In addition, in order to retain animalcules of the filter-type predators that predate dispersed bacteria in the second biological treatment tank 2, the second biological treatment tank 2 contains the carrier 22 for supporting the animalcules. While the animalcules of this type are adhered to sludge flocks and are retained in the system, sludge is withdrawn to the outside of the system in a certain retention time. Thus, the system must include a supply source of the animalcules. When the carrier is granular or angular and forms a fluidized bed, the carrier can not be stably held at a high concentration because of shear force due to fluidization. The carrier filling rate must be increased ~~addordingly.~~ accordingly.

[0039]

Thus, in the present invention, the carrier in the second biological treatment tank 2 is preferably not a fluidizing carrier but a fixed carrier, at least part of which is fixed directly or with a fastening device to a bottom, a side surface, or an upper portion of the second biological treatment tank 2. The carrier 22 may have any shape including a thread, sheet, or strip. The material of the carrier 22 may be any material including a natural material, inorganic material, polymer material, and a gel substance. It is preferable that the material of the carrier 22 is synthetic resin foam, such as porous

CLAIMS

1 A biological treatment method of treating organic wastewater under aerobic conditions, in which an entire load of all biological treatment tanks has a $COD_{Cr}$ volume load of 1.0 $kg/m^3/d$ or more or a BOD volume load of 0.5 $kg/m^3/d$ or more,

wherein aerobic biological treatment tanks at multiple stages of two stages or more are provided; the organic wastewater is fed to a first biological treatment tank and treated biologically by bacteria therein; first biologically treated water containing dispersed bacteria is transferred from the first biological treatment tank to a subsequent biological treatment tank including a second biological treatment tank and treated biologically by bacteria therein; treated water from the subsequent biological treatment tank including the second biological treatment tank is subjected to solid-liquid separation in a settling tank; and part of separated sludge is returned to the subsequent biological treatment tank including the second biological treatment tank, and

wherein the subsequent biological treatment tank including the second biological treatment tank contains a carrier for supporting animalcules, ~~and~~

wherein at least part of the carrier in the subsequent biological treatment tank including the second biological treatment tank is fixed to the biological treatment tank directly or with a fastening device, ~~.~~and

wherein the carrier in the subsequent biological treatment tank is a sheet or strip having a thickness in a range between 0.5 and 5 cm, a length of a first side in a range between 100 and 400 cm, and a length of a second side perpendicular to the first side in a range between 5 and 200 cm, and that the carrier is vertical and fixed to the biological treatment tank with the fastening device.

2 The biological treatment method of treating organic wastewater according to Claim 1, wherein the soluble BOD sludge load in the subsequent biological treatment tank including the second biological treatment tank is in the range of 0.025 to 0.050 kg/kg-MLSS/d.

3 The biological treatment method of treating organic wastewater according to any one of Claim 1 or 2, wherein part of the organic wastewater is introduced into the subsequent biological treatment tank including the second biological treatment tank without flowing through the first biological treatment tank.

4 The biological treatment method of treating organic wastewater according to any one of Claim 1, wherein sludge retention time (SRT) in the subsequent biological treatment tank including the second biological treatment tank is 50 days or less.

5 The biological treatment method of treating organic

wastewater according to any one of Claim 1, wherein the sludge retention time (SRT) in the subsequent biological treatment tank including the second biological treatment tank is in the range of 10 to 50 days.

6 A biological treatment apparatus for treating organic wastewater under aerobic conditions, in which an entire load of biological treatment tanks has a $COD_{Cr}$ volume load of 1.0 $kg/m^3/d$ or more or a BOD volume load of 0.5 $kg/m^3/d$ or more,

wherein aerobic biological treatment tanks at multiple stages of two stages or more are provided; the organic wastewater is fed to a first biological treatment tank and treated biologically by bacteria therein; first biologically treated water containing dispersed bacteria is transferred from the first biological treatment tank to a subsequent biological treatment tank including a second biological treatment tank and treated biologically by bacteria therein; treated water from the subsequent biological treatment tank including the second biological treatment tank is subjected to solid-liquid separation in a settling tank; and part of separated sludge is returned to the subsequent biological treatment tank including the second biological treatment tank, and

