

ABSTRAK

**RUGI-RUGI DAYA PADA TRANSFORMATOR DISTRIBUSI TIANG
PORTAL PA 0746 TERHADAP PERUBAHAN BEBAN
3 FASA DI PT PLN (PERSERO) ULP RIVAI**

(2026 : xiv + 60 halaman + Daftar Pustaka + Lampiran)

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Transformator distribusi gardu tiang portal PA 0746 PT PLN (Persero) ULP Rivai berkapasitas 250 kVA melayani beban fluktuatif dan tidak seimbang antar fasa, sehingga menimbulkan arus netral (I_N) yang berdampak pada rugi-rugi daya dan efisiensi. Penelitian bertujuan menghitung persentase ketidakseimbangan beban dan arus netral, rugi-rugi daya penghantar netral (P_N) dan rugi total (P_{total}), serta membandingkan efisiensi transformator sebelum dan sesudah pemerataan beban tiga fasa pada kondisi WBP dan LWBP. Metode meliputi studi literatur, observasi, dan pengukuran arus serta tegangan yang dianalisis secara perhitungan. Hasil menunjukkan pemerataan beban menurunkan ketidakseimbangan beban dari 21,6% menjadi 2,3% (siang) dan 22,6% menjadi 3,3% (malam), serta menurunkan arus netral dari 85 A menjadi 45 A dan 93 A menjadi 53 A. Rugi penghantar netral menurun, namun rugi total meningkat akibat kenaikan pembebanan. Efisiensi tetap di atas 99%, melampaui standar minimum SPLN 50:1997, sehingga pemerataan beban perlu dilakukan secara berkala.

Kata Kunci: ketidakseimbangan beban, arus netral, rugi-rugi daya, efisiensi transformator.

ABSTRACT
POWER LOSSES IN DISTRIBUTION TRANSFORMER PORTAL
POLE PA 0746 AGAINST CHANGES IN 3-PHASE LOAD
AT PT PLN (PERSERO) ULP RIVAI
(2026 : xiv + 60 pages + Bibliography + Appendices)

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The distribution transformer at the PA 0746 portal substation of PT PLN (Persero) ULP Rivai, capacity 250 kVA, serves a fluctuating, unbalanced load across phases, causing a neutral current (I_N) that produces power losses and reduces efficiency. This study calculates the load unbalance percentage and neutral current, the neutral conductor losses (P_N) and total losses (P_{total}), and compares transformer efficiency before and after three-phase load balancing during peak (WBP) and off-peak (LWBP) conditions. Methods include literature study, observation, and current and voltage measurements analyzed through calculation. Results show load balancing reduced the unbalance percentage from 21.6% to 2.3% (day) and 22.6% to 3.3% (night), and reduced the neutral current from 85 A to 45 A and 93 A to 53 A. Neutral conductor losses decreased, while total losses increased due to higher loading. Efficiency remained above 99%, exceeding the SPLN 50:1997 minimum, so load balancing should be performed periodically.

Keywords: load unbalance, neutral current, power losses, transformer efficiency.