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COMBINED BIOMASS UTILIZATION SYSTEM

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Abstract. The purpose of this study is to analyze existing technologies and optimize their operation in a closed-loop production and use of biomass fuel based on existing chemical-biological technologies of biochemical processing of biomass and its anaerobic fermentation processes.
The article presents a fundamentally new scheme of biomass utilization of different origins, the implementation of this scheme of utilization of household, sewage, industrial and technological biomass waste will solve simultaneously the problem of preserving the environment in an environmentally friendly condition, to obtain during processing energy sources thermal energy to ensure the flow of biochemical and thermal processes in the installation, and to produce pilot fuel for its use in the processes of heat production of decentralized heating systems and energy production of small and medium-sized settlements, private estates and cottages.

Keywords: Energy production, anaerobic fermentation, synthesis gas, production of pellets, boiler recovery.

1. Introduction

Among the great variety of biomass processing systems, a special place is occupied by systems of anaerobic fermentation of thermophilic temperature regime. At present, such systems are becoming more widely used in connection with the spread of the problem of overcrowded settling tanks of large cities and enterprises of agricultural importance. [1]

so their further processing makes sense and will be able to recoup the cost of transition to this modern technology. In this regard, within the framework of this article the basic schemes of using biomass processing technologies in a closed cycle and their analysis are given. [1]

2. Relevance of the topic

Today, the problem of waste disposal of society in large cities (domestic, sewage, industrial and technological waste), livestock and meat and dairy products, agricultural production enterprises, medical, medical is relevant for different countries in the modern world. and pharmaceutical institutions, etc., whose activities are accompanied by the need to daily direct to address the significant costs of energy and financial resources. In some emergencies, such enterprises can use waste incineration technologies and equipment, but their use requires energy consumption and does not allow to effectively solve this problem in the complex.

An appropriate and innovative way to solve this socio-environmental problem is to use integrated biological, chemical and physical methods for waste treatment in order to obtain biomass energy sources with the possibility of their use in energy production processes. This approach provides a promising opportunity to process large amounts of waste of various origins to generate heat and electricity at powerful processing plants and pave the way for waste-free technologies, processes and enterprises, which should be the goal and main task of environmental policy of modern states.

One of the possible variants of technology for processing waste of different origins can be based on the utilization of harmful biomass of animal and human origin. This technology should involve the development of integrated approaches using biochemical processes, the result of which under certain conditions should be an energy source as a fuel of biological origin of gaseous and solid form. The scheme of the variant of biochemical technology of waste processing, proposed in the general scheme of energy production, is shown in the figure. The resulting pellets can be used in individual heat production systems, and the gas turbine is capable of producing electricity.

3. Statement of the problem

The purpose of this article is: analysis of modern biomass processing systems and development of schematic examples of their combined use in closed systems. To solve the problem, the goal was to give a schematic example of a combined power plant capable of operating on all types of fuel.

4. Solving the problem

4.1.Description of the basic scheme of waste biomass utilization of large cities

The publication schematically considers a fundamentally closed system of biomass utilization and drying of its residues in order to produce pellets for further use (Fig. 1).

