A TOOLSET OF DECISION SUPPORT SYSTEMS FOR WOOD HARVESTING AND FOREST BIOENERGY LOGISTICS IN RUSSIA

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ABSTRACT

The paper introduces an overview of the new toolset for logging companies. The toolset containts several optimization tools, including the routing and scheduling of roundwood and energy wood harvesting teams, the sequencing of harvest areas, the estimation of available forest biomass potential in harvesting sites, and the planning of forest road networks. The toolset has been tested in logging companies located in Russian Karelia. The results show that the toolset can be used to support a wide range of planning decisions at company level including truck routing, fleet utilization levels, and choice of transport method under new infrastructure assumptions.

Keywords: wood harvesting, decision support system, GIS, optimization, logistics, Russia

ADVANCED EXERGETIC ANALYSIS OF COGENERATION SYSTEM WITH A BIOGAS ENGINE

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ABSTRACT

In this paper, through conventional exergy-based analysis are definitely the components with highest irreversibilities. To overcome limitations of the conventional exergy analysis and to increase our information about how and what extent the cogeneration system component can be improved, advanced exergetic analysis is conducted. At the same time, the method for calculating the avoidable and unavoidable exergy destruction for a similar class cogeneration system is proposed. Moreover, the criterions assist in identifying the real potential of improving of the *k*th plant components are calculated in present study. Therefore, this paper provides addition information about realistic potential for improving the thermodynamic efficiency of the cogeneration system component and approves the advanced exergetic analysis as a reasonable step in the development of the thermodynamic model of considered cogeneration system.

Keywords: Biogas Internal Combustion engine, Cogeneration system, Exergy Analysis, Unavoidable and Avoidable Exergy Destruction

ASPECTS CONCERNING THE INFLUENCE OF THE TEMPERATURE ON THE OHMIC RESISTANCE OF THE WINDING TRANSFORMERS WITH RATED POWER 400 MVA

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ABSTRACT

Electrical transformers having rated power of 400 MVA, represent the center of gravity of electric substations related to Power System, therefore, the prophylactic examinations have a major importance in preventing emergency arrangements and ensure the reliability of these types of transformers. The paper aims to conduct a case study on 400 MVA block transformers, which converts electrical energy produced by synchronous generators of 330 MW from a voltage level of 24 kV to 400 kV voltage level, feature of electricity transport aerial power lines with rated voltage of 400 kV.

Keywords: electrical transformer, ohmic resistance, temperature, transformer windings, medium voltage, high voltage

ASSESSMENT OF GREENHOUSE GAS EMISSIONS IN ROMANIA – CASE STUDY FOR RAPE CROP

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ABSTRACT

Use of renewable energy resources is regulated by EU Directive 2009/28/CE from April 23rd 2009. The reduction of the greenhouse gas emissions coming from the biofuels and bioliquids use is calculated according to the Article 19 of the Directive and is based on typical and default values. In this study the coefficients for rape crop (typical emissions of greenhouse gas -g $CO_{2\ ech}$ MJ^{-1}) were evaluated at NUTS3 level (county) taking into account the pedoclimatic and technological conditions of Romania. The evaluation of greenhouse gas emissions and of energy consumptions within the whole production chain of biodiesel was done by using three different computing programs: Greenhouse Gas Calculator – version 2.1b/2008; Greenhouse Gas Calculator for bioethanol and biodiesel designed in 2005 by Environmental Policy Center of Imperial College from London and adapted to the Directive requirements in 2009; Carbon Calculator – version 1.1 designed by E4Tech for Renewable Fuels Agency from UK. These programs were used for different crop production levels: multiannual national average for the period of 1991-2011 provided by National Institute of Statistics; the lower level of crop production defined as difference between multiannual average and standard deviation of crop production years; the upper level of the crop production defined as sum between multiannual average and standard deviation of crop production years; crop production for which the default values of crop coefficients are given in Annex V/part D. The aggregation of information on greenhouse gas emissions (g $CO_{2\ ech}$ MJ^{-1}) at NUTS3 level corresponding to the fourth levels of crop production was done as an average of emissions from each soil-terrain unit under arable land use. The results obtained using three computing programs showed that the dependence between greenhouse gas emissions specific to rape crop (g $CO_{2\ ech}$ MJ^{-1}) and crop yield (t ha^{-1}) are similar. The E4Tech model was then used for evaluation of spatial distribution of emissions. It was used the dependence between typical greenhouse gas emissions specific to rape crop and crop yield (optimum technology: multiannual average, multiannual average ± standard deviation; actual technology: multiannual average). The aggregation of these results at NUTS3 level showed that in the case of optimum technology most of the counties with arable land use have average values ranging within the default values for typical emissions included in the Directive. In case of actual technology, the average counties values of greenhouse gas emissions for the entire production cycle of biodiesel obtained from rape (based on the average production of rape at national level for the

ASSESSMENT OF MECHANICAL PROPERTIES OF PELLETS PRODUCED FROM BIOMASS

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ABSTRACT

Lowering the share of fossil fuel in energy production has become more important in recent years. Solid bio-fuels are an applicable option. Their popularity keeps increasing year by year. Their mechanical resistance is one of observed criteria. Mechanical resistance and strength of solid bio-fuels are tested in the frame of the diploma thesis. Results imply that water content is most important for the mechanical resistance.

Keywords: pellets, biomass, biofuel, strength

AUTONOMOUS PHOTOVOLTAIC ELECTRICITY GENERATING SYSTEM FOR SHIPS MOORING AT PORTS AS AN ENVIRONMENTALLY FRIENDLY SOLUTION

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ABSTRACT

Around the world, there is an increasing interest in how to reduce the negative impact of ships mooring in ports on the environment. It is necessary to find new solutions of this problem. One of them can be use of an autonomous electricity generating system on ships with photovoltaic cells.

The main source of air pollutants emission by ships mooring in ports are marine generating sets. The generators are driven by marine diesel engines called auxiliary engines. Shut down of marine generating sets and change of electricity source for photovoltaic cells panels leads to reduction of air pollutants emission.

It is important to estimate the electric power demand by ships mooring in ports and calculate the area of photovoltaic cells panels using solar energy.

The specificity of cargo ship construction, first of all bulk-carriers, allows to install on cargo-hold covers large area of photovoltaic cells panels. The main technical problem in that case deals with storage of electric energy generated by photovoltaic cells panels and conversion of the energy. The authors propose the solution that can lead to design of whole system and significant reduction of air pollutants emission by ships mooring in ports.

Keywords: emission of air pollutants by ships mooring in ports, electric power demand, storage of electric energy, photovoltaic cells, electric power converters

AUTONOMOUS POWER SUPPLY SYSTEMS BASED ON WIND POWER PLANTS FOR AGROFORMATIONS

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ABSTRACT

Energy saving and renewable resources' effective usage is the need for Kazakhstan's sustainable development. In article modern conditions of legal framework of Renewable energy sources' usage in Kazakhstan are described. Analysis of governmental program realization in Kazakhstan for development of Renewable energy sources' usage is included. Because of geographical, climatic and social factors agricultural formations are the most perspective consumers of Renewable energy in Kazakhstan.

The analysis of electric optimization problem in Kazakh's agroformations has shown: the solution of such task isn't simple, but multi-factorial. According to the last agricultural census more than 40% of agroformations is not connectable with the power lines, including only 1% that has got an autonomous source of power supply. The intensive equipping of agroformations began with wind turbines installing in the 1990s, but haven't shown good results because equipments were selected not according climatic and operational conditions, without effective storm protection and efficient service of technical maintenance.

Research purpose was to develop methods of rational parameters' choice according to climatic and operational conditions at Kazakh agroformations for wind power equipment as autonomous power supply system. The estimation criterion of optimal composition of autonomous power system is offered. The algorithms of optimal parameters choice for autonomous power system with software packets for choosing wind power plants rational parameters according to climatic and economy's operational conditions are developed. Work's practical value consists in adaptation of the system's substantiation technique to specific conditions of formations. It allows considering almost all the factors influencing on plant's work, and at the same time accelerates calculations and submits them in a convenient format for equipment choice.

Research methodical basis is the complex concept to describe of functioning autonomous power systems for agroformations, and wind power plants operations in aggregate with mathematical decision making methods that allows to raise efficiency and reliability of tasks solution. Information basis of work consists of statistical data from meteorological stations, technical characteristics of serially let out wind plants, their elements and accessories, experimental data. Methods of data analysis and searching optimization, the accidental processes theory, computer software Excel, STATISTICA and MatLab are used. Work results are taken as development principle for WE-5T-2M wind power plant's pre-production model, model samples of wind power plant's with capacity between 5…8 kW.

Keywords: wind power, renewables, autonomous power supply

BALANCED PERIOD VARIABILITY EFFECT VERSUS SUSTAINABLE RESERVOIR MANAGEMENT IN RESERVE CAPACITY RATIO APPLICATION TO THE CONSTANT PRODUCTION STRATEGY

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ABSTRACT

Sustainable reservoir management gained reputation past decades, to confront headlong geothermal resources depletion consequent to increased call for sustainable development and implementation of renewables into energy mixes. Combination of reserve capacity ratio, volumetric reserves evaluation and one tank open lumped parameter model was applied to test a deep reservoir of the Bešeňová elevation response and capacity confronting variable balanced period reserves are distributed for and defining adequate sustainable operation period and intensity. At local conditions, 55,5 $l.s^{-1}$ constant production for 100 years appears reasonable only (initial 9,6 MWt → 8,18 MWt at t = 100 years), however, there is still a question of compromise between nominal output and production longevity.

Keywords: balanced period, Bešeňová elevation, reserve capacity ratio, reservoir sustainability

BIOGAS PRODUCTION FROM GRASSES

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ABSTRACT

Fodder galega (*Galega orientalis* Lam.) and red clover (*Trifolium pratense*) are fodder legumes having high productivity and capacity to fix atmospheric nitrogen, so reducing the need for N-fertilisers. Reed canary grass (*Phalaris arundinacea*) can be harvested during long periods without reseeding and without application of pesticides. Investigated dry matter yields were 9.6-11.2 t ha^{-1}, 8-13 t ha^{-1} and 7-11 t·ha^{-1} for galega, red clover and reed canary grass respectively. Methane yields obtained in digesters were 218.6 l·kg_{V0S}^{-1} from cow's manure (control) and 384.2 l·kg_{VSd}^{-1}, 309.2 l·kg l·kg_{VSd}^{-1}, 244 l·kg l·kg_{VSd}^{-1} from different galega-cow's manure mixtures. Estimated volumes of methane released from galega haylage, in dependence of high and low organic load, were 46.8 and 119.6 l·kg_{VSd}^{-1} respectively. Methane production from red clover was 245.4 and 222.8 l·kg_{VSd}^{-1}. Methane yield from reed canary grass fresh biomass was 141.1 and 126.7 l·kg_{VSd}^{-1}.

