

METHOD FOR TREATING CONCENTRATED WASTE LIQUID

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims priority on Taiwanese Patent Application No. 100145490, filed on December 9, 2011.

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BACKGROUND OF THE DISCLOSURE

1. Technical Field

The technical field relates to a method for treating a highly concentrated waste liquid.

10 2. BACKGROUND

Since the climate change and human population growing rapidly, the distribution of water resources is an urgent issue. Particularly, it is an urgent issue to recycle waste water from the optoelectronics, semiconductor, petrochemical and steel industries.

Industrial waste water is recovered in multiple stages, and in a concentrated
15 procedure to produce a concentrated waste liquid containing a high concentration of salts. Traditionally, evaporation is performed to concentrate the waste liquid and reduce the volume of the waste liquid. However, evaporation consumes lots of energy and also needs additional equipment and facilities. This procedure is complicated and has high costs.

20 Further, in the conventional treatment and recycling of waste water, sludge is formed. Generally, a sludge dewatering device and a sludge drying device are used for reducing water content of the sludge; alternatively, the sludge is dried by a sludge drying device to form dried sludge to be further processed.

In the current methods for treating waste water, a concentrated waste liquid with

high concentration of salts and a dried sludge are formed, then the waste liquid is further concentrated via evaporation, and the dried sludge is buried. Thus, the conventional methods take a long time, and have high costs for treating the concentrated waste liquid.

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SUMMARY

One embodiment of the invention provides a method for treating a concentrated waste liquid having a high salt concentration. The method includes the steps of mixing a sludge cake and the concentrated waste liquid to form a sludge mixture containing the salt, and dewatering the sludge mixture to form a dried sludge.

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In one embodiment of the invention, the dewatered sludge cake is mixed with a concentrated waste liquid having a high salt concentration, and then heated via evaporation to form a dried sludge, such that the salt in the concentrated waste liquid stays in the dried sludge.

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BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a flow chart showing the method for treating a concentrated waste liquid having a high salt concentration according to the present invention.

DETAILED DESCRIPTION

In the following detailed description, for purposes of explanation, numerous specific details are set forth in order to provide a more thorough understanding of the disclosed embodiments. It will be apparent, however, that one or more embodiments may be practiced without these specific details. In other instances, well-known structures and devices are shown schematically in order to simplify the drawing.

In one embodiment of the invention, the method for treating a concentrated waste liquid having a high salt concentration includes the steps of mixing a sludge cake and the

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concentrated waste liquid having the high salt concentration to form a sludge mixture containing the salt, and dewatering the sludge mixture to form a dried sludge. In one embodiment of the present invention, the concentrated waste liquid to be treated has conductivity in the range of about 10 to 200 mS/cm, or in the range about 30 to 180 mS/cm, or in the range of about 50 to 160 mS/cm. The concentrated waste liquid having a high salt concentration may be, but not limited to, an organic concentrated waste liquid, an inorganic concentrated waste liquid or a combination thereof; wherein the organic concentrated waste liquid includes at least an organic component selected from the group consisting of a hydrocarbon, an alcohol, a ketone, an aldehyde, an acid, an ester and a phenol; and the inorganic concentrated waste liquid includes at least an inorganic component selected from the group consisting of a calcium salt, a sodium salt, a magnesium salt, an aluminum salt and an ammonium salt.

FIG. 1 shows a procedure for treating a concentrated waste liquid having a high salt concentration. The dewatered sludge cake 12 is mixed with a concentrated waste liquid 13 having a high salt concentration to form a sludge mixture 14 containing the salt. In this embodiment, the sludge cake may be obtained from a waste water treatment plant, and sludge cake 10 having about 95 to 99 wt% of water is dewatered by a sludge dewatering machine 11 to form the sludge cake 12. Generally, the water content of the sludge cake is in the range of about 55 to 80 wt%, and preferably in the range of about 60 to 70 wt%. The sludge cake may be, but not limited to, an organic sludge cake, an inorganic sludge cake or a combination thereof, wherein the organic sludge cake may be a biological waste sludge including at least an organic component selected from the group consisting of a microbial cell, a protein, a hydrocarbon, an alcohol, a ketone, an aldehyde, an acid, an ester and a phenol; and the inorganic cake may be a chemical sludge including at least an inorganic component selected from the group consisting of a calcium salt, a sodium salt, a magnesium salt, an aluminum salt and an iron salt.

In another embodiment of the present invention, the sludge cake and the concentrated waste liquid having high salt concentration may be mixed in a proper ratio according to the components or water content of the sludge cake. Generally, the sludge mixture is formed in a weight ratio of the sludge cake to the concentrated waste liquid, in the range of about 10:6 to 10:3, or in the range of about 10:4 to 10:3. If the sludge mixture has too high a water content, it would be very difficult to dewater the sludge mixture. The water content of the sludge mixture is in the range of about 89 to 92 wt%, or in the range of about 90 to 91 wt%, or in the range of about 89 to 90 wt%.

