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Declarations under Rule 4.17:
— *of inventorship (Rule 4.17(iv))*

(54) **Title:** WASTE WATER TREATMENT BY THE CLEANBOX MODULE

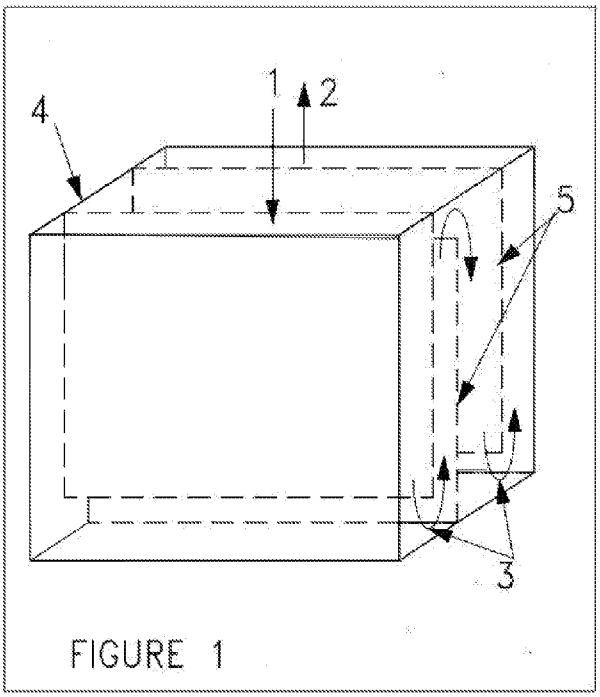


FIGURE 1

(57) **Abstract:** The treatment system includes box (4) through which wastewater being re- circulated and one drive section for providing re-circulation of the wastewater thorough the treatment box. The treatment box (4) includes zigzag arrangement of the plastic or steel plate or cloth (5) constituting the zigzag flowing route (3) of the wastewater and at least one carrier medium (6) where film being grown thereon, complementing the shape of the internal volume of the zigzag configuration plate or cloth and/ or occupying at least part of the internal volume of the box. The waste water will enter from one side (1) and treated waste water will come out from the other side (2) of the box. The space created (3) by the zigzag plate or cloth (3) will be used to put carrier medium (6) and treat the waste water.

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[Continued on next page]

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WASTE WATER TREATMENT BY THE CLEANBOX MODULE

FIELD OF INVENTION

[0001] This invention relates to Attached or suspended growth Fixed or Suspended film aerobic or anaerobic activated sludge process of waste water treatment system.

BACKGROUND

[0002] Waste water generated from the various sources shall be treated at the point of the discharge because it causes the threat to environment by polluting the raw water sources.

[0003] The principal objective of wastewater treatment is generally to allow human and industrial effluents to be disposed of without danger to human health or unacceptable damage to the natural environment. Irrigation with wastewater is both disposal and utilization and indeed is an effective form of wastewater disposal (as in slow-rate land treatment). However, some degree of treatment must normally be provided to raw municipal wastewater before it can be used for agricultural or landscape irrigation or for aquaculture. The quality of treated effluent used in agriculture has a great influence on the operation and performance of the wastewater-soil-plant or aquaculture system. In the case of irrigation, the required quality of effluent will depend on the crop or crops to be irrigated, the soil conditions and the system of effluent distribution adopted. Through crop restriction and selection of irrigation systems which minimize health risk, the degree of pre-application wastewater treatment can be reduced.

[0004] The most appropriate wastewater treatment to be applied before effluent use in agriculture is that which will produce an effluent meeting the recommended microbiological and chemical quality guidelines both at low cost and with minimal operational and maintenance requirements . Adopting as low a level of treatment as possible is especially desirable in developing countries, not only from the point of view of cost but also in acknowledgement of the difficulty of operating complex

systems reliably. In many locations it will be better to design the reuse system to accept a low-grade of effluent rather than to rely on advanced treatment processes producing a reclaimed effluent which continuously meets a stringent quality standard.

