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生物质颗粒燃烧器燃料适应性试验

Experiment on fuel flexibility of biomass pellet burner

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中文关键词: [生物质](#) [燃料](#) [燃烧](#) [生物质颗粒燃烧器](#) [灰分](#) [进料量](#) [风机转速](#) [燃料适应性](#)

英文关键词: [biomass](#) [fuels](#) [combustion](#) [biomass pellet burner](#) [ash](#) [feed rate](#) [fan speed](#) [fuel flexibility](#)

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中文摘要:

为深入研究生物质颗粒燃料的燃烧特性, 探讨自动燃烧器的燃料适应性, 该文基于PB-20型生物质颗粒燃烧器, 选择了5种灰分小于25% (空气干燥基) 的颗粒燃料, 分别研究了燃烧工况中进料量和空气量对燃烧性能的影响。试验结果表明灰分含量大于20%的颗粒燃料燃烧不充分, 工况不稳定, 效率低, 结渣大, 易熄火, 不适用于此类生物质颗粒燃烧器; 灰分含量为12.40%的颗粒燃料推荐参数为进料量4 kg/h, 风机转速2 600~2 800 r/min, 清渣速度为3 r/min, 转5 s/停35 s; 灰分在7.21%的颗粒燃料推荐控制参数为进料量3~4 kg/h, 风机转速2 600~2 800 r/min, 清渣速度相对应为3 r/min, 转5 s/停60~55 s; 灰分值低于1%的颗粒燃料均以进料量3~4 kg/h, 风机转速2 600~2 800 r/min, 不需清渣为推荐参数。该研究总结了生物质颗粒燃烧器的燃料适用控制参数, 为燃烧器的推广应用提供了数据支持。

英文摘要:

Abstract: Because there exists much diversity in raw materials, biomass fuel pellet properties, and corresponding combustion equipment, research to develop the fuel adaptability of biomass burners is necessary. The research was accomplished on a self-build biomass combustion equipment-monitoring platform. The monitoring platform has multiple sensors to collect and process data of the burner's control parameters and combustion state parameters. Based on the platform, the author used a PB-20-type biomass pellet burner, which is designed by the Chinese Academy of Agricultural Engineering. The author investigated five kinds of biomass pellets with ash values from 0 to 25 percent. And tested nine kinds of working conditions for each pellet with 3, 4, and 5 kg/h fuel feed rates and 2 600, 2 700, and 2 800 r/min fan speed. The thermal performance of the burner was tested according to the GB/T10180-2003 Thermal performance test code for industrial boilers and the GB13271-2001 Emission standard of air pollutants for coal-burning oil-burning gas-fired boilers. During each test, the water circulation amount, inlet and outlet temperature of water, cold air and exhaust gas temperature, slag temperature, O₂/CO/NO/NO₂ content in flue gas, and the slag ash content were processed. The excess air ratio, anti-balance efficiency, gas incomplete combustion heat loss, heat loss due to combustion in refuse, heat loss due to sensible heat in slag, soot emissions and blackness of each condition with the thermal performance data of the burner were then calculated. Combined with physical and chemical characteristics of the pellet fuels, the pellet fuel combustion efficiency change and its causes were analyzed, and fuel feed rate and the best match into the air flow of 15-25 kW biomass pellet fuel burner were obtained. The results showed that the pellets with ash content ≥ 20 percent were not applicable to this type of biomass pellet burner; the recommended parameters for pellets with ash rate 12.40 percent were 4 kg/h (feed rate), 2 600-2 800 r/min (fan speed), 3 r/min, turn on 5 sec/turn off 35 sec (slag-off speed); for pellets with ash rate 7.21 percent, the recommended parameters were 3-4 kg/h (feed rate), 2 600-2 800 r/min (fan speed), 3 r/min, turn on 5 sec/turn off 60-55 sec (slag-off speed); and for pellets with ash rate ≤ 1.0 percent, the recommended parameters were 3-4 kg/h (feed rate), 2600-2800 r/min (fan speed), without slagging. This study summarizes the burner's control parameters for the biomass pellet fuel, and provides data support for the promotion and application of the pellet burner.

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