Keywords: *Galega*, reed canary grass, energy crops, biogas, methane.

BIOMASS YEILD AT SORGHUM AT DIFFERENT DISTANCES BETWEEN ROWS IN THE CONDITIONS OF SOUTH ROMANIA

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ABSTRACT

Sorghum is one of the most drought tolerant plants which are of great interest in the area affected by drought. Sorghum is of interest both for producing grains and biomass used for different purposes. After harvesting the sorghum grain crops there is remaining a large amount of residues which represents biomass that could be used in different ways including as raw material for producing biogas. But for biomass production, especially it is used the biomass sorghum which is a sorghum type specialised in producing a large yield of biomass used as fodder as well as raw material for producing biogas.

The aim of the paper is to present the biomass yield at sorghum which is of interest to be used as raw material for producing biogas. The researches were performed in the year 2013 in the specific conditions from South Romania. The field experiment was located at Moara Domnească, Ilfov County. It was used the sorghum hybrid Biomass 150 which was sowed at different distances between rows, respectively 75 cm, 62.5 cm, 50 cm and twin-rows of 62.5/37.5 cm (4 variants with four replications).

The plant growth stages in which the biomass determinations were performed are the following: early dough-dough and fully ripe. In each of the two growth stages, there was determined the above-ground biomass both as fresh and dry biomass production per hectare. The fresh biomass was determined by weighing the plants from one square meter, while for dry biomass one plant of each experimental variant was oven dried.

Keywords: renewable energy, biomass, potential, sorghum, row distance.

BIOMASS YIELD AT MAIZE AT DIFFERENT SOWING TECHNIQUES IN THE CONDITIONS OF SOUTH ROMANIA

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ABSTRACT

Biomass is an important renewable source of energy more and more of interest for producing different types of energy, respectively heat, electricity, biofuels (bioethanol, biodiesel, and biogas). Among different sources of biomass, the crop biomass both as residues or energy plants is one of great importance. Energy plants could be of interest especially when they do not compete with food and feed plants, as well as when they put into value the marginal lands or they are using the periods between crop cycles. One of the most important energy plants with a significant use in the present is maize.

The aim of this paper is to present the biomass yield at maize in the specific conditions from South Romania, this being of interest to be used as raw material for producing biogas, but also for other purposes (i.e. pellets or fodder). Because one of the conditions to produce crop biomass in an efficient way is the use of the most appropriate cultivation techniques, our researches were performed under different sowing techniques at different maize hybrids, respectively different row spacing (75 cm, 50 cm, and twin-rows of 45/75 cm) and different plant population (60,000, 70,000 and 80,000 plants per hectare). Researches were carried out in the year 2013 in field experiments located in two places in South Romania, respectively at Fundulea, Calarasi County (chernozem soil), and Moara Domneasca, Ilfov County (reddish preluvosoil).

The biomass determinations were realized in the early dough-dough plant growth stage and at fully ripe stage of maize plants. It was determined the above-ground biomass both as fresh and dry biomass yield per hectare. At early dough-dough plant growth stage, there was determined the total above-ground biomass, while at fully ripe stage, there was determined the total above-ground biomass without grains, respectively the above-ground biomass which is remaining as crop residues after harvesting. The fresh biomass was determined in each variant by weighing the plants from one square meter, and the dry biomass was determined by oven drying one plant from each variant.

Keywords: renewable energy, biomass, potential, sowing techniques, maize.

CFD SIMULATION OF HEAT TRANSFER PROCESS FOR A SOLAR THERMAL COLLECTOR

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ABSTRACT

Solar thermal collectors are used all over the world, especially for domestic hot water applications. In order to establish the feasibility of a solar thermal collector for a specific location it must be taken into account, as input, variables like: global solar radiation, wind speed, minimum and maximum air temperatures, etc. These data can be retrieved from weather stations, by accessing online dedicated resources or dedicated software.

In present paper is analyzed heat transfer process inside solar collector by using computational fluid dynamics (CFD) simulation. CFD simulation is a solution that uses numerical methods and algorithms to solve and analyze problems that involve fluid flows. Many times that can prove to be the cheapest and fastest way for verification and validation of technical solutions. As a location it was chosen city of Constanta (Romania), disposed on western coast of Black Sea.

Keywords: solar thermal collector, solar radiation, CFD simulation, heat transfer

CHANGES IN PRODUCTION PARAMETERS OF FAST-GROWING ENERGY GREY POPLAR VARIETES (*POPULUS* × *CANESCENS*) IN SLOVAKIA

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ABSTRACT

The paper presents results of the research aimed at the production potential of Italian varieties of Grey poplar (*Populus* × *Canescens*) in soil and climatic conditions of south-western Slovakia. The research was conducted in the first year (2013) of the second four-year growing cycle (one year after the cut back) on four Italian varieties (Monviso, Pegaso, AF-2, Sirio). The following selected growth indicators were monitored: number of shoots, shoot length and shoot diameter. The average weight per plant of the individual varieties ranged from 3.6 kg (variety Monviso) to 3.43 kg (variety AF-2). The greatest amount of the biomass per plant on average was obtained by Monviso. The average number of shoots of the studied varieties ranged from 8 shoots (Monviso) to 10 shoots (Pegaso). The average shoot length of the varieties ranged from 3.19 m (Monviso) to 2.59 m (AF-2). The average diameter of shoots of the individual varieties measured in the height of 1 m ranged from 17.47 mm (Monviso) to 13.54 mm (AF-2). The growth indicators analysis of the studied varieties proved statistically significant differences. The biomass production in the fourth year (2012) of the first growing cycle differed among the varieties. The cut back affected a reduction in the biomass production on average by 76.83% in all four studied varieties. The most significant biomass decrease was observed in the variety Pegaso (-80.08%). The presented results show a significant impact of the cut back on the studied varieties of *Populus* × *Canescens* and support the findings about the regeneration ability of the varieties as a potential for the biomass production that can be utilized for energy purposes.

Keywords: *Populus* × *Canescens*, fast-growing tree species, biomass, south-western Slovakia

CO_2 SEQUESTRATION INTO SHALE BEDS - SIRNAK COAL MINES

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ABSTRACT

The CO_2 will be delivered by truck in liquid phase, temporarily stored at the well site, and conditioned before injection. The project proposed plans to inject the CO2 at the well head in gaseous phase at a slightly supercritical pressure and slightly supercritical temperature. The anticline at Şırnak -Silopi was used for gas storage in the past in a shallower depth interval in Şırnak-Silopi pit mine field, which also is an mining industry partner in CO2 sequestration and will be responsible for the CO_2-injection operations.

This paper discussed progress on reactor achieved by tests and search for fast reaction methods using exhaust gas containing waste sulfur and carbon gases at the stack of Power Stations. Other MEA capture CO_2, water slurry, and injection additives into shale beds were searched for optimum sequestration methods and also in order to enhance shale reactivity; and in analyzing the structural changes to identify reaction paths and potential barriers. liquid and gaseous products may change to near 60%–65% yield performances by time increase from 1day to 6 weeks.

Keywords: CCS; capturing and storing CO_2; sequestering the CO_2; Shale; Coal Shale

COMBUSTION ABILITY OF ENERGY CROP PELLETS: ASSESSMENT AND FUTURE PERSPECTIVES

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ABSTRACT

Use of the crop biomass in energy production is one of the preconditions to avoid ecological disasters in future and compensate growing shortage of fossil energy sources. Alternative biomass feedstocks will be required for renewable energy targets; yet it is imperative that production of renewable energy from biomass must be environmentally benign. Thus, it is important that emissions from biomass combustion are low.

The research covered preparation of various content pellets from reed canary grass (RCG) variety '*Marathon*' and energy wood osier and poplar in different proportions (1/3, 1/1, 3/1).

Combustion ability is greatly influenced by biomass indicators like content of hemicelullose, neutral detergent fibre (NDF), acid detergent fibre (ADF) or carbon ($p<0.05$). It was found that there is close negative correlation between combustion ability and content of hemicellulose ($r=-0.91$), NDF ($r=-0.93$) and carbon content ($r=-0.82$), while with ADF there is close positive correlation ($r=0.84$). Medium close correlation ($p<0.05$) was discovered between combustion ability and cellulose content ($r=0.66$), lignin content ($r=0.77$) and absolute dry matter ($r=0.71$). In its turn, there is no correlation between combustion ability and potassium or sulphur content ($p>=0.05$).

Analysis of the results acquired within the research allows concluding that proportion of components the most suitable for production of pellets is 1/3 (RCG+ timber).

Keywords: reed canary grass, osier, poplar, combustion ability, pellets

CONTROVERSIES REGARDING INVESTMENTS IN GREEN ENERGY IN ROMANIA

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ABSTRACT

For renewable energy industry scheme promoted by Romania until last year was the most generous in the EU. This scheme involves giving support to renewable energy producers green certificates, which they sell on a specialized market where thus obtained income in addition to the actual price of energy. Suppliers to end customers are forced to buy a certain number of green certificates and transfer to final invoice cost with the purchase of certificates. Consequently, end users, namely the population and industry are the ones who actually pay these subsidies. If you would have continued to develop this market result would be a massive increase in bills paid by end consumers. As it concerns the investors, repeated legislative changes lead to a reduction in their appetite for developing new renewable energy projects.

Keywords: renewable, suppliers, customers, subsidies, investors.

COOLING OF ELECTRONIC COMPONENTS USING CLOSED LOOP PULSATING HEAT PIPE

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ABSTRACT

Intensification of cooling electronic components is to use heat transfer through phase changes. From a structural point of view it is important to create a cooling system that is able to drain the heat loss of the inverter in each mode of operation the device. That is, not only during movement, when the relative velocity of air flow around the inverter sufficiently high for forced convection, but also in the case where the device does not move, the relative humidity of the air is zero. A further important consideration is the reliability of the cooling, and therefore it is advisable to choose such a cooling system, which does not contain moving elements. One way of ensuring sufficient cooling is the use of cooling system based on phase-change working fluid, therefore heat pipes. In this article the cooling system is solved by a closed loop pulsating heat pipe.

Keywords: electronic, heat pipe, temperature, cooling, system

DETERMINATION OF COMPACTING PRESSURE AND PRESSING TEMPERATURE IMPACT ON BIOMASS BRIQUETTES DENSITY AND THEIR MUTUAL INTERACTIONS

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ABSTRACT

In this article, we will present the impact of two most important technological parameters (compacting pressure and pressing temperature) on final wooden briquettes quality. Conditions in pressing chamber during densification can significantly impact the resulting briquettes quality which is evaluated by density. In the introduction, we present which parameters have the significant impact on briquettes densification. An experiment results and findings which are showed in this paper, described the detected impact of monitored parameters at densification of pine and also oak sawdust. Experiment was done in our department in laboratory conditions on our experimental pressing stand. By pressing conditions setting we will be able to achieve the suitable briquettes density with respect of characters and behaviors of pressed type of material. We will present also possibility that from experiment results can be designed mathematical model. This model can be used for prediction of briquettes density at various pressing conditions for given settings and materials.

