基于 Fluent 的流化床锅炉床下点火风道流场数值模拟与分析

陆 慷
(河南平煤神马聚碳材料有限责任公司,河南 平顶山 467000)

摘 要:某热电厂 260 t/h 循环流化床锅炉床下点火燃烧器存在稳燃困难问题,在点火风门关至 5%,助燃风门保持 100%,可点火成功,但点火风道振动较大。将点火风门逐渐开大,导致燃烧器灭火。且左右侧燃烧器燃烧状态不一致,为分析其原因,采用计算流体力学分析软件 Fluent 对锅炉床下燃烧器风道流场进行数值模拟。结果表明左右侧配风不均匀,同时点火风道内紊流较大,最后通过调整点火风门及助燃风门开度,实现燃烧器稳燃,实际操作思路与数值模拟分析结果一致。建议点火风道设计时合理分配通风风道,避免紊流过大;同时建议用户采购燃烧器设备时,充分与设计人员沟通,了解其设计思路,使各设备相匹配。

关键词:流化床锅炉;床下燃烧器;风道设计;风道流场;优化设计
中图分类号:TB24 **文献标志码**:A **文章编号**:1006-6772(2024)S1-0219-06

Numerical simulation and analysis of flow field in fluidized bed boiler underbed ignition duct based on Fluent

LU Kang
(*Polycarbonate Material Co.,Ltd.,China Pingmeishenma Group,Pingdingshan* 467000,*China*)

Abstract:The ignition burner under the bed of a 260 t/h circulating fluidized bed boiler in a thermal power plant is difficult to stabilize the combustion. When the ignition damper is closed to 5% and the combustion damper is kept 100%,the ignition can be successful,but the vibration of the ignition duct is large. Gradually opening the ignition damper will cause the burner to extinguish the fire. The combustion state of the left and right burners is inconsistent. In order to analyze the cause,the computational fluid dynamics analysis software Fluent was used to numerically simulate the flow field of the air duct of the burners under the boiler bed. The results show that the air distribution on the left and right sides is uneven,and the turbulence in the ignition duct is large. Finally,the combustion stability of the burner can be achieved by adjusting the opening of the ignition damper and the combustion damper. The actual operation idea is consistent with the numerical simulation analysis results. It is suggested to allocate ventilation ducts reasonably during the design of ignition duct to avoid excessive turbulence. At the same time,it is recommended that users purchase burner equipment,fully communicate with the designer,understand its design ideas,so that each equipment matches.

Key words:fluidized bed boiler;under bed burner;air duct design;duct flow field;optimal design

0 引 言

循环流化床(CFB)锅炉运行时因为具有大量炽热床料及循环物料,入炉燃料相对床料和循环物料量占比较小,因此 CFB 锅炉具有燃料适应性广、负荷调节性强及环保性能优异等特点,在我国得到迅速发展[1]。循环流化床(CFB)锅炉特有燃烧特性及锅炉结构,使其具备更强的低负荷稳燃能力及多类型燃料适应性[2]。我国劣质煤较多,另外石煤、褐煤、油页岩、煤矸石等劣质燃料储量较大,因此流化床锅炉技术在我国得到广泛使用[3]。

流化床锅炉燃烧过程中,一次风主要起到床料流化作用,同时为密相区内燃料燃烧提供初步燃烧氧气,二次风补充可保证燃料的充分燃烧。二次风

收稿日期:2024-03-11;**责任编辑**:白娅娜 **DOI**:10.13226/j.issn.1006-6772.24031101
作者简介:陆 慷(1977—),男,安徽淮南人,工程师。E-mail:15093840888@139.com
引用格式:陆慷.基于 Fluent 的流化床锅炉床下点火风道流场数值模拟与分析[J].洁净煤技术,2024,30(S1):219-224.
LU Kang.Numerical simulation and analysis of flow field in fluidized bed boiler underbed ignition duct based on Fluent[J].Clean Coal Technology,2024,30(S1):219-224.