Claims

1. A near-zero carbon sewage ecological treatment system, characterized by comprising:

a solar power supply system for supplying electric energy for system operation;

and a sewage ecological treatment system, comprising a sewage ecological treating tank, a plant carbon-sequestrating purification tank, and a recycling tank;

the sewage ecological treating tank and plant carbon-sequestrating purification tank are built in the pit excavated on the ground; the sewage ecological treating tank is arranged in the underground space below the plant carbon-sequestrating layer, and the sewage ecological treating tank and the plant carbon-sequestrating purification tank are integrated;

wherein the sewage ecological treating tank comprises a water distribution layer, a filtering and purifying layer, a water storage layer, and a sludge discharge layer arranged from top to bottom, the water distribution layer is connected to a sewage source via a water distribution device, and the water storage layer is connected to the recycling tank via a draining device;

a plant carbon-sequestrating layer is provided in the plant carbon-sequestrating purification tank, the plant carbon-sequestrating layer is provided above the water distribution layer, a light-transmitting cover is provided above the plant carbon-sequestrating layer, and a net carbon plant is planted in an enclosed space formed by the light-transmitting cover;

air interchanging device and an exhaust gas collecting device, wherein both the air interchanging device and the exhaust gas collecting device are in communication with the enclosed space of the light-transmitting cover, and an oxygen concentration

sensor is provided in the enclosed space of the light-transmitting cover;

the air interchanging device is used for supplying air into the enclosed space of the light-transmitting cover when the enclosed space has a low oxygen concentration;

the exhaust gas collecting device is used for discharging and collecting exhaust gas generated in the plant carbon-sequestrating purification tank;

setting liquid level sensor in the water distributing layer for real-time monitoring the liquid level of the water distributing layer;

further comprising a control and display system configured to control the water distribution device to supplement a water level in the water distribution layer to H1 within time T2 when the water level of the water distribution layer decreases from H1 to H2 within time T1; the running is continued for T1 time, and the above-mentioned running operations are repeated to achieve the sewage purifying treatment;

wherein H2=H1-V/S, T2=0.13~0.16T3;

in the above formula: H1 is a maximum water-distribution water level (m);

H2 is a minimum water-distribution water level (m);

V is a volume of sewage treated in a single purifying treatment cycle of a system (m^3);

S is a water distribution area of the system (m^2);

T1 is running time of a single purifying treatment cycle of the system;

T2 is water distribution time of a single purifying treatment cycle of the system;

T3 is a total time of the water level of the water distribution layer from when reaching moment H1 to the time when an oxygen concentration in the plant carbon sequestration tank reaches C1, wherein C1 is 13% vol~14.8% vol;

T1 is 8~12h and T2 is 1~2h;

the bulk of the sewage ecological treating tank is 3-5 times of the volume V of the sewage treated in a single purifying treatment cycle of the system, and the hydraulic

loading is 0.53-1.06 $m^3/(m^2 \cdot d)$;

the control and display system is further configured to operate the air interchanging device when the oxygen concentration in the plant carbon sequestration purification tank reaches C1, pass air into the plant carbon-sequestrating layer through an air outputting pipe of the air interchanging device, and discharge and collect exhaust gas from the plant carbon-sequestrating layer via an exhaust gas exhaust pipe of the exhaust gas collecting device; when an oxygen concentration value in the plant carbon-sequestrating layer is C2, the air interchanging device stops working, wherein C2=1.3~1.7 C1.

2. The near-zero carbon sewage ecological treatment system according to claim 1, characterized in that the filtering and purifying layer comprises a primary purifying layer and a secondary purifying layer arranged from top to bottom;

the primary purifying layer is filled with shale ceramsite, and the secondary purifying layer is filled with composite activated alumina particles.

3. The near-zero carbon sewage ecological treatment system according to claim 1, characterized in that the drainage device comprises a draining pipe and a draining pump provided thereon, a liquid inlet of the draining pipe is located in the water storage layer, and a liquid outlet of the draining pipe is connected to the recycling tank.

4. The near-zero carbon sewage ecological treatment system according to claim 1, characterized in that a sludge discharge device is connected to the sludge discharge layer in preparation for discharging the sludge;

the sludge discharge device comprises a sludge discharge pipe and a sludge

discharge pump provided thereon.

5. The near-zero carbon sewage ecological treatment system according to claim 1, characterized in that the sewage ecological treatment system further comprises a pretreating tank and an adjusting tank, wherein the adjusting tank is provided upstream of the sewage ecological treating tank via a pipeline, the pretreating tank is provided upstream of the adjusting tank via a pipeline, the pretreating tank is connected to an upstream sediment tank via a pipeline, and the sediment tank is connected to an upstream sewage source.

6. A near-zero carbon sewage ecological treatment method, characterized by using the near-zero carbon sewage ecological treatment system to treat sewage according to any one of claims 1 to 8,

the method comprises the following steps:

constructing a solar power supply system and a sewage ecological treatment system;

when the sewage ecological treating tank and the plant carbon-sequestrating purification tank are constructed, a pit is excavated on the ground, a sludge discharge layer, a water storage layer, a secondary purifying layer, a primary purifying layer, a water distribution layer, and a plant carbon-sequestrating layer are laid from bottom to top, a net carbon plant is planted on the plant carbon-sequestrating layer, the plant carbon-sequestrating layer is covered with a light-transmitting cover ;

and

supplying domestic sewage into the sewage ecological treatment system for purification treatment, and discharging purified sewage into the recycling tank for use at a water-consuming point;

wherein the domestic sewage entering the sewage ecological treatment system firstly enters the sediment tank, settles large particle impurities under the action of gravity, then enters a pretreating tank, and overflows into the adjusting tank after being filtered by a filter assembly in the pretreating tank;

when the adjusting tank reaches a pre-set water level, a water distribution pump is started to supply the sewage in the adjusting tank into the water distribution layer via a water distribution pipe, and the sewage distributes water to the sewage ecological treating tank from top to bottom in the water distribution layer; the sewage in the water distribution layer successively enters the primary purifying layer and the secondary purifying layer, the sewage ecological treating tank is added with Pseudomonas stutzeri, and the sewage treated by the secondary purifying layer enters the water storage layer, and is fed into the recycling tank via the draining device for use at the water consuming point;

in a process of sewage purification treatment, a net carbon plant adsorbs nitrogen, phosphorus, and other organic matters in the sewage, and at the same time, absorbs CO_2 gas generated during sewage treatment through photosynthesis.