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**Research progress of Mechanical Vapor Recompression (MVR) technology**

WANG Shuai, ZHANG Jun

(Wuxi City Vocational and Technical College of Jiang Su Province, Wuxi 214153, China)

**Abstract:** The technology of MVR has the advantages of low energy consumption, no scale formation, simple structure and good operation effect. The research progress of this technology in desalination, wastewater treatment, salt production, emulsion concentration, papermaking and distillation is reviewed. The principle and different characteristics of MVR compared with other technologies in high salinity wastewater treatment were analyzed. The effects of material properties, operation, elevation and process on the performance of MVR are summarized. All of these are in order to provide a reference for the later research and application of MVR.

**Key words:** MVR; application; high salinity wastewater; performance

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**Research on rewards and punishment mechanism of energy-consuming enterprises' performance behavior in energy-consuming right trading**

MA Jing-fu

(School of Automation and Electrical Engineering, Shenyang Ligong University, Shenyang 110159, China)

**Abstract:** The energy-consuming right trading is a market trading mechanism for the trading of the total amount of energy-consuming indicator. To control the total amount of energy-consuming can achieve the purpose of energy conservation. In this paper, we gave the definition of energy-consuming right trading in China and compared it with energy saving trading and carbon emission trading. Secondly, we introduced the practical experience of energy-consuming right trading and energy saving trading in several pilot areas. Finally, the problem of insufficient reward and punishment of energy-consuming enterprises' performance behavior in energy-consuming right trading was pointed out. Aiming at this situation, we established the corresponding rewards and punishment mechanism. The mechanism can ensure the fairness and operability of the energy-consuming right trading.

**Key words:** energy-consuming right trading; energy-consuming enterprises; performance behavior; rewards and punishment mechanism

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**Research on optimization design of finned tubular heat exchanger**Z HANG Jian, QIAO Chun-zhen, GUO Jiang-feng, et al  
(Civil Engineering College, North China Technology of University, Beijing 100144, China)

**Abstract:** The fin shape of a tube fin heat exchanger is studied, and an optimized heat transfer method for fin structure is proposed. The change law of the fin method for the fin side heat transfer coefficient

and the overall heat transfer with fin structure change, and the evaluation method of heat transfer coefficient and pressure drop for the combination of tube fin heat exchanger fin height, fin thickness and fin spacing optimization. The total heat transfer coefficient of the heat exchanger is obtained by calculating the optimum range under the control of a single variable or multiple variables.

**Key words:** finned tube heat exchanger; comprehensive performance; optimum design; flue gas waste heat

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**Thermodynamic analysis of 150MW gas-steam combined cycle units**ZHAO Bao-ling, REN Qiang, DONG Chang-wei, et al  
(North China University of Science and Technology, Tangshan 063210, China)

**Abstract:** In order to meet the strictly environmental protection requirements and optimize the energy structure, the development of combined cycle power plant has been drawn more and more attention. Taking a 150 MW Gas-Steam Combined Cycle power plant as the research object. Based on the first and second thermodynamics laws, the thermodynamic models were developed, and evaluate the exergy destruction of each part were analyzed. The results show that, the electrical efficiency of the CCPP unit can up to point reach 44.2% and exergic efficiency is 53.5% under the design operation conditions of 96%. the combustion chamber and heat recovery steam generator are the main positions of the system under the off-design operation conditions. The researches could provide theoretical supports for operation optimization and design for power plant.

**Key words:** CCPP; BFG; thermal analysis efficiency; exergy loss

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**Analysis of medium-low temperature geothermal power generation system based on Ebsilon Software**

MA Kuo, MAI Qiao-man, LOU Bo, et al

(Guangzhou special equipment inspection and research institute, Guangzhou 510663, China)

**Abstract:** The medium-low temperature geothermal power generation system of the flash power system, pure organic Rankine cycle and organic regenerative Rankine cycle power generation are analyzed with the Ebsilon software. Organic media screening results show that Rf234 is a good choice as Circulating medium. Pure organic Rankine cycle steam power generation system can be increased energy utilization 62.9% than flash system, and regenerative organic Rankine cycle power system further improve energy utilization 8.7% than the pure organic Rankine cycle. The study results have significance to medium-low temperature geothermal power generation system.

**Key words:** Ebsilon; medium-low temperature geothermal; power system; organic Rankine cycle; regenerative cycle

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**Experimental study on NO<sub>x</sub> emissions characteristics of CFB peak shaving boiler**

LI Qian, GAO Ming-fei, DONG Chang-wei, et al

(School of Metallurgy and Energy Engineering, North China University of Science and Technology, Tangshan 063210, China)

**Abstract:** It is a common problem that current coal-fired boilers regularly run in deeply peak load lead to the low efficiency and pollutant discharge is difficult to control. In a normal way, the boiler combustion optimization experiment was carried out, in order to solve the problem of low-load stable-combustion when peak load regulating operation, and achieve the goal of pollutant discharge controlling. Taking a 150 MW CFB boiler in Tangshan as example, it studied the relationship between NO<sub>x</sub> emissions of boiler variable condition operation and related influence factors. The results showed that the increase of the load, decrease of the ratio of water and coal, and increase of the ratio of ammonia and nitrogen were beneficial to control NO<sub>x</sub> emission; Controlling flue gas oxygen content under 5% and keeping the NO<sub>x</sub> denitration process at the best SNCR reaction temperature range, can effectively improve the NO<sub>x</sub> denitration efficiency; However, it can not only

change proportion of primary and secondary air, but also to take other factors such as bed temperature and excess air coefficient into consideration. The results of the study can provide reference for CFB plants peak shaving operation.

