

SYSTEM AND METHOD FOR REMEDIATION OF DREDGED SOIL OR SEDIMENT

CROSS-REFERENCE(S) TO RELATED APPLICATION

5 This application claims priority of Korean Patent Application No. 10-2015-0127599,
filed on September 9, 2015, in the Korean Intellectual Property Office, which is hereby
incorporated by reference in its entirety.

BACKGROUND

1. Technical Field

10 The present invention relates to a system and method for remediation of dredged
soil or sediment, and more particularly, to a system and method for remediation of dredged
15 soil or sediment, which can remediate a dredged soil complexly contaminated by various
pollutants including heavy metals and oils in an eco-friendly and economical way.

2. Description of the Related Art

20 Since sand and earthy matter or foreign substances carried from an inland area
and deposited on the bottom of a river or a harbor can impede a smooth flow of the river,
produce odors due to stagnant water, increase damage caused by flooding, or cause a ship
entering or leaving the harbor to be stranded, an operation of dredging sediments is
regularly performed for the purpose of environmental improvement and safe arrival and
departure of ships.

25 All over the world, various wastewaters flow into rivers and oceans due to
urbanization, industrial development, and the like, and soils contaminated by air pollutants
such as smoke from factories, trash, agricultural chemicals or fertilizers, and the like in
turn causes contamination of groundwater and river water.

As a result, in some regions, dredged soil often contains a large amount of

pollutants having high heavy metal concentration as well as domestic sewage and factory effluent. Particularly, when a river or a harbor has an industrial complex therearound, dredged soil from the river or the harbor is likely to be complexly contaminated by various pollutants such as heavy metals, oils, and the like.

5 Although contamination of sediments in rivers or seashore areas is an increasingly serious problem, typical soil remediation techniques exhibit low remediation efficiency and are thus difficult to apply to dredged soil. Therefore, there is a need for a technique capable of remediating dredged soil complexly contaminated by various pollutants.

10 Korean Patent Publication No. 10-2011-0130052 A (published on December 5, 2011) discloses a technique for remediation of dredged soil. This technique is a two-step advanced oxidation and washing method in which ultrasonication and chemical oxidation effective in removal of pollutants are used together with washing water (containing hydrochloric acid and EDTA) in two steps. This method can treat a large amount of heavy-metal contaminated dredged soil having high alkalinity and high organic matter content and containing a large amount of fine soil. However, this method has a problem in terms of
15 cost and management due to use of various chemicals including hydrochloric acid, EDTA, and hydrogen peroxide.

BRIEF SUMMARY

20 Exemplary embodiments of the present invention provide a system and method for remediation of dredged soil, which can treat dredged soil highly contaminated by various pollutants using a heat-treatment unit configured to volatilize oil pollutants and an extraction unit configured to extract and remove heavy metals while allowing the treated
25 dredged soil so as to be reused as an available resource.

 Exemplary embodiments of the present invention provide a system and method for remediation of dredged soil, which can cheaply and efficiently remediate dredged soil highly contaminated by various pollutants using a single extraction agent, wherein the extraction agent used in primary extraction unit can be reused in secondary extraction unit
30 when a process of extraction heavy metals is performed repeatedly.

As disclosed, there is provided a system for remediation of dredged soil contaminated by pollutants, which includes: a heat-treatment unit removing pollutants by heating dredged soil to volatilize the pollutants; a pretreatment unit physically removing pollutants adhered to a surface of the dredged soil; a screening unit separating coarse soil having a larger particle size and fine soil having a smaller particle size from the dredged soil; and an extraction unit chemically treating pollutants remaining in the fine soil separated by the screening unit.

In the system for remediation of dredged soil according to the present invention, contaminated dredged soil may be subjected to heat treatment in the heat-treatment unit, supplied to the pretreatment unit to be physically treated, and supplied to the screening unit to be separated according to soil particle size, and the separated fine soil may be chemically treated by the extraction unit.

The heat-treatment unit may heat the dredged soil to a temperature of 300°C to 400°C from 20 to 40 minutes.

The pretreatment unit may include a drum washer mixing the dredged soil with process water while causing friction therebetween to facilitate removal of pollutants from the dredged soil, and an air turbulencing pipe separating agglomerated particles of the dredged soil to facilitate screening while separating pollutants by applying physical impact to the dredged soil using compressed air.

