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邻炉高温风加热技术的应用

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摘　要: 在调峰锅炉起动前, 提高炉内各设备部件金属的温度, 对点火初期煤粉的迅速稳定着火燃烧具有非常特殊的作用。加装邻炉高温风再循环管, 完善了邻炉高温风加热系统, 从而保证了在起动过程中能连续使用邻炉高温风, 使加热系统更完善合理。

关　键　词: 锅炉; 高温风; 加热系统

中图分类号: TK227.1　　文献标识码: B

1　前言

高压以上的锅炉中, 空气预热器出口的高温风温度大都在 320 ℃左右。在电力供应紧张的年代, 部分锅炉安装的邻炉高温风加热系统没有发挥出它应有的作用。由于目前电力供大于求, 电网要求锅炉机组以 50%负荷运行频繁起停调峰, 因此完善和使用邻炉高温风加热点火十分重要。目前, 邻炉高温风加热系统大都还不够完善; 布置也不尽合理, 可操作性差, 以致于利用率很低。

高压锅炉邻炉高温风温度相当于压力为 11.2 MPa, 温度为 319.4 ℃的饱和蒸汽温度。在起动前利用这样的邻炉高温风加热炉内燃烧系统的设备部件, 使其温度提高, 为燃料的迅速稳定地着火燃烧提供条件。这对承担起停调峰任务的锅炉非常有利, 所以, 应提倡使用和完善。

2　邻炉高温风加热系统及三台锅炉参数

邻炉高温风加热系统见图 1, 锅炉参数见表 1。

表 1　三台锅炉的主要参数

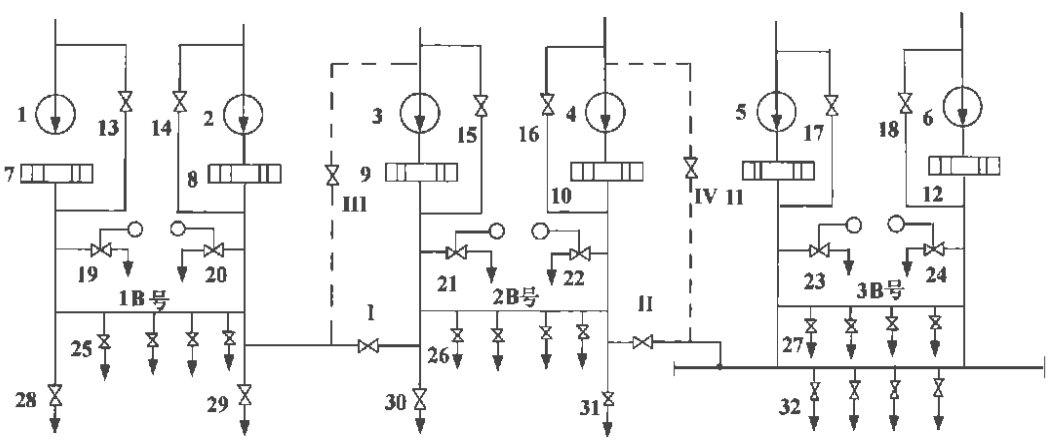
主要参数容量	1B 号	2B 号	3B 号
额定蒸发量/ $t \cdot h^{-1}$	410	410	670
过热蒸汽温度/ ℃	540	540	540
过热蒸汽压力/MPa	9.8	9.8	13.7
配套机组容量/MW	100	100	200
高温空气预热器出口温度/ ℃	320	320	330
进风温度/ ℃	30	30	30
排烟温度/ ℃	128.7	128.7	139.6

说明: 2B 号承担启停调峰任务;
1B、2B、3B 号均为中间储仓式制粉系统;
设计煤种为大同煤, 四角都装设有预燃室。

从表 1 中可以看出 3B 号高温空气预热器出口的热风温度高出 1B 号、2B 号 10 ℃。因此在 2B 号调峰起动时, 应首先使用 3B 号的高温风来加热点火, 这样可获得好的效果。

3　邻炉高温风加热的作用

3.1　提高了起动炉各设备部件的温度



1～6— 送风机; 7～12— 空气预热器(管式); 13～18— 热风再循环; 19～24— 二次风门;
25～27— 一次风门; 28～32— 磨煤机混合风门; Ⅰ、Ⅱ— 邻炉高温风加热门; Ⅲ、Ⅳ— 邻炉热风再循环门

