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- (54) **Title:** METHOD AND SYSTEM FOR GENERATION OF ELECTRIC POWER AND COOKING FUEL FROM BIO WASTE USING ALGAE

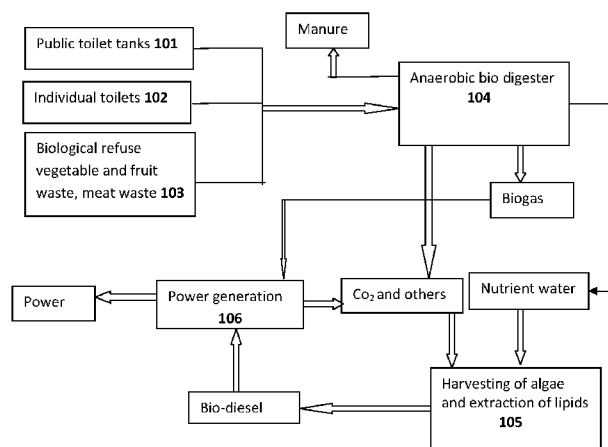


FIG 1

(57) **Abstract:** This invention discloses a system and method for generation of electric power and cooking fuel from bio waste utilizing anaerobic bio digester and algae. The system is adapted to collect biowastes from various natural resources. The processing module receives the collected biomasses as input and processes it to produce biogas, manure and nutrient solution. The gases obtained from processing module are fed to the algae to generate biodiesel that is further utilized for production of electric power. The generation of electric power from biomasses and availability of biofuels for cooking can save a lot of money and will benefit poor families living in villages and struggling for basic necessity.

Title of the Invention

Method and system for generation of electric power and cooking fuel from bio waste using algae

[001] Technical field of the invention

[002] The present invention relates to a method and system for generating electric power and biofuels byutilizing bio wastes and algae. More specifically the invention relates to a method of producing nutrients and bio gas from bio wastes and utilizing it further to treat algae in order to obtain biodiesel or synthetic gas that can be used to generate electric power.

[003] Background of the invention

[004] Electricity is one of the most complex manifestations of our system and is a basic necessity. It enables many of our modern life support systems. Lack of electricityleads to prolonged and increasingly social unrest.The fuel shortage is acute when it comes to coal, which accounts for two-thirds of the country's power generation.

[005] In developing countries there is a large population which isforced to remain in dark and is struggling to fulfill their basic necessities such as cooking, electricity etc. Development is going on in already developed places but no one is taking initiative to develop a place that is lacking in all basic facilities. The main reasons behind this problem are monetary factors, so to overcome such problems there is a need to develop an infrastructure that makes use of available natural resources and human resources in the village that can generate enough power and electricity.Therefore, there is an immense need of coming up with methodology for obtaining bio fuels from various types of wastes such as industrial waste, domestic waste.

[006] In the prior art application number **EP2105495A1** a system for bio waste usage and production of energy and food/feed is disclosed. The system is an integrated waste usage and energy production system comprising an anaerobic

digester unit, a liquid-solid separator unit, a refinery unit, an algae bioreactor unit, an oil extraction unit. The system is used in a process in which food or feed supplements from algae oil are made, together with energy production. The above system fails to provide a system or a method of providing bio fuels for purpose of cooking. The biogas obtained from anaerobic digestion of bio wastes can be separated compressed and utilized for cooking.

[007] In the prior art application number **EP2105495A1** bio-waste disposal method and apparatus is disclosed for biogenic waste treatment. The method consists of sequence of steps in which first the biogenic waste is evenly mixed with water vapor, so that the temperature reaches 130-190 DEG C and the pressure reaches 1.5-1.9 MPa after mixture, and this state is maintained for 1-25 minutes. Then the pressure of the mixture of said biogenic waste and water vapor is reduced to normal pressure so as to conducting low-molecularization of the biogenic waste to obtain a low-molecularized mixture; finally, the low-molecularized mixture is separated so as to obtain the final products. The above method fails to obtain biogases and biodiesels that are utilized for purpose of cooking and for generation of electric power.