[0005] There are various methods to treat wastewater using a combination of physical, chemical and biological treatment processes. A conventional treatment combination is to subject the wastewater to a physical pre-treatment and then to a biological one as a second stage of process. Conventional aerobic and anaerobic processes are very common for municipal wastewater treatment and they are considered effective technical solutions for environmental protection in terms of construction and operational costs for large units. In contrast, when large areas have to be serviced, while it is not possible to design a central treatment unit but many smaller ones, conventional systems are not the most appropriate choice

[0006] The domestic wastewater treatment systems where smaller volumes of wastewater are treated use various types of tanks for treatment operations. In these systems, the carrier materials are placed in the tank (fixed or moving). Since the surface area of the bio pack media affects significantly the efficiency of the treatment process, these large tanks are required and which leads to great space and volume required. Further to that, as tanks are difficult to transport and install, it is not so practical to replace or perform maintenance operations of the tanks. Besides, the tank cannot be replaced whenever the volume of wastewater to be treated changes. Therefore, there is still a need of development for those wastewater treatment systems which will save space losses and high costs of production and operation and provide a high performance treatment.

[0007] There are some inventions where waste water is treated by new structural design like pipe (US publication no US 2015/0175453 A1). In the method waste water is treated through the pipe which is filled with the bio media. And it proves following advantages against the conventional waste water treatment methods.

1. Low foot prints 2. Low energy consumption 3. Flexible and modular design 4. Low operation and maintenance cost. 5. Virtually silent method.

OBJECTS IN THE INVENTION

[0008] A main objects of the invention are as below

1. To provide an innovative waste water treatment unit which will consume very less electricity compared with current treatment technologies.
2. To provide compact waste water treatment unit to reduce area losses
3. To reduce operation and maintenance cost.
4. To provide economical or cost effective waste water treatment unit
5. To provide easy handling waste water treatment unit
6. To reduce the equipments erection cost

STATEMENT OF INVENTION

[0009] The treatment includes outer box with inside zigzag configuration plates or cloth or plates with alternate top and bottom holes to creates zigzag wastewater flow route or up and down flow route between the plate end and outer box.

With The air inlet vent the system can be aerobic and without air inlet vent the system can be anaerobic. So as per waste water characteristics the system can treat the wastewater by aerobically or an-aerobically or by combination of both i.e. anaerobic followed by the aerobic system or vice versa. In both the cases inside media filling is required.

A SUMMARY OF INVENTION

[0010] The method and system or unit for treating wastewater by a fixed or suspended growth bio-film process is mentioned. The treatment includes outer box with inside zigzag configuration plates or cloth or plates with alternate top and bottom holes. It creates zigzag wastewater flow route between the plate end and outer box to put the carrier medium where bio-film being grown thereon.

[0011] The space created by the zigzag plate or cloth will be used to put bio medium and treat the waste water. The nozzles for natural air or external air supply

will be provided for the aeration purpose in case of the aerobic system and there will not be air inlet for the anaerobic system.

A BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWING

[0012] The accompanying drawings are included to provide a further understanding of the present disclosure, and are incorporated in and constitute a part of this specification. The drawings illustrate exemplary embodiments of the present disclosure and, together with the description; it will serve to explain the principles of the present disclosure.

[0012] The diagrams are for illustration only, which thus is not a limitation of the present disclosure, and wherein:

[0014] **FIGURE.1** illustrates the schematic isometric arrangement of the plate to form a cleanbox module in accordance with the present invention.

[0015] **FIGURE.2** illustrates a side view of the cleanbox module in accordance with the present invention.

[0016] **FIGURE.3** illustrates a sectional side view of the cleanbox module in accordance with the present invention.

DETAILED DESCRIPTION OF DRAWINGS

[0017] The following is a detailed description of the accompanying drawings. The given details are such a way that it will clearly communicate the disclosure. However, the amount of detail offered is not intended to limit the anticipated variations of embodiments; on the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the scope of the present disclosure.

[0018] In the following description, numerous specific details are set forth in order to provide a thorough understanding of the modular arrangements of the present invention. It will be apparent to one skilled in the art that embodiments of

the present invention may be practiced without some of these specific details.

[0019] Various terms as used herein are shown below. To the extent a term used, it should be given the broadest definition persons in the pertinent art have given that term as reflected in printed publications and issued patents at the time of filing.

