner, thereby providing work efficiency and automation of the process.

Still another object of the present invention is to provide an oil-water separation and purification system which provides a step-by-step oil-water separation and treatment process suitable for a field installation section, so as to efficiently separate and discharge water and oil.

Still another object of the present invention is to provide an oil-water separation and purification system capable of improving work efficiency and oil-water separation and purification performance by enabling a customized construction suitable for a section of field-based facilities.

Still another object of the present invention is to provide an oil-water separation and purification method using an oil-water separation and purification system, which provides a step-

by-step oil-water separation and treatment process suitable for a field, so as to efficiently separate and discharge water and oil and enable a customized construction suitable for an installation site of basic facilities, thereby improving work efficiency and oil-water separation and purification performance.

【Technical Solution】

To achieve the above objects, the present invention may disclose an oil-water separation and purification system installed to mutually separate water and oil mixed in oil-water to purify the same, which includes: an oil-water storage tank, into which oil-water is introduced and stored; a supply pump for discharging and moving the oil-water from the oil-water storage tank; a drum screen for primarily pretreating various kinds of sludge in the oil-water introduced from the supply pump; a scum skimmer for separating the residual sludge and the oil-water in a dual manner from the oil-water primarily filtered from the drum screen and secondarily pretreating the same; an oil-water separator for separating water and oil in a dual manner from the oil-water pretreated by the scum skimmer and purifying and discharging the same; an inspection tank for confirming a degree of turbidity in the water separated and discharged from the oil-water separator; and a drainage pump connected to a bottom of the inspection tank and configured to discharge the finally purified water to sewage, in which a height of equipment installed from the drum screen to the drainage pump is

sequentially formed to have a step difference, so that a flow of the oil-water from the drum screen to the inspection tank is automatically guided in a natural falling manner.

In addition, the oil-water separation and purification
5 system may further include: an oil-water reservoir for storing the introduced oil-water with water and oil mixed therein at a predetermined position on the ground or underground; and a raw liquid supply pump for pumping the oil-water from the oil-water reservoir to the oil-water storage tank.

10 Furthermore, the oil-water separation and purification system may include: a supply pump for allowing the oil-water with water and oil mixed therein to be directly introduced into the oil-water storage tank from a sewage pipe and discharging and moving the oil-water of the oil-water storage tank; a drum
15 screen for primarily removing various kinds of sludge from the oil-water introduced from the supply pump; at least one scum skimmer installed to secondarily remove the residual sludge supplied from the drum screen; and an oil-water separator for separating water and oil from the oil-water introduced from the
20 scum skimmer and purifying and discharging the same, in which the water separated by the oil-water separator may be bypassed back toward the sewage pipe by a recovery pump.

Moreover, the system may further include a scum storage tank installed between the drum screen and the scum skimmer to
25 collect and store sludge and scum separated and discharged from

the drum screen and the scum skimmer through a screw conveyor.

Besides, the drum screen may include: a base frame; an inner container installed inside the base frame to provide a space into which the oil-water with the sludge filtered therefrom is introduced; a rotating drum container installed to be rotatable at an upper portion of the inner container, so as to filter and treat the sludge from the oil-water using a rotational centrifugal force; a rotating screw formed with an oil-water inlet into which the oil-water is introduced at one side and installed to be rotatable together with the rotating drum container, so as to discharge the sludge forward; a roller driving portion including a main roller and an auxiliary roller, installed to interwork and drive the rotating drum container; a driving motor for transmitting power to the main roller of roller driving portion; and an air nozzle installed in the inner container to remove the residual sludge from the rotating drum container by spraying air, in which when the oil-water is introduced at one side of the rotating screw, the rotating drum container and the rotating screw rotate at the same time, the oil-water introduced through the oil-water inlet hole is discharged forward by filtering the sludge through the rotating screw, and the oil-water with the sludge filtered therefrom is discharged to an outer circumference of the rotating drum container, so as to be accommodated in the inner container.

Further, the rotating drum container may include a mesh

net traversing one end and the other end and having a cylindrical
net structure, and an inner screw formed to protrude in a
plurality of spiral shapes corresponding to a blade of the
rotating screw while maintaining a regular equidistant interval
5 along an inner circumferential surface of the mesh net.

In addition, the scum skimmer may include: a base frame
supported on a bottom; a housing body supported by the base
frame, configured to have oil-water containing water and scum
introduced from a lower portion thereof, and configured to have
10 a dual structure of an inner container and an inside container
therein; an oil-water inlet pipe installed to penetrate the
bottom at a side surface of the housing body, and to inject oil-
water; an air diffuser installed to penetrate the bottom of the
housing body, and to supply air through a ring blower; a steam
15 pipe installed inside the housing body, so as to decompose the
water and scum by heat in the oil-water; an auxiliary heater
panel installed inside the housing body, so as to decompose the
floating scum by heat again; a water discharge pipe connected
to the inside container at a center of the housing body, so as
20 to discharge the purified water with the scum filtered therefrom;
a scraper device driven by a motor at an upper side of the
housing body, thereby rotating to sort and discharge the scum
from a surface of the oil-water; and a scum outlet configured
to discharge the scum sorted by the scraper device.