Keywords: biomass, briquetting, compacting pressure, pressing temperature, briquettes density, mathematical model

DEVELOPING A MATLAB TOOL FOR PV SYSTEMS ENERGY PRODUCTION FORECASTING USING ANFIS

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ABSTRACT

Providing integrated solutions dedicated to optimizing management of microgrids with distributed power from renewable energy sources (RES), is an important contribution to promoting of clean energy technologies. The solutions involve, among others, the integration of artificial intelligence techniques able of: monitoring, assessing (diagnosis) and estimating (prediction) periods of overload or under load etc. and propose plan effective action in terms of: reducing costs, improving profits or reducing the microgrids vulnerability.

Within this scope, a Matlab object oriented application based on adaptive neuro- fuzzy inference systems (ANFIS) was developed to facilitate forecasting energy production from RES. Firstly, the characteristics of ANFIS are briefly described in order to underline the advantages and disadvantages of these types of neuro- fuzzy systems in forecasting approaches. In the second part, are described the methodology and the flowchart used for GUI modeling, as well as, the data used for forecasting of produced energy from RES pre-processing using statistical methods and Matlab. The result of these computations is a data base used, in the third part, for ANFIS training and testing. The proposed graphical user interface (GUI) is tested in order to forecast de energy generation for short term. The effect of ANFIS parameters on the forecasting performances are underlined using root mead square error (RMSE).

Keywords: ANFIS, renewable energy sources- RES, forecasting, PV systems, Matlab

EFFICIENCY ANALYSIS OF A SMALL ISOLATED WIND ENERGY GENERATION SYSTEM TAKING INTO ACCOUNT CHARACTERISTICS OF A WIND AS TIME-CORRELATED RANDOM PROCESS

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ABSTRACT

Simulation model for a small wind energy generation system efficiency analysis is developed. The system is simulated as non-linear dynamic system operating in presence of wind as a time-correlated random process. New wind simulation model is developed and the model parameters are estimated for different sites by processing long-term meteorological observations data. System efficiency analysis numerical data are presented.

Keywords: small isolated energy system, wind, time-correlated random process, simulation dynamic model, efficiency.

EFFICIENCY OF PRODUCTION AND DELIVERY OF HOT WATER OBTAINED FROM WASTE HEAT

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ABSTRACT

A steam condenser could reject a great amount of heat. Recovering this amount of heat can be done using heat pumps, but is difficult to find heat consumers because of the amount of heat and usually the long operation time of turbine. Underground mines can be matching heat consumers as they need hot water and mining is basically a continuous process. Exergy efficiency of heat pump is studied for different temperatures as cooling water temperatures at condenser outlet can vary depending on climatic factors from 18 to 30 °C. Exergy analysis of hot water delivery network was also carried out in order to establish overall exergy efficiency of production and delivery, which is found to be 42.57% a far better value than typical exergy efficiency of cogeneration plants 30.7% or 25% for boiler units. Heat pump coefficient of performance varies from 2.66 to 3.29 while work supplied to compressor decreases from 265.613 kW to 214.146 kW. The primary energy resources savings calculated varies from 8.56% to 21.41%.

Keywords: waste heat, steam condenser, heat pump, exergy efficiency

EMPIRICAL RESEARCH ON INDUSTRIAL STRUCTURE EFFICIENCY OF ENERGY IN WESTERN REGION OF CHINA

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ABSTRACT

The research focuses on energy efficiency which is affected by industrial structure and does empirical study on industrial structure efficiency of energy using the OOS model based on DEA approach. The empirical data are used in the proposed analysis on industrial structure efficiency of energy in western region of China from 2000 to 2011. The results of empirical research show that industrial structure will have a strong impact on energy efficiency. There are some space of adjustment for future improvement in terms of industrial structure efficiency of energy by adjusting related industrial structure in provinces of western region. By the reseach, it provides practical foundation to improve industrial structure validity by optimizing industrial structure with a better composition, and provides policy basis for relevant government departments to adjust and optimize industrial structure in specific provinces.

Keywords: Energy Efficiency, Industrial Structure Validity, Industrial Structure Efficiency of energy, Optimizing Industrial Structure

ENERGY AND EXERGY ANALYSES OF COGENERATION SYSTEM WITH A BIOGAS ENGINE

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ABSTRACT

In this paper, an existing cogeneration system driven by 2x160 kW biogas engine are investigated by energy and exergy analyses. The biogas is produced in the Wastewater Treatment Plant, Varna, Bulgaria. The basic thermodynamic parameters on the characteristic stations of the cogeneration system are determined by energy analysis of the considered system's components. Exergy destruction within the system is also assigned in present study. Moreover, the energy and exergy relationships and parameters for entire system, as well as for each component of the cogeneration system according to [6] have performed. Therefore, the present study provides methodology, which permits us to analyze thermodynamic efficiency parameters of similar class energy conversion systems.

Keywords: Biogas Internal Combustion engine, Cogeneration system, Energy, Exergy, Thermodynamic Efficiency Parameters

ENERGY EFFICIENT URBAN PLANNING

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ABSTRACT

The importance of energy efficient and ecologically aware city design becomes obvious if the trend of rising citizens is observed. According to statistics, in 2050 about 70% of world's population will concentrate in cities, thus multiplying their social and environmental problems. But city represents not only a problem, it also can be the solution.

To cope effectively with ambitious goals set by the EU-strategy Europe 2020 the growing energy demand needs to be addressed at urban scale and new local renewable sources need to be introduced, respecting cultural values and identity of contemporary cities. The city fabric needs to be looked at both as energy resource and energy consumer. From such viewpoint many questions emerge – addressing legislative, cultural, historic, technical, methodological issues related to urban planning.

This paper examines electric energy demands in Ostredky, a city quarter of Bratislava, Slovakia built in 1960's. Based on proposed strategies of sustainable urban planning defined by authors *(Energy Effective Urban Structures Generating* and *Energy Cooperativeness of Urban Structures)* the study investigates solar potential and energy cooperation possibilities of the settlement. Resulting from the analyses, measures to optimisation of urban density, smart usage of local renewable energy sources and increase of energy efficiency are proposed, leading to a nearly-zero-energy neighbourhood. New energy-related urban indicators (solar index and energy cooperation indicator) are introduced and verified on the example of Ostredky. To enable future urban concepts based on synergic utilisation of energy from renewables the implementation of these indicators into urban development regulation is of great importance and has to be supported by law.

It is no doubt that the significance of dealing with energy efficiency and sustainability at urban scale rises. However, some pitfalls may occur, because according to Marcel Roncayolo: "Urbanism rarely escapes from the temptation and the need for authoritarianism".[1] And for that matter, authoritarianism could not be sustainable by its very nature.

Keywords: Solar Urban Planning, Sustainable Urbanism, Solar Index, Cooperation Indicator, Renewable Energy Sources Potential

ENERGY PERFORMANCE OF DIFFERENT DOMESTIC HOT WATER SYSTEMS IN THE MULTI-DWELLING HOUSE

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ABSTRACT

This paper presents the results of energy performance of domestic hot water system in the multi-dwelling house. The aim of this energy balance is to compare the performance of central and decentralised domestic hot water system. As a central domestic hot water system it is thinking about the storage heating for all flats in the central boiler room of multi-dwelling house. Within the frame of a decentralised system there are analysed systems with residential thermal stations (RTS) or with individual local heat sources for domestic hot water system in every flat. The energy balance is elaborated by current valid European standards and regulations for EPBD.

Keywords: domestic hot water system, energy performance, residential thermal station, central system, decentralised system

ENERGY SAVING POSSIBILITIES DURING DRINKING WATER TREATMENT AND WATER TREATMENT FOR THE SWIMMING POOLS

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ABSTRACT

This article deals with energy saving methods and renewable energy sources which it is possible to use at drinking water treatment plants and at water treatment plants for swimming pools. At water treatment plants there are the main possibilities in energy savings in the water treatment processes which can be enabled by optimisation of the treatment process or reconstruction where different technology or more effective devices are used. Very important part is the use of small hydropower stations at the water treatment plant or the use of renewable energy sources for heating. At water treatment plants for swimming pools the same principles of energy savings methods can be used but there are also other possibilities. One of them, the use of heat pump for warming the water for swimming pool is discussed in this article. An example of air-source heat pump which uses a waste heat from an engine room for warming the water for a swimming pool is presented and energy savings are evaluated.

Keywords: energy saving, water treatment, swimming pool, heat pump

ENVIRONMENTAL EVALUATION METHODOLOGY OF FOSSIL FUELS

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ABSTRACT

Classic environmental impact analysis is usually used in order to assess the whole life cycle on the basis of actual real data. In the process of coal combustion all steps from cradle to grave should be included, which means from coal mine to the combustion chamber. This analysis is relatively easy if all necessary input data is available. The evaluation of potential environmental impact of the coal itself is much more problematic. Some part of environmental impact is associated with fuel properties like composition and concentration of specific compounds, and could be predicted for instance on the basis of the stoichiometric analysis. However, some part of emission is associated with specification of installation where combustion process takes place which is much more difficult to predict. Methodology of assessment of potential environmental effect of the coal itself is proposed in the manuscript. The evaluation is made using CML2001 methodology in 6 major impact categories: human health, eutrophication, acidification, abiotic depletion, climate change and photo-oxidant formation. The new indicator of coal quality, which is introduced in different major impact categories, is defined in the manuscript. The indicator could be treated as a measure of potential environmental impact of the coal, which could be used for assessment of balancing the environmental costs associated with the activities at the coal mine.

Keywords: environmental impact, coal mining, LCA

ESTIMATION OF WIND ENERGY RESOURCES AT KAZAKHSTAN TERRITORY FOR AUTONOMOUS POWER SUPPLY OF LOW POWER CONSUMERS

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ABSTRACT

According to the Kazakh Ministry of Environment Protection potential reserves of renewable energy resources in Kazakhstan are estimated as 12 billion dollars a year. Wind's power characteristics estimated by determining the gross potential, technical potential and economic potential which is defined as the size of annual electric energy receipt from renewables in the region. Therefore calculations are conducted concerning the surface area on which wind plants are supposed to be placed considering interposition of separate plants. At design of autonomous power supply systems based on low powered wind plant it is necessary to determine the specific power and energy not per region area, but per wind wheel's area. For creation of the wind energy resource electronic maps it is necessary to execute the following steps:

1. To create climatic characteristics' database based on Kazakh meteorological stations' records.

2. To analyze repeatability of wind speed and to prove distribution law.

3. To calculate the gross potential of wind energy resources at wind wheel's axis per the set time interval for a plant with 1 m of wind wheel's diameter taking into account all derating factors and distribution law of wind speeds' repeatability.

