

Noah Westfall
Heat Transfer from Biomass II

The United States has extensive energy needs to maintain homes and businesses. Composting organic material (biomass) produces heat. The primary aims of this project were to: 1) Determine how much heat can be extracted from biomass. 2) Determine the contribution of a chemical reaction or plant respiration to the overall heat production in biomass.

The first aim of the project consisted of 8 experiments. Water, compost, and air temperatures were obtained simultaneously while circulating water through biomass for 8-12 hours. Total and hourly BTU production was calculated. A small-scale compost model was developed. UV light was used to disinfect a small amount of biomass. Temperature changes in regular and disinfected biomass were measured over 4 hours.

Aim 1) The heat production from biomass transferred to 50 gallons of water through a heat exchanger increased the water temperature 12 degrees Fahrenheit in 12 hours. This equates to about 417 BTU/hour. Aim 2) Both regular and UV-C disinfected compost produced significant measurable heat within 2 hours.

Composting can be applied and used to preheat water and may be used as an alternative heat source. The BTU production in this experiment was small, a larger scale system with insulated tubing and storage tank may increase heat capture. While microbial activity may be an important component of long-term heat production in biomass, initial heat production continues even in disinfected biomass.. Although maintaining compost requires lots of care, the application of using compost to preheat water may be efficient and beneficial.