[008] In the prior art application number **WO2012063137A2** a method of organic waste processing, processing equipment and utilization of processed products is disclosed. The method facilitates for complex processing of organic waste with help of waste preparation module, which includes waste separation, waste mixing and bio tunnel. It also possesses a module that assist in gasification of the organic wastes. The above method fails to produce bio fuels for purpose of cooking and provide a cost effective and efficient method of producing bio fuels and electric power from bio wastes.

[009] Hence, looking at the state of the art technologies available there is a need to come up with a system and a method that may collect industrial and domestic waste locally and process it to obtain nutrients and bio gas, these output can be further used to obtain biodiesel or synthetic gas that may be further used for generation of electricity. This kind of a system will be especially suitable for a village where bio wastes can be found and collected easily in any barren land that

is not in use. The electric power that is generated can be further used to provide clean water and sanitation to the village people.

[0010] Objects of the invention

[0011] There is abundance of biowastes available in the villages in the form of domestic waste, plant waste, animal waste and industrial waste. If in any manner these biowastes may be utilized to produce biofuels, it can benefit peoples dwelling in villages in several manners. Peoples will not struggle for basic necessities like electric power and cooking gas. It is therefore an object of present invention to provide a system and method for generation of electric power using biowastes and algae.

[0012] A further object of the invention is to provide a method of processing of biowastes to produce biogas and further feeding the algae to generate biodiesel.

[0013] Yet another object of the invention is to provide an anaerobic digestion process of bio wastes and feeding of algae that leads to generation of electric power and provides fuels for cooking.

[0014] Summary of the invention

[0015] To achieve these and other objectives, the present invention provides a system and method for generation of bio fuels and electric power utilizing bio waste and algae. Bio waste is collected from several natural resources that include plant waste, animal waste and domestic waste. The obtained wastes are subjected to anaerobic digestion to produce bio gas along with manures and nutrients. The biogas is utilized to feed algae and extract biodiesel that is further used for generation of electric power.

[0016] The method described above makes use of all natural resources to generate cooking fuels and electric power such as bio wastes and algae that makes the entire system economical and affordable. This method can be implemented in villages for generation of electric power and provide poor people with cooking fuels.

[0017] It is to be understood that both the foregoing general description and the following details description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

[0018] BRIEF DESCRIPTION OF THE DRAWING

[0019] The foregoing and other features of embodiments will become more apparent from the following detailed description of embodiments when read in conjunction with the accompanying drawings. In the drawings, like reference numerals refer to like elements.

[0020] **FIG 1** is a block diagram which illustrates the sample environment within which system for generation of electric power from bio waste and algae is implemented in accordance with one or more embodiments of the invention.

[0021] **FIG 2** is a diagram which illustrates the anaerobic biodigester component of the system implemented in accordance with one or more embodiments of the invention.

[0022] **FIG 3** is a diagram which illustrates various components of the system for generation of electric power from bio waste and algae in accordance with one or more embodiments of the invention.

[0023] In order to more clearly and concisely describe and point out the subject matter of the claimed invention, the following definitions are provided for specific terms which are used in the following written description.

[0024] By the term “*biowaste*” we mean a type of waste which can be broken down in a reasonable amount of time into its base compounds by micro-organisms and other living things. It can include food waste, paper waste, green waste etc as context requires.

[0025] By the term “*algae*” we mean photosynthetic organisms that occur in most habitats. They vary from small, single-celled forms to complex multicellular forms, as context requires.

[0026] By the term “*biodiesel*” we mean a fuel that is typically made by chemically reacting lipids (e.g. vegetable oil, animal fat) with an alcohol producing fatty acid esters, as context requires.

[0027] By the term “*synthetic gas*” we mean a mixture of gases usually used as a feedstock, as context requires.

[0028] By the term “*manure*” we mean plant and animal wastes that are used as sources of nutrients in form of fertilizers, as context requires.

[0029] By the term “*anaerobic digestion*” we mean a collection of processes by which microorganism’s breakdown biodegradable material in the absence of oxygen, as context requires.

[0030] By the term “*Biological refuse*” we mean discarding or destroying of garbage, sewage, or other waste matter or its transformation into something useful or innocuous, as context requires.

[0031] By the term “*Fertilizer sludge*” we mean a residual left after any sewage treatment processes, as context requires.