4. To process the obtained data for creation of the wind energy resource electronic maps by Delaunnay triangulation – geometrical analysis method.

For creation of the wind energy resource electronic maps for the Kazakhstan territory based on 122 meteorological stations' records the climatic characteristics' database was created. Daily and annual change of average wind speed, the maximum wind speed, power silence period length data are also included in the database. The winds map is constructed from which it is visible that for 85% of the countries territory the average annual wind speed at the height of 10 m makes 3 … 5 m/s, for 13% – very light breezes (average annual wind speed less than 3 m/s), and only for 2% of the territory winds with an average annual speed more than 5 m/s are observed. Dependence for processing of wind wheel's optimum working speed by the value of average annual wind speed is received. As the result of climatic data processing for Kazakhstan 5 district types by value of average annual wind speed are defined, for which optimum values of rated wind speed, kinetic energy receipt and specific wind potential in a year per wind wheel's area unit were allocated. Maps for determination of the nominal working wind speed at 10 m of mast height, and wind energy resource maps for Kazakhstan territory at various heights are compiled.

Keywords: wind power, renewables, autonomous power supply, electronic maps of

wind energy resources

EVALUATION OF PV SYSTEMS DEGRADATION PERFORMANCES

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ABSTRACT

This article proposes is a study on the performance of photovoltaic (PV) panels (SNM-M135 from SUNEL) after 15 years of use. The proposed system consists of 11 photovoltaic (PV) panels conected in series, an invertor Sunny Boy 2100TL, a Sunny SensorBox with temperature sensor and irradiance sensor, and Sunny WebBox. The energy produced by the PV panels is taken directly from the inverter Sunny Boy 2100TL. Thus we have the voltage and current of the PV system. The temperature cell and radiation are obtained using Sunny SensorBox. Also, in this work we performed a simulation of I-V characteristic and P-V characteristic of PV system. This characteristics are influenced by two factors, the solar radiation and the cell temperature. Simulation will be given the radiation and temperature cell values acquired. Thus, a comparison was made between the real system and simulation for current and active power variations curves.

Keywords: Renewable sources, monitoring, energy, simulation, PV systems, degradation, performances

EVALUATION THE LOSSES POWER AND ELECTRICAL ENERGY ON THE BASIS OF THE RELATIVE LOAD CURVES, BY REFERENCE TO THE BASIC SIZES

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ABSTRACT

The problem of determining the active and reactive electrical losses power, is not new, and this aspect is dealing with professional designers, operating units (electricity suppliers), as well as a number of international organizations, as well as a number of international organizations.

In the context of the concerns of energy savings analysis is part of the methodology for calculating energy losses presented below, based on the relative load curves, reported to the base size.

In this paper are presented in detail a method for calculating the relative sizes reported to the base sizes (S_b apparent power base, t_b time base, U_b voltage base, τ_{Sb} time of losses associated with the apparent power base S_b), considering equivalent schemes by type Γ cuadripol, of the elements of the network, as well as required load curves or modeled (approximated).

Keywords: energy losses, relative load curves, apparent power base, time base, voltage base.

FEATURES OF VORTEX MULTISTAGE SOLID FUELS GASIFICATION

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ABSTRACT

Solid fuels conversion in vortex apparatuses allows the processes of heat and mass transfer intensify significantly through the high-turbulized rotating flow creation. It will lead to the possibility of compact plants designing that are perspective for power engineering. According to the results of this work, the vortex multistage gasifier scheme are developed. It should be noted, that the difficulty of the vortex process control requires the multistage conversion and the operating modes organizations to optimal process parameters maintain in the different gasifier zones. A series of coal conversion tests in air were performed in a thermogravimetric analysis system, at non-isothermal heating conditions for modeling the conversion process in the gasifier. The experimental thermal imaging technique of low-calorie fuel gas combustion study are developed. It is used to determine the efficiency of this process and to improve the quality by microjets introducing into gas flow.

Keywords: thermochemical conversion, vortex process, fuel gas, thermogravimetric analysis, wavelet analysis

FLY ASH FROM COAL-FIRED POWER PLANTS AS RAW MATERIAL IN BUILDING MATERIALS INDUSTRY. EXPERIMENTAL ASSESSMENT OF THERMO-PHYSICAL PROPERTIES

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ABSTRACT

Electricity generation based on coal combustion still remains in the forefront of attention in terms of low cost, especially when done in large scale industrial plants in areas with direct access to the primary energy source, such as units producing within Oltenia Energy Complex. If ash entrained in the flue gas (fly ash) is continuously recovered in the cement industry, heavy ash collected on the bottom of the combustion chamber is more important quantitatively and poses considerable problems regarding discharge into the environment and, moreover, remain a constant problem in terms of deposits generated in time.

This paper presents the results of experiments carried out on recovery of heavy ash deposit Valea Ceplea (Turceni) as auxiliary raw material in brick building using clays obtained from the stripping site Rovinari. The positive effects and deficiencies involved the addition of ash manufacturing recipes (variation of density, apparent porosity and mechanical resistance), up to an addition of 10 to 30% (mass) are presented. The results indicate that the use of fly ash as raw material can be effective, especially since, the source is a local industrial waste.

The paper is developed based on activities performed within the frame of the EU project LIFE10 ENV/RO/729.

Keywords: fly ash, deposits, mechanical resistance

GROWTH DYNAMICS OF PERENNIAL ENERGY GRASS GENUS *MISCANTHUS* STUDIED IN SLOVAKIA

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ABSTRACT

In the conditions of the current climate changes, it is essential to develop possibilities of alternative energy sources and thus seek to diversify energy sources. One way of obtaining a "clean energy" is to cultivate biomass for energy purposes. In this paper, the dynamics of aboveground biomass of two *Miscanthus* genotypes (*Miscanthus* × *giganteus* (Greef et Deu) and *Miscanthus sinensis* (Tatai)) is evaluated in conditions of the south-western Slovakia in the fourth year after the planting. The research was realized in the field trial on the University's farm located in the village Kolíňany. The observed parameters included the accumulation of the aboveground phytomass (stalks and leaves) and the change of selected growth indicators (number of stalks, plant height and stalk thickness) during the growing season of 2013. The dependence of the phytomass production on the number of shoot and plant height was demonstrated. The maximum dry weight of the aboveground organs per individual plant was reached before the end of the growing season (end of September) and averaged 3348.31 g (*Miscanthus* × *giganteus*) and 2858.77 g (*Miscanthus sinensis* (Tatai)). Statistically significant differences were found among the studied genotypes in the dynamics of the dry matter formation. The total phytomass obtained for the energy utilization is 32.67 t ha^{-1} (*Miscanthus* × *giganteus*) and 29.16 t ha^{-1} (*Miscanthus sinensis* (Tatai)).

Keywords: *Miscanthus,* energy grass, phytomass, production potential, south-western Slovakia

HEALTH AND SAFETY HAZARDS OF BIOMASS STORAGE

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ABSTRACT

Growing popularity of biomass fuel in Europe is connected to its label of green and cheap renewable energy. Especially, wood pellets are very wanted and many times unavailable during the winter months. On the other hand there several serious risks and health and safety hazards related to biomass storage that cannot be ignored. Self ignition and moulds inhalation are the most dangerous. To ignore safety aspects and official regulations can lead to fatal injuries or huge material damages. Both bacterial or most likely fungal diseases and biomass fires are very likely to occur especially within huge biomass facilities. The paper gives overview of most likely risks, most dangerous hazards related to biomass storage. Spontaneous auto-ignition, their conditions and self-explosion as the most dangerous hazard is described. When three elements of fire triangle or five elements of explosion pentagon are present at the time, there is a very high risk of huge damage and fatal injuries. Several biomass facilities had been destroyed in last decades in Europe and USA. The most frequent health risk according global experiences and statistics measurements is connected to dangerous moulds in wood chips. Typically Aspergillus Fumigatus causes serious health complication like Aspergillosis, or various breath complications, lung and heart infections, asthmatic problems etc. Aspergillosis is considered rare. Last very risky property if biomass is CO release. There were several fatal injuries caused by concentred CO due to lack of air ventilation in the storage rooms.

Keywords: Wood Pellets, self-ignition, Aspergillosis, CO.

HEAT PUMPS AS A MEANS OF EFFICIENTLY USING RENEWABLE ENERGY SOURCES

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ABSTRACT

The use of renewable energy sources has become a worldwide trend and is one of the ways to get cheaper and more accessible primary energy that has a minimum impact on the environment compared to conventional sources of energy (e.g. oil, coal). This paper focuses on the application of renewable energy resources in the form of heat pumps and their distribution as a low temperature (low-potential) heat source.

Keywords: renewable resources, heat pump, low-potential heat sources

HERE A TECHNICAL SOLUTION FOR BURNING LARGE AMOUNTS OF BIOMASS IN COAL-FIRED BOILERS

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ABSTRACT

The Romanian Government adopted and implemented the regulations on large combustion plants, which promotes the replacement of current technologies for producing energy with clean technology for coal combustion in order to reduce SOx, NOx and dust emissions, but the CO2 emissions still remain at the same level. Co-firing of coal and biomass is considered as one of the main targets for the EU's renewable energy goals. Currently, the Romanian large power plants use only fossil fuels to generate electricity. Although the coal-fired power plants are not designed to process and burn huge amounts of biomass, the paper presents a technical solution to decrease the CO2 emissions in large coal fired power plants, by co-firing coal with biomass. The paper focuses on the co-firing of coal and miscanthus giganteus, which is considered an additional and renewable fuel, with natural CO2 capture within the energy crops planted on historic mining waste dumps. This approach could be considered as one of the best options to achieve an effective and quantitative reduction of GHG emissions from coal combustion.

Keywords: Biomass, large coal fired power plants, CO2 mitigation

IMPACT OF FILLING RATIO ON THE THERMAL PERFORMANCE OF CLOSED LOOP PULSATING HEAT PIPE

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ABSTRACT

For good, reliable and long-term use of electric components must dissipate heat from these devices and to provide cooling. One of the solutions available is to use a sealed heat pipe with a throbbing filling, where development meets the current requirements for intensification of heat removal and elimination of moving parts cooling systems. Heat pipes operate using phase change working fluid, and it is evaporation and condensation. They have a meandering shape and are characterized by high intensity of heat transfer, high durability and reliability. Advantage of these tubes is that it is not necessary to create the internal capillary structure for transporting liquid and they need any pump to the working fluid circulation. They have a simple structure, low cost, high performance, and they can be used for various structural applications. The choice of working fluid volume and performance affects thermal performance. Three types of working fluids were used in the performance ranges 0-80%.

