

IMPROVED OIL INTERCEPTOR

TECHNICAL FIELD

5

The invention relates to a low cost device and process to separate oil waste from waste water temporarily kept in oil interceptors and related process for removal and transport of said oil waste for disposal and/or recycling.

10 BACKGROUND OF THE INVENTION

Currently, factories, workshops, eating establishments and others install and maintain oil interceptors to prevent waste oil from flowing into the sewers. The function of these oil interceptors is to trap the waste oil, preventing it from being discharged into the sewer, and temporarily store the waste oil, pending removal. These oil interceptors can be one or more than one compartments, can be rectangular, circular or in any other shape. Normally, an establishment having an oil interceptor in its premises would engage a sewage disposal contractor to remove the waste oil from the oil interceptor for disposal at the contractor's own source. The contractor would arrange for a tanker with a suction pump and pipe to extract out the waste oil from the oil interceptor. The waste oil would have to be further treated before disposal or re-cycling. Although this arrangement has been working for decades until now, this arrangement is both expensive and time consuming to carry out and still not environment-friendly enough.

25 As water is an important resource, and waste oil disposal is still a problem, even after removal from said oil interceptor, improvement should be made to this process with an object of recycling both waste water and oil waste more efficiently.

There are many approaches towards improvements in oil interceptors. One approach is for oil interceptors to use a simple hydrocyclone principle. Oily water separation is achieved by pumping oily wastewater tangentially into the cone shaped separator. This creates a spinning vortex which accelerates as the water is forced down the cone. Strong centrifugal forces separate the heavier water phase to the outside of the vortex while the lighter oil phase moves to the centre. The separated oil is removed through an orifice located in the inlet end and the treated water is discharged through the opposite end.

Another approach proposed by JP 10316994 is to use mechanical means such as a system of pumps to separate the supernatant oil from the settled oil.

5 Yet another approach is to add chemicals to separate the waste oil from the waste water. Such an approach had been proposed in JP 2003 238989 in which an alkali catalyst was proposed. JP 2001 000115 offers a solution wherein the waste food oil is converted to a easily handled semi solid or solid feed by attaching the oil to powder of a dried spongy waste food by adhesion or inclusion taking advantage of capillary
10 phenomenon.

All the prior art solutions involve expenditure on some form of purpose built machinery which is expensive and requires maintenance. Alternatively if chemicals are used, further process of the waste oil would have to be carried out if the waste oil is to be
15 recycled.

The approaches to separation of waste oil from waste water produced from the work processes in factories, workshops, eating establishments and others using any of the prior art is therefore costly and complex.

20 What is required is a simple and low cost process to separate the oil waste and water waste from each other and then upon said separation, said process allows for easy, efficient and quick removal of both types of waste and one in which no additional processes are necessary before taking the waste oil and waste water for disposal or
25 recycling.

SUMMARY OF INVENTION

The inventor has proposed an improved oil interceptor with a temperature reducing device in the inlet chamber of the oil interceptor to reduce the temperature of the
30 oil waste and water waste to a cooling temperature range and upon reaching the cooling temperature range, the oil waste is turned into a jelly-like substance. The oil waste which is now a jelly-like substance enables separation of the oil waste from the water waste. The jelly-like substance oil waste is also easily removed from the
35 oil interceptor and disposed of.

The temperature reducing device can be either a chiller or a cooler in the inlet chamber of the oil interceptor. The chiller or cooler can be adapted to be fitted into inlet chamber of an oil interceptor. New oil interceptors can also be manufactured with a chiller or cooler device installed in the inlet chamber. It is possible for inlet chambers of existing oil interceptors to be modified to have the chiller or cooler fitted in them.

The chiller or cooler reduces the temperature of the oil waste and water waste in the oil interceptor to around 2 – 10 °C, preferably from 2 to 3 °C. At this cooling temperature range, the oil waste turns into a jelly like state. However, the waste water would still be in liquid form and continues to be drained out of the oil interceptor and be discharged from the oil interceptor into the sewers.

The jelly-like oil waste would then removed easily regularly for disposal or recycling.

DRAWINGS

Fig. 1 is an example of the oil interceptor currently in use.

Fig. 2 is a drawing of the improved oil interceptor, with the temperature reducing device in the inlet chamber, during normal operations.

Fig. 3 is a drawing of the improved oil interceptor with the temperature reducing device in the inlet chamber, after the oil waste had been turned into a jelly-like state.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

An description of an embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings.

Fig. 1 is an example of the oil interceptor currently in use.