As shown in FIG. 1, in one embodiment of the present invention, the sludge cake 12 and the concentrated waste liquid 13 having a high salt concentration are mixed to form the sludge mixture 14 containing the salt, and then the sludge mixture 14 is dewatered by the sludge dewatering machine 15, such that the salt in the concentrated waste liquid stays in dried sludge 16. Thus, the concentrated waste liquid is treated, and meanwhile, the sludge is dried and has a smaller volume. In another embodiment of the present invention, the sludge mixture having the salt is dewatered by heat to form a dried sludge. Generally, heating is performed at a temperature ranging from about 100 to 250°C, or at a temperature ranging from about 150 to 250°C, or at a temperature ranging from about 200 to 250°C, to dewater the sludge mixture, and so as to form a dried sludge. Generally, the dried sludge formed in the embodiment of the present invention has a water content which is less than 40 wt%, or less than 30 wt%, and more preferably less than 20 wt%.

Embodiment(s)

A sludge cake (organic sludge, water content: 87 wt%) was obtained via a dewatering machine in an optoelectronics plant, and the concentrated waste liquid having a high salt concentration (a mixture of an organic waste liquid and an inorganic waste liquid, conductivity: 38 mS/cm) was obtained from an optoelectronics plant. The sludge cake and the concentrated waste liquid were mixed to form a sludge mixture having 90 wt% of

water and a sludge mixture having 91 wt% of water, respectively. The sludge mixture was dried by a high performance two-stage sludge drier (Hyper X 0500). The test conditions and the results are shown as follows:

(1) Preparation of the sludge mixture having 90 wt% of water: 10 kg of the sludge cake and 3 kg of the concentrated waste liquid were mixed at 230°C, and the conveying rate of introducing the sludge cake and the concentrated waste liquid was 90 cm/min.

(2) Preparation of the sludge mixture having 91 wt% of water: 10 kg of the sludge cake and 4.5 kg of the concentrated waste liquid were mixed at 230°C, and the conveying rate of introducing the sludge cake and the concentrated waste liquid was 90 cm/min.

Water content before test (wt%)	Water content after 1 st stage drying (wt%)	Water content after 2 nd stage drying (wt%)	Water removal rate (%)	Operation temperature (°C)	Weight before test (kg)	Weight of removed water (kg)	Conveying rate (cm/min)
90	50.7	1.6	97	230	13.0	11.7	90
91	57.9	2.5	98	230	14.5	13.0	90

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In this embodiment, the sludge cake and the concentrated waste liquid were mixed to form a sludge mixture having 90 wt% of water and a sludge mixture having 91 wt% of water, respectively. After the first drying stage, the water content of the sludge mixture was in the range of 50 to 60% wt%, and after the second drying stage, the water content of the sludge mixture was in the range of 1.5 to 2.5wt%. Accordingly, water removal rate was more than 97 wt%. The water in the sludge mixture was effectively removed to form a dried sludge, and the salt in the concentrated waste liquid remained in the dried sludge for further treatment.

In comparison with the prior art, whereby salts reduction in a concentrated waste liquid is achieved by means of an evaporation-based concentration device, the embodiments of the present invention show that a dewatered sludge cake is mixed with a concentrated waste liquid having a high salt concentration, so as to save space for
5 equipment and facilities, thereby simplifying the procedure and reducing costs.

It will be apparent to those skilled in the art that various modifications and variations can be made to the disclosed embodiments. It is intended that the specification and examples be considered as exemplary only, with the true scope of the disclosure being indicated by the following claims and their equivalents.

CLAIMS

1. A method for treating a concentrated liquid having a high salt concentration, comprising the steps of:
 - mixing a sludge cake and the concentrated liquid having high salt concentration to
 - 5 form a sludge mixture having the salt; and
 - dewatering the sludge mixture having the salt to form a dried sludge.
2. The method of claim 1, wherein a water content of the sludge cake is in the range of 50 wt% to 90 wt%.
3. The method of claim 1, wherein the concentrated waste liquid has conductivity in the
- 10 range of 10 to 200 mS/cm.
4. The method of claim 1, wherein the sludge cake and the concentrated waste liquid are mixed in a weight ratio in the range of 10:6 to 10:3, to form the sludge mixture.
5. The method of claim 1, wherein the water content of the sludge mixture is less than 92 wt%.
- 15 6. The method of claim 1, wherein the water content of the dried sludge is less than 40 wt%.
7. The method of claim 1, wherein the dried sludge is an organic sludge including at least an organic component selected from the group consisting of a microbial cell, a protein, a hydrocarbon, an alcohol, a ketone, an aldehyde, an acid, an ester and a phenol.
- 20 8. The method of claim 1, wherein the dried sludge is an inorganic sludge including at least an inorganic component selected from the group consisting of a calcium salt, a sodium salt, a magnesium salt, an aluminum salt and an iron salt.
9. The method of claim 1, wherein the concentrated waste liquid is an organic waste liquid including at least an organic component selected from the group consisting of a

hydrocarbon, an alcohol, a ketone, an aldehyde, an acid, an ester and a phenol.

10. The method of claim 1, wherein the concentrated waste liquid is an inorganic waste liquid including at least an inorganic component selected from the group consisting of a calcium salt, a sodium salt, a magnesium salt, an aluminum salt and an ammonium salt.