Keywords: closed loop pulsating heat pipe, thermal performance, resistance, working fluid

INCREASING ENERGY EFFICIENCY OF THE SOLAR THERMAL PANELS THROUGH THE USE OF HYDRAULIC TRACKING SYSTEMS

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ABSTRACT

The paper presents some new results obtained by the institute INOE 2000-IHP Bucharest, Romania, in promoting advanced technologies and equipment for solar thermal panel technologies, in order to use the renewable energy resources for individual users. The article presents some results regarding the solar thermal panels, obtained in ROMANIA in the last period, especially in developing of systems used for actuation/guidance automation devices, named solar tracking hydraulic systems, used in the construction of equipment for the conversion of solar energy directly into thermal energy. Also, there are presented some practical hydraulic systems developed in ROMANIA to achieve guidance devices, based on their hydraulic actuation. Finally, the paper presents a new technical solution for a solar tracking system with hydraulic actuation, designed in the institute, which allows optimizing the working regimes, in order to increase the efficiency of collecting the solar energy and its adaptation to the variations of thermal loads during the day. The obtained results can be transferred to industry.

Keywords: renewable energy, solar energy, solar thermal panel, solar tracking systems, orientation/guidance hydraulic system

INCREASING THE ENERGY PERFORMANCE OF AN INDUSTRIAL BUILDING BY TECHNOLOGICAL WASTE HEAT RECOVERY

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ABSTRACT

Increasing the energy performance of a building implies, to a great degree, optimizing the energy balance of the given building, while energy saving, in many instances, is an easy to access, effective tool for it. Energy saving, symbolically called "the new energy source", represents a first step in any strategy for energy efficiency, to optimize energy use and to reduce the fossil fuels used to produce it and consequently to reduce the emissions of greenhouse effect gases.

In this respect, the industrial sector offers a high potential in saving energy. Referring to the thermal energy associated with the industrial processes, by recovering technological waste heat one sustains energy saving by using this heat in thermal systems that ensures the microclimate in industrial spaces.

This article highlights several ways of recovering the technological waste heat for an industrial production hall and its influence on the building's thermal balance.

Keywords: energy performance, technological waste heat, recovery.

INNOVATIVE SOLAR WALL PERFORMANCE STUDY FOR LOW ENERGY BUILDINGS APPLICATIONS

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ABSTRACT

Perforated solar walls pre-heat the fresh air introduced in the building when the air is forced to pass through this solar heated perforated facade, the heat transfer between the fluid and the metal being intensified depending on the flow's characteristics. Solar perforated envelope facades can be used horizontally or vertically for a variety of purposes and applications, from heating buildings to agricultural or drying process.

An experimental campaign evaluated some characteristics of a certain type of solar collectors which have a major influence on the heat transfer or thermal efficiency. Two types of experimental investigation were performed: flow analysis with Particle Image Velocimetry method correlated with evaluation of the thermal efficiency of the model. The complex fluid dynamics generated by certain types of the geometries can be directly linked to the temperature increase of airflow.

The perforated panels were placed on a rectangular box with acrylic glass walls. The box is connected through a circular pipe to an exhausting fan, forcing the ambient air to pass through the perforated panel. After positioning of each perforated cladding, the box is sealed, in order not to have leaks which might perturb the tests.

The study reveals the importance of certain characteristics of solar collectors which can improve with almost 20% the thermal efficiency. Changing the geometry of the perforations is generating complex fluid dynamics, resulting in a higher efficiency of heat recovery of these devices. Extended to a real scale building, we can obtain high energy savings for pre-heating the fresh air introduced. On the one hand, it can be an effective solution for major refurbishment of buildings and on the other hand

Unglazed transpired solar walls improve their thermal efficiency with a significant rate for the case of innovative perforations.

Keywords: unglazed transpired solar wall; lobed perforation; fluid flow; thermal efficiency;

INNOVATIVE SOLUTION OF ENERGY EFFICIENCY AND MANAGEMENT FOR THE PRODUCTION OF ALUMINUM WIRES

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ABSTRACT

From the analysis of manufacturing process flow of aluminum wires, carried out on the rolling mills at ALRO Slatina Company, in Romania, the authors of this paper have found that significant losses in end product occur, in shape of wire coils, because of the conceptual shortcomings of the machine located at the flow output – the winding machine. These shortcomings lead often to a variable winding pitch, around the drum, of the wire coming out of the rolling mill. Thus, a rate of 5 ... 10% of wire coils resulted from flow are remelted and returned into the fabrication circuit, because they do not fit the gauge and mass specified for the end products, which are to be delivered to the beneficiaries. The authors propose an innovative solution for energy efficiency and management of manufacturing aluminum wires, based on cutting such losses in end product down by half.

The classical reference system for drive of the winding machine is characterized by: electromechanical drive of the drum, with adjustable speed electric motor and reducer; electrohydraulic drive, without control loop, of the reeling device, which moves linearly, along the drum, the wire coming out of the rolling mill. This drive system has the disadvantage of lack of synchronization between the drum rotative speed and the linear constant travel speed of the reeling device, the random variations in the travel speed of the reeling device being the cause for variable pitch of wire winding around the drum.

The proposed solution consists in the development of an electrohydraulic digital control system for driving the reeling head, which enables control of the position and speed of the latter by means of an electrohydraulic control loop. The system provides a reduction in the positioning error of the reeling head by at least one order of magnitude. Additionally, the proposed solution can provide the management of predictive and centralized monitoring of the entire production of wire.

To materialize the proposed solution, the authors have used the next working methods: completion of the schematic diagram of the reeling head drive; development of a prototype of this drive system (through numerical simulation, design and construction); monitoring the operation over time of this new drive system, installed on an aluminum wire winding two-ply machine, existing at Alro Slatina Company, using SCADA (Supervisory Control and Data Acquisition) system technology.

Keywords: energy efficiency; aluminum winding machine; electrohydraulic digital control system; SCADA system.

INNOVATIVE SYSTEM SDH-C FOR SUPPLY BUILDING ENERGY BASED ON RENEWABLE ENERGY SOURCES

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ABSTRACT

Energy supply is a prerequisite for economic and social development. Energy is not moved by the most sophisticated mechanisms, nor the most intelligent computer, and it is not possible construction and operation of buildings. One of the basic conditions for sustainable development is sustainable energy supply that also has to be reliable and to meet the quantitative and qualitative requirements of the user system. Sustainable energy supply based on fossil fuels is limited to a period in the history of the development of human civilization is only a very short episode, because their stocks are finite and are diminishing at a rapid pace. Historically a relatively short time mankind will be confronted with a serious problem to replace fossil fuels, of which currently covers a crucial part of its energy needs. In the context of energy supply on "Sustainability" can talk only about the supply from renewable sources (RES), which represent different forms of solar energy. Indeed the sun will radiate to the Earth in an hour more power than its entire annual needs even billions of years. Energy emitted by the Earth is very sparse and now even the most sophisticated equipment it can be transformed into commercial forms as efficiently as possible to those obtained from fossil sources. Nevertheless, they may be relatively effective substitute mainly on the supply of building heating/cooling, because to create thermal comfort is necessary to maintain a relatively small difference between the interior and exterior temperature.

The heat supply systems of buildings right combination of biomass and solar energy can be in many cases a suitable substitute for fossil fuels. Solar radiation is the cleanest renewable energy source, it is therefore desirable that its share was the greatest. In this crucially affect the technical excellence as well as the type and size of solar heat reservoir. The transition from short-term to seasonal accumulation allows to increase the degree of solar coverage in the supply of heat from the current 15-30 % theoretically up to 100 real to 40-70 %. Due to the high investment intensity, this should not be part of the transition from the smaller decentralized systems performance to centralized systems, which are known as SDH (Solar District Heating).

Article deals with upgrade options the standard SDH system in order to increase its competitiveness. As a major innovation measures are considered: the replacement of fossil fuels with biofuels, which is used for combined heat and power and integration of the heat pump system structure in order to increase the capacity of the seasonal heat accumulator. With proper concept of collaboration with the container lets you use the cooling capacity of the heat pump. SDH system will change to the system SDH/C (Solar District Heating/Cooling), which as a valuable by-product also produces electricity.

Keywords: biomass, renewable energy sources, SDH/C

LIGNING AND ASH CONTENT CORRELATIONS IN GRASS BIOMASS PELLETS

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ABSTRACT

Plant biomass is one of ecological solutions for the future, since it allows compensating growing shortage of fossil resources. Hoverer, biomass production has to face problems related to cultivation of grass with particular chemical content. Ash is indicator used to characterise quality of fuel, since higher ash content causes problems to automation of combustion process, whereas lignin is natural astringent rates, finding out biomass suitability for the production of biofuel, as well as studying correlations between factors influencing above indicators.

The research helped discovering that ash content in grass biomass is high: festulolium 6.46-7.84%, timothy 4.89-7.13 %, meadow fescue 5.97- 6.98%. While lignin content in grass biomass is low: festulolium 4.1-4.59%, timothy 7.97-8.43%, meadow fescue 3.6-4.18%. Festulolium, timothy and meadow fescue biomass samples indicated close positive correlation between ash content and lignin content ($r = 0.66$; $r = 74$; $r = 0.58$, $n = 18$). Moreover, the research showed that as lignin content in grass biomass increases also ash content rises. Tests of grass biomass samples did not indicate correlation between lignin and ash content. Since in comparison with wood fuel indicators, ash content rates estimated in this study are that holds a granule together. Productivity and chemical content of grass are largely influenced by fertilisers, namely their types and rates applied; therefore the research aims at evaluating ash and lignin content in festulolium, timothy and meadow fescue biomass depending on fertiliser types and higher while lignin – lower, it is recommended to use herbaceous biomass only as an additive to wood chips or pellets.

Keywords: festulolium, timothy, meadow fescue, fertilizers, lignin, ash

MARKETING OF RENEWABLE ENERGY SOURCES IN THE REGION KOŠICKÁ KOTLINA

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ABSTRACT

Slovak republic has to produce till 2020 from total energy consumption 14% through using of renewable energy sources, which presents 65,8 PJ.

In spite Slovakia disposes with significant technical potential for using of renewable energy sources, in comparing with market potential it is rather low value. Big part of this potential loss its economical potential that means theoretically it is possible to use renewable energy sources in greater measure, but it is restrained by financial demand or economical inadvisability.

Using of alternative energy sources is hindered mainly by geographical limitations, but also by their not sufficient using in areas, where there are proper conditions, but weak interest of community due to the low informing.

Contribution gives results of research of the individual types of renewable energy sources in concrete region of Slovak Republic. This region presents Košická kotlina, where there was made detail marketing analysis of individual types of renewable energy sources and strategy, recommended in connection with their using and support in the region.

Keywords: region Košická kotlina, renewable energy sources, marketing analysis, strategy

MIXED BIO-FUEL PRODUCED WITH USE OF RAPESEED POMACE

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ABSTRACT

It has been large support for renewable source of energy. Reason of these policies is in less negative impact to environment. Agriculture wastes can be used for bio fuels manufacturing. Practical part deals with preparation and production of mixed bio fuels based on rapeseed pomace. Produced bio fuels fulfil quality parameters for mixed bio fuels is the reason of testing.

