

ABSTRAK

Teknologi insinerator merupakan salah satu solusi untuk mengurangi volume sampah, tetapi emisi gas buangnya masih menjadi tantangan. Dalam mengembangkan sistem pemfilteran udara pada insinerator ramah lingkungan menggunakan metode *fuzzy*. Proses pembakaran menggunakan insinerator dilakukan dengan ruang pembakaran tertutup dan dilengkapi dengan sistem filter. Sistem ini dirancang untuk filter kadar emisi gas seperti karbon monoksida (CO) dengan menggunakan tiga ruang filter seperti, filter kapiler terdapat proses penyaringan awal, filter karbon aktif digunakan untuk penyaringan kedua serta filtrasi partikel penyaringan terakhir. Sistem dilengkapi sensor MQ-7 untuk mengukur kadar karbon monoksida CO dan thermistor *Positive Temperatur Coefficient* (PTC) untuk memantau suhu pada ruang filter. Metode *fuzzy* Sugeno digunakan sebagai sistem kendali untuk mengatur kecepatan pompa dan *blower* berdasarkan kondisi suhu dan kadar CO yang terdeteksi. Pompa berfungsi mengurangi kadar karbon monoksida dan menurunkan suhu, sedangkan *blower* mengatur laju pembuangan udara. Pengujian dilakukan dengan membakar sampah organik sebanyak 1 kg dengan empat skenario uji. Hasil penelitian menunjukkan bahwa sistem mampu menurunkan kadar CO dari nilai awal kurang dari 100 *Parts Per Million* (ppm) hingga mencapai kisaran aman mendekati 20 ppm. Terdapat penambahan aktuator berupa kipas membantu mendorong aliran sisa pembakaran menuju filter sehingga proses pemfilteran lebih stabil.

Kata Kunci: Insinerator, karbon monoksida, *fuzzy* sugeno, filter kapiler, filter karbon aktif, filter partikel.

ABSTRACT

Incinerator technology is one solution to reduce waste volume, but its gas emissions remain a challenge. In developing an air filtration system for environmentally friendly incinerators, a fuzzy method is used. The combustion process in the incinerator is carried out in a closed combustion chamber equipped with a filtration system. This system is designed to filter gas emissions such as carbon monoxide (CO) using three filter stages: a capillary filter for initial filtration, an activated carbon filter for secondary filtration, and a particulate filtration for the final stage. The system is equipped with an MQ-7 sensor to measure carbon monoxide (CO) levels and a Positive Temperature Coefficient (PTC) thermistor to monitor the temperature in the filter chamber. The Sugeno fuzzy method is used as a control system to regulate the speed of the pump and blower based on the detected temperature and CO levels. The pump functions to reduce carbon monoxide levels and lower the temperature, while the blower regulates the air exhaust rate. Testing was conducted by burning 1 kg of organic waste under four test scenarios. The results showed that the system was able to reduce CO levels from an initial value of less than 100 Parts Per Million (ppm) to a safe range close to 20 ppm. An additional actuator, in the form of a fan, was added to help push the remaining combustion flow toward the filter, making the filtering process more stable.

Keywords: *Incinerator, carbon monoxide, fuzzy Sugeno, capillary filter, activated carbon filter, particle filter.*