ABSTRACT AND REFERENCES

ENERGY-SAVING TECHNOLOGIES AND EQUIPMENT

DEVELOPING OF HYDRO-AERODYNAMIC SYSTEMS' ELEMENTS BASED ON INTELLECTUAL VISUALIZATION (p. 4-8)

Elena Arsiriy

For identifying and studying the hydro-aerodynamic processes influence the hydraulic resistance in the elements of a complex shape complex modeling tools are developed. These tools allow receive the visual and intellectual models. For receiving of hydrodynamic intellectual models of hydro-aerodynamic structural primitives in the implementations array of the hydro-aerodynamic flows in major and minor hydro-aerodynamic systems' elements analysis and search of regularities for a more compact description of the data were carried out. The analysis was carried out in four phases: a priori alphabet classes preparation based on the clustering procedure, a priori attributes dictionary preparation, the classification algorithm implementation; clarify the description of all the classes in the signs language considering the classification quality index. For determining the prototype classes it was proposed to carry out the clustering of the visual data based on the method of intelligent visualization (MIV) using Kohonen self-organizing maps (SOM) in the form of coherent regions (coherent region) (SOM-CR). MIV SOM-CR is implemented in the form of two procedures: the classical self-organization and the modified calibration.At the stage of classification for separating surfaces building the multilayer perceptron (multilayer perceptron – MLP) is used. It was trained on the basis of back-propagation (back-propagation learning – BPL).

Keywords*:* information technology, data mining, hydrodynamic modeling, design and operation of the hydro-aerodynamic systems.

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STEAM-EJECTOR REFRIGERATING SYSTEMS IN ENERGY SAVING TECHNOLOGIES OF AMMONIA PRODUCTION (p. 8-13)

Anatoliy Babichenko

In the context of the general problem of increasing the energy efficiency of the units of ammonia synthesis the results of research and engineering aimed at reduction of energy-intensity of synthesis were presented. The analysis of the state and impact of condensation stages of productional ammonia on the operating costs of production was carried out. A possibility of improvement the energy efficiency by exclusion from the scheme of the most energy-intensive ammonia turbo compressor refrigerating unit and reduction of the consumption of natural gas in block of compression of section of synthesis was substantiated. The scientific problem of disposal of low-potential heat with temperatures lower than 100 ° C in a steam ejector refrigerating units by application of a low-boiling cooling agent – ammonia, which was irrevocably lost in the air coolers of steam generation section with power consumption was solved. By mathematical modeling, the synthesis of energy-efficient hardware-design process of condensation systems was carried out, providing in high temperature the redistribution of generated refrigeration energy in condensation units with its increase at the stage of primary condensation due to the inclusion of steam ejector refrigeration unit. The usage of the proposed power technological design permits to reduce the specific consumption of electricity and natural gas on average by 20 kW • h/t.NH_3 and 3.67 m^3/t.NH_3.

Keywords: production of ammonia; energy efficiency; heat disposal, steam ejector cooling system.

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KINETICS OF FILTRATION DRYING OF RAW MATERIALS PRODUCTION SLAG GRAVEL (p. 13-17)

Volodymyr Atamanyuk, Iryna Barna, Dmytro Symak

In article present results of experimental and theoretical researches of the kinetics and dynamics of filtration drying of raw materials production slag gravel. Proved the existence of a period of partial and complete saturation of the thermal agent during filtration drying. The influence of technological parameters of the thermal agent (drying potential) on the rate of filtration drying of raw materials. The investigated of the dynamics of moisture removal as a graphical dependence of residual moisture in the layer depending on the height of the layer. Summary results of the drying kinetics enables to justify the optimal technological parameters of the process, depending on the required performance and calculate the basic dimensions of the drying plant.

Keywords: kinetics, dynamics, clay, source granules, rate of filtration drying.

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SAVING OF ENERGY RESOURCES BY USING A SOFTWARE HEAT SUPPLY (p. 18-20)

Bohdan Kytnuy, Anna Borisyuk

Despite the need for compliance with acceptable microclimate parameters nowadays one of the main issues is the energy resources saving that are used to create these very conditions. The software supply of heat is a tool which permits to maintain microclimate parameters during working hours and save energy resources by reducing the temperature of indoor air in buildings after working hours.

The need to optimize the energy saving effect with the program regulation is the objective of the research. The temperature mode calculations were performed on the basis of the thermophysical data of 2 storey brick office building, the building number 9 of Poltava National Technical University. of Yu. Kondratyuk, city of Poltava. The calculations of heat expenditure were made subject to the application of software control for three options of wall insulation: insulation of the exterior walls from the outside, insulation of the interior walls on both sides and the simultaneous insulation of the exterior and interior walls. The calculations were performed for different air temperatures.

