

**04/01962 The effect of circumsolar radiation on a solar concentrating system**

Buie, D. and Monger, A. G. *Solar Energy*, 2004, 76, (1–3), 181–185. Empirical models for the energy distribution of the sun, as seen after atmospheric scattering, show a strong correlation on an annual or month-by-month basis to observed data. When applied to cases where the requirement is for a real-time solar energy distribution, such as in the optimization of the flux distributions in imaging concentrators, these models prove insufficient. This paper presents results illustrating trends in observed solar profiles that are invariant to changes in location that lay the framework to a definitive solar model. It also shows how using this information, a more complete understanding of the effect of a change in the spatial energy distributions of the sun can have on the size of the spatial energy distribution in the absorber plane of a (linear Fresnel) concentrating collector.

**04/01963 The sustainable management of renewable energy sources installations: legal aspects of their environmental impact in small Greek islands**

Maria, E. and Tsoutsos, T. *Energy Conversion and Management*, 2004, 45, (5), 631–638.

Nowadays, an attractive legislative and financing framework has been established in Greece for the development of renewable energy sources. This has resulted in a strong increase of investors' interest, especially in the islands, mainly due to their high renewable energy potential all year round. However, the typical characteristics of the small Greek island, which constitute sensitive ecosystems with unique attributes of a natural and cultural heritage, impose a limitation on the development of energy generation plants using renewables. In order to adopt the principles of sustainable development of these island regions, the application of the proportionality principle in relation to other general principles of environmental law is proposed as a suitable legislative tool for resolution of the foreseeable conflicts.

**04/01964 Water-in-glass evacuated tube solar water heaters**

Morrison, G. L. *et al. Solar Energy*, 2004, 76, (1–3), 135–140.

Evacuated tube solar collectors have better performance than flat-plate solar collectors, in particular for high temperature operations. A number of heat extraction methods from all-glass evacuated tubes have been developed and the water-in-glass concept has been found to be the most successful due to its simplicity and low manufacturing cost. In this paper, the performance of a water-in-glass evacuated tube solar pre-heater is investigated using the International Standard test method ISO 9459-2 for a range of locations. Factors influencing the operation of water-in-glass collector tubes are discussed and a numerical study of water circulation through long single-ended thermosyphon tubes is presented. Preliminary numerical simulations have shown the existence of inactive region near the sealed end of the tube which might influence the performance of the collector.

Three types of low-emission gas-fuel oil burners, implemented in Russian electrical power plants during the conversion of pulverized coal boilers and modernization of gas-fuel oil boilers for decreased formation of nitrogen oxides are described.

**04/01967 Evaluation of the 200 MWe Tonghae CFB boiler performance with cyclone modification**

Lee, J.-M. *et al. Energy*, 2003, 28, (6), 575–589.

The performance of the Tonghae circulating fluidized bed (CFB) boiler with modification of the cyclone has been evaluated using the IEA-CFBC model. The effect of the cyclone efficiency on solid hold-up and pressure and temperature profiles in the combustor has been detected. From the calculated results, solid hold up in the lean phase of the combustor and pressure in the combustor increase, whereas solid hold-up in the dense phase and temperature in the combustor decrease as the cyclone efficiency increases. After modification of the cyclone through extension of the vortex finder and reduction of the width of the cyclone inlet duct,  $\Delta P_{\text{upper part}}$  and  $\Delta P_{\text{lower part}}$  in the combustor increase from 1328 to 1942 Pa and from 4402 to 4950 Pa, respectively. The temperature and the emission of  $\text{SO}_2$  of the combustor decrease after modification of the cyclone. Therefore, modification of the cyclone to improve its efficiency can allow operation and control of the Tonghae CFB boiler to be stable. The simulation results by the IEA-CFBC model can also explain well the improved performance of the CFB boiler.

**04/01968 Modelling of deposits formation on heating tubes in pulverized coal boilers**

Tomeczek, J. *et al. Fuel*, 2004, 83, (2), 213–221.

A mechanism of particles and condensable vapour deposition enabling simulation of the deposits composition and size has been developed. The results of deposit growth on heat transfer tubes during nine months of boiler firing by subbituminous coal containing 13.9 wt% of mineral matter are presented. It has been demonstrated that a 4 m deep front of most intensive deposition on the superheater tubes moves with time down the tubes bundle. The deposits grow quickly during the first three months of boiler operation, and then remain almost stable, reaching after nine months of operation a thickness of about 30 mm.

**04/01969 Operate a boiler system designed to combust paper sludge in combination with chip rubbish –contribute to the community, conversion fossil fuel, and reduce energy cost**

Hirakawa, H. *Kami Pa Gikyoshi*, 2003, 57, (5), 694–702. (In Japanese)

In recent years Tokai Pulp & Paper Co., Ltd. has made a concerted effort to improve the natural environment, such as minimize the effect of the solid waste that is released into the city. This means to increase wastepaper utilization rate, and maximize the uses of recycled paper. During the process of minimizing its impacts on the environment, increased manufacturing waste is also generated. With paper sludge/chip rubbish steam plant in place (number 10 boiler), Tokai Pulp & Paper Co., Ltd. is now able to use the majority of its paper sludge by-product, reducing both energy and disposal costs. By using the paper sludge and chip rubbish as a fuel, Tokai Pulp & Paper Co., Ltd. minimizes its impacts on the environment, reduces reliance on fossil fuel related greenhouse gas emissions, and stability of the power generation.

**04/01970 Status and perspective of cement generation in coal fired power boilers**

Wang, W. *et al. Zhejiang Daxue Xuebao, Gongxue-ban*, 2003, 37, (2), 225–230. (In Chinese)

The temperature in coal-fired power boilers and cement rotary kilns is very close. Furthermore, the suspended and fluidized combustion, which is the direction of new calcinations technologies of cement clinker, is generally adopted in power boilers. So, it may be possible to generate cement as a byproduct in power plants. The state-of-the-art in new calcinations technology is discussed in this paper. The feasibility of the technology was verified through a series of experiments. It is certain that there will be tremendous economical and social benefits generated in both energy saving and environment protection if the coal power industry and cement industry can be united through this technology.

**04/01971 Steady-state modeling of coal boilers**

Lee, W. U. and Yeo, Y. K. *Korean Journal of Chemical Engineering*, 2003, 20, (3), 436–439.

Coal boilers are widely used to generate process steam. Because of the highly non-linear dynamics, coal boilers have not attracted the attention of many researchers. In the present study, two modelling approaches were investigated: parametric efficiency modelling and neural network modelling. Results of simulations compared with operation data demonstrate the effectiveness of the proposed modelling approaches.

## 08 STEAM RAISING

## Boiler operation/design

**04/01965 Analysis the factors affecting the bed temperature of BT-75/4.4-M circulating fluidized-bed boiler**

Qing, S. and Wang, H. *Meitan Zhuanhua*, 2003, 26, (2), 56–59. (In Chinese)

The temperature of the boiler is the most important control parameter of circulating fluidized bed (CFB) boiler. It directly affects the thermal and sulfur capture efficiency of the whole boiler. The authors analyse factors affecting circulating fluidized bed temperature, the primary factors being the amount of coal, the quality of coal, particle size of coal, primary air, secondary air, the sulfur capture of matter, the height of bed, etc. Selecting the appropriate CFB bed temperature, adjusting returned ash to achieve auto-control of the boilers's bed temperature, thus achieving the best thermal efficiency and sulfur capture effect.

**04/01966 Development and implementation of low-emission gas-fuel oil burners in power-industry boilers**

Chavchanidze, E. K. *et al. Teploenergetika*, 2003, (2), 58–63. (In Russian)