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Current status and prospect of the research on renewable energy sectors based on System Dynamics

CAI Qiang, REN Hong-bo, QIU Liu-liang, et al

(College of Energy and Mechanical Engineering, Shanghai University of Electric Power, Shanghai 200090, China)

Abstract: According to the deep analysis of the concept and features of System Dynamics (SD), the feasibility of SD for the research of development strategies for renewable energy resources is discussed from both macro and systematic levels. In addition, based on the comprehensive review of the application of SD in the energy field, the current status of the research on renewable energy sectors based SD is reviewed and discussed from the aspects of policy assessment, long-term prediction and multi-method coupling. Moreover, the possible direction of the application of SD for the renewable energy related sectors is proposed from the viewpoints of application field and research method.

Key words: System Dynamics; renewable energy; current status; prospect

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Numerical simulation and optimization of heat storage unit of shell and tube heat exchanger

WANG Mei-jun, TIAN Song-feng, HAN Qiang, et al

(Key Lab of Condition Monitoring and Control for Power Plant Equipment, North China Electric Power University, Baoding 071003, China)

Abstract: Low thermal conductivity of phase change materials cause reduce the heat release of the phase change heat storage device. In order to solve this problem, a three dimension calculation model for Latent Heat Storage (LHS) unit of fin-tube and light tube type was established. Based on the numerical simulation method, the influence of fin tube and light tube on the heat storage performance were analyzed from the aspects of the heat storage rate, heat storage capacity and temperature field. Results showed that the addition of fins on the outer wall of the light tube can reduce the complete melting time of the phase change material and the time required for the whole thermal storage and heat release process. Compared to the light tube structure, the complete melting time was reduced by 32% and the total heat release time was reduced by 14.5% when the fin heat exchange tube is adopted. Adding fins can improve the heat storage performance of the regenerator under certain conditions. The study can provide good references

for the optimal design and performance enhancement of phase change heat storage device in the future.

Key words: fin-tube; Latent Heat Storage; performance enhancement; numerical simulation

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SCR process parameter optimization of pulverized coal boiler

FU Qian-yu, ZHAO Bin, MA Hai-peng, et al

(College of Metallurgy and Energy, North China University of Science and Technology, Tangshan 063009, China)

Abstract: SCR is the mature and efficient technology of flue gas denitrification in coal-fired power plant, this paper based on the boiler of 660MW coal-fired unit in one power plant is regarded as the research object, mainly do briefly introduced on the NOX removal mechanism and method, combined with the 660MW Boiler SCR denitrification facility of the actual operation data, investigate the influence of coal-fired power station denitrification efficiency related factors, Propose SCR denitrification system of operation on the essentials of direction and operation optimization. The research can provide theoretical and technical support for the optimization design and operation of coal-fired power plants, and provide ideas for the optimization and reconstruction of the denitrification system.

Key words: pulverized coal boiler; SCR; influencing factors; parameter optimization

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Economic analysis of CHG620V8 series gas engine waste heat boiler

LV Yu-kun, ZHAO Wei-ping, LI Jin-gang

(North China Electric Power University, Baoding 071003, China)

Abstract: In order to make full use of the waste heat of CHG620V8 gas engine, design calculation and checking calculation of the waste heat boiler were carried out. Furthermore, the economic performance of the waste heat boiler was analyzed. The results showed that: the relative error of each heating surface of the boiler was less than 2%, the total resistance of the flue gas being less than the maximum allowable pressure, therefore meets the requirement of design. 2.5MPa, 350℃ and 3.677t/h new steam generated by the boiler, if used exclusively for power generation, operated in accordance with 4000 hours per year, an annual generation capacity was 612474.2kW(h. Calculated at a market price of 0.37 ¥ per kilowatt-hour, the annual generating proceeds can be of up to 226,620 ¥ and it was considered that the initial investment costs of the use of waste heat boiler plant operation will be recovered in about 43 months.

Key words: CHG620V8 gas engine; waste heat boiler; design calculation; checking calculation; economical efficiency

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The analysis of the application of green energy-saving building wall

TANG Yu-min, CHEN Long, QI Shui-bing, et al

(Guangdong Polytechnic of Environmental Protection Engineering, Foshan 528216, China)

Abstract: To highlight the advantages of Double-skinned curtain wall, this paper analyses the energy efficiency of Double-skinned cur-

tain wall and summarizes its application and concludes its types and characteristics from its application. Besides, this paper takes Foshan Science Museum and Youth Palace as example to analyze the applied technique, characteristics, the energy-saving effect and the landscape effect of energy-saving building wall. Based on these two examples, this paper makes comparison of energy saving of the wall from different aspects and draws conclusion, which aims to explain that the application the energy-saving wall should adjust measures to local conditions to give full play to the particularity of contradiction and realize the maximum of the economy energy rates.