The oil interceptor of the prior art can have one or more than one compartments. In Fig. 1, the oil interceptor has an inlet chamber, an intermediate chamber and an outlet

chamber. The oil interceptor can be circular or rectangular in shape or can be any shape. It can be made of any material. The oil interceptor would have a removable cover, so that the waste oil could be extracted from the oil interceptor, by a contractor for eventual disposal or recycling. Since waste oil is lighter than waste water, the waste oil would always be on top of the waste water. As the waste oil and waste water is discharged by the establishment, the waste oil and waste water is directed into the inlet chamber of the oil interceptor. The waste oil and waste water would gradually fill up the inlet chamber. Since oil is lighter than water, the oil would float to the top in the inlet chamber. The waste water would flow from a T-pipe in the first chamber into the intermediate chamber and from another T-pipe into possibly a outlet chamber and finally discharged into the sewers.

Fig. 2 is a drawing of the improved oil interceptor, with the temperature reducing device in the inlet chamber, during normal operation. In this embodiment, the chiller is an integral part of the oil interceptor, being manufactured as a chiller cum oil interceptor.

The chiller cum oil interceptor of the invention has an inlet chamber, a second chamber for waste water to accumulate and a third valve chamber. The chiller cum oil interceptor can be circular or rectangular in shape or can be of any shape. The chiller cum oil interceptor can also be made of any material and have suitable insulation, for more efficient cooling of the oil interceptor. Only the first (or inlet chamber) has a chiller to reduce the temperature of the waste oil and waste water stored therein. The chiller cum oil interceptor has a slidable cover, for removal of the waste oil when the waste oil had been chilled and turned into a jelly-like state.

In operation, the waste oil and waste water is discharged by the establishment into the chiller cum oil interceptor. Again, the waste oil and waste water is directed into the inlet chamber of the oil interceptor. The waste oil and waste water would gradually fill up the inlet chamber. Since oil is lighter than water, the oil would float to the top in the inlet chamber. The waste water would flow from a T-pipe in the first chamber into the intermediate chamber through a flap valve. The intermediate chamber has a removable slab, so that samples of the waste water stored therein can be obtained, for testing purpose. The waste water would finally flow out via gravity through a valve chamber to be discharged into the sewers.

Since waste oil is lighter than waste water, the oil would always be on top of the waste water stored within the inlet chamber. As the waste oil and waste water is discharged by the establishment, the waste oil and waste water flows into the inlet chamber of the chiller cum oil interceptor, gradually filling the inlet chamber. Since oil is lighter than water, the oil would float to the top in the inlet chamber. As more and more waste water and waste oil is being discharged into the chiller cum oil interceptor throughout the day, the waste oil would continue to accumulate within the inlet chamber while most of the waste water would flow from the T-pipe in the inlet chamber into a horizontal pipe through a flap valve, and into the intermediate chamber.

The T-pipe of the chiller cum oil interceptor acts as an escape pipe and is of a length calibrated with the dimensions of the oil interceptor so that excess water can always flow out, into the intermediate chamber, leaving the waste oil in the inlet chamber, which is fitted with the chiller.

It should be note that the third or valve chamber of the chiller cum oil interceptor will also include a stagnant water release valve leading from a outlet pipe at the bottom of the chiller cum oil interceptor. This stagnant water release valve can be opened to flush out stagnant water at the bottom of the chiller cum oil interceptor which has a tendency to remain behind.

The chiller cum oil interceptor has an sensor and an autoswitch. When the waste oil reaches a pre-determined height (almost full capacity for oil waste), the chiller would be automatically switched on. However, the capacity of the chiller cum oil interceptor should be such that it can hold a normal day's waste oil discharge. This being the case, the chiller can also be switched on at the end of the day. The chiller, upon activation, would reduce the temperature of the oil waste from ambient temperature until the oil waste cools down to a jelly-like substance.

The function of the sensor is to detect the state of the oil waste in the chamber of the oil interceptor, so that when the oil waste is turned into a jelly-like substance, the sensor will then send a signal or sound a buzzer to signal the waste oil can be disposed.

If the autoswitch is to turn on the chiller at the end of the day e.g. when the food establishment closes for the night, the autoswitch will activate the chiller at the pre-determined time. The temperature of the oil waste and water waste in the inlet chamber of the oil interceptor would then be cooled down. By early morning, the temperature of the oil waste will reach the cooling range which is generally from 2 to 10 ° C and more specifically from 2 to 3 ° C. Once the cooling range is reached, the oil waste would turn into a jelly-like substance, floating on top of the water, which is still not frozen and therefore in liquid state.

