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Experimental Study of a Biomass Carbonization System with Heat Recovery for Hot Water Cogeneration.

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Carbonization is a thermochemical process that produces charcoal while releasing significant amount of heat. Systems designed to recover this thermal energy for co-, tri-, or multi-generation applications are attracting increasing interest. This study presents a carbonizer equipped with a heat recovery system for the cogeneration of hot water. The objective is to improve the recovery of thermal energy lost during carbonization and to investigate the influence of carbonization temperature on the biomass charcoal yield. The system integrates a copper coil (inner coil) placed in the combustion chamber, connected to an outer coil incorporated into the carbonizer and wrapped around the carbonization chamber. The results show that increasing the water flow rate reduces the maximum temperature in the carbonizer from 638.4 ℃ at 0 L/h to 472.2 ℃ at 50 L/h while slightly increasing the charcoal yield from 25.51 % to 25.76 %. Meanwhile, the efficiency of the heat recovery system is confirmed, with water temperature rises reaching 63.1 ℃ at 12.5 L/h and 24.6 ℃ at 50 L/h. This performance is attributed to the high heat transfer efficiency of the inner copper coil.
Keywords: Carbonization, Heat recovery, Cogeneration, Charcoal, Energy efficiency

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