25 Furthermore, the scum skimmer may be configured such that

the oil-water is introduced into the housing body along the oil-water inlet pipe, so as to be decomposed into water and scum by air bubbles generated by the diffuser and heat generated by the steam pipe, the scum floated through the scraper device rotated at an upper side is discharged to the scum outlet, and purified water with the scum removed therefrom is purified and discharged through the water discharge pipe.

Moreover, the inside container of the housing body may have a pipe connection hole formed at one side thereof, so that the water discharge pipe may pass therethrough, and the inside container may further include at least two or more water flow holes which are vertically formed at a bottom surface adjacent to a bottom of the inner container, so as to allow water to pass through the inner container.

Besides, the oil-water separator may include: a box body provided with a cover on an upper end thereof and provided in a form of a water tank; an oil-water inlet through which the oil-water with water and oil mixed therein is introduced at one side of the box body; a water outlet through which water with oil separated therefrom is discharged at one side opposite to the oil-water inlet; a first partition wall portion provided at a position adjacent to the oil-water inlet inside the box body and vertically installed up to a position spaced apart from a bottom of the box body, so that the introduced oil-water may pass downward; a second partition wall portion vertically installed

at a position adjacent to the water outlet inside the box body,
so as to be spaced apart from the bottom of the box body, so
that the water with oil separated therefrom may flow from a
lower portion to an upper portion; a third partition wall portion
5 vertically installed at a position adjacent to the water outlet
inside the box body while maintaining a predetermined interval
from the second partition wall portion and formed to carry water
coming up from a lower portion forward; an oil blocking plate
horizontally installed at a predetermined height between the
10 first partition wall portion and the second partition wall
portion; a ball trap oil discharge portion coupled to an upper
end of one side of the oil blocking plate, so as to discharge
only the floated oil; and a heating unit installed at a lower
portion of the oil blocking plate, so as to heat the introduced
15 oil-water to a predetermined temperature.

Further, the ball trap oil discharge portion may further
include: a housing screw-coupled to an upper end of one side of
the oil blocking plate; an oil discharge valve, of which an
upper end has a vertical inner diameter and of which a lower end
20 has an inclined inner diameter structure inside the housing; a
ball trap installed to be movable to suit an amount of oil
drained in accordance with the oil discharge valve, thereby
operating to turn on/off the valve; a ball separation preventing
net configured to extend in a net shape to a lower end portion
25 of the housing, thereby preventing the ball trap from being

separated; and an oil discharge pipe configured to guide discharge of oil outside by an on-off operation of the ball trap in the oil discharge valve.

In addition, to achieve the above-described objects, the present invention may disclose an oil-water separation and purification method using an oil-water separation and purification system for separating water and oil mixed in wastewater introduced from outside from each other, the method including: an oil-water storage step of storing oil-water of raw liquid with water and oil mixed therein by supply in an oil-water storage tank; an oil-water transfer step of discharging and moving the oil-water of the oil-water storage tank by a supply pump from the oil-water storage step; a primary floating material removal step of primarily pretreating various floating materials by a drum screen in the oil-water supplied from the supply pump in the oil-water transfer step; a secondary scum skimming step of separating the residual floating materials and the oil-water in a dual manner by the scum skimmer, so as to secondarily pretreat the oil-water supplied from the primary floating material removal step; an oil-water separation and purification step of separating water and oil in a dual manner by the oil-water separator from the oil-water supplied from the secondary scum skimming step, so as to discharge the same; an inspection step of confirming a degree of turbidity of water through an inspection tank in the water separated and discharged

from the oil-water separation and purification step; and a purification and drainage step of discharging the water finally purified in the inspection step to the sewage.

Furthermore, a height of devices installed from the oil-
5 water storage step to the inspection step may be sequentially formed to have a step difference, so that a flow of the oil-water from the drum screen to the inspection tank may be automatically guided in a natural falling manner.

【Advantageous Effects】

10 The present invention may provide an oil-water separation and purification system which provides a step-by-step oil-water separation and treatment process in contaminated water with water and oil mixed therein, so as to efficiently separate and discharge water and oil, thereby purifying the same.

15 In addition, the present invention may provide an oil-water separation and purification system which provides a step-by-step oil-water separation and treatment process suitable for a field installation section, so as to efficiently separate and discharge water and oil.

20 Furthermore, the present invention may have an effect of automatically guiding a flow of oil-water according to the oil-water separation and treatment process in a natural falling manner, thereby providing work efficiency and automation of the process.

Moreover, the present invention may provide an oil-water separation and purification system capable of improving work efficiency and oil-water separation and purification performance by enabling a customized construction suitable for a section of
5 field-based facilities.