The calculation results show that the use of software supply of heat in non-insulated building provides relatively small energy resources saving (5%). The maximum effect from the supply of heat can be obtained by the insulation of the exterior and interior walls. The comparison of saving of heat from the insulation of the exterior and interior walls shows that the insulation of the interior walls provides greater economic effect. Application of software supply with the insulation of walls provides energy saving for15 ÷ 20%.

Keywords: software supply of heat, walls, wall insulation, economic effect

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TORSIONAL STRAIN OF LONG STEAM TURBINE BLADES (p. 21-24)

Alexandr Shubenko, Victor Suhinin, Alexey Boyarshinov

Long naturally twisted blades of steam turbines during the operation experience the aggregate stress-strain state. The strain of the elastic bootstrapping, which is a function of the geometry of the blade and the impact of centrifugal forces developed by it, in turn, causes the shear stresses, the distribution of which along the blade height has not been reflected in the press.

The article presents the results of the study of the effect of smoothness of the derivative of natural blade twist angles in the initial state on the nature of the distribution of shear stresses caused by the elastic bootstrapping in sections of the blade.

The influence of different kinds of errors (design, production) on the growth of additional shear stresses was determined. The effect of abrupt changes of the derivative of the angle of the

natural twist on the nature of the elastic bootstrapping of the blade was revealed.

The article provides recommendations to reduce the additional shear stresses caused by a violation of the smoothness of natural twist angles, as well as to compensate for deviations from the design values of the natural twist angles in the process.

Keywords: blade, strain, stress, rod, angle, derivative, strength, twist.

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THERMODYNAMIC EFFICIENCY OF USE OF HEAT PUMPS FOR COMFORTABLE CONDITIONS IN INDOOR POOLS (p. 25-30)

Mihail Bezrodny, Taras Dranik

Today it is common to use heat pumps in air conditioning systems (split systems). It is also known that heat pumps are used to maintain comfort conditions in indoor pools, but there is no sound data on the thermodynamic efficiency of their use in heating and cooling systems. The article analytically and using the method of balance equations, analyzes the thermodynamic efficiency of the system of comfortable conditions in an indoor pool using a heat pump. Graphic dependences of main parameters that characterize the efficiency of the system on temperature of the surrounding air were presented. It was determined that in order to maintain the heat balance of the scheme the more efficient and rational option is to discharge excess heat into the environment. It was found that the efficiency of the heat pump scheme is little dependent on ambient temperature and is determined by the temperature of the pool water, and as a result, by the air temperature in the pool. The results can be used in the design of heating systems, ventilation and air-conditioning of indoor pools.

Keywords: heat pump, system dehumidification, pool ventilation systems.

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HEAT TRASFER OF FLAT OVAL CYLINDERS IN CROSS FLOW (p. 30-34)

Alexandr Terekh, Alexandr Semenyako, Valeriy Tuz, Alexandr Rudenko, Vadim Kondratyuk

The article presents the results of the experimental study of convective heat transfer of single tubes of circular and flat oval profile in the range of variation of the relative elongation of the profile of the tubes d_2/d_1 from 1 (round tube) to 2.625. The experiments were conducted in an open-type wind tunnel of rectangular cross section in the range of Reynolds number from 3000 to 25000. The degree of turbulence Tu of the incoming flow was (3.5-4)%, relative length of the cylinders h/d_1=3.5. The method of electric heating of the studied surface was used at which the inner wall of the tube was provided with constant heat flow, and the regular method of the cooling of bodies of simple geometric shape of the I-st kind (for round tube d = 16 mm) was applied, at which the conditions t_w=const were provided.

The analysis of the data indicates that the heat exchange intensity of tubes of circular profile is higher than that of flat oval tubes at (16-35)% depending on the elongation of the profile. Its increase provides the reduction of heat transfer intensity. A generalized dependence was proposed to determine convective heat transfer coefficients of single flat oval tubes, which takes into account the effect on the heat transfer intensity of the relative elongation of the profile.