Keywords: biomass, pellets, biofuel, pomace

MODELING AND SIMULATION OF A PHOTOVOLTAIC MODULE USING THE TWO DIODE MODEL

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ABSTRACT

Due to increasingly human needs of energy, new technologies and energy sources must be used to supply the demand of clean energy in the context of environmental issues. Renewable energy sources like solar energy has one of the most potential and it is studied here. In this model, solar panels are one of the essential parts of a photovoltaic system which convert solar energy to electrical energy and have nonlinear I-V characteristic curves. The purpose of this paper is to propose a MATLAB/ Simulink simulation for photovoltaic module based on the two-diode model of a photovoltaic cell. This model is known to have better accuracy at low irradiance levels which allows for more accurate prediction of photovoltaic systems performance.

Keywords: diode, energy, modeling, photovoltaic, simulation.

NEW TRENDS IN THE USE OF WOOD ASH AND BIOMASS

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ABSTRACT

The paper focuses upon possibilities for the production and subsequent use of briquettes made from a mixture of wood waste and wood ash. Ash samples were obtained from incineration in power stations to create biomass with an output of 4.6 $MW.h^{-1}$. The power station annually consumes 50,000 tons of waste biomass which is created when processing fir and spruce timber. Several ratios of sawdust mixed with wood ash residue were tested. The best results were found using briquettes made in a ratio of 2:1 (sawdust : wood ash). The calorific value of such produced briquettes is 15.83 $MJ.kg^{-1}$. The briquettes may fully replace wood or coal.

Keywords: biomas, pellet, wodd ash, combustion heat, renewable source

NEW WAYS OF UTILIZATION OF RENEWABLE ENERGY SOURCES IN BUILDINGS

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ABSTRACT

Nowadays, utilization of renewable energy sources is well-known field, but current researches continually provide us with new ways of utilization. The most reliable renewable energy source is sun. That is the main reason why we focus our attention on it. Disadvantage of sun as an energy source is low density of energy flow. Another question is represented by current microclimatic conditions as impact of weather, for example number of cloudy days per year, average temperatures and the lowest temperatures as well, etc. In our theoretical research we focus on design of modern active façade transparent element, which can utilize incident solar energy. Our aim is to create energetically balanced system at current conditions. It means location, temperature, number of sunny days, etc. The next aim is to create full scale model of window, heat exchanger, and volume storage tank. Answering the question of reliability of the whole system is relevant due to massive implementation of renewable energy sources in domestic use before 2020.

Keywords: Liquid-filled window, solar power, active buildings, renewable source energy, active elements, passive elements, heat gain reducing

OVERVIEW OF HYDROGEN PRODUCTION TECHNOLOGIES FROM RENEWABLE RESOURCES

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ABSTRACT

The issue regarding the energetic dimension of economic growth and development has become today a very sensitive subject, and the energetic paradigm will sharpen even more in the future years. In present day alternatives are searched for to obtain energy by using some technologies that offer maximum yield, high reliability and minimum pollution. A technology like this, considered at the present day, the cleanest one, by which sustainable energy can be obtained, uses hydrogen as fuel.

Hydrogen has great potential as a non polluting fuel, it can be considered as synthetic fuel in an age later the fossil fuel and also, hydrogen, with the role of secondary energy carrier can help increase the stability of energetic safety and price, creating competition between the sources of energy. Besides these, hydrogen is applied at a large scale, in the centre of attention is the fact that hydrogen can be easily obtained by a large range of primary energies from classic or renewable resources, and it can be used at great rates for a large range of applications, starting transportation and portable ones, till stationary, without carbon dioxide emissions.

Hydrogen can not be found in nature, in the pure state, so it can not be exploited as oil or coal. It must be extracted from chemical compounds. Regardless of the source from which the hydrogen is extracted from, the process to obtain it is necessary, and it needs energy consumption. The great advantage is that to generate hydrogen it is not strictly necessary to use energy from classic fuels; it can be used renewable sources of energy.

Hydrogen production is not something recent, to fabricate it there are already well known technologies, but the last tendencies from technologic domain to extract hydrogen are based on producing hydrogen from renewable resources, thus being the object of different demonstrative projects that will allow validation of these technologies as alternatives to the classic ones, having a real potential to become solutions in providing access for every citizen of this planet to pure, clean, non polluted energy, at a reasonable cost.

This article has as purpose evaluation of possibilities of producing hydrogen from renewable resources, being highlighted the innovational tendencies of extraction technologies. In this matter the following have been investigated: the characteristic data available regarding these technologies, the advantages and disadvantages of it, aspects regarding effects on environment and application domains of hydrogen - especially in the stationary applications.

Keywords: biohydrogen, clean technologies, hydrogen generation, hydrogen - green synthetic fuel, renewable resources.

PERFORMANCE AND EMISSIONS OF DIESEL ENGINE WITH TARAMIRA BIODIESEL

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ABSTRACT

In this paper test results of Taramira biodiesel in a four-stroke, single-cylinder, direct-injection diesel engine over the range of loads at the rated speed are provided. Engine performance and emissions parameters with biodiesel were compared with those of diesel oil. Result's discussion and conclusions drawn are supported by an analysis of the fuel injection and combustion characteristics derived from indicator diagrams. Engine fuelled with the undiluted Taramira biodiesel showed increased by about 15% specific fuel consumption, which was explained by the lesser heating value and reduced by about 2% fuel conversion efficiency of biodiesel, whereas emissions were comparable with those of diesel oil. It was concluded, that Taramira oil can be used as the feedstock for commercial production as well as by the farmers for the domestic production of biodiesel. The ways to improve engine performance with biodiesel are discussed.

Keywords: Taramira biodiesel, efficiency, emissions

POSSIBILITIES OF GRAPHITIC SLATE UTILIZATION FOR MIXED FUEL PRODUCTION WITH BIOMASS ADDITION

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ABSTRACT

Biomass presents one of renewable sources of energy. Biomass is an alternative source of energy in countries where amount of fossil fuels is insufficient. The article is aimed to use biomass for bio fuels production, where one of the component is graphitic slate from Burkina Faso and other additives based on biomass. It can be stated, that mixed fuel with ratio graphitic slate, waste biomass, waste light oil (50 % : 40 % : 10 %) has calorific value about 15 MJ/kg. Produced briquettes or pellets correspond to the parameters for solid fuel.

Keywords: biomass, briquettes, pellets, graphitic slate

POTENTIAL IMPACT ASSESSMENT OF A BIOGAS STATION OPERATED IN CZECH REPUBLIC (LIFE-CYCLE ASSESSMENT METHOD)

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ABSTRACT

Biogas production by anaerobic digestion is one way how to use energy from organic substrates, obtain a natural fertiliser for agriculture and, at the same time, reduce waste flows from manufacturing processes. In assessing impacts in the case of biogas stations the main problems are usually seen in shipping the raw materials to the biogas stations and a subsequent transport of produced digastate from the biogas station to the fields. Therefore, the initial project focused on the specific case of a biogas station which has been part of a well run-in farm. As a feed the farm uses most of their own agricultural wastes and also they use the digestate as a fertiliser on their own fields. In this project the LCA method helps to define the key processes or used materials, which may have potentially negative environmental impacts. Based on LCA methodology, significant negative effects were identified as for one type of fermenter feedstock in the biogas station, i.e. grass harvested from the public area and incorporated into the silage. At the same time, there is a cardinal defect in the Czech legislation, this means neither new nor the existing biogas stations are forced to utilise their waste heat. Therefore, this leads to an increase in the potential negative impacts of the generated power.

Keywords: biogas, LCA, digestate, Czech Republic, potential impact

PRODUCTION OF ELECTRICAL ENERGY BY CO FIRING BIOMASS AND COAL

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ABSTRACT

This paper will demonstrate the many benefits of cultivation of the biomass on the sterile dump of the open mining pit and its use to produce electrical energy in the big boiler of the thermal power plants. The paper is elaborated in accordance with the priorities of the Romanian energy sector development with those of the EU energy policy, by increasing energy supply security by means of choosing a balanced fuel mixture, focusing on the use of lignite and renewable energy sources biomass providing the energy sector with competitiveness and supply security. The paper will presents the technical issues related to energy and the environment in that it takes into account all problems globally, namely air, water, soil and natural resources, mentioned both in EU legislation and therefore of Romania, in the field of wastes, pollutants from large combustion plants, climate change and energy strategy. In our researches we will demonstrate: how we can to obtain of two new products: biomass cultivated on sterile, ash and slag dumps and energy mix biomass: coal for burning in power plants and how we have a sustainable use of natural resources - biomass and fossil fuels to mitigate climate change and reduce greenhouse gas emissions. These products will have a positive impact on the competitiveness of the energy industry in Romania by developing and adopting renewable fuel combustion processes with coal.

Keywords: biomass, co firing, sterile dump, greenhouse gas emissions, renewable energy

PRODUCTIVITY AND YIELD QUALITY OF WHITE CLOVER - GRASS MIXED SWARDS DEPENDING ON CUTTING FREQUENCY

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ABSTRACT

In long-term field trials the productivity, coexistence, persistency and dynamics of crude protein (CP) content of white clover cv. 'Priekulu 61' grown in binary- and multi-component swards in mixtures with 13 grass species have been studied on sod calcareous soils and sod-podzolic gleysolic soils of Latvia. The16 mixed binary swards were composed of white clover 'Rivendell' and 6 perennial ryegrass, 6 *Festulolium* and 4 hybrid ryegrass cultivars. Swards were cut two to four times during the growing season. Crude protein content in dry matter (DM) was determined between cuttings both for each two-component clover/grass sward and for each component in a sward. The inclusion of *Poa pratensis, Lolium perenne, Agrostis stolonifera, Festuca rubra, Festuca pratensis, Phleum pratense* in mixture favored the persistency of white clover in binary clover/grass swards. Tall and cenotically active grasses as *Arrenatherum elatius, Bromus inermis, Dactylis glomerata, Festuca arundinacea* reduced ration and productive persistency of white clover in a sward. The ration of white clover and interaction between clover and definite species in clover/grass sward determined crude protein content in total DM yield of each sward as well as CP content for each component in a sward.

Keywords: white clover - grass mixtures, productivity, cutting freguency, coexistence

PROFOUND THERMAL TREATMENT OF OIL WASTE IN HELIODEVICES EQUIPPED WITH CONCENTRATED ELEMENTS

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ABSTRACT

In this scientific article based on a study of the problem of utilization and processing of oily waste describes the problems of environmental safety and discusses possible ways of solving this problem. Direct on alternative methods to influence the structure of hydrocarbons a way to clean the oily waste with the use of solar energy. Established and described in detail the experimental setup for cleaning oil-contaminated waste. The results of experimental studies on the clean-up of oil waste in the solar device which equipped concentrating elements.