Besides, the present invention may provide an oil-water separation and purification method using an oil-water separation and purification system, which provides a step-by-step oil-water separation and treatment process suitable for a field, so as to
10 efficiently separate and discharge water and oil and enable a customized construction suitable for an installation site of basic facilities, thereby improving work efficiency and oil-water separation and purification performance.

【Description of Drawings】

15 FIGS. 1 to 9 are embodiments showing an oil-water separation and purification system according to the present invention.

FIG. 1 is an overall exemplary view showing an oil-water separation and purification system according to the present
20 invention.

FIG. 2 is another exemplary view showing an installation of an oil-water separation and purification system according to the present invention.

FIG. 3 is still another exemplary view showing an

installation of an oil-water separation and purification system according to the present invention.

FIG. 4 is exemplary front and plan views showing a drum screen of an oil-water separation and purification system
5 according to the present invention.

FIG. 5 is an exemplary exploded view showing a skim skimmer of an oil-water separation and purification system according to the present invention.

FIG. 6 is an exemplary side sectional view showing a scum
10 skimmer according to the present invention.

FIG. 7 is another exemplary side sectional view of FIG. 6.

FIG. 8 is an exemplary front sectional view showing an oil-water separation and purification system according to the present invention.

15 FIG. 9 is an exemplary sectional view of a main part showing a ball trap oil discharge portion of an oil-water separator of FIG. 8.

FIG. 10 is an exemplary process view showing an oil-water separation and purification method according to the present
20 invention.

【Mode for Invention】

Since the present invention may be implemented with various changes and provide various embodiments, specific embodiments will be illustrated in the drawings and described in more detail through detailed description. However, this is not intended to
5 limit the present invention to specific embodiments, and it needs to be understood that the present invention includes all modifications, equivalents, and substitutes included in the spirit and scope of the present invention.

The present invention is not limited to the embodiments
10 disclosed below, but may be implemented in various different forms, and only the embodiments are provided to make the disclosure of the present invention complete and to fully inform those skilled in the art of the scope of the invention.

Hereinafter, preferred embodiments will be described in
15 detail with reference to the accompanying drawings. First of all, in adding reference numerals to the components of each drawing, it should be noted that the same components in the drawings are denoted by the same reference numerals and symbols as possible even though they are displayed on different drawings.
20 In addition, in describing the present invention, when it is determined that a detailed description of a related known technology may obscure the gist of the present invention, the detailed description thereof will be omitted.

The features and advantages of the present invention will
25 become more apparent from the detailed description of the

following preferred embodiments based on the accompanying drawings.

Furthermore, terms used in the present specification are and the claims are used only to describe a certain exemplary
5 embodiment and are not intended to limit the present invention.

For example, the terms of a singular form may include plural forms unless otherwise specified. Moreover, the terms "comprise," "include," "have," or the like are intended to designate that the features, the numbers, the steps, the
10 operations, the components, the parts or combinations thereof are present, and are not to be understood as excluding the possibility that one or more other features, numbers, steps, operations, components, parts or combinations thereof may be present or added.

15 Besides, when a portion of a layer, film, region, plate, etc. is said to be "on" another portion, this includes not only the case of being "directly on" the other portion, but also the case of having another portion in the middle thereof. Conversely, if a portion of a layer, film, region, plate, etc. is said to
20 be "under" another portion, this includes not only the case where it is "directly under" the other portion, but also the case where there is another portion in the middle.

In addition, terms including ordinal numbers such as "first", "second", and the like used in the present

specification may be used to describe various components, but the components are not limited by the terms, and the terms are used only for the purpose of distinguishing one component from another component.

5 Hereinafter, in describing one embodiment of the present invention in detail with reference to the drawings, the same reference numerals are used for the same components, and only different parts will be mainly described so as not to overlap as much as possible for clarity.

10 FIGS. 1 to 6 are embodiments showing an oil-water separation and purification system according to the present invention.

Referring to FIGS. 1 to 6, the oil-water separation and purification system according to the present invention may be
15 designed to mutually separate water and oil mixed in oil-water, thereby purifying and discharging the same, the system including: an oil-water storage tank 100, in which oil-water is stored; a supply pump 200 for discharging and moving the oil-water from the oil-water storage tank 100; a drum screen 300 for primarily
20 pretreating various kinds of sludge in the oil-water introduced from the supply pump 200; a scum skimmer 400 for separating the residual sludge and the oil-water in a dual manner from the oil-water primarily filtered from the drum screen 300 and secondarily pretreating the same; an oil-water separator 500 for
25 separating water and oil in a dual manner from the oil-water

pretreated by the scum skimmer 400 and purifying and discharging the same; an inspection tank 600 for confirming a degree of turbidity in the water separated and discharged from the oil-water separator 600; and a drainage pump 700 connected to a
5 bottom of the inspection tank 600 and configured to discharge the finally purified water to sewage.