Keywords: heat transfer, flow, cross, cylinder, tube, flat oval

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INFLUENCE OF HOT WATER TEMPERATURE PUMPED INTO FORCE MINING HOLES ON OUTPUT OF OIL (p. 35-39)

Vladimir Kravchenko, Alex Pogosov, Ali Abdul Husien

The subject of the study is the increase of output of crude oil, depending on the temperature of pumped water. The pumping into holes of a coolant is one of the main methods to improve oil extraction. Preparation of the coolant can be carried out with the help of heat station using organic and nuclear power. For the selection and optimization of the parameters of these power plants, it is necessary to know the dependence of consumption of crude oil on the temperature of the pumped coolant. The purpose of the article is to obtain such dependence. The method of achievement of the results is the use of the formula of Walter for the temperature dependence of kinematic viscosity and of the formula of Mendeleev for density of oil. Currently, to maintain the sheeted pressure, cold water is injected into the pumped mining holes. It is known that the oil output is inversely proportional to its viscosity. Increase of the output of crude oil is determined as the ratio of the dynamic viscosity of the oil at 40 ° C to the viscosity of oil at a predetermined temperature. To calculate this ratio we derived temperature dependences of kinematic viscosity, density and dynamic viscosity. We obtained the desired dependence of the coefficient of increase of oil output to use it as a coolant of hot water, taking into account 42% of loss of heat into surrounding rocks.

Keywords: oil flow rate, thermal methods of intensification of extraction, viscosity, density, temperature of coolant

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RESEARCH OF WORKFLOW OF VERTICAL WIND TURBINES BY NUMERICAL SIMULATION (p. 39-44)

Vitaliy Lipoviy, Andriy Papchenko

The article presents the results of the numerical simulation of vertical wind turbines with calculated system ANSYS CFX. The basic steps of calculation were described in details. The object of the research is an open airfoil. The comparative data of construction of the calculated domain, using the surface of an interface and without it was presented. A possibility of using the calculated domain without the interface surface in order to save computational resources without compromising the accuracy of the calculation was grounded. The calculation was carried out and there is a comparison of the experimental and calculated aerodynamic characteristics under conditions that different models of turbulence are used. It was proved that the most adequate results of prediction of aerodynamic characteristics of the vertical wind turbine are provided by the SSG turbulence model. To improve the accuracy of the calculated experiment it was suggested to use the empirical coefficient.

Keywords: numerical simulation, aerodynamic characteristics, vertical wind turbine, turbulence model, airfoil.

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THE METHOD FOR LOW-RESISTANCE POLES FINDING WITHOUT GROUP UNTARTHING (p. 45-49)

Oleksandr Poliakh

This article discusses the problem of identifying the low-resistance poles without removing them from the group grounding wire, and it's given some results of our research in this area. The main purpose of this article is to develop a more effective, less time-consuming diagnosing method. Using modern calculating techniques and comparing theoretical results with measured ones allow us to make an analysis of information take a decision. Also in this article it's discussed the variations of the total resistanceofpoles, united with group grounding wire from the power supply frequency, depending the location of the low-resistance pole. The proposed method allows to find a low-resistance poles without disconnecting them from the grounding wire, thereby decreasing exploitation costs. The author propose the principle of total resistance variation with accordance to the different frequencies of the power source for defining a low resistance pole, situated in a group of poles with the general grounding wire. The research results can be applied by experts in the diagnosis on railway transport that involves the identification of the technical condition of catenary poles.

Keywords: contact network, cable grounding group, with low support, frequency.

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ANALYSIS OF MODERN METHODS OF COMBUSTION OF LIGNITE IN PRIMARY FURNACE (p. 50-54)

Valeriy Rogachov, Sergiy Reva, Maryan Vandgura

The article analyzes the methods of heat treatment of lignite in primary furnace in order to create an efficient primary furnace for burning solid fuel with small dimensions.

The article provides an overview of the existing technologies of combustion of solid fuel in the primary furnaces of steam boilers, and tested heat treatment technologies of lignite in a fluidized bed and in the vortex, in a fixed or movable dense layer, and in a circulating fluidized bed.

From the above-mentioned methods of combustion of solid fuel for the heat treatment of lignite, the best is the cyclone or vortex method. It differs from others by the least necessary dimensions of the principal and auxiliary equipment. If the furnace provides a complete combustion mode, the ash will not contain carbon, and contraction at the outlet of the cyclone will prevent much of the ash in the boiler of the furnace. If the effective heat treatment of gas coal, without initiating fuel usually requires the temperature level of molten slag, for the more reactive lignite it may be sufficient to maintain the temperature not much less than the softening point of the ash. This greatly simplifies the deashing and requirements to materials of internal lining.

This analysis can be used when developing new technologies of combustion of lignite in primary furnace installed in front of the existing boiler units designed to combust both coal and natural gas or fuel oil, mainly used in the municipal power system of Ukraine.

Keywords: primary furnace, lignite, combustion techniques, fluidized bed, dense layer, circulating bed.