Key words: energy-saving building wall; green building; double-skinned curtain wall; energy conservation

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Research of window-wall ratio of residential building in Shandong

LI Zheng, ZHAO Yuan-yuan

(School of Thermal Engineering, Shandong Jianzhu University, Jinan 250101, China)

Abstract: In cold areas of a city in Shandong rural residential building case model, using DEST software simulated the effect of changes in the north and south window-wall ratio on building heating and air conditioning energy consumption. The results show: For cold region, with the increasing of north-south window-wall ratio, the consumption of heating and air conditioning energy will increase. According to the simulation results, and combined living habits in rural areas, Author recommended south window-wall ratio of 0.5 or less, north window-wall ratio below 0.4. Users can also accord to their needs and buildings energy-saving targets, select the appropriate window-wall ratio.

Key words: cold areas; DEST; heating energy consumption; air conditioning energy consumption; window-wall ratio

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The treatment technology situation and development prospects for the rural sewage

FENG Ning, SU Lei, LI Ya-feng

(School of Municipal and Environmental Engineering, Shenyang Jianzhu University, Shenyang 110168, China)

Abstract: Summarizes the characteristics of rural sewage water quality, introduces the advantages and disadvantages of rural sewage treatment technology, and look for new technology and future development of the new technology for rural sewage treatment. To ensure the safety of rural water sources and the people's health, to strengthen the collection and treatment of rural domestic sewage.

Key words: rural sewage; treatment technology; development trend

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Designing a heat pipe device with CAV and energy saving and analyzing its performance

AO Yong-an, DUAN Zhi-hong

(School of Municipal & Environmental Engineering, Shenyang Jianzhu University, Shenyang 110168, China)

Abstract: A heat pipe device with Constant Air Volume (CAV) and

energy saving is designed and installed on the outer wall of the room according to different geographical location and winter air temperature, then fluent simulation displays indoor temperature and velocity distribution and theory analysis displays heat recovery efficiency in different indoor and outdoor temperature conditions as well as the operating costs. It can be concluded that the heat recovery efficiency is highest when a heat pipe device with Constant Air Volume (CAV) and energy saving is applied in freezing, cold regions, indoor temperature and velocity is the most reasonable when it is applied in cold in winter and hot in summer, mild region and it cannot be applied in areas with hot summer and warm winter.

Key words: heat pipe; Constant Air Volume (CAV); energy saving; fluent

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An intelligent power saver based on self-learning fuzzy control for drinking water dispenser

CHEN Zhong-ren, ZHU Ming-jun, HUANG Jian, et al
(Zhongshan Polytechnic, Zhongshan 528404, China)

Abstract: In order to solve some problems existing in drinking water dispenser widely used in offices and homes, such as wasting power energy and producing 'thousands of boiling water', an intelligent power saver based on self-learning fuzzy control for drinking water dispenser is developed. A single-chip microcomputer is used as CPU and self-learning fuzzy control is used as control strategy to reduce the ineffective heating of drinking water dispenser. In order to improve the power saving effect, the low consumption design of power saver is proposed. The compound switches and buzzer warning circuit designed are also proposed to reduce the conduction loss and save power energy. In addition, the power saver has multiple operation modes so that it can be applied to different requirements of the occasion. The experimental data shows that the power saving effect of power saver is significant, and it is worth to be further popularized.

Key words: self-learning; fuzzy control; intelligent; drinking water dispenser; power saver

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Thermodynamic analysis of stirring liquid Wind-heating device

JIN Hao, HU Yi-huai, YU Chi-cheng, et al

(Merchant Marine College, Shanghai Maritime University, Shanghai 201306, China)

Abstract: According to both the first and second laws of thermodynamics, an energy and exergy analysis is performed on the liquid stirred heating system. The analysis model of both the energy balance and exergy balance is established. This paper analyzes each section of the liquid stirred heating system with respect to both the first and second laws of thermodynamics. Giving the approach to improve both the energy and exergy efficiency of the liquid stirred heating system. It is shown that the second law provides unique insight beyond a first law analysis, thereby providing a useful guide for energy-saving design of the liquid stirred heating system.

Key words: the liquid stirred heating device; energy analysis; exergy analysis; efficiency; energy-saving

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