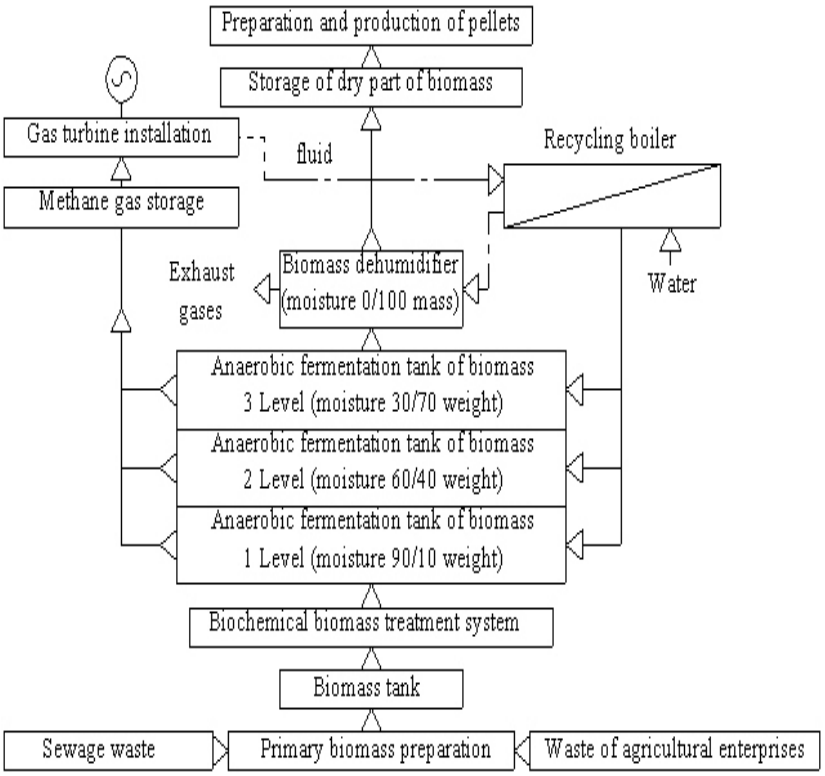

Fig.1 Schematic diagram of step-by-step utilization of biomass by the method of its processing to the state of pellets using thermophilic anaerobic fermentation technologies and drying systems. [10]

In this scheme, waste biomass is disposed of from sewage and settling tanks of agricultural enterprises by: supplying biomass to the primary treatment system that processes biomass by cleaning it from debris and squeezing out excess substances, then biomass fills fuel tanks to feed into the biochemical preparation system to create fermentation conditions by mixing sugar and other substances to improve and accelerate the fermentation process [2-7], after preparation the biomass fills the first 1 level of anaerobic thermophilic fermentation tanks, in this tank there is a mixing mechanism to obtain a more concentrated composition of biomass. Fermentation is carried out in a thermophilic mode which causes (+ 55ºC) but the automatic system will regulate the temperature to a greater or lesser extent [7-9],

4.2. Description of the basic scheme of realization of the dry part of biomass processed to a condition of chickens

The publication schematically considers the fundamentally closed system of realization of piles harvested by drying biomass (Fig. 2)

In this scheme there is a step-by-step sale of pilot fuel obtained from the sale of waste biomass (Fig. 1), after the production of pellet fuel it is transported to the fuel storage unit with gasification system, fuel therefore it is not necessary to modify it under pilot fuel, in the steam gasifier pilot fuel by means of sharp steam (560 ºC) is crushed to a coke condition, and gas part of fuel goes to system of purification of synthesis gas which by means of the membrane conversion reactor regulates hydrogen mixture. for the safe operation of gas turbines, which with their exhaust gases heat the boiler utilizer of the steam-gas installation, which produces electricity,and gives the required amount of steam required for continuous operation of the gasifier, [7-10] also on the circuit there is a slag processing system, which allows to extract from the coke obtained by gasification of fuel recyclable materials such as precious metals (palladium, gold, silver and others) , the scheme also includes a system for processing gas synthesis residues to the state of the substance (gasoline) in order to process

it into recyclable substances such as (kerosene, gasoline, hydrogen, methane, propane, butane). [1-6]The scheme also includes a system for processing gas synthesis residues to the state of a substance (gasoline) in order to process it into recyclable substances such as (kerosene, gasoline, hydrogen, methane, propane, butane). [1-6]also in the scheme there is a system of processing residues of gas synthesis to the state of the substance (gasoline) in order to process it into recyclable substances such as (kerosene, gasoline, hydrogen, methane, propane, butane). [1-6]

4.3. Description of the basic scheme of utilization and further realization of combined systems in a closed cycle of processing and use of biomass of settling tanks of large cities and agricultural enterprises