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HEAT TRANSFER OF FEW ROW BUNDLES OF SCREW-SHAPED TUBES (p. 54-56)

Sergiy Reva, Valeriy Rogachov, Alexandr Terekh, Olga Alfyorova

The article is devoted to assessing the impact of a number of transverse rows of tubes on heat transfer in heat exchangers with helical tubes in order to create a generalized dependence for calculating the correction factor that takes into account the impact of transverse rows of helical tubes z_2 on heat transfer of bundles.

The studies of the convective heat transfer of the staggered bundles of helical tubes with cross flow of air were carried out in a pilot plant, represented by the open-type wind tunnel of rectangular cross section in the range of the Reynolds numbers from 5,000 to 70,000.

The article describes the generalized dependence to calculate the factor that takes into account the impact of the transverse rows of helical tubes on heat transfer of the bundles. The findings showed an increase of heat intensity during the transition from the first to the second and the third rows of the bundle, which is explained by the increase of the degree of turbulence of the flow as it travels deep into the bundle. To calculate the correction factor for few row bundles of helical tubes it is recommended to use the dependence obtained for the staggered bundles of round tubes with washer and helical ribbing in case of $S_1/S_2 > 2$.

The studies can be used to select the solutions when designing new heat exchangers of heat exchange elements in the form of helical tubes, used in air heaters- regenerators of gas turbine installations.

The results can form the basis of thermal calculations when designing new heat exchangers of helical tubes.

Keywords: tube, bundle, few row, helical surfaces, heat transfer, calculation

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AIR-WATER GREEN HOUSE HEATING WITH TUBE GAS HEATERS (p. 57-60)

Konstyantin Dudkin, Valeriya Tkachova, Vladislav Danishevski

A new heating system for green houses has been proposed in the article. The air-water heating system consists of tube gas heaters ("air-air" and "air-water") with multi-counter structure. Utilization of "air-water" heaters and "air-air" heaters with multi-counter structure leads to the reduction of heater surface temperature with sufficient total efficiency that is necessary for green house heating.

Mathematical model of the heating system is proposed as a model of multi-counter hydraulic circuit with distributive parameters. The stationary and one- dimensional regime has been assumed. Main unknown parameters are pressure, temperature, density and velocity of gas-air mixture.

The model includes the set of hydraulic and heat transfer differential equations for every linear tube heaters and equations of the first and the second circuit laws. Heat transfer equations are given for convection, heat conductivity and radiation processes from gas-air mixture into tube exchanger to air or water environment of the heater. Hydraulic equations are given for mass and momentum conservation of gas-air mixture.

The task of heat and hydraulic regime calculation has been presented in this work. Algorithm for numerical solving of hydraulic and heat regime has been formulated. It is based on the evolutionary random search of more preferable (Rs –optimal) solutions. For the evolutionary search the convergence with probability 1. has been proved. Unknown quantity is the set of chord flows in the multi-counter heating system. The results of a numerical solution of the task of heat and hydraulic regime calculation have been considered.

Keywords*:* Air-water heating system; Gas tube heater; Hydraulic circuit; Evolutionary search.

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THE GRAPH MODEL OF ENERGY-SAVING MEASURE SYSTEM (p. 61-65)

Valeriy Kuznetsov

The power supply systems of railway transport can be considered as a combination of different processes, combined solution for continuous supplying of electricity with appropriate quality to electric rolling stock. In addition power supply systems should provide a cost-effective supplying of energy and the rational level of losses that occure during the process of transmission and transformation. The problem of energy saving in traction power supply systems is a complex, multi-level and multi-factor. The author proposed two-step approach for selecting the energy saving measures on the basis of several criteria, in accordance with the hierarchy of the goals. At a first phase, the experts form a set of energy-saving measures using proposed by the author the invariant-agreed method of hierarchy analysis. At a second phase it's formed a final set of energy saving measures using a proposed graph model. In accordance with the proposed methodology it's made a selection of energy saving measures for Donetskaya railway. The resulting economic effect is about 3 mln. grn.

Keywords: graph model, railway, traction power supply system, traction substations, contact line.

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ОТ АВТОРА

Я, Быкова Татьяна Ильинична, соавтор статьи «Дослідження впливу роботи низькопотенціального комплексу на техніко-економічні показники ТЕС і АЕС» опубликованной в "Восточно-Европейском журнале передовых технологий" № 2/8(62) (с.14-16) приношу свои извинения редакции журнала в связи с тем, что при подаче сведений об авторах в редакцию была допущена техническая ошибка: перед моей фамилий было набрано "кандидат технических наук" которым я не являюсь. Прошу считать этот факт недостаточной внимательностью при оформлении статьи для публикации.

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