[0032] DETAILED DESCRIPTION OF INVENTION

[0033] The present invention overcomes the drawback of current system that lacks to make use of all natural resources available locally and produce biogas and biodiesel that can be used for generation of electric power and for purpose of cooking. The implementation of this system will bring down the cost and provide an efficient method of producing electric power and bio fuels from bio wastes. This will benefit lot of people residing in villages.

[0034] **FIG 1** is a block diagram which illustrates the sample environment within which system for generation of power from bio waste and algae is implemented in accordance to one or more embodiments of the invention. In one embodiment, the power generation system utilizing bio wastes and algae (**100**) comprises public toilet tanks (**101**), individual toilets (**102**) and biological refuse (**103**) that act as natural source for collecting bio wastes. The biological refuse (**103**) contains

vegetables, fruits and meat wastes. The bio wastes obtained from these sources is subjected to anaerobic digester (104) for processing, which breaks down the bio-wastes into gas, nutrients and fertilizer sludge. Carbon dioxide obtained from anaerobic biodigester (104) along with other nutrients is provided to algae in a harvesting place (105) that is generally a pond etc. for producing biodiesel after processing. The algae are harvested in the pond the harvesting place (105) to produce oil or gas at a particular temperature, pressure and in the presence of a catalyst. The oil is converted to biodiesel using methanol. The biodiesel obtained from the algae harvesting place (105) and the bio gas obtained from anaerobic digester (104) both are used for generation of electric power.

[0035] FIG 2 is a diagram which illustrates the anaerobic biodigester component of the system implemented in accordance to one or more embodiments of the invention. The anaerobic biodigester (104) takes biowastes obtained from the sources such as public toilet tanks (101), individual toilets (102) and biological refuse (103) as the input and produce biogas which comprises roughly equal amounts of carbon dioxide and methane. A scrubbing process is used to separate CO₂ and methane. The methane with a minimal amount of CO₂ is then compressed to 3Kg/cm² for use as cooking fuel. The solution obtained with nutrients is stored in a separate tank. Manure obtained from the anaerobic biodigester (104) is dried and stored to be used as fertilizers.

[0036] FIG 3 is a diagram which illustrates the various modules or components of the system for generation of electric power using biowastes and algae. The collecting module (301) is configured to collect bio wastes from various sources such as public toilet tanks (101), individual toilets (102) and biological refuse (103). All collected biowastes is pulverized and mixed in a central processing tank outside the village, preferably on a non-productive land. The processing module (302) is enabled to process the collected biowastes in an anaerobic biodigester (104). The processing module takes collected biowastes as an input from the collecting module (301) and undergoes anaerobic digestion of the biowastes at a particular pressure to yield biogas, manure and nutrient rich solution as an output. Biogas contains roughly equal amounts of carbon dioxide & methane. A scrubbing process is used to separate CO₂ out and pump it to the raceway ponds

the harvesting place (105) to feed algae. The methane with a minimal amount of CO₂ is then compressed to 3Kg/cm² for use as cooking fuel. The harvesting module (303) is used to harvest algae in a harvesting place (105) and feed it with CO₂ and nutrient solution obtained as an input from anaerobic biodigester (104) along with sunlight. The algae are harvested into oil or gas at a particular temperature, pressure and in the presence of a catalyst. The oil is then converted to biodiesel using methanol or ethanol. The power generation module (304) is configured to utilize biogases obtained from anaerobic biodigester (104) and biodiesel obtained from harvesting of algae to generate electric power.

[0037] Hence, the system and method for generation of cooking fuel and electric power utilizes natural resources such as bio wastes and algae that makes the entire system cost effective and affordable. The system can be implemented in villages and provide employment and basic necessity such as electric power and cooking fuel to poor people dwelling in villages.