图 1　邻炉高温风加热系统简图

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2B 号起动前，开启邻炉高温风加热门Ⅰ或Ⅱ，邻炉的高温风通过连接管分别流经一次风管、二次风管、喷燃器、预燃室、炉膛、过热器、经济器、空气预热器。邻炉高温风流经这些设备时，使这些设备的金属温度升高。起动前加热的时间越长，被加热的设备金属温度就越高。尤其对空气预热器的加热，提高了空气预热器金属壁面温度，预防空气预热器在点火初期由于烟气温度、金属壁面温度低，而产生的低温腐蚀。

3.2 提高了点火初期着火燃烧的稳定性

2B 号炉点火前，开启部分一、二次风门，调整送风量到点火风量进行点火。由于起动前邻炉高温风的加热，使炉内各设备部件金属温度得以提高，减少了点火初期用助燃油和煤粉燃烧所放出的热量来加热炉内各金属部件所需的热量，由邻炉高温风加热替代点火初期用助燃油和煤粉燃烧加热的过程，缩短了起动时间，降低了起动热损失，节约了助燃油，使调峰锅炉更快地承担起负荷。邻炉的高温风充当调峰炉的一、二次风，对煤粉一、二次风管进行了加热，提高了一次风温度，煤粉迅速稳定地着火，炉膛内的温度、燃烧温度、烟气温度迅速升高，着火燃烧的稳定性得到了大大的提高。尤其对预燃室的加热，使预燃室内的温度升高，在点火初期对煤粉迅速稳定地着火都创造了良好的着火条件。

从点火开始到带电负荷，这期间内，按规程规定升温升压，需起动送风机，切换风源时，开启邻炉加热门Ⅲ或Ⅳ，同时开启送风机入口调整门，逐渐关小邻炉高温风加热门Ⅰ或Ⅱ。操作时应缓慢，加强炉与炉之间的联系工作。这样可减小对一、二次风温及燃烧工况的影响。

3.3 烘干长期停运的锅炉

邻炉高温风加热，可用来为停炉时间长，过热器系统复杂，汽水系统内的水不易放尽的锅炉表面进行加热烘干。代替用助燃油点火来烘干锅炉，保持金属表面干燥，使锅炉不受腐蚀。

4 邻炉高温风加热系统的完善

为了完善邻炉高温风加热系统，需要加装邻炉高温风与送风机入口的连接管，即邻炉高温风再循环管(图中虚线所示)。大约 15 m 左右。这样完善了邻炉高温风加热系统，消除了起动送风机切换风源时，对一、二次风温及燃烧工况的影响，提高了锅炉在点火初期的安全性，保证了在起动过程中连续使用邻炉的高温风。另一方面，在冬季起动时，由于送风机入口进风温度低，可提高进风温度，减少空气预热器金属壁面温度变化的幅度，预防空气预热器产生低温腐蚀，可起到暖风器的作用[1]。

5 结论

应用加装再循环管的邻炉高温风加热，更有利于调峰锅炉缩短起动时间、节约助燃油和燃料，能够迅速稳定地着火燃烧。锅炉均匀受热，延长锅炉的使用寿命，特别是对点火初期的安全十分有利。因此，此方法应积极推广使用，逐步积累经验，使锅炉燃烧系统更加合理完善。

(渠 源 编辑)

22Cr—15Ni—Nb—N 钢管的显微组织和高温强度

据《火力原子力发电》2000 年 3 月号报道，当代火电生产锅炉被设计成比过去更高的温度和压力。这些锅炉要求使用具有比通常的 18—8 奥氏体不锈钢更高温强度和耐腐蚀性的钢。

KA—SUS309J4HTB 是一种 22%Cr—15%Ni—0.7%Nb—0.2%N—Fe 钢，其耐蚀性与 NCF800H 相当，高温强度则大于 NCF800H，并具有优良的经济效率。

本文叙说了已在锅炉中运行 2 年的这种管子的性质。按照得到的结果，所用管子内部蒸汽氧化锈皮的厚度很薄并且其蠕变断裂强度相当于新管的强度。预期这种 KA—SUS309J4HTB 是用于超超临界锅炉和 PFBC(增压流化床燃烧)锅炉的一种候选材料。