[0020] Below provided are the figure wise reference numerals used for respective components as shown in the FIGs. 1-3:

[0021] Figure 1 shows the arrangement of the plate inside the cleanbox module, wherein:

1 denotes : Waste water entry for the cleanbox
2 denotes : Waste water outlet of the cleanbox
3 denotes : Wastewater flow zigzag route
4 denotes : Outer box
5 denotes : Zigzag plates

[0022] Figure 2 shows the side view of the cleanbox module.
wherein:

1 denotes : Waste water entry for the cleanbox
2 denotes : Waste water outlet of the cleanbox
3 denotes : Wastewater flow zigzag route
4 denotes : Outer box
5 denotes : Zigzag plates
6 denotes : Carrier medium for biofilm growth

[0023] Figure 3 shows the sectional side view of the cleanbox module
wherein:

4 denotes : Outer box
5 denotes : Zigzag plates
6 denotes : Carrier medium for biofilm growth

[0024] The present invention is related to a wastewater treatment unit and method in order achieve the objectives mentioned above and to bring the advanced

technology to the related technical field. The major objective of this invention is to provide a wastewater treatment system or unit which will reduce the high costs of erection, operation and maintenance. Also to reduce the significant space consumption and which will be user friendly at varying conditions.

[0025] In addition to above, further objective of this invention is to provide a wastewater treatment unit and method which will reduce the environmental pollution with high efficiency compared with current wastewater treatment technologies.

In order to realize all of the above-mentioned objects and the objects which are to be obtained from the detailed description, the present invention is related to a treatment unit in which the wastewater is treated by means of attached or suspended bio-film process.

[0026] The treatment system includes at least one box (4) formed by the inside zigzag arranged steel plate (5) through which wastewater will flow. The treatment box includes outer box (4) with inside zigzag configuration plates (5) or cloth or plates (5) with alternate top and bottom holes. It creates zigzag wastewater flow route (3) between the plate end (5) and outer box (4) to put the carrier medium (6) where bio-film being grown thereon occupying at least part of the internal volume of the box (4).Or up and down flow route (3) between the plate end (5) and outer box (4) to put the carrier medium (6)

[0027] The space created by the zigzag arranged plate (4) will be used to put bio medium (6) and treat the waste water. The nozzles for natural air or external air supply will be provided for the aeration purpose.

[0028] Following are the theoretical parameters comparison between the various conventional waste water treatment systems and the bio drum system

Sr. No.	Parameter	Sequencing Batch Reactor (SBR)	Membrane Bioreactor (MBR)	Moving bed Bioreactor (MBBR)	Rotating Biological Contactor (RBC)	Cleanbox system
1	Footprint	Moderate	Low	Low (depends on media fill factor in MBBR tank, type of liquid solid separation unit e.g.	Low	Low because of the less equipments required

				settling tank verses DAF unit etc)		
2	Control	Simple	Complicated	Simple	Simple	Simple
3	Electricity consumption	High	High	Moderate	Moderate	Low because of the less equipments required like air blower , sludge settling system etc
4	Operation and Maintenance	High	High	Moderate	Moderate	Low because of the less equipments required
5	Equipment installation cost	High	High	Moderate	Moderate	Low because of the compact system i.e. the less equipments used
6	System cost	High	High	Moderate	Moderate	Low because of the compact system i.e. the less equipments used

CLAIMS:

1. A CLEANBOX consists of at least one box (4) with inside zigzag plates (5);

   Where in a plate (5) made from the plastic or cloth or steel is arranged in the zigzag configuration by keeping the required space between the plate end (5) and outer box (4) resulted in the formation of a rectangular or circular cross-section passage or up and down flow route (3);
   Bio media (6) placed in this rectangular passage;
   the waste water is admitted to the said cleanbox through the waste water entry passage (1) and further passing through the bio materials (6) placed in the rectangular passage, wherein the bio - film is grown and the waste water is cleaned as it passes towards the waste water outlet passage (2) and this cleaned or treated water is further sent for the further use or discharge in the environment;