Preferably, a height of equipment installed from the drum screen 300 to the drainage pump 700 may be sequentially formed to have a step difference P, so that a flow of the oil-water
10 from the drum screen 300 to the inspection tank 600 may be automatically guided in a natural falling manner.

The oil-water storage tank 100 may have a box-shaped housing structure in which the introduced oil-water is stored, and the bottom thereof may have an inclined surface R, so as to
15 allow the oil-water to be smoothly discharged and moved.

Meanwhile, as shown in FIG. 2, the oil-water storage tank 100 may further include in combination: an oil-water reservoir 1100 for storing the introduced oil-water with water and oil mixed therein at a predetermined position on the ground or
20 underground; and a raw liquid supply pump 1200 for pumping the oil-water from the oil-water reservoir 1100 to the oil-water storage tank 100.

In addition, referring to FIG. 3, it may include: a supply pump 200 for allowing the oil-water with water and oil mixed

therein to be directly introduced into the oil-water storage tank 100 from a sewage pipe and discharging and moving the oil-water of the oil-water storage tank 100; a drum screen 300 for primarily removing various kinds of sludge from the oil-water introduced from the supply pump 200; at least one scum skimmer 400 installed to secondarily remove the residual sludge supplied from the drum screen 300; and an oil-water separator 500 for separating water and oil from the oil-water introduced from the scum skimmer 400 and purifying and discharging the same, in which the water separated by the oil-water separator 500 may be bypassed back toward the sewage pipe 10 by a recovery pump 1300.

Here, through a method for pumping and transferring the oil-water, which is stored as a raw liquid directly introduced from the underground or on the ground, by using a raw liquid supply pump 1200 and introducing the pumped oil-water into the oil-water storage tank 100, a section installation may be possible under the conditions for field installation having a large amount of oil-water discharged per day or having a large scale, and the oil-water directly supplied from the sewage pipe along a sewage line may be also bypassed back to the sewage pipe through a last recovery pump 1300 and installed to meet the performance of purifying the oil-water compared to a volume thereof to be introduced through a repeated process.

Meanwhile, a scum storage tank 1400 may be further provided to be installed between the drum screen 300 and the scum skimmer

400 to collect and store sludge and scum separated and discharged from the drum screen 300 and the scum skimmer 400 by a screw conveyor 1410.

The supply pump 200, which is a device for transferring
5 the oil-water of the oil-water storage tank 100 and the oil-water of the drum screen 300 with a pump pressure, may have a shape of a motor pump structure, may be installed on the same line as a bottom height of the oil-water storage tank 100, and may be installed to be disposed on the same line as or lower
10 than the drum screen 300. In this case, when the supply pump is installed at the same height as that of the drum screen 300, the supply pump may be installed to provide a condition for guiding a free fall from the oil-water storage tank.

The drum screen 300 may include a base frame 310; an inner
15 container 320 installed inside the base frame 310, and configured to have a space into which the filtered oil-water with sludge filtered therefrom is introduced; a rotating drum container 330 installed to be rotatable at an upper portion of the inner container 320, and configured to filter and treat the
20 sludge by filtering the sludge in the oil-water using a rotational centrifugal force; a rotating screw 340 formed with an oil-water inlet 341 into which the oil-water is introduced at one side thereof, installed to be rotatable together with the rotating drum container 330, and installed to discharge the
25 sludge forward; a roller driving portion 350 including a main

roller and an auxiliary roller installed to interwork and drive the rotating drum container 330; a driving motor 360 configured to transmit power to the main roller of the roller driving portion 350; and an air nozzle 380 installed in the inner
5 container 320, and installed to remove the residual sludge in the rotating drum container 330 by spraying air to the residual sludge.

Here, when the oil-water is introduced at one side of the rotating screw 340, the rotating drum container 330 and the
10 rotating screw 340 may rotate at the same time, the oil-water introduced through the oil-water inlet 341 may be discharged forward by filtering the sludge through the rotating screw 340, and the oil-water with the sludge filtered therefrom may be discharged to an outer circumference of the rotating drum
15 container 330, so as to be accommodated in the inner container 320.

Meanwhile, the rotating drum container 330 may include a mesh net 331 traversing one end and the other end and having a cylindrical net structure, and an inner screw 332 formed to
20 protrude in a plurality of spiral shapes corresponding to a blade of the rotating screw while maintaining a regular equidistant interval along an inner circumferential surface of the mesh net 331.