The screening unit may include a vibrational dehydration screen removing foreign substances and primarily separating coarse soil particles and the fine soil having pollutants accumulated thereon from the dredged soil treated by the pretreatment unit. When finer screening is required based on contamination characteristics according to the particle size of the dredged soil, the screening unit may include a multi-stage cyclone.

The screening unit may include at least one cyclone and at least one screen depending on the desired number of particle size fractions. When the screening unit includes a plurality of cyclones, the cyclones are disposed in a serial multi-stage fashion, and, when the screening unit includes a plurality of screens, the screens are disposed in a vertical multi-stage fashion (for example, double-decker).

The system for remediation of dredged soil may further include a solid-liquid

separator separating a solid substance and a liquid substance from a slurry composed of washing water and the fine soil separated by the screening unit through coagulation and precipitation.

The extraction unit may include: an extraction agent tank containing an extraction agent for extracting heavy metals; and at least one extraction tank mixing the fine soil with process water and the extraction agent and stirring the mixture to extract pollutants from the fine soil.

The extraction agent may be sulfuric acid.

The extraction tank may include a primary extraction tank and a secondary extraction tank based on the degree of contamination, wherein the extraction agent used in the primary extraction tank may be collected so as to be reused in the secondary extraction tank.

A ratio of the fine soil to washing water containing the extraction agent may be 1:3.

The system for remediation of dredged soil may further include a neutralization unit neutralizing the fine soil chemically treated by the extraction unit using a neutralizer.

The neutralizer may be caustic soda (sodium hydroxide) or fly ash.

The system may further include a dewatering unit reducing a moisture content of the neutralized fine soil and finally discharging the fine soil.

The dewatering unit may be a filter press.

The system may further include a wastewater treatment unit treating wastewater discharged from the solid-liquid separator and the extraction unit.

The wastewater treatment unit may include a neutralization tank, a dissolved air flotation tank, and an activated carbon adsorption tower, and water purified by the wastewater treatment unit may be stored in a process water storage tank so as to be reused.

In accordance with another aspect of the present invention, there is provided a contaminated dredged soil remediation method using the system for remediation of dredged soil as set forth above.

In accordance with a further aspect of the present invention, there is provided a system for remediation of dredged soil for remediating dredged soil contaminated by organic pollutants and heavy

metals, which includes: a heat-treatment unit removing pollutants by heating dredged soil to a temperature of 300°C to 400°C for 20 to 40 minutes to volatilize the pollutants; a pretreatment unit including a drum washer mixing the dredged soil with process water while causing friction therebetween to facilitate removal of pollutants from the dredged soil and an air turbulencing pipe separating agglomerated particles of the dredged soil to facilitate screening while separating pollutants by applying physical impact to the dredged soil using turbulence generated by compressed air so as to physically remove pollutants adhered to a surface of the dredged soil; a screening unit separating coarse soil having a larger particle size and fine soil having a smaller particle size from the dredged soil; an extraction unit chemically treating pollutants remaining in the fine soil separated by the screening unit using sulfuric acid, as an extraction agent, wherein the extraction agent used in primary extraction is reused in secondary extraction; and a neutralization unit neutralizing the fine soil chemically treated by the extraction unit using fly ash, as a neutralizer, wherein the contaminated dredged soil is subjected to heat treatment in the heat-treatment unit, supplied to the pretreatment unit to be physically treated, and supplied to the screening unit to be separated according to soil particle size, and the separated fine soil is chemically treated by the extraction unit.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other aspects, features, and advantages of the present invention will become apparent from the detailed description of the following embodiments in conjunction with the accompanying drawings, in which;

FIG. 1 is a schematic block diagram of a system for remediation of dredged soil according to one embodiment of the present invention;

FIG. 2 is a schematic block diagram of an exemplary screening unit of the system for remediation of dredged soil according to the embodiment of the present invention;

FIG. 3 is a schematic block diagram of an exemplary extraction unit of the system for remediation of dredged soil according to the embodiment of the present invention; and

FIG. 4 is a schematic block diagram of an exemplary wastewater treatment unit of

the system for remediation of dredged soil according to the embodiment of the present invention.

DETAILED DESCRIPTION

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A system for remediation of dredged soil according to exemplary embodiments of the present invention may be used to remediate soil complexly contaminated by various pollutants in an eco-friendly and economical way.

