

Complex Problems of Power Systems Based on Renewable Energy Sources

ROKHMAN B. (Kyiv). **On the organization of the most effective mode of burning a mixture of dropouts anthracite culm and sludge in the boiler with a circulating fluidized bed of number 4 unit of the Starobeshevskaya power plant. 2. Modeling and theoretical studies of motion, physical and chemical processes in the freeboard.**

We have built a stationary model describing the upward motion, heat and mass transfer and chemical reaction of coke-ash polydisperse ensemble of particles in the flow core with variable admixture consumption along height of freeboard (FB). We have undertaken extensive theoretical studies of workflow in a FB of the boiler furnace with a circulating fluidized bed, the results of which were compared with the experiment and the data given in [1]. It has been shown that in the initial part of FB the temperature of large fractions can exceed 900°C which is considered the maximum temperature allowable by the fastening of sulphur oxides. However, it has practically no effect on the process of capturing SO₂ as the share of large fractions in the gas-particle flow is low.

BUD'KO V., KUDRYA S., PAVLOV V. (Kyiv). **The concept of charging the electricity-driven vehicle battery by photovoltaic plant**

There have been evaluated the influence of technological shutdowns of a vehicle over its mileage increase when using a PV plant as an additional power source. The PV plant is installed on the carriage part of a vehicle. A new method to charge batteries by stationary photovoltaic plants has been suggested. It allows realizing classical charge of tractive batteries even in the seasons with the lowest solar radiation intensity.

GUBIN S., GONTAR' M. (Kharkiv). **Formulating the integration problem of an alternative power plant for energy supplying of a stand-alone unit.**

The article lists the application field and the topical choice of a wind-solar power plant. There have been considered an integrated approach to describe complex energy systems (ES). The ES components parameters have been analyzed and a mathematical model of a general installation has been developed.

GUSEV A. (Sarov, Russia). **Photochromic and electrochromic triplex for climate control systems.**

The results of successful R&D implementation of photochromic and electrochromic triplex for climate control systems. There has been created a technological groundwork for pilot production. Organizational, technological and scientific work have been done on creating the production of electrochromic triplexes. The construction is scheduled to begin in the pilot area the city of Sarov. It has been expected to create three sections with 3 different techniques of electrochromic film manufacture.

Solar Energy

RYEZTSOV V., SURZHYK T., TEIMURAZYAN M. (Kyiv). **Distribution analysis for higher harmonic voltage components and currents in PV power plant cable lines and limit facilities of their impact over the environment.**

PV plant operation is accompanied by higher harmonic voltages components and currents in PV cable lines. Having analysed the models of higher harmonic components propagation

in twin-lead long lines it has been recommended to use semiconductor filtering devices as well as electromagnetic shields to limit negative impact of higher harmonics over the environment and PV plant maintenance staff.

KNYSH L. (Dnipropetrovsk). **Thermal inertia influence of the elements of a flat solar collector on its energy performance.**

Research of effect the thermal inertia of the elements of a solar collector on its energy performance has been conducted. The mathematical model based on the energy equation has been solved numerically using the average data on the intensity of solar radiation. A significant effect of the thermal inertia when reviewing the work of the local collector has been shown and minimal effect on the heat capacity of its integrated energy performance has been proved.

SIMEYKO K. (Kyiv). **A research study to find the option of carbothermic silicon recovery.**

The possibility of carbothermic recovery of silicon has been considered. As a reducing agent encapsulated pyrolytic carbon quartz sand has been used. The sand is obtained in a reactor with an electrothermal aerated bed. The main advantage of using this material as a feedstock to the carbothermic recovery is relative purity in comparison with similar reducing agents as pyrolytic carbon has been obtained from the gas phase. Encapsulated quartz sand gets melted by pyrocarbon influence and this process is conducted in a graphite crucible in the induction heating furnace.

There have been presented the following: substantiation of research study and the technology of carbothermic recovery upgrade; the results of experiments with encapsulated quartz sand getting melted by pyrolytic carbon in an induction furnace; microscopic analysis of obtained material; thermodynamic calculations results as well as prospects for future research studies.

STEBLENKO L., PODOLYAN A., KOROTCHENKOV O., TODOSICHUK T., YASHCHENKO L., VORONTSOVA L., KALYNYCHENKO D., KOBZAR Yu., KURYLYUK A. (Kyiv). **Influence of polymeric covering and magnet treatment over carriers' lifetime in silicon that is used in solar energy industry.**

There has been studied a possibility to increase efficiency ratio of solar cells being produced on basic crystal solar-Si. These cells get covered with polymeric coating due to magnetic treatment in weak magnetic fields. It has been shown that combination of passivating antireflecting polymeric coatings and magnetic field influence leads to photovoltage drop and diffusion length increase. As a result, this fact points out the possibility to increase solar cells efficiency.