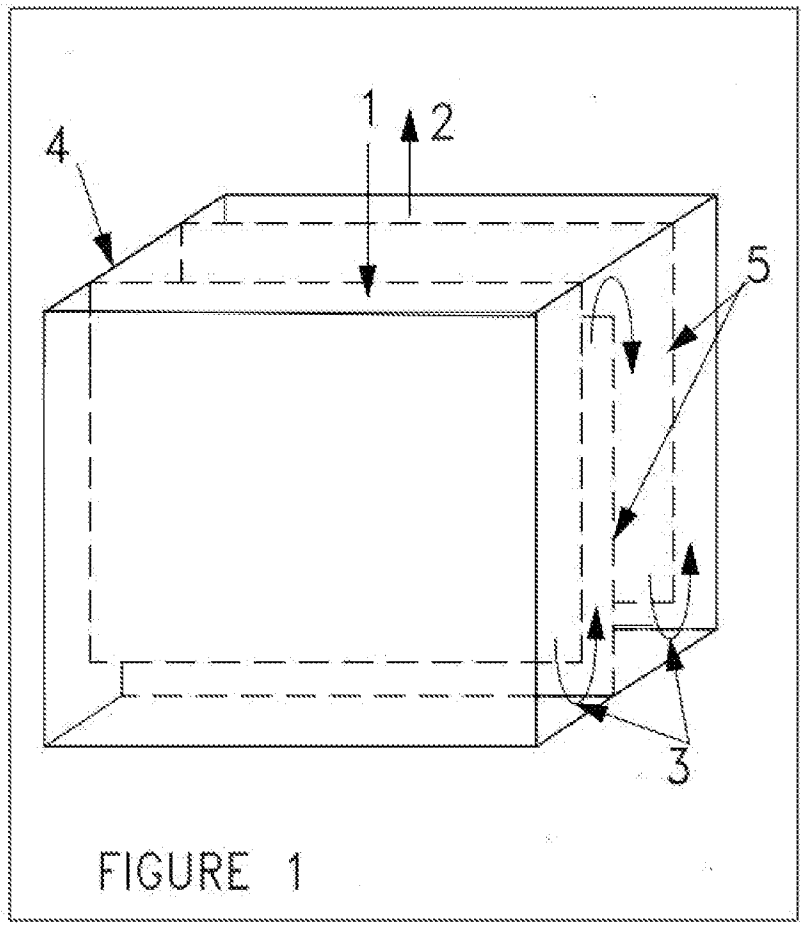


FIGURE 1

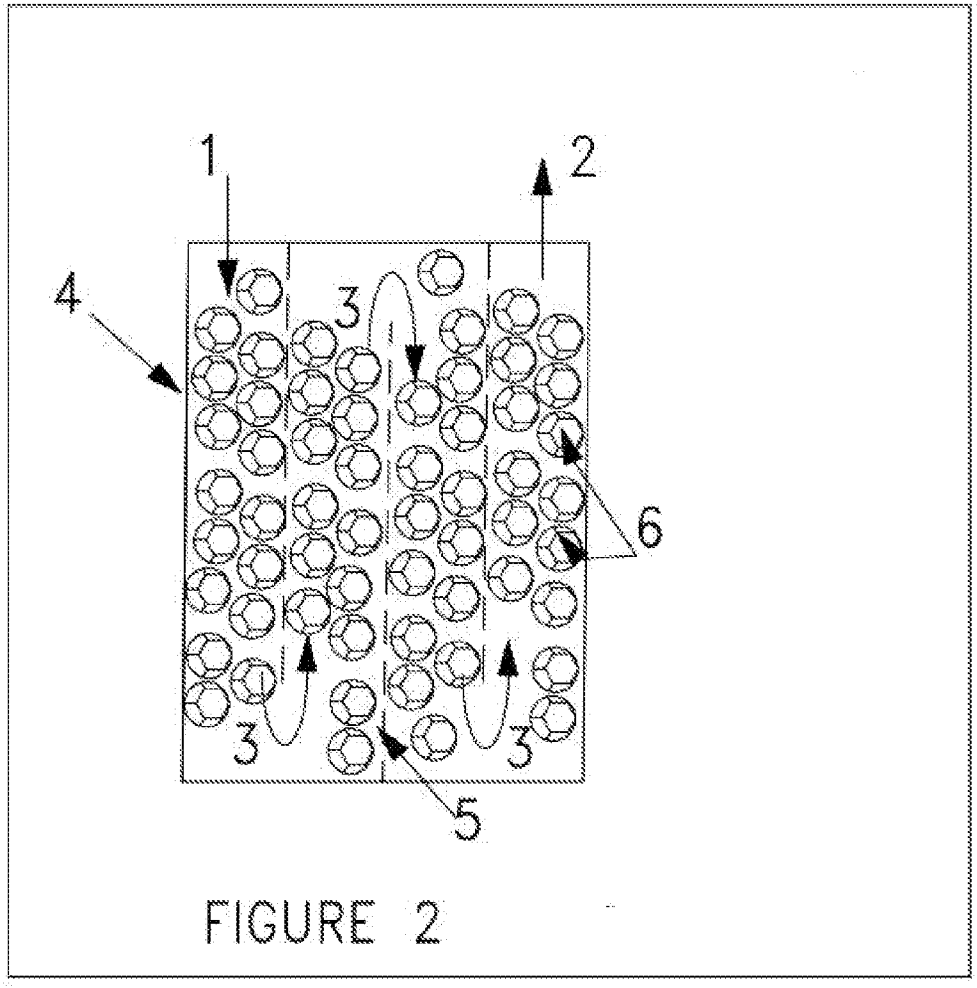


FIGURE 2

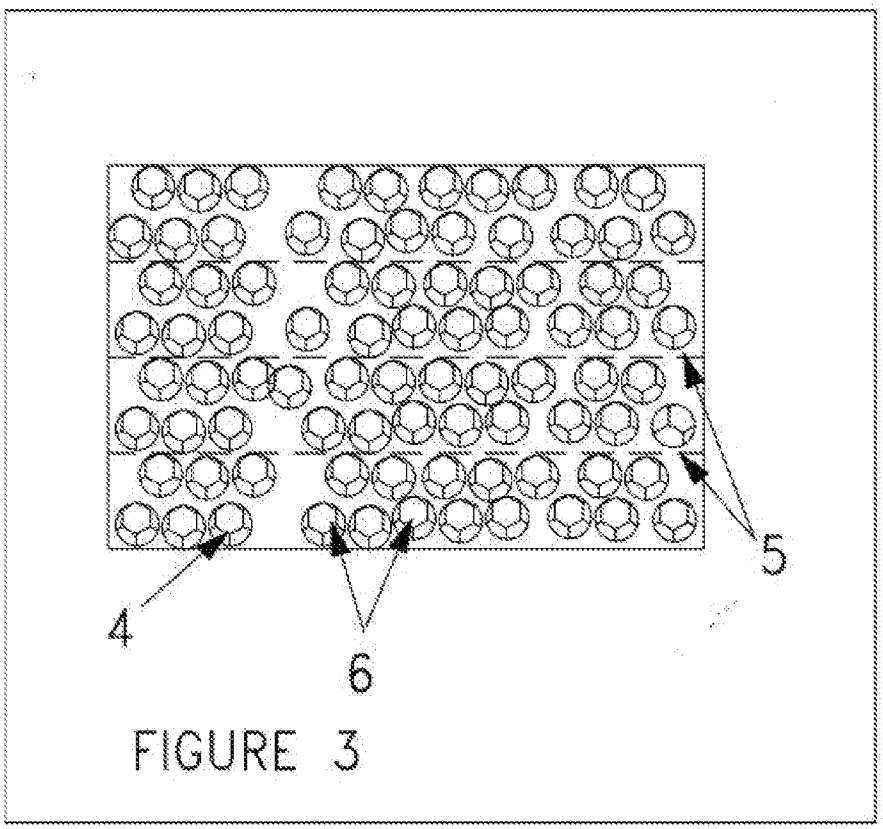


FIGURE 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IN2023/050584

A. CLASSIFICATION OF SUBJECT MATTER
C02F3/02,C02F3/28 Version=2023.01

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

C02F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database consulted during the international search (name of database and, where practicable, search terms used)

PatSeer, IPO Internal Database

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	IN202121032883A (PALLAVI DNYANESHWAR PHADATARE) (05/08/2022) 05 August 2022 Refer- Claim-1	1

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document cited by the applicant in the international application
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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