As used herein, the term "various pollutants" refers to materials including heavy metals and organic contaminants such as oils. However, this expression is not intended to exclude pollutants that include either several kinds of oils or several kinds of heavy metals. Since a system for remediation of dredged soil according to exemplary embodiments of the present invention can remediate dredged soil contaminated by pollutants including both heavy metals and organic contaminants, it is apparent that the system for remediation of dredged soil can also remediate dredged soil contaminated by several kinds of oils or heavy metals.

As used herein, the term "highly contaminated soil" refers to a soil having a TPH concentration of higher than 5,000 mg/kg. A system for remediation of dredged soil according to exemplary embodiments of the present invention can be highly effective in remediation of highly contaminated soil having a TPH concentration of higher than 5,000 mg/kg. Here, TPH is an abbreviation for total petroleum hydrocarbon and a higher TPH indicates a higher level of contamination by oils.

Hereinafter, a system and method for remediation of dredged soil according to exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings.

Referring to FIG. 1, a system for remediation of dredged soil according to one embodiment includes a heat-treatment unit 10 volatilizing and removing oils; a pretreatment unit 20 physically separating pollutants (for example, heavy metals, organic materials, and the like) from the surface of dredged soil; a screening unit 30 separating the soil according to size; and an extraction unit 50 chemically treating and removing

pollutants (for example, heavy metals) remaining on and inside fine soil separated by the screening unit.

The system for remediation of dredged soil according to this embodiment may further include a solid-liquid separator 40, which receives a slurry composed of fine soil and washing water from the screening unit after separation of coarse soil using the screening unit 30 and separates a solid substance (i.e. fine soil) and a liquid substance (i.e. washing water) from the slurry through coagulation and precipitation. The remediation system may further include a neutralization unit 60, which neutralizes and fertilizes the fine soil chemically treated by the extraction unit 50 for reuse of the fine soil, a dewatering unit 70, which reduces moisture content of the neutralized fine soil and finally discharges the fine soil, and a wastewater treatment unit 80, which treats wastewater discharged from the solid-liquid separator 40 and the extraction unit 50.

The heat-treatment unit 10 heats the dredged soil to a temperature of 300°C to 400°C for 20 to 40 minutes (for example, to 300°C for 30 minutes) to volatilize oils and organic pollutants. Through heat treatment by the heat-treatment unit 10, TPH can be completely removed from the dredged soil. As described above, TPH is an abbreviation for total petroleum hydrocarbon, and a higher TPH indicates a higher level of contamination by oils. The system for remediation of dredged soil according to this embodiment may be configured to allow pollutants volatilized by the heat-treatment unit 10 to be separately collected, purified, and discharged without being directly released into the atmosphere.

With TPH removed from the dredged soil by the heat-treatment unit 10, the dredged soil is supplied to the pretreatment unit 20. The pretreatment unit 20 may include a drum washer 21 and an air turbulencing pipe 22.

The dredged soil discharged from the heat-treatment unit 10 is supplied together with process water to the drum washer 21 which is a part of the pretreatment unit 20. The drum washer 21 serves to mix the dredged soil with the process water while causing friction therebetween through rotation of a cylindrical drum such that pollutants adhered to the surface of the dredged soil can be easily removed therefrom.

The dredged soil primarily treated by the drum washer 21 is supplied to the air turbulencing pipe 22. In the air turbulencing pipe 22, the dredged soil collides with an

impaction plate placed inside the turbulence generating tube due to turbulence generated by compressed air, such that agglomerated soil particles are separated to facilitate screening and the pollutants adhered to the surface of the dredged soil are secondarily separated from the dredged soil particles.

5 With the pollutants (for example, heavy metals and organic materials) physically removed from the surface of the dredged soil by the pretreatment unit 20, the dredged soil is supplied to the screening unit 30 so as to be separated according to particle size.

Referring to FIG. 2, the screening unit 30 may include a vibrational dehydration screen 31 and a cyclone 32. The dredged soil treated by the pretreatment unit 20 is
10 supplied to the screen 31, which removes foreign substances from the dredged soil supplied from the pretreatment unit 20 and separates coarse soil (coarse soil particles) and fine soil from the dredged soil.

When finer screening is required based on contamination characteristics according to the particle size of the dredged soil, a multi-stage cyclone 32 may be provided to the
15 screening unit 30.