Wind Energy

YAKOVLEV A., ZATUCHNAYA M., PASHKOV V., BALBEKOV M., MERKUSHEV V. (Kharkiv). **Comparing power characteristics of orthogonal WT's blades of various types.**

The paper deals with a comparative analysis of power characteristics of orthogonal windwheels. It has been made a conclusion about optimum angles of the blades for different windwheels.

KUZNETSOV M. (Kyiv). **Methods to evaluate random parameters of power systems operation together with**

integrated wind power plants.

Reliability of the power system is determined by its capacity to provide electricity needs and adequately respond to changes in its consumption. If the generating energy system includes wind power farms, which are also due to the variable work, depending on the wind speed, it introduces an additional uncertainty factor and can dramatically affect the stability of the power supply. Mathematical modeling allows predicting the power system operation and evaluating its reliability.

PEKUR P. (Kyiv). Stochastic characteristics of a WT rotor mechanical loads.

The stochastic mathematical model for ram force over wind-driven plant rotor has been developed. The model considers aeromechanical characteristic non-linearity and its dependence upon blades rotation angle. It also determines the connection between wind speed ram and force probability characteristics.

Hydroenergy

MOROZ. A. (Kyiv). The analysis of design data for hydropower resources of small rivers in Ukraine.

There were analyzed the initial data and the provisions that had been used in the determination of the hydropower potential of small rivers in Ukraine throughout historical data.

Geothermal Energy

PAZYUK V. (Kyiv). Basic ways to reduce energy consumption when drying grains by a heat pump drier.

The paper offers methods to reduce energy consumption of heat for grain drying with the help of a heat pump dryer.

BIOENERGY

CHETVERYK G. (Kyiv). Synergy analysis of formation conditions for temperature self-oscillation and organic substance concentration during anaerobic digestion of the agent in a bioreactor.

There have been presented formation conditions for self-oscillatory modes in energy conversion processes at a biogas plant bioreactor and the conditions when these modes can be avoided.

DOVZHENKO D. (Kyiv). Designing a thermodynamic cycle of an automobile internal combustion engine working on power gas.

The thermodynamic cycle of an internal combustion engine has been designed. In this engine power gas is used as a fuel. A computer program has been designed to calculate thermodynamic cycle of an internal combustion engine.

**XII МІЖНАРОДНА СПЕЦІАЛІЗОВАНА ВИСТАВКА
ЕНЕРГЕТИКА В ПРОМИСЛОВОСТІ-2014**

ЕНЕРГЕТИЧНЕ, ЕЛЕКТРОТЕХНІЧНЕ ОБЛАДНАННЯ • ЕЛЕКТРОУСТАТКУВАННЯ МЕХАНІЗМІВ, МАШИН • ПРОМИСЛОВИЙ ЕЛЕКТРОПРИВІД • СВІЛОТЕХНІКА
ЕЛЕКТРООБЛАДНАННЯ ДЛЯ ЕЛЕКТРОТРАНСПОРТУ • КАБЕЛЬНО-ПРОВІДНИКОВА ПРОДУКЦІЯ • АВТОМАТИЗАЦІЯ СИСТЕМ ЕЛЕКТРОПОСТАЧАННЯ

**XII МІЖНАРОДНИЙ ФОРУМ
ПАЛИВНО-ЕНЕРГЕТИЧНИЙ КОМПЛЕКС УКРАЇНИ:
СЬОГОДЕННЯ ТА МАЙБУТНЄ**

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**23-25
ВЕРЕСНЯ**

ОРГАНІЗАТОРИ:
Міністерство енергетики
та вугільної промисловості України
Міжнародний виставковий центр

Технічний партнер:

Друкується згідно з рекомендацією Вченої ради Інституту відновлюваної енергетики НАНУ, протокол №3 від 20.02.14.

Підписано до друку 13.03.2014. Формат 297×420. Друк – різнографія. Умовн.друк.арк. 6. Тираж 300 прим.

Зареєстровано 01.09.2004, свідоцтво: серія КВ, № 9115. Ціна договірна.

Віддруковано ТОВ "Видавництво Вікторія", м. Київ, вул. Н.Вал, 23, офіс 3.