

KZL 型锅炉加装过热器的改造方案

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[摘要] 本文介绍了 KZL2-0.7-A II 型快装锅炉加装过热器的改造设计方案。该设计方案已取得了成功的应用经验。

关键词 KZL 型快装锅炉 过热器

分类号 TK223.32

1 前言

我国的 KZL 型快装锅炉数量多,使用面广,但全部按生产饱和蒸汽设计,不能满足工业生产对过热蒸汽的需要。为此,我们经过几年的试验研究,提出了在原 KZL2-0.7-A I 型快装锅炉基础上加装过热器的方案,实践证明该方案可行。

2 技术关键与方案确定

2.1 技术关键

2.1.1 KZL2-0.7-A I 型锅炉结构比较紧凑,在不改变原锅炉结构的情况下,布置过热器比较困难。要求过热器结构紧凑,尺寸小,制造简单,成本低廉。

2.1.2 小型锅炉水处理设备一般都不齐全,水质达不到要求,蒸汽带水带盐现象十分严重。布置过热器将导致受热面管内部积盐较

多,易烧坏管子,降低过热器使用寿命。

2.2 方案确定

2.2.1 过热器的安放位置。布置于炉膛出口和第一对流烟管入口的燃烬室,如图 1 所示。此处温度约为 910℃,比较理想,并且也有一定的空间容纳过热器。过热器的吊挂、固定比较方便,可以满足设计要求。

2.2.2 过热器蛇形管采用 $\phi 42 \times 5$ mm 的 20 号锅炉无缝钢管,由于弯管半径较小,故用装沙加热手工弯制而成。沿集箱轴线布置 7 排,每排 4 根,集箱采用 $\phi 159 \times 6$ mm 的 20 号锅炉无缝钢管,上下各一根,结构比较紧凑。

*** 2.2.3** 过热器出口集箱处设置热电偶温度计、压力表和安全阀,在设计上保证了过热器的运行安全。

2.2.4 要求用户配备齐全的水处理设备,水质化验手续齐全,水质指标要达到低压锅炉水质国家标准(GB1576-XX)规定的技术要求。

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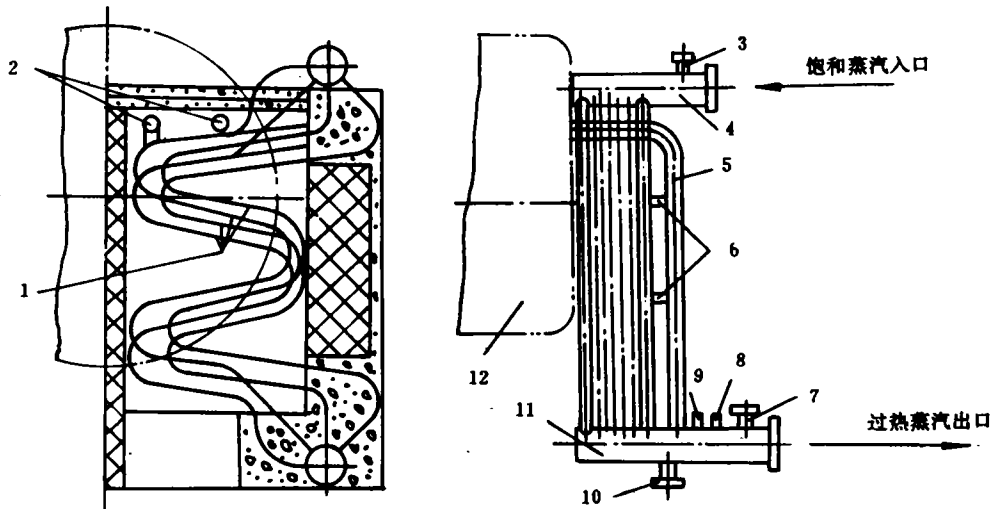


图 1 过热器的结构及安装位置

- 1. 过热器管 2. 固定装置 3. 空气阀管座 4. 集箱 5. 后棚管 6. 支撑
- 7. 安全阀管座 8. 压力表管座 9. 温度计管座 10. 疏水管 12. 锅壳

3 设置安全保护装置 加强运行管理

- 3.1 过热器在投入运行前,出口集箱安全阀应与锅筒安全阀同时进行调整校验。
- 3.2 过热器与锅筒之间应加装截止阀,以控制饱和蒸汽进入过热器的流量,在正常情况下应防止误操作。
- 3.3 经常检查过热蒸汽温度,过热蒸汽长期温度增高应尽快处理,以免过热器烧坏。
- 3.4 严格防止锅炉满水事故,防止产生汽水共腾,以免过热器蛇形管内部结垢。
- 3.5 锅炉启动时,过热器与锅筒间的阀门要微开,保持有气流通过过热器,防止过热器干烧;停炉时,过热器前后的阀门不要立即关闭,当炉温达到室温时再关闭阀门。