Although the screening unit 30 is shown in FIG 2 as including one cyclone and one screen, it should be understood that the screening unit may include a plurality of cyclones and a plurality of screens. When the screening unit includes a plurality of screens, the screens may be disposed in a vertical multi-stage fashion (for example, double-decker).
20 When the screening unit includes a plurality of screens, the screens may be disposed in a serial multi-stage fashion.

Coarse soil having a larger particle size can be more easily washed than fine soil having a smaller particle size. Coarse soil and fine soil contained in the contaminated dredged soil may be separated depending upon the particle size by the screening unit 30
25 after being treated by the heat-treatment unit 10 and the pretreatment unit 20. Referring to FIG. 1 again, the fine soil separated by the screening unit 30 may be further treated by the extraction unit 50. The coarse soil, which can be relatively easily washed, may be completely remediated only through treatment by the heat-treatment unit 10, the pretreatment unit 20, and the screening unit 30 and may be discharged as a remediated soil
30 (coarse soil).

Herein, the term "coarse soil" may refer to soil having a particle diameter of greater than about 0.075 mm, and the term "fine soil" may refer to soil having a particle diameter of about 0.075 mm or less. However, it should be understood that the cutoff particle diameter may vary depending upon *in-situ* contamination characteristics according to the particle size of the dredged soil.

The fine soil separated by the screening unit 30 may be supplied to the solid-liquid separator 40 in the form of a slurry composed of the fine soil and water. The solid-liquid separator 40 separates a solid substance (i.e. fine soil) and a liquid substance (i.e. washing water) from the fine soil slurry supplied from the screening unit 30.

The solid substance separated by the solid-liquid separator 40, i.e. the fine soil, is supplied to the extraction unit 50, and the liquid substance separated by the solid-liquid separator 40, i.e. the washing water, is supplied to the wastewater treatment unit 70.

Referring to FIG. 3, the extraction unit 50 may include an extraction agent tank 51, which contains an extraction agent, such as an acid, an alkali and an organic solvent, and an extraction tank 52, 53, in which the fine soil supplied from the solid-liquid separator 40 is mixed with process water and the extraction agent in order to remove pollutants, for example, heavy metals from the fine soil.

According to this embodiment, sulfuric acid (98%, for industrial use) may be used as the extraction agent. The extraction agent may have a concentration of about 1.5 M and may be reacted at room temperature. According to this embodiment, a single extraction agent, i.e. sulfuric acid, is used, rather than using a combination of various extraction agents.

The extraction tank may include a primary extraction tank 52 and a secondary extraction tank 53, and a reaction time in each of the extraction tank may range from about 30 minutes to 1 hour. Although the extraction tank is shown as including the primary and secondary extraction tank 52, 53 to allow the extraction process to be performed twice, it should be understood that the extraction process may be performed only once in the primary extraction tank, depending on concentration of pollutants, desired level of remediation, and the like.

In the extraction process performed in each of the extraction tanks, a ratio of the

soil to the process water including the extraction agent may be about 1:3.

When the extraction process is performed twice, an acid solution (i.e., extraction agent) used in the primary extraction tank 52 may be reused in the secondary extraction tank 53. Here, a recovery rate of the extraction agent may be about 83%, and an extraction agent savings may be about 45% upon reuse of the extraction agent.

Although the extraction process is shown in FIG. 3 as being performed twice in the primary and secondary extraction tank 52, 53, it should be understood that the extraction process may be performed three times or more in three or more extraction tanks, as needed.

Referring to FIG. 1 again, the dredged soil with pollutants such as heavy metals chemically removed therefrom by the extraction unit 50 is supplied to the neutralization unit 60 for neutralization and fertilization treatment. The fine soil treated by the neutralization unit 60 may be finally discharged as a remediated soil through the dewatering unit 70.

In the neutralization unit 60, the fine soil is mixed with a neutralizer, and, as the neutralizer, for example, caustic soda (sodium hydroxide) or fly ash may be used. Since fly ash is a byproduct generated when coal is burned in a power plant or the like, it is possible to reduce neutralization treatment costs using fly ash as the neutralizer. A reaction time in the neutralization unit 60 may be about 2 hours and the neutralizer may be used in an amount of 60% of the weight of the dredged soil. In addition to the neutralizer, nutrients may be added to the fine soil, as needed.

The dewatering unit 70 reduces a moisture content of the neutralized fine soil to a level of 30% to 40% and finally discharges the fine soil, such that remediated soil can be more effectively utilized later.