[0038] Claims:**I Claim,**

1. A method of generating electric power and cooking fuel from bio waste utilizing algae comprising steps of:
 - a) collecting bio wastes from various sources;
 - b) processing the collected bio wastes in anaerobic bio digester to generate biogas, nutrients and manure;
 - c) separating carbon dioxide and methane obtained from biogas by a scrubbing process;
 - d) feeding algae with carbon dioxide obtained by scrubbing process to generate biodiesel.
2. The method as claimed in claim 1, wherein said biowaste includes fecal matter, vegetables waste and animal waste.
3. The method as claimed in claim 1, wherein said biogas further comprises roughly equal amounts of carbon dioxide, methane and other gases.
4. The method as claimed in claim 1, wherein feeding of algae takes place in a pond.
5. The method as claimed in claim 1, wherein said separated methane with a minimal amount of carbon dioxide can further be compressed to 3Kg/cm² for use as cooking fuel.
6. A system for generation of electric power from biowastes and algae, the system comprising;
 - a) a collecting module adapted to receive bio wastes from various natural resources;

- b) a processing module further comprising anaerobic biodigester that functions by degrading the collected bio wastes to produce manure, biogas and nutrient solutions;
 - c) a harvesting module enabled to harvest algae using carbon dioxide obtained from processing module and sunlight to produce biodiesel;
 - d) a power generation module programmed to produce electric power utilizing biogases and biodiesel obtained from processing and harvesting modules.
7. The system as claimed in claim 6, wherein said collecting module collects biowastes that includes fecal matter, animal waste and vegetable waste.
8. The system as claimed in claim 6, wherein said biomass is diluted to 10% along with 90% liquid to be provided as an input to the processing module;
9. The system as claimed in claim 6, wherein said algae is pressed for extracting lipids which is further converted to biodiesel.
10. The system as claimed in claim 6, wherein said biogases is utilized as cooking fuel as well as to generate electric power.