When the chiller is switched on, the temperature of the waste oil and water will gradually be lowered until 2 – 10 ° C. Waste oil consists of molecules in long chains called lipids, usually with a mixture of molecules of different sizes and shapes. That makes it hard for the waste oil to form a regular crystal, suppressing ordinary freezing. Cooling down oil does make it resist flow however, becoming more "viscous". Eventually, when the temperature of the oil waste is cold enough, the oil will seem to be quite solid, as the molecules lose the energy needed to move around. Waste oil does not have a sharply defined freezing point, like water. When the temperature reaches 2 – 10 ° C and more specifically 2 – 3 ° C, the waste oil turns into a jelly-like substance and floats on top of the waste water. When the waste oil turns into this jelly-like substance, it is soft and not in a frozen hard state.

Referring to Fig. 3, the waste oil and waste water in the inlet chamber of the chiller cum oil interceptor, is now at the end of the temperature reducing cycle, and had reached the cooling range. Upon reaching the cooling range, the oil waste in the inlet chamber of the chiller cum oil interceptor is now turned into a jelly-like state. The waste oil is soft and not frozen hard. This makes removal of the jelly-like oil waste easy. The sliding cover of the inlet chamber of the chiller-cum oil interceptor is then moved away, to facilitate the removal of the jelly-like oil waste.

In working, the inlet chamber of oil interceptor selected is one of about double the capacity of the daily waste oil discharge. This inlet chamber of the oil interceptor can act as a chiller by the installation of a chilling or cooling motor. For safety reason, its height should not be more than 1 400mm. An auto switch will be installed to turn on/off the chiller cum oil interceptor at a fixed time e.g. from 8 pm at night to the next morning at 7am. There are two guiding factors here, the flow should not be interrupted while the

premises is in operation and the waste oil should be in jelly-like state when the power supply to the chiller is switched off. A sensor can also be installed in the inlet chamber, so that once the waste oil is turned into the jelly-like state, the sensor detects this state and sends a signal to indicate that the waste oil could be collected.

The waste oil in its jelly-like state can then be easily removed manually by scooping out the jelly-like oil waste. This method obviates the necessity to arrange for a tanker to suck out the waste water and waste oil from the oil interceptor, thereby avoiding the noise pollution associated with such tankers.

Since the chiller cum oil interceptor has a stagnant water release valve leading from a outlet pipe at the inlet chamber of the chiller cum oil interceptor, this stagnant water release valve can be opened to flush out stagnant water at the bottom of the inlet chamber and intermediate chambers of the chiller cum oil interceptor.

While only one embodiment (a chilling device cum oil interceptor) has been described, other embodiments are also envisaged. It is possible the chiller or cooler can be adapted and fitted into an existing oil interceptor, with appropriate modifications.

This inventive process and method is therefore save a lot of space as it requires a smaller capacity oil interceptor, is easy to maintain and relatively low cost,

The inventive process is also environmental friendly. The waste oil can be removed easily and disposed off as debris or recycled. Moreover, because of the inventive process dispenses with the use of an oil tanker to convey the sludge, pollution problems associated with it will be eliminated which includes spillage into the surrounding and possibly noise pollution caused during the removal of the sludge from the oil interceptor. The capital investment in such oil tankers can be dispensed with in preference to the cost of the freezing device or chilling device or cooling device and costs of modification of existing oil interceptors or the total costs of improved oil interceptor fitted with such freezing device or cooling device or chilling device.

Based on the same principle, the invention shall be extended to cover all waste liquid removal by first converting them from liquid form into solid form for ease of disposal. One of such extension is to use a floating vessel/freezer to remove oil leaks in the high sea.

ADVANTAGEOUS EFFECTS OF THE INVENTION

5 The invention will provide an easy way to dispose oil in the oil interceptor. If implemented, there is no longer any requirement for the service of sewage tanker or sewage disposal contractor.

10 The inventive process helps the owners save substantial sums on the maintenance of the oil interceptors annually. Moreover, the inventive process is cleaner, since there is no spillage into the surrounding area where the oil interceptor is installed, as compared to the current method.

15 The new invention will almost ensure there is not a single drop of oil to be discharged into the sewer.

In addition, the waste oil collected can be recycled as against the current method of disposed as debris. Thereby the inventive process will make our environment cleaner.

20 Besides using the chilling device or cooling device being fitted in oil interceptors, the invention can also be used in the high sea in the collection of spillage of crude oil from the oil tankers. Basically the same inventive device in the form of chilling device or cooling device of an appropriate size and capacity can be used for reduce the temperature of the oil spill turning the oil spill into a jelly-like substance, which can facilitate easy removal of large amounts of oil spilled into the oceans.