The scum skimmer 400 may include: a base frame 410
25 supported on a bottom; a housing body 420 supported by the base

frame 410, configured to have oil-water containing water and scum introduced from a lower portion thereof, and configured to have a dual structure of an inner container 421 and an inside container 423 therein; an oil-water inlet pipe 430 installed to
5 penetrate the bottom at a side surface of the housing body 420, and to inject oil-water; an air diffuser 440 installed to penetrate the bottom of the housing body 420, and to supply air through a ring blower; a steam pipe 450 installed inside the housing body 420, so as to decompose the water and scum by heat
10 in the oil-water; an auxiliary heater panel 460 installed inside the housing body 420, so as to decompose the floating scum by heat again; a water discharge pipe 470 connected to the inside container 423 at a center of the housing body 420, so as to discharge the purified water with the scum filtered therefrom;
15 a scraper device 480 driven by a motor at an upper side of the housing body 420, thereby rotating to sort and discharge the scum from a surface of the oil-water; and a scum outlet 490 configured to discharge the scum sorted by the scraper device 480.

20 In addition, the inside container 423 of the housing body 420 may have a pipe connection hole 423a formed on one side surface thereof, so that the water discharge pipe 470 may pass therethrough, and the inside container 423 may be configured to further have at least two or more water flow holes 423b which
25 are vertically formed at a bottom surface adjacent to the bottom

of the inner container 421, so as to allow water to pass through the inner container. In this case, the water introduced through the water flow hole 423b may be carried over at a predetermined height as the water separated from the scum fills up from the bottom and may be discharged through the water discharge pipe 470. In other words, it may be possible to provide a structure in which the scum is filtered from an upper portion and discharged, and water is discharged to the water discharge pipe through the bottom via the inside container, so that the scum and water may be separated and discharged in a dual manner.

Preferably, the scum skimmer 400 may be configured such that the oil-water is introduced into the housing body 420 along the oil-water inlet pipe 430, so as to be decomposed into water and scum by air bubbles generated by the air diffuser 440 and heat generated by the steam pipe 450, the scum floated through the scraper device 480 rotated at an upper side is discharged to the scum outlet 490, and the purified water with the scum removed therefrom is purified and discharged through the water discharge pipe 470.

The scraper device 480 may be a device driven by a motor at an upper side of the housing body 420 and rotated to sort scum on a surface of the floating materials, thereby discharging the scum through the scum outlet 490, and may include: a support plate 481 installed at an upper end of the housing body 420; a driving motor 482 provided at one side of the support plate 481;

a driving shaft 483 axially coupled to the driving motor 482; a rotating shaft 485 connected to the driving shaft 483 and configured to rotate to filter scum floating at an upper end of the housing body 420; a guide rotating rod 486 connected across
5 the rotating shaft 485; a rotating roller 487 installed at both ends of the guide rotating rod 486 to guide rotation along an upper end circumference of the housing body 420 along a radius of rotation; and a scum skimming plate 489 connected to a lower end of the guide rotating rod 486 to remove floating scum.

10 Here, the support plate 481 may be horizontally and vertically assembled, respectively, and may be fixedly installed at an upper end circumference or a side surface of the housing body 420 through a bolting joint.

In addition, the driving shaft 483 and the rotating shaft
15 485 may be provided in a bevel gear structure for smooth gear operation.

Furthermore, various electronic control devices for driving the motor may be installed at the support plate 481.

Preferably, the support plate 481 may be configured to be
20 covered and protected by a finishing cover.

In addition, the scum skimming plate 489 may be installed such that a height adjusting unit (not shown) is provided at a lower longitudinal end portion thereof, so as to adjust a height of the scum skimming plate 489 according to a height of a water

surface at which the scum is located, thereby adjusting the height thereof in response to the height of the water surface of the scum.

Meanwhile, the driving motor 482, the driving shaft 483,
5 and the rotating shaft 485 may be configured to be rotatable on the same axis that is vertically installed.

The oil-water separator 500 may include: a tank-shaped box body 510 having an oil-water inlet 511 provided with a cover at an upper end thereof and through which the oil-water with water
10 and oil mixed therein is introduced at one side thereof, and a water outlet 513 through which water with oil separated therefrom is discharged at an opposite side thereof; a handle filtering net 520 coupled near the oil-water inlet 511 of the box body 510, so as to filter foreign substances from the
15 introduced oil-water; a first partition wall portion 530 provided at a position adjacent to the oil-water inlet 511 inside the box body 510 and vertically installed up to a position spaced apart from a bottom of the box body 510, so that the introduced oil-water may flow downward; a second partition wall portion 550
20 vertically installed at a position adjacent to the water outlet 513 inside the box body 510, so as to be spaced apart from a bottom of the box body 510, so that the water with oil separated therefrom may flow from a lower portion to an upper portion; a
25 third partition wall portion 560 vertically installed at a position adjacent to the water outlet 513 inside the box body

510 while maintaining a predetermined interval from the second partition wall portion 550 and formed to carry water coming up from a lower portion forward; an oil blocking plate 570 horizontally installed at a predetermined height between the
5 first partition wall portion 530 and the second partition wall portion 550; a ball trap oil discharge portion 580 coupled to an upper end of one side of the oil blocking plate 570, so as to discharge only the floated oil; and a heating unit 590 installed at a lower portion of the oil blocking plate 570, so
10 as to heat the introduced oil-water to a predetermined temperature.