Wastewater discharged from the solid-liquid separator 40, the extraction unit 50, and the dewatering unit 70 may be supplied to the wastewater treatment unit 80. Referring to FIG. 4, the wastewater treatment unit 80 may include a wastewater tank 81, a neutralization tank 82, a dissolved air flotation tank 83, and an activated carbon adsorption tower 84. Wastewater purified through the neutralization tank 82, the dissolved air flotation tank 83, and the activated carbon adsorption tower 84 may be stored in a process

water storage tank 85 to be reused later. Here, the shortage of process water due to evaporation and the like may be filled by water supplied from outside.

Fine soil particles, the particle size of which is small enough to efficiently remediate the particles, may be separated from the wastewater through coagulation and precipitation in the neutralization tank 82 and dissolved air flotation in the dissolved air flotation tank 83 and then discharged through a filter press 86 in the form of a sludge cake.

Table 1 shows results of an example in which dredged soil contaminated by various pollutants was remediated using the system for remediation of dredged soil including the heat-treatment unit and the extraction unit according to the present invention, and comparative examples.

Table 1

(Unit: mg/kg)	TPH (removal efficiency)	Heavy metal (removal efficiency)							
		Cu	Zn	As	Cr	Ni	Cd	Pb	Hg
Before treatment	9,508	1,850	2,518	55	176	107	3.8	170	10
Example 1	ND	175 (91%)	204 (92%)	5 (91%)	59 (66%)	30 (72%)	ND	70 (59%)	0.37 (96%)
Comparative Example 1	3,485 (63%)	651 (65%)	468 (81%)	33 (40%)	84 (52%)	34 (68%)	ND	166 (2%)	-
Comparative Example 2	ND	1,779	2,515	-	-	-	-	-	-

In Table 1, ND means 'not detected' and – means 'not measured'.

In Example 1, after heat treatment for removal of oil pollutants was performed, extraction for removal of heavy metal pollutants was performed twice. In Comparative Example 1, only extraction was performed without heat treatment. In Comparative Example 2, only heat treatment was performed without extraction. As shown in Table 1, from the results of remediating dredged soil contaminated by various pollutants using the system for remediation of dredged soil according to the present invention, it could be seen that Example 1 in which both heat treatment and extraction were performed could efficiently remove both heavy metals and organic pollutants including oils and thus achieved excellent remediation effects, as compared with Comparative Examples 1 and 2 in which either heat treatment or extraction was performed.

Table 2 shows results of an experiment in which heat treatment for removal of oil

pollutants and extraction for removal of heavy metal pollutants were sequentially performed while changing the number of extraction processes.

Table 2

(Unit: mg/kg)	TPH (removal efficiency)	Heavy metal (removal efficiency)	
		Cu	Zn
Before treatment	9,508	1,850	2,518
Example 1	ND	175 (91%)	204 (92%)
Example 2	ND	170 (91%)	180 (93%)
Example 3	ND	158 (91%)	125 (95%)

5 In Example 1, after heat treatment for removal of oil pollutants was performed, extraction for removal of heavy metal pollutants was performed twice. In Example 2, after heat treatment for removal of oil pollutants was performed, extraction for removal of heavy metal pollutants was performed three times. In Example 3, after heat treatment for removal of oil pollutants was performed, extraction for removal of heavy metal pollutants was performed four times. As shown in Table 2, it can be seen that heavy metal removal efficiency is gradually increased with increasing the number of extraction processes using the system for remediation of dredged soil according to the present invention. Thus, it is possible to determine the number of extraction operations by taking into account a desired level of remediation and cost efficiency.

15 As such, the present invention provides a system and method for remediation of dredged soil, which can treat contaminated dredged soil using a heat-treatment unit volatilizing organic pollutants and oils and an extraction unit to remove heavy metals. With this structure, the system and method for remediation of dredged soil according to the present invention can treat and reuse dredged soil highly contaminated by various pollutants.

20 In addition, the system and method for remediation of dredged soil according to the present invention can remove materials binding heavy metals to soil particles together with oils through heat treatment for volatilizing oil substances before extraction for removing heavy metals, thereby improving heavy metal removal efficiency upon

extraction.

Further, the system and method for remediation of dredged soil according to the present invention can remediate dredged soil using a single extraction agent, thereby facilitating management of the remediation system while reducing treatment costs.

