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Determining the level of explosive gas generator gas in the autonomous power supply system

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Regularities explosive concentrations of air and gas generator to eliminate explosion in the autonomous power supply system based on pyrolysis boilers

Producer gas, explosion, explosive mixture.

Currently, considerable scientific potential of the developed world is focused on the development of new and modernization of existing technologies generate electricity using renewable sources such as wind flow, solar radiation, biomass and geothermal energy potential of the crust. Interest in these technologies emerged through exhaustion of fossil hydrocarbons, rising prices for energy and the negative trend in changing ecological situation of the planet. It is a number of these problems and directly led to the development of autonomous power systems with distributed generation sources (DRG) energy [1,2,6].

One of the most promising areas of DRG, which is currently being actively developed, there are power systems that operate using biomass energy. These power systems emissions of carbon dioxide in the atmosphere can be called conditionally missing, because after generating an electric current CO2 consumed biological component complex. Upon receipt of electricity from biomass uses many methods of turning it into a source of energy, in particular anaerobic

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fermentation, pyrolysis and transesterification of vegetable oils.

In terms of the development of an autonomous power system nayperspektyvnym is a method of pyrolysis of wood, as compared to the other it has a small number of process stages easily be subjected to automation and wood is readily available raw materials. Variant of such power systems is presented in [3] and its control algorithm in [4] and [5] solved the issue of increasing pozhezhovybuhobezpechnosti power plant. However, in [3,4,5,6] was solved questions explosive concentrations of gas generator that can occur in pyrolysis plant. To address this issue conducted an experimental study to establish the concentration of explosive gas air and gas producer, which allowed to obtain the necessary dependencies for ventilation installation with automatic ignition of fuel in the gas generator.

The purpose of research - analysis of dependencies explosive concentrations of air content in the mixture of gas generator gas control algorithms for improving the autonomous power supply system and improve its vybuhobezpechnosti.

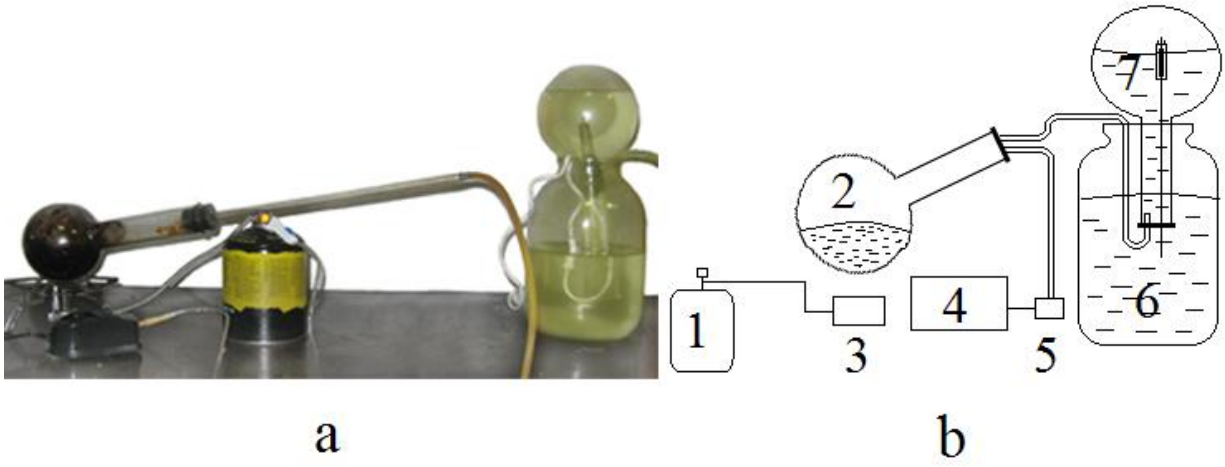
Materials and methods research. Research explosive concentrations was conducted experimentally, based on the structure and algorithms of an autonomous power system are described in [4,5,6,7].

Studies. According to [5] an algorithm for power control system that provides for forced ventilation pyrolysis installation before you start. This operation due to the need to control the gas composition in the pyrolysis boilers to avoid explosion or fire situation.

To determine the safety value of the gas mixture in the installation it is necessary to study the upper and lower limits of the concentration at which explosion can occur. This was developed physical model of the gasifier and a series of tests.

Physical model gasifier consists of a gas cylinder, burner capacity to generate gas and gasholder with electric igniter (Figure). In this model, beech sawdust pidihrivalasya to 600 oC in reservoir volume of 1 dm3 when the air supply

and the rate of 0.1 dm3/hv., Which provided the compressor. The generated gas got into gasholder as pyrolysis gas consists of nitrogen N2: 50,9% of carbon monoxide CO: 27,0 hydrogen H2: 14,0% Carbon Dioxide CO2: 4,5% CH4: 3.0%, and oxygen O2 : 0.6%. In wet gas container vyvkorystano oil instead of water in order to avoid dissolution of carbon dioxide.



Systems for the study of explosive concentrations of pyrolysis gas: a) - general view and b) - Structural diagram: 1 - bulb with methane and 2 - vessel with beech sawdust, 3 - burner control gas supply, 4 - Compressor 5 - control of air supply, 6 - gasholder, 7 - Electrodetonators

After the generation of gas in the tank portions served gasholder air and detonation conducted by an electric igniter. At a time when gas exploded, he pushed oil from the gasholder, then the recorded value of generator gas and air. As a result of the experiments was obtained upper and lower explosive limit concentration gas generator vidnosnodo air, which was 1/3 and 2/3.

Conducted research confirmed previous assumptions about the necessity of forced ventelyuvannya pyrolysis boiler before work, put forward in [5]. However, the structure of the system should include methane sensor, whereby Gage module at the start of pyrolysis installation carried out monitoring the presence of residual gas.

Conclusions

The dependence of explosive concentrations of air content in the mixture of gas generator gas, which was 1/3 and 2/3, respectively, allowing improved control algorithms autonomous power supply system and improve its explosion.

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Yssledovanы zakonomernosty vzrыvchatыh concentrations of air and gas generator for ustranenyya vzrыvoopasnosty in Autonomous system Power Options Based pyrolyznыh boilers.

Heneratornыy gas vzrыvobezopasnost, explosive mixture.

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