**Key words:** CFB boiler; peak shaving operation;  $\text{NO}_x$  emissions; test

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### The feasibility plan and energy saving analysis of open-typed water pump system in thermal power plants

MA Yu-jie, WANG Jing-jing

(Huaneng Linyi Power Generation Co. Ltd., Linyi 276016, China)

**Abstract:** With analysis to operation situation of open-typed water system in Thermal Power Plant, We think it more affluence to the open-typed water system in winter, open-typed water pump outlet has holding pressure phenomenon, given three technological revamp programs of the open-typed water pump by high and low speed, frequency conversion and add auxiliary water pump. The feasibility and economy of the three schemes are analyzed, it is found that the three schemes are feasible and auxiliary power consumption rate will be reduced and unit operation economy will be greatly increased.

**Key words:** open-typed water pump; high and low speed; frequency; auxiliary water pump; energy conservation

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### Research on comprehensive monitoring system of ring main unit

GUO Fu-ran, QI Meng, MA Xin

(Henan Kaifeng Electric Power Bureau, Kaifeng 475000 China)

**Abstract:** Unmanned ring main unit is a kind of high voltage complete sets of equipment, which is widely used in urban residential areas, high-rise buildings, large-scale public buildings, factories, enterprises and other load centers. The acquisition and inspection for the comprehensive information of the ring main unit, has been relying on the staff to the scene. This artificial method is time-consuming, laborious and inefficient. It doesn't meet the requirement of the social economic growth and development of the power supply enterprises. According to above background, this article has carried on the key research, and proposed the corresponding solutions. It is proved by examples that the theory and methods presented in this paper are correct, and the result has stronger practicability on comprehensive monitoring and state maintenance of distribution equipments.

**Key words:** ring main unit; unattended operation; fault processing; comprehensive monitor; condition-based maintenance

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### Optimization analysis of steam temperature for 300MW unit after low nitrogen combustion modification

LIAN Xu-gang, WANG Tao

(ShanXi Zhongshan Electric Power Co. Ltd., Changzhi 046000, China)

**Abstract:** This paper first introduces the 2<sup>#</sup> unit of Jingneng group Zhang Shan power plant and low nitrogen transformation, the transformation of the specific programs and content transformation. According to the low nitrogen transformation, due to the uneven combustion caused by side flue gas temperature has great deviation, the outlet temperature of A side B side than the low reheat steam temperature is above 10, on both sides of the reheat steam temperature had a greater deviation, the average temperature of reheating steam is not up to the rated value of one side and steam temperature high current over temperature, serious affect the economy and safety of unit operation. According to the characteristics of swirl burner, through the analysis of the cascade control loop of the steam temperature, by increasing the feed-forward control of steam temperature control logic optimization, so as to eliminate the sides of the reheat steam temperature deviation effect, ensure the unit average reheat temperature can reach 540 DEG

C set value.

**Key words:** low nitrogen transformation; steam temperature deviation; feedforward; logic optimization

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### The computer network control system of campus energy-saving supervision

JIN Jian-yu

(College of National Defense Education, Northeastern University, Shenyang 110004, China)

**Abstract:** Based on the university energy management platform, combined with computer technology, the fieldbus control technology, network communication technology and the field of embedded system, the paper is to design a set of intelligent, automated and modernized campus energy-saving supervision computer network control system. The design satisfied the various requirements of university's power management both in teaching areas and office areas, and it also played a crucial role in energy savings.

**Key words:** energy-saving supervision; the computer network; control system

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### Numerical analysis for panel type radiator with stamping type vortex generator

HAN Xu, WANG Liang, ZHANG Ming-hui, et al

(School of Energy and Environment Engineering, Hebei University of Technology, Tianjin 300130, China)

**Abstract:** The heat dissipation of the radiator is enhanced by stamping type vortex generator on the plate radiator under natural convection. The influence of the length, width, angle of the generator, the distance of the radiating fin and the location of the generator on the heat dissipation and the convective heat transfer coefficient of the radiator are analyzed by numerical simulation. Since the fin thickness is 1mm, considering the actual machining process, the final selection of the vortex generator conditions is  $C = 13.5\text{ mm}$ ,  $K = 5\text{ mm}$ ,  $G = 3\text{ mm}$ ,  $\theta = 30^\circ$ . When the vortex generator with the corresponding position of the two radiation fins is 60 degrees, the same side vortex generators move 50mm in the direction of the air inlet, and the heat radiation of the radiator can be increased by 15.71%.

**Key words:** transformer; panel type radiator; vortex generator; stamping process; heat transfer enhancement

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### Technical and economic analysis of central heating water transformation in 300 MW co-generation unit

HE Xiao-hong, GAO Xin-yong

(Huadian Electric Power Research Institute, Hangzhou 310030, China)

**Abstract:** Based on an 300MW sub critical coal-fired heating unit and existing absorption heat pump, the technical solutions of central heating system for 70°C and 80°C is completed. The energy-saving effects and technical economy in non-heating period, early cold period and high cold period are analyzed in detail. Through the contrast analysis, the thermal market is expanded, the absorption heat pump can be put into operation in the non-heating season, and power generation can be increased. The 70°C hot water project has greater net income, shorter payback period than 80°C. In the case of hot water demand 4000 tons/day, the preparation of 70°C domestic hot water can achieve 12,800 tons of coal savings, which is 15,100 tons in 80°C. The project has a better energy saving effect.

**Key words:** central heating; absorption heat pump; hot water; energy conservation

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