Furthermore, the system and method for remediation of dredged soil according to the present invention can cheaply and efficiently remediate dredged soil highly contaminated by various pollutants by allowing an extraction agent used in primary extraction to be reused in secondary extraction when a process of removing heavy metals using an extraction unit is performed repeatedly.

Although some embodiments of the present invention are disclosed herein, it will be apparent to those skilled in the art that these embodiments are given by way of illustration only, and that various modifications, changes, alterations, and equivalent embodiments can be made without departing from the spirit and scope of the invention. The scope of the invention should be limited only by the accompanying claims and equivalents thereof.

<List of Reference Numerals>

10: Heat-treatment unit

20: Pretreatment unit

21: Drum washer

22: Air turbulencing pipe

30: Screening unit

31: Screen

32: Cyclone

40: Solid-liquid separator

50: Extraction unit

51: Extraction agent tank

52: Primary extraction tank

53: Secondary extraction tank

60: Neutralization unit

- 5
- 70: Dewatering unit
 - 80: Wastewater treatment unit
 - 81: Wastewater tank
 - 82: Neutralization tank
 - 83: Dissolved air flotation tank
 - 84: Activated carbon adsorption tower
 - 85: Process water storage tank
 - 86: Filter press

CLAIMS

1. A system for remediation of dredged soil for remediating dredged soil contaminated by organic pollutants and heavy metals, comprising:

a heat-treatment unit removing pollutants by heating dredged soil to a temperature of 300°C to 400°C for 20 to 40 minutes to volatilize the pollutants;

a pretreatment unit comprising a drum washer mixing the dredged soil with process water while causing friction therebetween to facilitate removal of pollutants from the dredged soil and an air turbulencing pipe separating agglomerated particles of the dredged soil to facilitate screening while separating pollutants by applying physical impact to the dredged soil using turbulence generated by compressed air so as to physically remove pollutants adhered to a surface of the dredged soil;

a screening unit separating coarse soil having a larger particle size and fine soil having a smaller particle size from the dredged soil;

an extraction unit chemically treating pollutants remaining in the fine soil separated by the screening unit using sulfuric acid, as an extraction agent, wherein the extraction agent used in primary extraction is reused in secondary extraction; and

a neutralization unit neutralizing the fine soil chemically treated by the extraction unit using fly ash, as a neutralizer,

wherein the contaminated dredged soil is subjected to heat treatment in the heat-treatment unit, supplied to the pretreatment unit to be physically treated, and supplied to the screening unit to be separated according to soil particle size, and the separated fine soil is chemically treated by the extraction unit.

2. The system for remediation of dredged soil according to claim 1, wherein the screening unit comprises a vibrational dehydration screen removing foreign substances and primarily separating coarse soil particles and the fine soil having pollutants accumulated therein from the dredged soil treated by the pretreatment unit.

3. The system for remediation of dredged soil according to claim 2, wherein the screening unit comprises at least one screen, and, when the screening unit comprises a plurality of screens,

the screens are disposed in a vertical multi-stage fashion.

4. The system for remediation of dredged soil according to claim 2, wherein the screening unit further comprises a cyclone for finer screening.

5. The system for remediation of dredged soil according to claim 4, wherein the screening unit comprises at least one cyclone, and, when the screening unit comprises a plurality of cyclones, the cyclones are disposed in a serial multi-stage fashion.

6. The system for remediation of dredged soil according to claim 1, further comprising:
a solid-liquid separator separating a solid substance and a liquid substance from a fine soil slurry separated by the screening unit through coagulation and precipitation.

7. The system for remediation of dredged soil according to claim 1, wherein the extraction unit comprises: an extraction agent tank containing an extraction agent for removing heavy metals; and at least one extraction tank mixing the fine soil with water and the extraction agent to extract pollutants from the fine soil.

8. The system for remediation of dredged soil according to claim 7, wherein a ratio of the fine soil to washing water containing the extraction agent is 1:3.

9. The system for remediation of dredged soil according to claim 6, further comprising:
a wastewater treatment unit treating wastewater discharged from the solid-liquid separator and the extraction unit.

10. The system for remediation of dredged soil according to claim 9, wherein the wastewater treatment unit comprises a neutralization tank, a dissolved air flotation tank, and an activated carbon adsorption tower, and wherein water purified by the wastewater treatment unit is stored in a process water storage tank so as to be reused.

11. A dredged soil remediation method using the system for remediation of dredged soil according to any one of claims 1, 2 to 7, 8, 9 and 10.