

## ABSTRAK

Perkembangan zaman berpengaruh terhadap kemajuan teknologi yang saat ini muncul dua jenis beban yaitu beban linier dan non linier. Lampu LED termasuk beban non linier sehingga menimbulkan harmonisa. Untuk itu dilakukan perbandingan pemakaian daya antara beban lampu LED dan gabungan lampu TL-D dan XL LED untuk mencari mana yang lebih baik untuk digunakan. Akibat terjadinya harmonisa oleh beban lampu LED tersebut diperlukan perbaikan harmonisa dengan cara mendesain filter pasif tipe *Single Tuned Filter* dengan bantuan aplikasi ETAP Power Station 12.6. Metode penelitian ini dengan studi literatur, melakukan pengukuran, pengolahan data beban akibat harmonisa terhadap perbandingan pemakaian lampu TL LED dan TL-D di Gedung FPEB Baru, dan perancangan desain filter pasif sehingga dapat mendapatkan hasil yang diinginkan. Harmonisa arus dan tegangan pada SDP tidak sesuai standar IEEE 519-2014 yaitu harmonisa arus pada setiap lantai harmonisa arus berkisar diatas 45,95% sampai 94,73%, berbeda dengan harmonisa tegangan berkisar 2,2% sampai 2,8% masih dalam standar yang diperbolehkan yaitu dibawah 5%. Akibat harmonisa menimbulkan rugi daya total sebelum terkena harmonisa sebesar 7715,11 Watt dan daya total yang terharmonisa sebesar 9639,92 Watt. Sehingga total rugi daya akibat harmonisa beban lampu LED sebesar 1924,81 Watt. Pada biaya investasi, biaya penggantian lampu berdasarkan *lifetime*, dan biaya pemakaian daya lebih murah lampu jenis LED dibandingkan dengan gabungan lampu TL-D dan XL LED. Pada simulasi filter tipe Single Tuned Filter yang didesain untuk mereduksi harmonisa orde 3, 5, dan 7 dapat menurunkan THDi masing – masing fasa R, S, dan T yaitu 7,19%, 7,01%, dan 10,95%.

Kata kunci: Perbandingan Daya, LED, TL-D, Harmonisa Arus, Filter Pasif

## **ABSTRACT**

The development of the era affects the technological advances that currently appear two types of loads, those are linear and non-linear loads. LED light included non-linear loads so causes harmonics. For that reason, the comparison of power consumption between LED lamp load and the combination of TL-D and XL LED lamps to find which one is better to use. Due to the occurrence of harmonics by the LED lamp load, it is necessary to improve the harmonics by designing a Single Tuned Filter passive filter with the help of ETAP Power Station 12.6 applications. This research method with literature study, measurement, load data processing due to harmonics to the comparison of TL LED and TL-D lamps in New FPEB Building, and the design of passive filter design so that can get the desired result. The current and voltage harmonics on the SDP are not compliant with IEEE 519-2014 standard, that is current harmonics on each floor of it ranges above 45.95% to 94.73%, in contrast to voltage harmonics ranging from 2.2% to 2.8% which still within the standards allowed that is under 5%. As a result of harmonics causing total power loss before exposed to harmonics of 7715.11 Watt and total harmonized power of 9639.92 Watt. So the total loss of power due to harmonics of LED lamp loads of 1924.81 Watt. At investment cost, lamp replacement cost based on lifetime, and lower power consumption cost of LED type lamp compared to combination of TL-D and XL LED lamps. In Single Tuned Filter type filter simulation designed to reduce 3rd, 5th, and 7th harmonics can decrease THDi respectively R, S, and T phases of 7.19%, 7.01%, and 10.95%.

**Keywords:** *Power Comparison, LED, TL-D, Harmonic Flow, Passive Filter*