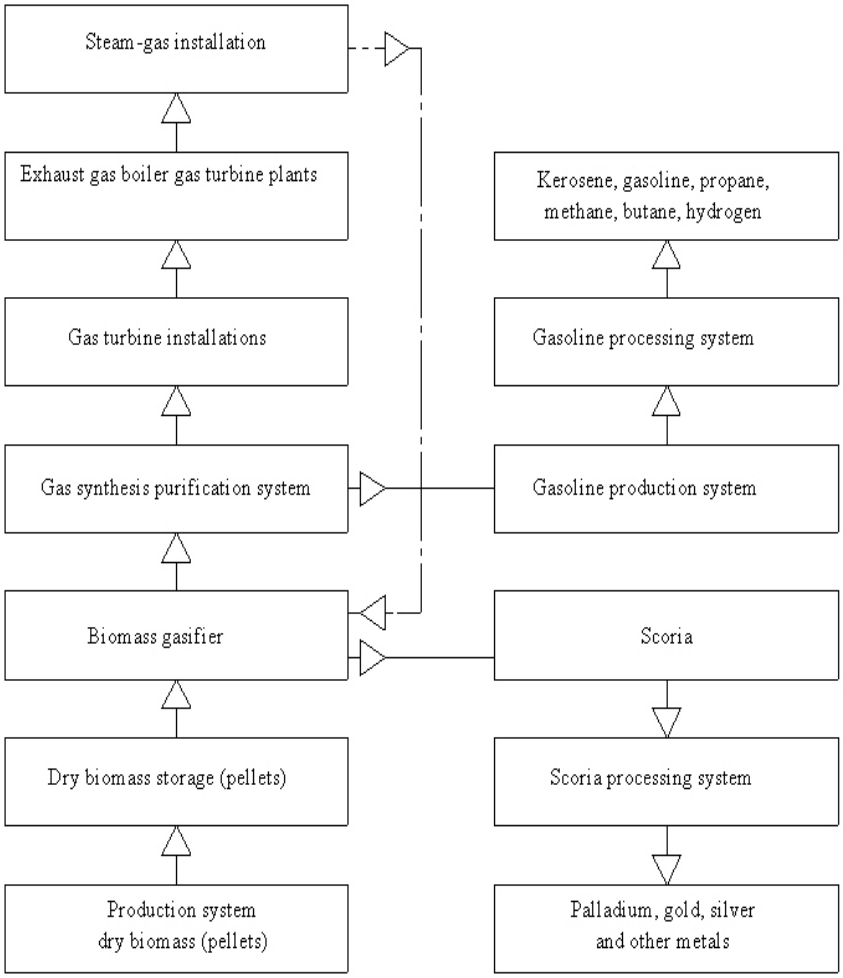

Fig.2 Schematic diagram of step-by-step implementation of pilot fuel obtained by drying biomass [10]

The publication shows a diagram of two closed systems in a combined cycle (Fig.3 combination (Fig .1-2))

Or used as the main fuel for both gas turbines, which in turn eliminates the consumption of synthesis gas for one of the gas turbines, in order to process gas into gasoline. Also, a closed system requires less staff to maintain than separate systems, this will also be important for the cost [1-10].

5. Conclusions

1. The diagrams show the implementation of existing and long-established technologies for creating a system of biomass utilization, this combined system is of great importance for countries with large populations and developed agricultural industries, as well as for countries with a shortage of solid and liquid fuels, and if you add GTU exhaust filtration system then this installation will have less emissions than any thermal power plant.

2. The only downside is the size, because this installation will take up a lot of space, but there is an opportunity to reduce the cost of installation by upgrading existing thermal power plants and CHP, as well as fuel residues can be used as the main fuel for all gas and liquid power plants.

3. In today's world, this installation is very relevant because now fuel resources are rising very quickly in price, so the payback period of these systems will be much shorter compared to existing counterparts, and theoretically, depending on the origin of biomass, these plants will be able to establish production of precious metals from slag no less than large companies for the extraction of precious metals which will lead to a reduction in imports of scarce scarce metals.

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Метою даної статті є аналіз існуючих технологій та оптимізація роботи їх у схемі замкнутого циклу виробництва та використання біомасового палива на основі існуючих хіміко-біологічних технологій біохімічної обробки біомаси та процесів її анаеробного бродіння.

В статті наведено принципово нову схему утилізації біомас різного походження, реалізація даної схеми утилізації побутових, каналізаційних, промислових та технологічних біомасових відходів дозволить вирішити одночасно у комплексі проблему збереження в екологічно сприятливому стані навколишнє природне середовище, отримати під час переробки енергетичні джерела, здатних генерувати електричну та теплову енергії для забезпечення протікання біохімічних та теплових процесів в самій установці, та виготовляти пілетне паливо для його застосування у процесах тепловиробництва децентралізованих систем теплозабезпечення та енерговиробництва малих та середніх населених пунктів, приватних садиб та котеджів.

Ключові слова: *Енерговиробництво ,анаеробне бродіння, синтез-газ, виробництво пілет, котел-утилізатор.*

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Комбинированная система утилизации биомасс

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Целью данной статьи является анализ существующих технологий и оптимизация работы их в схеме замкнутого цикла производства и использования биомассового топлива на основе существующих химико-биологических технологий биохимической обработки биомассы и процессов ее анаэробного брожения.

В статье приведена принципиально новая схема утилизации биомасс различного происхожде-ния, реализация данной схемы утилизации бытовых, канализационных, промышленных и технологических биомассовых отходов, позволит решить одновременно в комплексе проблему сохранения в экологически благоприятном состоянии окружающую природную среду, получить при переработке энергетические источники, способных генерировать электрическую и тепловую энергии для обеспечения протекания биохимических и тепловых процессов в самой установке, и изготавливать пилетное топливо для его применения в процессах тепло производства децентрализованных систем теплоснабжения и энергопроизводства малых и средних населенных пунктов, частных усадеб и коттеджей.

Ключевые слова: *Енергопроизводство, анаэробное брожение, синтез-газ, производство пеллет, котел- утилизатор.*

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