In addition, the bottom of the box body 510 may be configured to have an inclined surface 511, so as to naturally discharge the residual sludge accumulated at the bottom through
15 a valve.

Furthermore, the handle filtering net 520 may have a box-shaped net structure and may include a handle 523 for hand-gripping when removing foreign substances at an upper side thereof, and a prevention cover 525 formed at an upper side with
20 a handle 521, so as to prevent oil-water from splashing upward according to a sudden inflow amount of the oil-water.

Moreover, the oil blocking plate 570 may be formed to be inclined upward in the direction of the ball trap oil discharge portion 580, so that the oil may be concentrated on the ball
25 trap oil discharge portion.

Besides, the ball trap oil discharge portion 580 may include: a housing 581 screw-coupled to an upper end of one side of the oil blocking plate 570; an oil discharge valve 583, of which an upper end has a vertical inner diameter 583a and of which a lower end has an inclined inner diameter 583b structure inside the housing 581; a ball trap 585 located at a lower end of the oil discharge valve 583 and also installed to be movable to suit an amount of oil drained, thereby operating to turn on/off the oil discharge valve; a ball separation preventing net 587 formed to extend in a wire net shape at a lower end of the housing 581, thereby preventing the ball trap from being separated; and an oil outlet 589 formed to be inclined, thereby guiding discharge of oil outside through an on-off operation of the ball trap 585 in the oil discharge valve 583.

Here, the ball separation preventing net 587 may have any shape of a wire net or a net, and may have any structure and shape in which oil-water is freely introduced and the ball trap is prevented from being separated.

Meanwhile, the heating unit 590 may be installed at a position close to the first partition wall portion 530 at a lower portion of the oil blocking plate 570, so as to heat the introduced oil-water to a predetermined temperature, and may maintain the temperature, so as to prevent a phenomenon in which the animal oil hardens and prevent blockage of a portion through which the oil is discharged. The heating unit may be operated

by an external power source of the main body, and having a structure of heating lamp or heating pipe may be sufficient, and the heating unit may be installed as a double structure in which one is the heating lamp and the other is the heating pipe.

5 Hereinafter, the operation and effect of the oil-water separation and purification system according to the present invention and the oil-water separation and purification method using the purification system will be described as follows. The following description may follow the structural description.

10 It may provide an oil-water separation and purification method using an oil-water separation and purification system for separating water and oil mixed in wastewater introduced from outside from each other.

 The oil-water separation and purification method according
15 to the present invention may be configured as a process including:
an oil-water storage step (S100); an oil-water transfer step (S200); a primary floating material removal step (S300); a secondary scum skimming step (S400); an oil-water separation and purification step (S500); an inspection step (S600); and a
20 purification and drainage step (S700).

<Oil-water storage step>

 Store oil-water of raw liquid with water and oil mixed therein by supply in an oil-water storage tank 100 (S100).

<Oil-water transfer step>

Discharge and move the oil-water of the oil-water storage tank 100 by a supply pump 200 from the oil-water storage step S100 (S200).

<Primary floating material removal step>

- 5 Primarily pretreat various floating materials by a drum screen 300 in the oil-water supplied from the supply pump 200 in the oil-water transfer step (S200), so as to primarily remove the floating materials (S300).

<Secondary scum skimming step>

- 10 Separate the residual floating materials (scum) and water in a dual manner by the scum skimmer 400 in the oil-water supplied from the primary floating material removal step (S300), so as to secondarily pretreat the same, thereby secondarily skimming the scum (S400).

- 15 <Oil-water separation and purification step>

Separate water and oil in a dual manner by the oil-water separator 500 from the oil-water supplied from the secondary scum skimming step (S400), so as to discharge the same, thereby carrying out oil-water separation and purification (S500).

- 20 <Inspection step>

Make an inspection to confirm a degree of turbidity in water separated and discharged from the oil-water separation and purification step (S500) (S600).

<Purification and drainage step>

Carry out purification and drainage to discharge the water finally purified in the inspection step to the sewage (S700).

First, in the oil-water storage step (S100), the wastewater
5 or the treated water (oil-water) of the raw liquid with water and oil mixed therein may be introduced and stored, and then immediately move to the next step flow process, so as to carry out a collection step.

Here, according to the level of a volume of the oil-water,
10 it may further include a process of using an oil-water reservoir 1100 for storing the introduced oil-water with water and oil mixed therein at a predetermined position on the ground or underground; and a raw liquid supply pump 1200 for pumping the oil-water from the oil-water reservoir 1100 to the oil-water
15 storage tank 100.

Then, in the oil-water transfer step (S200), the oil-water may be transferred to the drum screen 300 by using the supply pump 200.

After that, in the primary floating material removal step
20 (S300), the oil-water supplied through the drum screen 300 may be received, and then foreign substances, sludge, and the like may be are primarily filtered from the oil-water for pretreatment.