Keywords: oily waste; heat treatment; concentrator solar energy; solar device; hydrocarbon raw materials.

PROSPECT ON THE ENERGY MARKET IN ROMANIA

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ABSTRACT

The coal, a fossil fuel continues to be one of the most important energy sources. The value of coal used on the global energy market has fallen between 1995-2001 years from 40% to 25%. The 33% is used on the thermal power station. Under this circumstance, the coal deposit is principled energetic source, yet. The paper presents our energetic policy and the prospect the energy market in Romania in which the coal mining becomes partner for sustainable development and on the energy strategy applies in practice capitalization of renewable energy potential.

Keywords: energy market, coal, renewable sources, environmental impact, sustainable development

REAL DIAGRAMS AS A BASE FOR PLANNING HOT WATER DISTRIBUTION SYSTEM

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ABSTRACT

The paper deals with the analysis of the actual measurements of hot water over several months in residential buildings in Slovakia. After contemporary status analysis execution in the field of hot water (HW) preparation and distribution the second step was an experimental observation hot water off-take in residential houses at its central preparation with intention to develop diagrams of heat consumption and determine off-take coincidence coefficients. The article is processed on the base of hot water off-take daily loading developments. An imperative assumption for optimal systems of hot water production and distribution design is a consumer's real demands knowledge. The paper presents the evaluation of hot water consumption over the year, monthly, daily and hourly course. For determining the coefficients of uniformity of heat consumption for water heating was applied the dynamic pace of consumption, followed by optimization of the water heaters storage parameters.

Keywords: hot water distribution system, consumption of hot water

REDUCING CARBON FOOTPRINT IN EASTERN SLOVAKIA

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ABSTRACT

Regional policy and measures adopted by each government in its decisions are one of the tools in reducing carbon footprint. Operation of public buildings contributes to the total energy consumption in the EU and CO_2 emissions. Currently there are effective solutions leading to a reduction of energy intensity in the operation of public buildings. Reducing energy consumption and the use of renewable energy sources in buildings represents important measures needed to reduce energy dependence and greenhouse gas reductions. Analysis of the current state and the design of appropriate solutions and actions can help regions to focus their resources on a few key priorities instead of distributing their investments between the different areas and the business sector.

Keywords: energy intensity, environment, carbon footprint, efficiency, government

REFORMULATION OF GASOLINE WITH A FOCUS TO THE VOCs EMISSIONS MITIGATION

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ABSTRACT

In the recent years, the quality characteristics of the gasoline have been reviewed, in order to get environmentally friendly fuels with less sulfur, higher octane number, less VOC emissions. For this purpose, besides improving processes to obtain better quality gasoline compounds, the replacement of a small part of them with alternative fuels was imposed. One of the quality characteristics is the vapor pressure of the final product whose effect on the VOCs emissions is direct. With the aim to improve the octane number, the vapor pressure is affected too and as a consequence, the VOCs emissions.

The aim of this paper is to study blending recipes of conventional fuels and the effect of adding alternative fuels such as bioethanol, methanol, 1-propanol, 1-butanol and MTBE, from the viewpoint of vapour pressure and VOCs emissions. Reid vapour pressure (RVP) was the main characteristic measured with conventional Reid apparatus but also with a modern MINI variant of the said apparatus, keeping always in view fulfiling the octane number requirements. The octane number was measured in an experimental engine. The results showed that hydrocarbons heavier than hexane and, surprisingly, the addition of MTBE up to 3% vol lower the RVP, with dramatic increase over this concentration. The methanol increases by 24 kPa the RVP up to 10% vol in blendings. Bioethanol brings about an increasing of max. 10 kPa of the RVP, in any concentration and heavier alcohols don't affect the values of RVP. The authors explain these tendencies and conclude about blending rules to mitigate VOCs emissions.

Keywords: gasoline compounds, Reid Vapour Pressure, VOCs emissions

RESEARCH ON THE REDUCTION OF NO_X BIOLERS OF 330 MW POWER UNITS IN OLTENIA ENERGY COMPLEX

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ABSTRACT

This paper presents a case study on the technical measures proposed in the experimental researches to reduce NOx emissions of power units of 330 MW power plants Rovinari and Turceni belonging Oltenia Energy Complex. Energy group of 330 MW boiler has a nominal flow rate of steam in 1035 t/h and operates lignite. Are the results of measurements of NOx emissions for different operating regimes of power units of 330 MW, made with automatic flue gas analyzers TESTO. Based on the results of experimental research are proposed technical solutions for reducing NOx combustion speed by organizing the coal burners in the furnace and boiler .

Keywords: NOx emissions, low NOx burners, gas analyzers TESTO.

RESTORING THE SYSTEM OF HOT WATER IN RESIDENTIAL BUILDINGS IN SLOVAKIA

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ABSTRACT

The paper discusses hot water system and controlling of the restoration of residential buildings, discusses the possible causes and consequences of the improper operation and also discusses possible ways of resolving these problems. Currently, we meet with a comprehensive rehabilitation of the housing stock, as part of the thermal insulation of residential buildings, thermostatic regulation of heating systems and comprehensive exchange of piping system in the house. Until these modifications are introduced considerable sums of money from which residents of flats often expect miraculous savings and reduce the cost of housing. Are demonstrable savings for building insulation, thermostatic balancing central heating and replacement of piping system uptime guarantees and often improve the supply of hot water, cold water, safety of operation of gas distribution and improving hygiene after replacing sewer lines. The paper discusses the basic rules when replacing piping hot water, the most common causes of defects and the operation depending on the hot water system and balancing of hot water. Current water heating systems waste up to 20% of their energy due to poor insulation in pipes or water tanks, but improving this insulation is too costly to be practical for energy savings [1].

Keywords: balancing of HWS, hot water distribution

STRUCTURES OF COGENERATION UNIT FOR SYSTEM QUASI FULLY-SOLAR BUILDINGS ENERGY SUPPLY

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ABSTRACT

The dominant part of the EU final energy is consumed in buildings as low-temperature heat for space heating and hot water. This is the most produced by burning fuels that are linked to adequate environmental load environment, regardless of whether it is a fossil or bio-fuel. It is therefore high efficiency fuel is a natural requirement in designing, implementation and operation of heat sources for the supply of buildings. For this reason, before commonly used conventional mono-production of heat should be preferred more efficient combined heat and power. This technology is, however, investments is much more difficult. Accordingly, its share in total production of heat to be set so that the operation of the heat source was also economy effective. Article presents a simple method to solve this problem.

Keywords: cogeneration unit, biomass, efficiency,

SYNERGIC APPLICATION OF RENEWABLE ENERGY SOURCES IN REDUCING ENERGY LOAD OF BUILDINGS

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ABSTRACT

An increased utilization of renewable energy sources in the heat and electricity generation is one of priority tasks of the Slovak Republic to boost the use of domestic energy potential and thus to decrease the Slovakia's dependence on imported fossil fuels. Heat pumps and photovoltaics offer the most energy-efficient way to provide heating and cooling in many applications, as they can use renewable heat sources in our surroundings. The experimental workplace of our Faculty "Economic Research Centre for Renewable Energy Sources and Distribution systems" was founded with the purpose of investigating possibilities to reduce the energetic costs of buildings tied to economy. The realized project of the Centre creates real environment for effective implementation research of technologies in laboratory and operative conditions: technologies of co-generative elements, heat pumps, photovoltaics elements, thermal capillaries, and technologies in field of measurement and regulation.

The article discusses the issue of prediction of electric energy production using photovoltaic system. The procedure and results of photovoltaic system simulation model are subjected to comparisons between measurement, simulation and calculation methods. In regard to results of the comparison is established simulation model of produced electricity for the buildings. Within indoor environmental engineering system is installed in a building as a source of cooling. In conclusion, energy balance evaluated the electricity consumption coverage of heating and cooling system using photovoltaic system.

Keywords: synergy, photovoltaic system, renewable energy sources

TECHNOLOGY MANAGING EARTH TEMPERATURE BY GEOTHERMAL POWER PLANT

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ABSTRACT

Nature has generously offered the use of geothermal energy, which is environmentally friendly and economical source of renewable energy in the world. Geothermal energy is used for various purposes - pools, water parks, residential heating and also in agriculture and spas. Generally Slovakia belongs to the countries with comparable young underground conditions created by latest movement of the earth in the Europe. By this movement there where many water lakes covered underground as well as the underground structure allows to cumulate the ground water long time and heat it up by natural earth deep heat. However, geothermal energy is also used to produce electricity in Slovakia areas with sufficient potential. Geothermal survey showed that the potential of the Eastern lowlands, east of Slanské is sufficient to build a geothermal power plant.

Keywords: geothermal power plant, heat source, reservoir, Hot Dry Rock resources, backpressure unit, permeability, Geothermal sources in Slovakia, Feasibility Study

THE ASSESSMENT OF THE ENERGETIC PERFORMANCES OF A DISTRICT HEATING SYSTEM

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ABSTRACT

The assessment of the urban district heating system has been carried out onsite through experimental determinations on the following: main network, district heating substations, distribution network, and final consumer. The data processed allowed for the energetic balance elements to be determined based on numeric calculus software. The results were synthesized both graphically and in tables. The interpretation of the obtained diagrams allows for the system to be diagnosed and as well as for measures which lead to the increase of their energetic efficiency to be stated.

Keywords: district heating, measurement methodology, energetic analysis, thermal power, Sankey diagram

THE CONSTRUCTION OF „BOREHOLE THERMAL ENERGY STORAGE“ IN MIOCENE ROCKS ON LOCALITY OF GREEN GAS DPB, A.S. IN PASKOV (CZECH REPUBLIC)

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ABSTRACT

Real Borehole Thermal Energy Storage (BTES) was built under the support of grant project “Using Geothermal Energy for Renewable Energy Sources Systems Including Verification of Energy Accumulation” founded by Technology Agency of Czech Republic. New research BTES polygon in Paskov (Czech Republic) consist of 16 energy boreholes (each 60 m deep), 5 monitoring boreholes (each 15 m deep) and 1 central monitoring borehole (80 m deep). BTES is heated with hot water from CHP unit at temperatures up to 95°C. Rock temperature is measured by sensors in monitoring boreholes situated at different depth levels. The temperature of the fluid in the boreholes is measured by contact sensors which are all ways placed before the first borehole in the series between boreholes in the series and after the output from second borehole. This article will describe experiences from construction and research of storage and explore of heat in the BTES.

Keywords: heat exchanger, borehole, monitoring, miocene rocks

THE ENERGETIC QUANTIFICATION OF THERMODYNAMIC INEFFICIENCIES OF HOT WATER DISTRIBUTION NETWORKS

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ABSTRACT

The paper deals with the scenarios of thermal rehabilitation of a hot water distribution network considering an energetic as well as an environmental point of view. The study method is based on thermal transfer equations suited for the objective of the paper. 4 different calculations are therefore presented. The simulations of the operations were realized using numeric determination programs. The energetic as well as environmental results have been graphically presented.

