

ABSTRAK

ANALISIS PERBANDINGAN KINERJA SINGLE DAN DOUBLE CONDENSOR PADA MESIN 3R (*RECOVERY, RECYCLE, REUSE*)

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(2026: xix + 76 Halaman +17 Gambar + 8 Tabel + 7 Lampiran)

Mesin 3R (*Recovery, Recycle, Reuse*) berperan penting dalam pengelolaan refrigeran bekas untuk mengurangi dampak lingkungan. Kinerja mesin 3R sangat dipengaruhi oleh kemampuan kondensor dalam melepaskan kalor. Penelitian ini bertujuan menganalisis perbandingan kinerja mesin 3R menggunakan konfigurasi *single condenser* dan *double condenser* (paralel dengan kipas) terhadap parameter tekanan, temperatur, waktu *recovery*, dan konsumsi energi. Pengujian dilakukan secara eksperimental menggunakan refrigeran R134a sebanyak 0,35 kg di CV Central Indo HVAC. Hasil penelitian menunjukkan bahwa konfigurasi *double condenser* menghasilkan tekanan *discharge* yang lebih rendah (70 psi) dibandingkan *single condenser* (130 psi). *Pressure Ratio* (PR) turun sebesar 46,15% dari 13 menjadi 7. Waktu *recovery* lebih cepat 40% (dari 3 menit menjadi 2 menit). Efisiensi energi meningkat signifikan dengan penurunan *Specific Energy Consumption* (SEC) sebesar 32,69% (dari 0,0416 kWh/kg menjadi 0,0280 kWh/kg) dan penghematan energi total sebesar 32,76%. Kalor yang dilepas kondensor juga meningkat 5,26%. Dapat disimpulkan bahwa konfigurasi *double condenser* lebih optimal untuk meningkatkan kinerja dan efisiensi mesin 3R.

Kata Kunci: Mesin 3R; *Single Condenser*; *Double Condenser*; *Recovery*; *Specific Energy Consumption*

ABSTRACT

COMPARATIVE ANALYSIS OF SINGLE AND DOUBLE CONDENSOR PERFORMANCE IN 3R (*RECOVERY*, *RECYCLE*, *REUSE*) MACHINES

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The 3R (Recovery, Recycle, Reuse) machine plays a crucial role in managing used refrigerants to reduce environmental impacts. The performance of a 3R machine is highly influenced by the condenser's ability to release heat. This study aims to analyze the performance comparison of a 3R machine using single condenser and double condenser (parallel with fan) configurations on pressure, temperature, recovery time, and energy consumption parameters. Experimental testing was conducted using 0.35 kg of R134a refrigerant at CV Central Indo HVAC. The results show that the double condenser configuration produces a lower discharge pressure (70 psi) compared to the single condenser (130 psi). The Pressure Ratio (PR) decreased by 46.15% from 13 to 7. Recovery time was 40% faster (from 3 minutes to 2 minutes). Energy efficiency increased significantly with a 32.69% reduction in Specific Energy Consumption (SEC) (from 0.0416 kWh/kg to 0.0280 kWh/kg) and a 32.76% total energy saving. The heat released by the condenser also increased by 5.26%. It can be concluded that the double condenser configuration is more optimal for improving the performance and efficiency of the 3R machine.

Keywords: 3R Machine; Single Condenser; Double Condenser; Recovery; Specific Energy Consumption