wherein the subsequent biological treatment tank including the second biological treatment tank contains a carrier for supporting animalcules, ~~and~~

wherein at least part of the carrier in the subsequent biological treatment tank including the second biological

treatment tank is fixed to the biological treatment tank directly or with a fastening device,

wherein the carrier in the subsequent biological treatment tank is a sheet or strip having a thickness in a range between 0.5 and 5 cm, a length of a first side in a range between 100 and 400 cm, and a length of a second side perpendicular to the first side in a range between 5 and 200 cm, and that the carrier is vertical and fixed to the biological treatment tank with the fastening device.

7 The biological treatment apparatus for treating organic wastewater according to Claim 6, wherein the soluble BOD sludge load in the subsequent biological treatment tank including the second biological treatment tank is in the range of 0.025 to 0.050 kg/kg-MLSS/d.

8 The biological treatment apparatus for treating organic wastewater according to any one of Claim 6 or 7, wherein the apparatus further comprises means for introducing part of the organic wastewater into the subsequent biological treatment tank including the second biological treatment tank without flowing through the first biological treatment tank.

9 The biological treatment apparatus for treating organic wastewater according to any one of Claim 6, wherein the sludge retention time (SRT) in the subsequent biological treatment tank including the second biological treatment tank is 50 days or less.

10 The biological treatment method of treating organic wastewater according to Claim 1, wherein the first biological treatment tank1 has a hydraulic retention time (HRT) of 0.5 to 8h.

11 The biological treatment method of treating organic wastewater according to Claim 1, wherein the first biological treatment tank contains a carrier at a packing rate of 10% or less, and

wherein the subsequent biological treatment tank including the second biological treatment tank contains the carrier at a packing rate of 0.1 to 20%.

12 The biological treatment method of treating organic wastewater according to Claim 1, wherein the carrier in the subsequent biological treatment tank including the second biological treatment tank has a shape of a thread, sheet, or strip.

13 The biological treatment method of treating organic wastewater according to Claim 12, wherein the length of a first side of the sheet or strip is in the range of 100 to 400 cm, the length of a second side of the sheet or strip perpendicular to the first side is in the range of 5 to 200 cm, and the thickness of the sheet strip is in the range of 0.5 to 5 cm.

14 The biological treatment method of treating organic wastewater according to Claim 1, wherein the carrier in the subsequent biological treatment tank including the second biological treatment tank consists of porous polymer material.

15 The biological treatment method of treating organic wastewater according to Claim 14, wherein the porous polymer material is porous polyurethaene foam.

16 The biological treatment apparatus for treating organic wastewater according to Claim 6, wherein the first biological treatment tank1 has a hydraulic retention time (HRT) of 0.5 to 8h.

17 The biological treatment apparatus for treating organic wastewater according to Claim 6, wherein the first biological treatment tank contains a carrier at a packing rate of 10% or less, and

wherein the subsequent biological treatment tank including the second biological treatment tank contains the carrier at a packing rate of 0.1 to 20%.

18 The biological treatment apparatus for treating organic wastewater according to Claim 6, wherein the carrier in the subsequent biological treatment tank including the second biological treatment tank has a shape of a thread, sheet or strip.

19 The biological treatment apparatus for treating organic wastewater according to Claim 18, wherein the length of a first side of the sheet or strip is in the range of 100 to 400 cm, the length of a second side of the sheet or strip perpendicular to the first side is in the range of 5 to 200 cm, and the thickness of the sheet strip is in the range of 0.5 to 5 cm.

20 The biological treatment apparatus for treating organic wastewater according to Claim 6, wherein the carrier in the subsequent biological treatment tank including the second biological treatment tank consists of porous polymer material.

21 The biological treatment apparatus for treating organic wastewater according to Claim 20, wherein the porous polymer material is porous polyuretheane foam.