

INTISARI

Pada Tugas Akhir ini, penulis melakukan analisis termodinamika *Siklus Rankine* pada PLTU (*Steam Power Plant*) milik PT Pertamina (Persero) Refinery Unit IV Cilacap. *Siklus Rankine* yang dipakai adalah *Siklus Rankine Cogeneration*, yang menghasilkan dua macam *useful energy* berupa energi listrik dan *process heat*. Bahan bakar *boiler* menggunakan campuran *fuel oil & fuel gas*. Adapun penelitian ini bertujuan untuk mengetahui *utilization factor* dari *Cogeneration Power Plant* dan juga menganalisa performa dari komponen utama *Power Plant* (*boiler*, turbin uap, kondenser, dan pompa).

Penelitian ini dilakukan dengan melakukan studi literatur dari berbagai sumber serta survey lapangan kondisi *power plant* terlebih dahulu di *Utilities Area 05*. Kemudian dilakukan pengambilan data *properties* yang dibutuhkan untuk melakukan analisis dan perhitungan. Data-data tersebut diperoleh dari *Control Room 05*, pengamatan langsung di lapangan, *specification sheet* milik perusahaan, dan juga wawancara dengan *engineer* perusahaan. Setelah data terkumpul lengkap, dilakukan analisis *utilization factor* dari *Cogeneration Power Plant* beserta perhitungan unjuk kerja komponen utamanya.

Dari hasil analisis dan perhitungan didapatkan nilai *utilization factor* rata-rata dari *Cogeneration Power Plant* di *Utilities Area 05* pada 10 macam pembebanan aktual (W_{act}) sebesar 63,44 %. Nilai efisiensi rata-rata *boiler* 052B102 pada tanggal 19 Mei 2017 sebesar 83,58 %. Nilai efisiensi rata-rata turbin uap 051TG101 pada 10 macam pembebanan aktual sebesar 80,66 %. Nilai efektivitas *surface condenser* 051E101 sebesar 99,5 %. Nilai efisiensi *high pressure - boiler feedwater* (HP-BFW) *pump* sebesar 72,38 %. Faktor-faktor yang mempengaruhi nilai *utilization factor* antara lain *pressure*, temperatur, dan *mass flow rate* dari *High Pressure Steam* (HPS), *Medium Pressure Steam* (MPS), dan *Condensate* ; daya listrik yang dihasilkan oleh turbin uap ; jumlah dan kapasitas pompa yang digunakan ; *process heat* yang dihasilkan ; dan energi kalor input yang masuk ke dalam *boiler*. Adapun metode yang dapat dilakukan untuk meningkatkan nilai *utilization factor* dari *Cogeneration Power Plant* adalah dengan mencari metode yang akurat dan efisien untuk mendeteksi serta mengurangi rugi-rugi energi pada sistem ; melakukan penyesuaian nilai *mass flow rate*, *pressure*, dan temperatur dari *High Pressure Steam* (HPS), *Medium Pressure Steam* (MPS), dan *Condensate* ; serta melakukan *maintenance* dari komponen-komponen penyusun *Power Plant* secara berkala sesuai prosedur yang berlaku.

ABSTRACT

A thermodynamic analysis of *Rankine Cycle* was conducted at *Steam Power Plant*, PT Pertamina (Persero) Refinery Unit IV Cilacap. *Rankine Cycle* that used in the company is *Cogeneration Rankine Cycle*, that producing two kinds of energy : electricity power and process heat. Boiler's fuel are mixture of fuel oil and gas. This research aimed to investigate the *utilization factor* from *Cogeneration Power Plant* and analyzing the primary component's performance of Power Plant (boiler, steam turbine, condenser, and pump).

The first steps of this research were a literature study from many sources and field surveying of power plant condition at *Utilities Area 05*. Then, the data acquisitions for some properties that required for analysis and calculations. Those datas were acquired from *Control Room 05*, field observations, company's specification sheets, and also did some interviews with company's engineer. After the data were collected completely, the analysis of *utilization factor* of *Cogeneration Power Plant* with the calculations of its primary components was obtained.

As a result, the average value of *utilization factor* 63,44 % at ten kinds of actual loads. The average boiler 052B102's efficiency at May, 19th 2017 was 83,58 %. The average efficiency of the steam turbine 051TG101 is 80,66 % at ten kinds of actual load. The effectiveness of the surface condenser 051E101 is 99,5 %. The efficiency of the high pressure - boiler feedwater (HP-BFW) pump is 72,38 %. Some factors that affected the *utilization factor* value, among others are pressures, temperatures, and mass flow rates of *High Pressure Steam* (HPS), *Medium Pressure Steam* (MPS), and *Condensate* ; the electricity powers produced by the steam turbines ; amount and capacity of the pumps ; *process heat* produced ; and also input energy that enter the boilers. As for, methods that can be undertaken to improving *utilization factor* value of the *Cogeneration Power Plant* are : finding methods that accurately and efficiently can detect and reduct energy losses in the system ; adjusting the value of mass flow rates, pressures, and temperatures of *High Pressure Steam* (HPS), *Medium Pressure Steam* (MPS), and *Condensate* ; and also maintaining the constituent components of power plant periodically following the applicable procedures.