Keywords: hot water network, thermal transfer, heat losses, environmental effect, insulation class.

THE ENERGY PERFORMANCE MODEL OF VENTILATION SYSTEM - PART 1

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ABSTRACT

The paper deals with the energy efficiency of the ventilation systems (ventilation units) in different design alternatives (with heat recovery, without recovery, effective fans, etc…). The alternatives of operation of the ventilation system at intervals during the day and throughout the year are also presented. The calculation of the airflow was executed in accordance with laws and standards valid in the EU and Slovakia (EN 15251, EN 13779, etc.). A large potential for energy savings in the Slovak building generally, due to the fact that majority of the buildings were constructed before 1989, before first important requirements for energy performance and savings of building.

Keywords: energy savings, energy performance, ventilation, distribution system, ventilation rate, heat recovery, energy

THE ENERGY PERFORMANCE MODEL OF VENTILATION SYSTEM - PART 2

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ABSTRACT

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Keywords: energy savings, energy performance, ventilation, distribution system, ventilation rate, heat recovery, energy

THE FUNCTIONING OF AGRICULTURAL ENTERPRISES, LOCATED IN DIFFERENT CLIMATIC ZONES

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ABSTRACT

This article describes the agricultural enterprises located in different natural climatic zones, which were analyzed on the basis of the energy approach on the example of Western Siberia and North Kazakhstan. The comparative analysis of enterprises functioning by the criterion of energy efficiency was conducted. The values of farming resource potential were identified. It shows that the density of energy consumption is very heterogeneous at different territories.

Keywords: energy efficiency, energy approach, resource potential

THE HOT WATER DISTRIBUTION SYSTEMS ANALYSIS FROM HEAT LOSSES POINT OF VIEW

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ABSTRACT

The presented study deals with the analysis of heat loss reduction in the hot water distribution systems. Not only does the efficiency of hot water preparation depend on the heat losses in the hot water systems, but it also depends on other factors. To express the impact of these factors on the pipes of small dimensions, results obtained by calculation, numerical simulation and experimental measurements are used in this paper. Finally, energy savings, which can be achieved at the intermittent operation of the system, are expressed for different insulation thicknesses.

Keywords: energy savings, finite volume modelling, heat losses, hot water distribution system

THE INFLUENCE OF SIZE FRACTION AND MOISTURE CONTENT ON THE COMPRESSIBILITY OF WOOD SAWDUST IN EFFECTIVE PROCESS OF PRODUCTION A SOLID BIOFUEL

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ABSTRACT

Many technological factors (size fraction, moisture content, and others) have major effect on the densification process of biomass to the form of high-grade solid biofuel. The basic parameter describing the densification process of particulate matter is its compressibility, quantified by the coefficient of compressibility. Knowing this coefficient for a specific material like wood sawdust is a basic prerequisite for the application of compressibility equations describing the densification process, and for calculating the workload in the production process of high-grade solid biofuel. This paper deals with a methodology for determining the compressibility factor for sawdust on the basis of experiments to quantify pine sawdust. The experiments were performed in two stages. The first stage was an experimental investigation of the influence of size fraction and moisture content on the final compressibility of pine sawdust. High-pressure binderless densification of pine processing residues in the form of sawdust was studied. A piston-and-die process was used to produce densied briquettes under room temperature and at pressure up to 159 MPa. The results show the behaviour of the pressure load when the parameters of the particulate matter are changed. In the second stage, the experiments were evaluated and optimized to achieve minimum energy input of the process and a maximum degree of densification. The research results will be used to develop new technologies and machinery for effective biomass densification to achieve a high-grade solid biofuel.

Keywords: biomass, biofuel, compressibility, densification, briquetting

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Keywords: biomass, biofuel, compressibility, densification, briquetting

THE MODULAR CONSTRUCTION OF NON-METALLIC MEDIUM TEMPERATURE CONCEPT SOLAR COLLECTOR SOLABLOK

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ABSTRACT

The presented article focuses on the construction and design of non-metal concept solar collector SOLABLOK, which absorber and thermal insulations are formed from block of foam glass. Function of SOLABLOK collector is based on direct insolation of heat transport medium in the absorber, which works as a photothermal converter , creating a so-called thermal trap. The theoretical part describes the basic principles and functions of collector and previous theoretical and practical research by authors in this field of study, consists of prototype design and several experiments and physical measurements, which resulted in the possible applicability of presented concepts in solar technology. The main part discusses the design of a solar collector, which is heading to a simple modular composition consisting of modules with low production costs and low energy consumption during the manufacturing process. The advantage of this construction is easy assembling, modifiability and estimated affordability mainly in segment of structurally simple solar systems where SOLABLOK concept brings more efficiency and energy obtained at same low input costs.

Keywords: Solar Collector, Foam Glass, SOLABLOK Concept, Photothermal Convertor, Modular Design

THE STRATEGIES OF MUNICIPALITIES ABOUT USAGE OF RENEWABLE ENERGY RESOURCES IN TURKEY

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ABSTRACT

Air pollution and climate change arising from the use of fossil energy resources has historically been reducing the quality of human life drastically. Nevertheless the decline in reserves of these resources has led to an increased interest into new and renewable energy systems. Renewable energy sources such as solar, wind and biomass have started playing a major role in meeting energy needs increasingly in developing countries.

Municipalities can be perceived as solution areas for different urban, environmental, and social problems. Analysing the overall structure the environment-related projects led by municipalities is now taking place as a result of collaborated studies across multiple departments. Development of renewable energy sources and other work done on the environment are produced with the cooperation of the City Council, Municipal Volunteers, Construction Department and the Directorate of Environment. Therefore, various strategic actors take place in the studies about renewable energy resources. In this study, approaches on renewable energy in Turkey are determined by analysing some of the examples from these projects.

Keywords: Renewable energy, energy strategies, renewable energy projects, municipality, sustainability.

USE OF BIOFUELS IN PAKISTAN: CURRENT STATE AND PERSPECTIVE

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ABSTRACT

For Pakistan with its limited resources of crude oil the use of biofuels in transportation is the issue of the day. In this paper the issues related to biofuels production and use have been discussed. In particular, it has been proved experimentally that the use of Jatropha biodiesel along with bioethanol allow to operate diesel engines on the neat biofuel without significant engine modification.

Keywords: diesel engine, efficiency, emissions, biodiesel, alcohol

USE OF NATURAL ORES AND WASTE MATERIALS AS OXYGEN CARRIERS FOR CHEMICAL-LOOPING COMBUSTION

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ABSTRACT

The increasing CO_2 levels in the atmosphere require an immediate action in order to avoid irreversible climate changes. Chemical-looping combustion (CLC) is an innovative technology that provides an energy and cost-effective separation of CO_2 for further capture and storage and thereby helps to mitigate the anthropogenic CO_2 emissions from thermochemical fuel conversion.

The solid oxygen carrier is a core component of every CLC system and the choice of the oxygen carrier depends on the fuel and operation conditions. Low-cost oxygen carriers tend to be more suitable for the process as the lifetime of the oxygen carrier material is often limited by side reactions with fuel ash, or by carryover losses in the ash separation.

A series of natural ores and waste products have been investigated as potential oxygen cares, such as Mn-ore, Fe-ore, ilmenite. The materials are chosen based on their content of oxides that have proven to have promising oxygen transporting capabilities. The results lead to summary of criterion for further screening of the existing materials for more reactive and better suited candidates for the process.

Keywords: CO_2 capture and storage, ores, oxygen carriers, waste materials, energy conversion, CO_2-neutral, CLC

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VENTILATION OF PREMISES AND MUTUAL COMPUTING COMPARISON

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ABSTRACT

The insufficiently and poorly ventilated premises or inappropriately ventilated operation can cause primarily health problems of occupants but also damage to building structures. It is necessary to ensure adequate quality of ventilated area, a healthy environment, the required air humidity and air temperature. On the other hand, it is needed to achieve reasonable energy costs and sufficient air exchange (ventilation rate) under current legislation. To reconcile all of these requirements and then find appropriate solutions and alternatives of ventilation is necessary to evaluate several modes of moist ventilation premises and to choose the best alternative. In the work is carried out analysis of calculation methods to determine the ventilation rate. Is processed the methodology for calculating the ventilation rate of room, by are used the measured values in concentrations of carbon dioxide. Values concentrations of carbon dioxide and ventilation rate are verified by experimental measurements. The methodology is selected for calculating ventilation rate applicable in to Slovakia. The result of methodology is nearest the result from experimental measurements. By the following is determined the methodology for calculating ventilation rate for office.

Keywords: ventilation rate, legislative, concentration of carbon dioxide, experimental measurement, volume airflow, mass flow, office

VERMICOMPOSTING OF BIOGAS STATION DIGESTATE

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ABSTRACT

The article deals with testing vermicomposting as an option in processing a material that is difficult to biodegrade, i.e. digestate from biogas stations. Vermicomposting is grounded in the exploitation of the potential of certain earthworm species to convert fresh organic matter into high-quality compost. Vermicompost is a high quality fertilizer containing a high amount of humic acids and growth controllers. The research predominantly focuses on the observation of hazardous elements contained in the feed materials in relation to the quality of the formed vermicompost. The results point at the applicability of the material as a fertilizer as it complies with the valid legislation.

Keywords: vermicompost, fertilizer, digestate.

WAVE FARM INFLUENCES ON THE MANGALIA NEARSHORE WAVE PATTERN

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ABSTRACT

The objective of the present work it is to evaluate the expected influence of a wave farm on the local wave field patterns. The target area is the Mangalia sector in the Romanian nearshore of the Black Sea. As a first step, in situ wave measurements from the Gloria drilling unit, covering a seven-year time interval (between 2003 and 2009) was considered for the present analysis. In order to identify the most representative wave conditions the following patterns were defined: a) average; b) high (non storm) and c) extreme (storm events). Several case studies were developed based on numerical simulations carried out with the SWAN model. In the SWAN computational domain a generic wave farm project was also included. The presence of the wave farm was considered throughout sequences of corner points of a line which act as an obstacle, modifying in this way the properties of the incoming waves. Locally, the significant wave heights are reduced while reporting to the geographical space the reflection and refraction processes become more significant. In order to identify various possible situations, the absorbing property of the generic farm was adjusted from a no farm scenario (zero absorption) to an ideal wave farm scenario (total absorption). It was noticed that the presence of the wave farm can significantly reduce the incoming wave height, which indicates that this type of project, besides the extraction of the renewable energy, can be considered also suitable for an effective coastal protection.

Keywords: Black Sea, Romanian nearshore, SWAN, wave farm, coastal impact