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Hydrothermal Gasification for Waste to Energy BRENDEN EPPS, MARK LASER, YEUNUN CHOO, Dartmouth College — Hydrothermal gasification is a promising technology for harvesting energy from waste streams. Applications range from straightforward waste-to-energy conversion (e.g. municipal waste processing, industrial waste processing), to water purification (e.g. oil spill cleanup, wastewater treatment), to biofuel energy systems (e.g. using algae as feedstock). Products of the gasification process are electricity, bottled syngas (H2 + CO), sequestered CO2, clean water, and inorganic solids; further chemical reactions can be used to create biofuels such as ethanol and biodiesel. We present a comparison of gasification system architectures, focusing on efficiency and economic performance metrics. Various system architectures are modeled computationally, using a model developed by the coauthors. The physical model tracks the mass of each chemical species, as well as energy conversions and transfers throughout the gasification process. The generic system model includes the feedstock, gasification reactor, heat recovery system, pressure reducing mechanical expanders, and electricity generation system. Sensitivity analysis of system performance to various process parameters is presented. A discussion of the key technological barriers and necessary innovations is also presented.

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