(思娟 供稿)

Post Code: 266033) // Journal of Engineering for Thermal Energy & Power. — 2001, 16(4). —447 ~ 449

Presented is a highly cost-effective mode of electric power generation, the so-called thermal power and pumped storage-based electric power generation. Under the above-mentioned power generation mode a steam turbine directly drives a water pump for pumped storage power generation, thereby reducing the secondary energy conversion link and making it possible to enhance power generation efficiency by 11%. The boiler, steam turbine and pumps all can operate at a full rated load, thus attaining the maximum efficiency. Moreover, the thermal power and pumped storage-based power generation system enjoys a higher operational safety, a better peak load shaving capability and greater savings in condenser circulating water. Furthermore, it also entails a moderate investment outlay. **Key words**: thermal power and pumped storage-based power generation, peak load shaving, electrical power economy

逆向 FTF 方法在船用燃气轮机故障分析中的应用= **The Application of Reverse FTF Method in the Fault Analysis of Marine Gas Turbines** [刊, 汉] / LIU Yong-bao (Naval Engineering University, Wuhan, China, Post Code: 430015), HAN Feng-ke (Harbin Turbine Works, Harbin, China, Post Code: 150046) // Journal of Engineering for Thermal Energy & Power. — 2001, 16(4). —450 ~ 452

Discussed are the specific features of FTA (failure tree analysis) and FMECA (failure mode effect criticality analysis) as well as the interrelationship between the two methods of analysis. On this basis the authors have come up with a reverse FTF (FTA + FMECA = comprehensive analysis method) method to analyze system reliability. With the help of the above-cited method a quantitative analysis was conducted of the start-up failure of a marine gas turbine with vulnerable links in the turbine system being identified and practical countermeasures suggested. **Key words**: failure analysis, fault tree analysis, gas turbine

燃用褐煤锅炉改烧烟煤时干燥剂的计算及选取= **The Calculation and Selection of Drying Agents in Connection with the Change of Fuel for a Boiler from Brown Coal to Bituminous One** [刊, 汉] / SHU Ji-wei, MENG Fan-bing (Energy Engineering College under the Harbin Institute of technology, Harbin, China, Post Code: 150006), HUANG Qi-long (Heilongjiang Provincial Electric Power Research Academy, Harbin, China, Post Code: 150030) // Journal of Engineering for Thermal Energy & Power. — 2001, 16(4). —453 ~ 456

Contrast tests were conducted concerning a 200 MW brown coal-fired boiler prior to and after its modification to firing bituminous coal of Heilongjiang Province. During the tests it has been found that after a change of coal to the bituminous one the boiler enjoyed a stable combustion and basically attained the same design efficiency as that of the brown coal-fired boiler. No severe slag-formation has been detected. However, regarding the pulverized coal preparation system there was an excessively high temperature and oxygen content of flue gas at the coal mill outlet. Through a renewed thermodynamic calculation and selection of the drying agent it was decided to adopt a more rational drying mode involving the use of "high-temperature boiler flue gas + hot air + pressurized cooling air". The latter can also meet the explosion-proof requirements of the pulverized coal preparation system. **Key words**: brown coal, bituminous coal, pulverized coal preparation system, drying agent

邻炉高温风加热技术的应用= **An Exploratory Study on the Technique of Using High-temperature Air from a Neighboring Boiler** [刊, 汉] / MENG Xiang-jun (Changjiakou Xiahuayuan Power Plant in Hebei Province, Changjiakou, Hebei Province, China, Post Code: 075300) // Journal of Engineering for Thermal Energy & Power. — 2001, 16(4). —457 ~ 458

Prior to conducting the start-up of a peak load-shaving boiler it is essential to enhance the metal temperature of its various components. This plays a very unique role in attaining the rapid and stable ignition and burning of the pulverized coal at the early period of the boiler start-up. In view of the above one should pay due attention to improving the high-temperature air heating system of a neighboring boiler so that the high-temperature air can be made available during the whole process of a boiler start-up. The addition of a recirculation pipe for the neighboring boiler high-temperature air may improve the above-mentioned heating system and render its design more rational. **Key words**: boiler, high-temperature air, heating system