Then, in the secondary scum skimming step (S400), the

primary pretreated oil-water may be received through the scum skimmer 400 and may be secondarily filtered again for pretreatment. In this case, the scum skimmer 400 may include a first scum skimmer 400A and a second scum skimmer 400B, which
5 are installed in parallel or in series according to a volume of the oil-water.

Preferably, a subsequent scum skimming step may be configured to separate and discharge the water and oil in a dual manner, respectively, through specific gravity treatment.

10 Then, in the oil-water separation and purification step (S500), the water (oil-water) pretreated in the scum skimming step may be supplied to the oil-water separator 500, and the water and oil may be separated and discharged in a dual manner, respectively, through pre-treatment using specific gravity and
15 heat.

Here, an installation may be configured such that the oil-water directly supplied along a sewage line from a sewage pipe under the conditions for field installation having a large amount of oil-water discharged per day or having a large scale
20 may be also bypassed back to the sewage pipe through a last recovery pump 1300, so as to improve the performance of purifying the oil-water compared to a volume thereof to be introduced through a repeated process.

Finally, only the finally separated water may be left alone,

the degree of turbidity of the water may be checked, and then purified and discharged.

Preferably, it may be configured such that a height of devices installed from the oil-water storage step to the inspection step is sequentially formed to have a step difference, so that a flow of the oil-water from the drum screen to the inspection tank may be automatically guided in a natural falling manner.

As such, the oil-water separation and purification system according to the present invention and the oil-water separation and purification method using the same may provide a step-by-step oil-water separation and treatment process in contaminated water with water and oil mixed therein, so as to efficiently separate and discharge water and oil to purify the same, may provide a step-by-step oil-water separation and treatment process suitable for a field installation section, so as to efficiently separate and discharge water and oil, and may automatically guide a flow of the oil-water according to the oil-water separation and treatment process in a natural falling manner, thereby providing work efficiency and automation of the process.

The present invention may provide a device having a separate oil-discharging portion for automatically separating oil and collecting 99% or more of animal and vegetable oils discharged from kitchen, in which a content of animal and

vegetable fats and oils in the discharged water is 20 mg/L or less, and the collected oil has a water content of less than 1%, thus providing a high degree of purity and a high value of recycling. According to the Enforcement Rules of the Sewerage Act, a screen with an effective interval of 10 mm or less may need to be installed at an inlet through which solid substances are introduced, and a fat & oil blocking device may need to be installed at the inlet through which fats and oils are introduced. In the Enforcement Rules of the Water Environment Conservation Act, a permissible emission criterion for animal and vegetable fats and oils in the normal hexane extract materials is 30 mg/L.

Although the present invention has been illustrated and described with reference to preferred embodiments as described above, the present invention is not limited to the above-described embodiments, and various modifications and variations can be made by those skilled in the art within the equivalent range of the technical spirit of the present invention and the appended claims to be described below without departing from the spirit of the present invention.

20

[List of reference numbers]

100 : Oil-water storage tank	200 : Supply pump
300 : Drum screen	310 : Base frame
320 : Inner container	330 : Rotating drum container

340 : Rotating screw	350 : Roller driving portion
360 : Air nozzle	400 : Scum skimmer
410 : Base frame	420 : Housing body
430 : Oil-water inlet pipe	440 : Air diffuser
5 450 : Steam pipe	460 : Auxiliary heater panel
470 : Water discharge pipe	480 : Scraper device
490 : Scum outlet	500 : Oil-water separator
510 : Box body	520 : Oil-water inlet
530 : Water outlet	540 : First partition wall
10 portion	
550 : Second partition wall portion	560 : Third partition
wall portion	
570 : Oil blocking plate	580 : Ball trap oil
discharge portion	
15 590 : Heating unit	600 : Inspection tank
700 : Drainage pump	1100 : Oil-water reservoir
1200 : Raw liquid supply pump	1300 : Recovery pump
1400 : Scum storage tank	

【CLAIMS】

【Claim 1】

An oil-water separation and purification system comprising:
an oil-water storage tank, into which oil-water is introduced
5 and stored; a supply pump for discharging and moving the oil-
water from the oil-water storage tank; a drum screen for
primarily pretreating various kinds of sludge in the oil-water
introduced from the supply pump; a scum skimmer for separating
the residual sludge and the oil-water in a dual manner from the
10 oil-water primarily filtered from the drum screen and
secondarily pretreating the same; an oil-water separator for
separating water and oil in a dual manner from the oil-water
pretreated by the scum skimmer and purifying and discharging the
same; an inspection tank for confirming a degree of turbidity
15 in the water separated and discharged from the oil-water
separator; and a drainage pump connected to a bottom of the
inspection tank and configured to discharge the finally purified
water to sewage, wherein the oil-water separation and
purification system is installed to mutually separate water and
20 oil mixed in the oil-water to purify the same, wherein