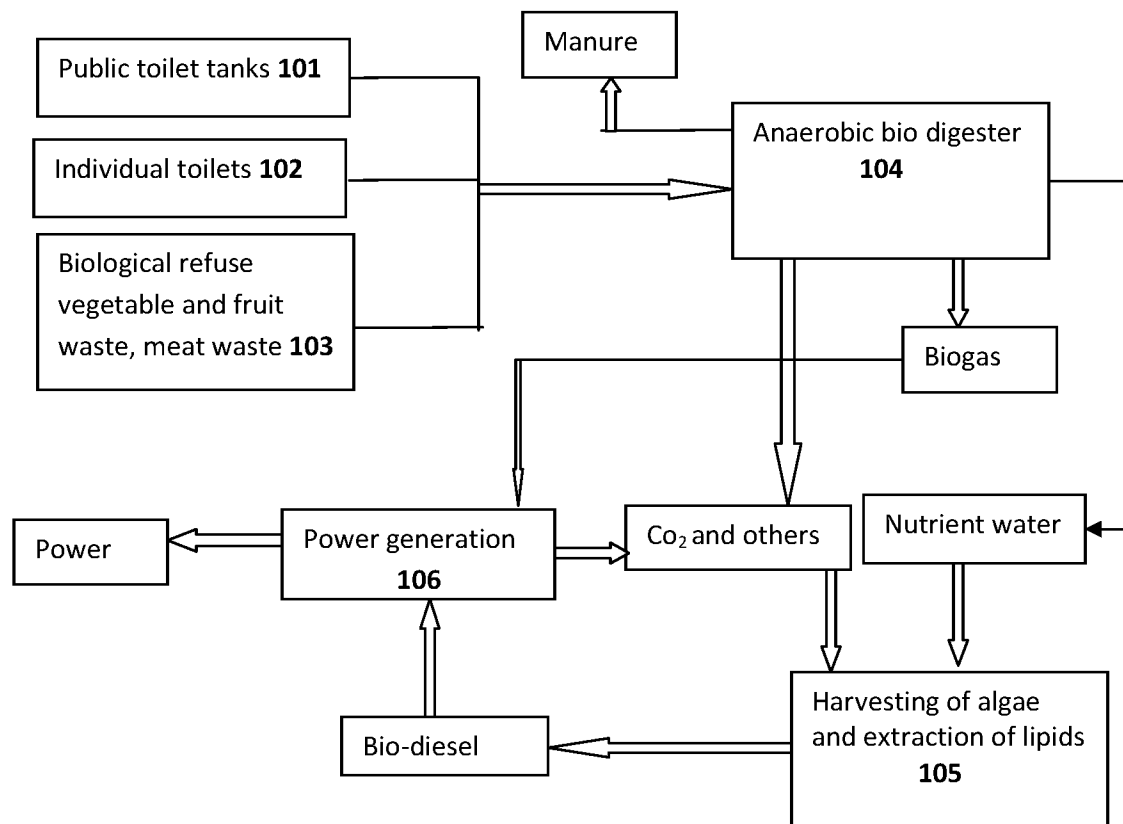


FIG 1

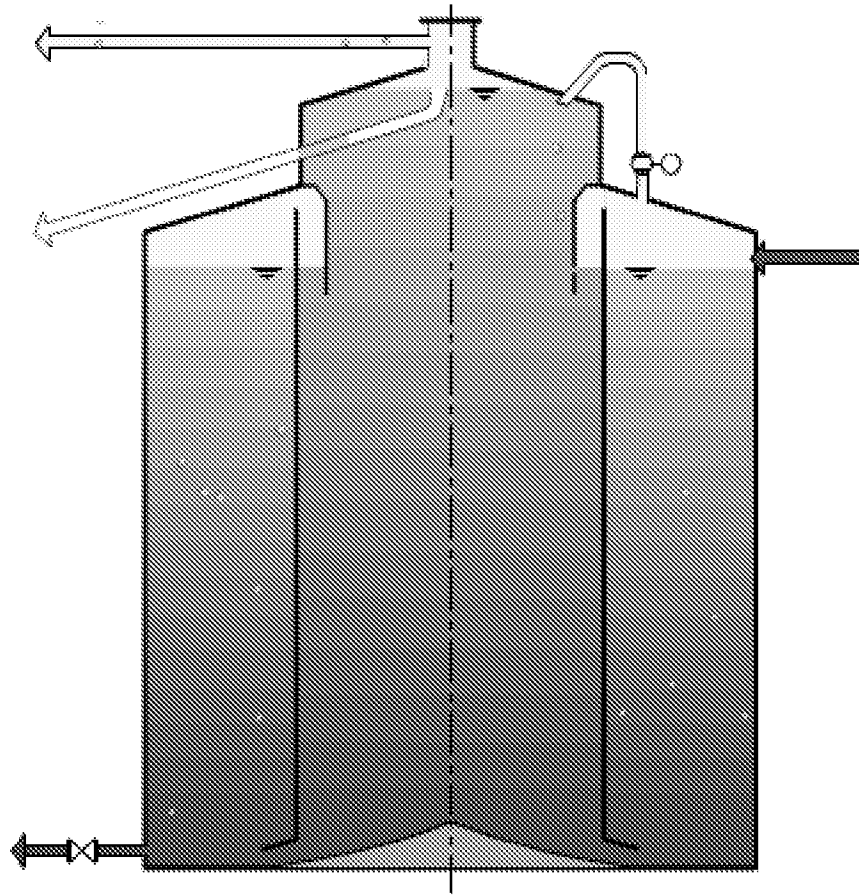


FIG 2

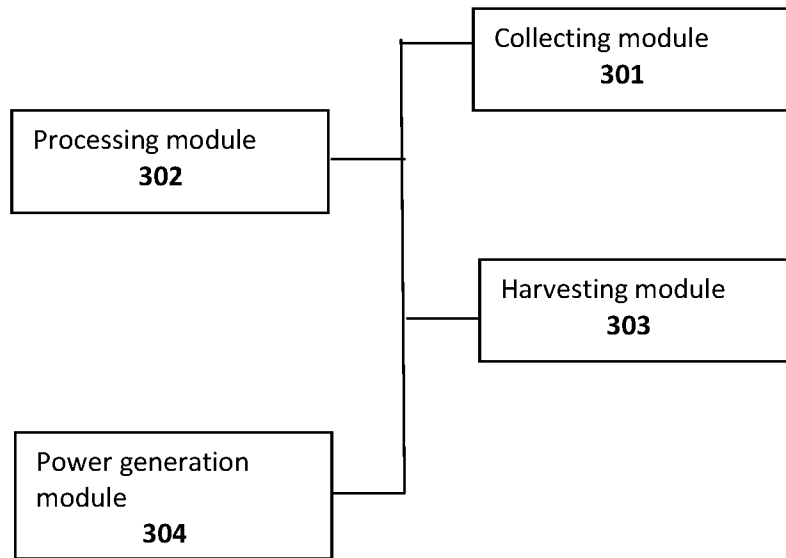


FIG 3