INTISARI

Kebutuhan energi listrik semakin meningkat dari tahun ke tahun. Keterbatasan sumber energi listrik konvensional mendorong untuk pengembangan energi baru dan terbarukan. Di sini lain rasio elektrifikasi nasional sulit mencapai 100% karena kondisi geografis yang luas dengan banyak daerah terpencil yang sulit dijangkau. Di daerah seperti itu listrik perlu dikembangkan sistem pembangkit skala kecil dengan sumber energi yang mudah diperoleh. Salah satu daerah dengan profil demikian adalah perkebunan kelapa sawit, terutama wilayah yang dihuni penduduk lokal dan petani. Potensi biomassa dari limbah kelapa sawit dapat dimanfaatkan sebagai bahan bakar untuk pembangkit listrik mesin Stirling.

Mesin Stirling tipe α dioperasikan dengan kalor hasil pembakaran biomassa cangkang kelapa sawit. Sebuah *combustor* dibangun dan diintegrasikan dengan mesin Stirling dan generator. Pembakaran dilakukan dengan biomassa berbentuk serbuk, pelet, dan tatal dengan laju aliran kalor 10, 15, dan 20 kg/jam serta laju aliran udara 25,952 kg/jam.

Hasil pengukuran menunjukkan profil distribusi temperatur di ruang bakar menurut lokasi dan waktu. Kinerja mesin Stirling ditunjukkan oleh parameter-parameter yang diukur, yaitu temperatur operasi, daya output generator, dan putaran mesin. Perhitungan dengan analisis Schmidt menghasilkan daya teoritis dan efisiensi termal.

Kata kunci: biomassa, cangkang, kelapa sawit, pembakaran, mesin Stirling

ABSTRACT

Demand on electrical power increase from year to year. Limited sources of electrical energy conventional induce to energy development new and renewable. On other hand the national electrification ratio is difficult to reach to 100 % because the vast geographical with many areas remote that difficult to reach. In such an area electricity needs to be developed system power station a small scale to the source of energy that is easily obtained. One of the areas profile is palm oil plantations, especially a region that is inhabited to local people and farmers. Potency biomass of sewage palm oil can be used as fuel for Stirling engine power plants.

Alpha type Stirling engine was operated by heat transfer from the results of shell oil palm biomass combustion. A combustor has been constructed and been integrated into Stirling engine and electrical generator. Combustion process done with powder, pellets, and chips biomass with the rate of flow of heat engine 10 , 15 , and 20 kg per hour and the rate of flow of air 25.952 kg per hour.

The measurement result exhibit the distribution of temperature profile in the combustion chamber by location and time. Stirling engine's performance is indicated by measured parameters, the operation temperature, generator output power, and rotational speed. Calculations with Schmidt analysis give the theoretical power and thermal efficiency.

Keywords: biomass, shell, oil palm, combustion, Stirling engine