4 经济性分析

经测试,普通的 KZL2-0.7-A I 型锅炉排烟温度为 252 ℃,加装过热器后排烟温度降低到 203 ℃,热效率提高约 3% 左右。若每年按运行 300 天计算,每天运行 16 h,每台锅炉每年节约 92 t 燃煤,折合标准煤 55 t,每年可节约资金约 1.5 万元,而加装过热器后对锅炉出力影响不大。

KZL2-0.7-A I 型锅炉每台售价 8.2 万元(带有过热器,可生产 300 ℃ 的过热蒸汽),而一台能生产 300 ℃ 蒸汽的 DZL10-1.25-A I 型锅炉售价 48.0 万元,从这一点考虑可为企业节约大量资金。只购买一台带有过热器的 KZL2-0.7-A I 型锅炉一般即可满足生产需要。另外,若企业有 KZL 型锅炉,可进行加装过热器的改造,企业用较少的钱办较多的事,减轻了企业的负担。

5 结论

近几年鸡西、七台河、安达等地都进行了 KZL2-0.7-A I 型锅炉加装过热器的改造,运行实践表明,锅炉运行工况稳定,取得了较好的经济效益。

KZL2-0.7-A I 型锅炉加装过热器后生产的过热蒸汽比中型锅炉生产的饱和蒸汽具有更好的品质,有一定的过热度。这样的蒸

汽作为工艺用汽更为理想。

本文以 KZL2-0.7-A I 型锅炉为例研究了快装锅炉加装过热器的可行性,其它规格的 KZL 型快装锅炉也可以参考此法推广应用。

参 考 文 献

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工程信息

从安装燃机到发电仅用 38 天

据“Gas Turbine World”1994 年 5—6 月号报道,在中国海南岛四马村,涡轮动力(Turbo Power)的一套 50 MW FT8 双联燃机,从安装到开始发电仅用了 38 天。

1993 年 7 月订购的这套发电箱装体被发运到海南岛三亚港,再运到四马村现场。

38 天以后,1994 年 2 月 15 日该燃机首次发电。第一套双联燃机是海南岛电力公司围绕二套 FT8 双联燃机而建立的 100 MW 电站项目的一部分。第二套燃机应在同年 5 月投运。该工程项目的总投资为 3350 万美元。

两套燃机都烧馏出油,最初以简单循环方式运行,装置布置时就考虑到以后通过加装余热锅炉和两台汽轮机可方便地转换到以联合循环方式运行。

乌克兰燃机在美洲销售

据“Gas Turbine World”1994 年 9—10 月号报道,加拿大 Hawker Siddeley Orenda 分部将制造并销售乌克兰尼古拉耶夫 Mashproekt(机械设计科学生产联合体)的燃气轮机装置,供美国、加拿大和南美洲电力生产和机械传动用,其输出功率从 2.5 到 27.5 MW(3300 到 36800 hp)。

加拿大的公司将负责装配和销售供石油、天然气和电力生产用的成套设备,并负责对北美洲和南美洲用户提供服务和技術保障。

乌克兰 Mashproekt 燃气轮机箱装体的范围包括 2.9 MW 的 GT2500, 6.7 MW 的 GT6000, 17.5 MW 的 GT15000 和 27.5 MW 的 GT25000。较大的机组都是带自由动力涡轮的双转子设计。

特别是,GT15000 原来被研制为船用推进发动机,它驱动了前苏联海军半数以上的水面战舰。

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△ The Present status and Future Prospects of Nuclear Power Generation Technology.....Ji Guiming, Li Jie (*Harbin Marine Boiler & Turbine Research Institute*) *Journal of Engineering for Thermal Energy & Power*, 1995, 10(2); 65~68

△ The Reliability/Safety Factor design Method of Steam Turbine Blades.....Zha Changsong (*The Resident Military Representative Office at No. 425 Shippard*), Liu Deming and Xu Yigui (*Naval Engineering Academy*) *Journal of Engineering for Thermal Energy & Power*, 1995, 10(2); 69~72

Based on the current design criteria of vibration strength for steam turbine blades, the authors present a reliability/safety factor design method. Some calculation formulas are given along with a brief description of the application of the above-cited design method to turbine blade design. **Key words:** *reliability design, safety factor*

△ A Thermo-economic Method for the Determination of the Thermal Power Plant Heat Supply Cost.....Yang Yongping, Wang Jiakuan (*Beijing Graduate Department under the North China Institute of Electrical Power Engineering*) *Journal of Engineering for Thermal Energy & Power*, 1995, 10(2); 73~77

This paper describes an analytical model for determining thermal power plant heat supply costs, which has been established by utilizing the basic theoretical method of thermo-economics. A relevant computer software has been prepared. With the 200 MW heat supply unit of Shijingshan Thermal Power Plant being taken as an example the authors have presented the main technico-economic indexes of the said unit. The thermo-economic method features objectivity and precision as well as ease of processing by a computer. **Key words:** *thermal Power plant, cost, thermo-economics*