a height of equipment installed from the drum screen to
the drainage pump is sequentially formed to have a step
difference, so that a flow of the oil-water from the drum screen
to the inspection tank is automatically guided in a natural
25 falling manner, and wherein

the scum skimmer includes: a base frame supported on a bottom; a housing body supported by the base frame, configured to have oil-water containing water and scum introduced from a lower portion thereof, and configured to have a dual structure
5 of an inner container and an inside container therein; an oil-water inlet pipe installed to penetrate the bottom at a side surface of the housing body, and to inject oil-water; an air diffuser installed to penetrate the bottom of the housing body, and to supply air through a ring blower; a steam pipe installed
10 inside the housing body, so as to decompose the water and scum by heat in the oil-water; an auxiliary heater panel installed inside the housing body, so as to decompose the floating scum by heat again; a water discharge pipe connected to the inside container at a center of the housing body, so as to discharge
15 the purified water with the scum filtered therefrom; a scraper device driven by a motor at an upper side of the housing body, thereby rotating to sort and discharge the scum from a surface of the oil-water; and a scum outlet configured to discharge the scum sorted by the scraper device.

20

【Claim 2】

The oil-water separation and purification system of claim 1, wherein the drum screen includes:

a base frame; an inner container installed inside the base

frame, and configured to have a space into which the filtered oil-water with sludge filtered therefrom is introduced; a rotating drum container installed to be rotatable at an upper portion of the inner container, and configured to filter and
5 treat the sludge by filtering the sludge from the oil-water using a rotational centrifugal force; a rotating screw formed with an oil-water inlet into which the oil-water is introduced at one side thereof, installed to be rotatable together with the rotating drum container, and installed to discharge the sludge
10 forward; a roller driving portion including a main roller and an auxiliary roller installed to interwork and drive the rotating drum container; a driving motor configured to transmit power to the main roller of the roller driving portion; and an air nozzle installed in the inner container, and installed to
15 remove the residual sludge from the rotating drum container by spraying air to the residual sludge, in which

when the oil-water is introduced at one side of the rotating screw, the rotating drum container and the rotating screw rotate at the same time, the oil-water introduced through
20 the oil-water inlet is discharged forward by filtering the sludge through the rotating screw, and the oil-water with the sludge filtered therefrom is discharged to an outer circumference of the rotating drum container, so as to be accommodated in the inner container.

【Claim 3】

The oil-water separation and purification system of claim 1, wherein the scum skimmer is configured such that the oil-water is introduced into the housing body along the oil-water inlet pipe, so as to be decomposed into water and scum by air bubbles generated by the air diffuser and heat generated by the steam pipe, the scum floated through the scraper device rotated at an upper side is discharged to the scum outlet, and purified water with the scum removed therefrom is purified and discharged through the water discharge pipe.

【Claim 4】

The oil-water separation and purification system of claim 1, wherein the inside container of the housing body has a pipe connection hole formed at one side thereof, so that the water discharge pipe passes therethrough, and

the inside container further includes at least two or more water flow holes which are vertically formed at a bottom surface adjacent to a bottom of the inner container, so as to allow water to pass through the inner container.

20 【Claim 5】

The oil-water separation and purification system of claim 1, wherein the oil-water separator includes:

a box body provided with a cover on an upper end thereof

and provided in a form of a water tank; an oil-water inlet through which the oil-water with water and oil mixed therein is introduced at one side of the box body; a water outlet through which water with oil separated therefrom is discharged at one side opposite to the oil-water inlet; a first partition wall portion provided at a position adjacent to the oil-water inlet inside the box body and vertically installed up to a position spaced apart from a bottom of the box body, so that the introduced oil-water flows downward; a second partition wall portion vertically installed at a position adjacent to the water outlet inside the box body, so as to be spaced apart from the bottom of the box body, so that the water with oil separated therefrom flows from a lower portion to an upper portion; a third partition wall portion vertically installed at a position adjacent to the water outlet inside the box body while maintaining a predetermined interval from the second partition wall portion and formed to carry water coming up from a lower portion forward; an oil blocking plate horizontally installed at a predetermined height between the first partition wall portion and the second partition wall portion; a ball trap oil discharge portion coupled to an upper end of one side of the oil blocking plate, so as to discharge only the floated oil; and a heating unit installed at a lower portion of the oil blocking plate, so as to heat the introduced oil-water to a predetermined temperature, in which

the ball trap oil discharge portion further includes: a housing screw-coupled to an upper end of one side of the oil blocking plate; an oil discharge valve, of which an upper end has a vertical inner diameter and of which a lower end has an inclined inner diameter structure inside the housing; a ball trap installed to be movable to suit an amount of oil drained in accordance with the oil discharge valve, thereby operating to turn on/off the valve; a ball separation preventing net configured to extend in a net shape to a lower end portion of the housing, thereby preventing the ball trap from being separated; and an oil discharge pipe configured to guide discharge of oil outside by an on-off operation of the ball trap in the oil discharge valve.