25 Besides helping the owners to save a big sum on the maintenance of their oil interceptors, this new method is cleaner and environmental friendly. The waste oil can be removed easily and disposed off as debris or recycled. Moreover, because of the inventive process dispense with the use of an oil tanker to convey the sludge, pollution problems associated with it will be eliminated which includes spillage into the surrounding and possibly noise pollution caused during the removal of the sludge from the oil interceptor. The investment costs in oil tankers can also be dispensed with.

30

35

CLAIMS

1. An improved oil interceptor for the temporary storage of oil waste and water waste
5 which are waste products in factories, workshops, food outlets, the oil interceptor
having an inlet chamber, an intermediate chamber and an outlet chamber, the inlet
chamber having an escape T-pipe of a length calibrated with the dimensions of the oil
interceptor such that excess water can flow out of the inlet chamber into the
intermediate chamber, leaving the waste oil on top of waste water in the inlet
10 chamber of the oil interceptor,

characterized by the inlet chamber having a temperature reducing device to
reduce the temperature of the oil waste and water waste to a cooling range such
that the oil waste is turned into a jelly-like substance while the water waste remains
15 in liquid form, thereby separating the frozen oil waste from the waste water, so that
the jelly-like oil waste could be removed from the inlet chamber of the oil interceptor.

2. The temperature reducing device in the inlet chamber of the improved oil
interceptor as claimed in Claim 1, the device being a chiller to reduce the
20 temperature of the oil waste and water waste to the cooling range for waste oil
which is generally from 2 – 10 ° C.

3. The temperature reducing device in the inlet chamber of the improved oil
interceptor as claimed in Claim 1, the device being a cooler to reduce the
25 temperature of the oil waste and water waste to the cooling range for waste oil
which is generally from 2 – 10 ° C.

4. The temperature reducing device in the inlet chamber of the improved oil
interceptor as claimed in Claim 1, the device being a chiller to reduce the
30 temperature of the oil waste and water waste to the cooling range for waste oil
which is preferably from 2 – 3 ° C.

5. The temperature reducing device in the inlet chamber of the improved oil
interceptor as claimed in Claim 1, the device being a cooler to reduce the
35 temperature of the oil waste and water waste to the cooling range for waste oil
which is preferably from 2 – 3 ° C.

6. The temperature reducing device in the inlet chamber of the improved oil interceptor as claimed in Claim 1, wherein the device is a modified inlet chamber which acts as a inlet chamber cum chiller.

5

7. The temperature reducing device in the inlet chamber of the improved oil interceptor as claimed in Claim 1, wherein the device is a modified inlet chamber which acts as a inlet chamber cum cooler.

10 8. The temperature reducing device in the inlet chamber of the improved oil interceptor as claimed in Claim 1, wherein the device is adapted and installed in the inlet chamber of oil interceptors.

15 9. An improved oil interceptor as claimed in Claim 1, the improved oil interceptor having a sensor to detect the state of the oil waste and water waste in the inlet chamber and when the waste oil turns into a jelly-like state after reaching the cooling range, the sensor would send a signal so that maintenance personnel could remove the jelly-like oil waste from the inlet chamber.

20 10. An improved oil interceptor as claimed in Claim 1, the improved oil interceptor having an autoswitch so that once the oil waste in the chamber of the oil interceptor reaches a pre-determined height, the autoswitch will be activated to switch on the temperature reducing device, to reduce the temperature of the oil waste and waster waste in the inlet chamber to the cooling range.

25

11. An improved oil interceptor as claimed in Claim 1, the improved oil interceptor having preferably an autoswitch so that at a pre-determined time of the day, the autoswitch would turn on the temperature reducing device to reduce the temperature of the oil waste and water waste in the inlet chamber to the cooling range.

30

12. An improved oil interceptor as claimed in Claim 1, the improved oil interceptor having a stagnant water release valve, said stagnant water release valve leading from a pipe at the bottom of the inlet chamber, through intermediate chamber into the valve chamber for the flushing out of stagnant water which tends to remain at the bottom of the inlet chamber and intermediate chamber of the chiller cum oil

35

interceptor.

10. An improved process to separate oil waste from water waste in an oil
5 interceptor used for the temporarily storage of oil waste and water waste which are
waste products in factories, workshops, food outlets, the oil interceptor having an inlet
chamber, an intermediate chamber and a valve chamber, the inlet chamber having
an escape pipe of a length calibrated with the dimensions of the oil interceptor such
that excess water can flow out, leaving the waste oil in the oil interceptor,

10 wherein the improved process uses a temperature reducing device to reduce the
temperature of the oil waste and water waste in the inlet chamber until the oil waste
reaches the cooling range and is turned into a jelly-like substance while the water
waste remains in liquid form, thereby separating the frozen oil waste from the jelly-like
15 oil waste, so that the jelly-like oil waste could be removed from the oil interceptor.