△ The Treatment of Economic Factors in "Unit Consumption Analysis"Song Zhiping (*Graduate Department under the North China Institute of Electric Power Engineering in Beijing*) *Journal of Engineering for Thermal Energy & Power*, 1995, 10(2); 78~83

In accordance with the "unit consumption analysis" proposed on the basis of recent advances in exergy and exergy economics a product cost can be divided into four kinds of appended costs including a theoretical minimum cost and irreversible additional cost. An analysis is made of these costs with respect to the sensibility of decision variables. The author has come up with the conception of cost reduction effect and time/space distribution, which can serve as a basis for guiding and monitoring operations, thereby fostering the engineering application of exergy economics. **Key words:** *unit consumption, cost reduction, exergy, second law analysis, energy saving*

△ An Exploratory Study of the drum Internals of a Natural Circulation Hot-water Boiler Zhu Qinyi, Zhao Guangbo, Hao Manjin, Yang Minxin (*Harbin Institute of Technology*) *Journal of Engineering for Thermal Energy & Power*, 1995, 10(2); 84~88

By the use of a simulation method an experimental study is made of the effect of the drum internals of a natural circulation hot-water boiler on the downcomer Inlet water temperature. Also given is a method for designing the drum internals. **Key words:** *natural circulation hot-water boiler, boiler drum internals*

△ A Modification Design Version Involving the Addition of a Superheater to a KZL Type Boiler Zhao Yan, Lu Chengqing, Wang Fa (*Heilongjiang Provincial School of Machine Building*) *Journal of Engineering for Thermal Energy & Power*, 1995, 10(2); 89~91

This paper deals with a modification design version involving the addition of a superheater to a KZL2-0.7-A I type packaged boiler. The said design version has been proved to be successful in practical use. **Key words:** *KZL type packaged boiler, superheater*

△ The Determination of the Separation Efficiency of a High-temperature Separator for a Circulating Fluidized Bed Boiler Wei Tanzheng (*Xiangtan Boiler Works*) *Journal of Engineering for Thermal Energy & Power*, 1995, 10(2): 92~95

Based on the heat balance analysis of a circulating fluidized bed dense phase region the author holds that the circulating ash quantity and its temperature are major factors influencing the temperature level of the dense phase region. By the use of the definition of circulation ratio a formula for calculating the circulation ratio was derived. On the basis of the ash balance analysis a relationship between the high-temperature separator separation efficiency and circulation ratio has also been deduced. It is recommended to develop the circulating fluidized bed boilers of low circulation ratio ($R_c = 2-10$), which are in tune with the current conditions in China. **Key words:** *circulating fluidized bed, dense phase region heat balance, ash balance, circulation ratio, high-temperature separator, separation efficiency*

△ A Computer Aided Design of High Integration for Boilers Fan Zhiming, Wu Tao, Wang Xinhua, Lin Ren (*Hangzhou Boiler Works*) *Journal of Engineering for Thermal Energy & Power*, 1995, 10(2): 96~100

This paper dwells on the specific details and methods used during the development and research of a highly integrated CAD software package. The said system represents an organic combination of a graphic system, engineering data base and a computation calculation software, resulting in a highly integrated CAD software package. **Key words:** *boiler, computer, CAD*

△ The Application of a PMK Programmable Single-loop Regulator in the Combustion Automatic Control System of Daya Bay Nuclear Power Station Preoperational Test Boilers Wang Xiaolei Zheng zi Qiang (*Harbin Marine Boiler & Turbine Research Institute*) *Journal of Engineering for Thermal Energy & Power*, 1995, 10(2): 101~105

Described in this paper are the design, commissioning test and operating conditions of a combustion automatic control system for Daya Bay Nuclear Power Station preoperational test boilers as well as the application of a PMK programmable single-loop regulator for the said system. **Key words:** *combustion automatic control system, single loop, regulator, design, commissioning test*

△ The Study of a Steam Turbine Free Blade Stall Flutter Zhang Yangjun, Tao Deping (*Beijing University of Aeronautics and Astronautics*) *Journal of Engineering for Thermal Energy & Power*, 1995, 10(2): 106~109

To provide a technical basis for assessing the safe operation of a turbine unit and analysing its blade failures, the authors have analysed the blade flutter characteristics of a steam turbine through the use of a flutter prediction method based on interblade phase angle numerical variation. The results of theoretical prediction are basically in agreement with those obtained by experiments. The study results show that under the condition of a certain incident flow Mach number, an interblade vibration phase angle and a relatively large attack angle of the incident flow, there exists the possibility of free blade failure caused by a flutter stall. A discussion is also conducted of the method aimed at improving the aeroelasticity stability of the free blades. **Key words:** *steam turbine, free blade, stall flutter, flutter prevention*

△ Grey Correlation Analysis of the Factors having an Effect on Coal Char Specific Surface Area and Pore Properties