INTISARI

Sistem tenaga listrik dalam kondisi ideal menyalurkan daya listrik yang mempunyai gelombang arus dan tegangan sinusoida, kenyataan yang terjadi karena sifat beban nonlinier mengubah gelombang arus dan tegangan sinusoida menjadi arus dan tegangan distorsi yang mengandung harmonik. Peralatan elektronik yang digunakan dalam rumah tangga rata-rata bersifat nonlinier sehingga menghasilkan distorsi gelombang harmonik arus yang signifikan. Tujuan yang hendak dicapai dalam penelitian ini adalah untuk memperoleh informasi kandungan harmonik yang dihasilkan dari pelanggan rumah tangga dengan kapasitas daya terpasang 450 VA dan 900 VA. Melakukan simulasi-simulasi filter pasif serta filter aktif dan hibrid, sehingga diperoleh rancangan prototipe filter harmonik yang sesuai dengan kondisi THD_i pelanggan listrik rumah tangga 900 VA dan 450 VA. Metode penelitian dilakukan dengan meneliti langsung kepada pelanggan listrik rumah tangga dengan kriteria jaringan distribusinya terpisah dengan jaringan industri, serta pelanggan tenaga listrik yang berdomisili disekitar industri mempunyai jarak tidak lebih dari 20 meter dari transformator daya. Mengolah data hasil pengukuran lapangan serta melakukan simulasi dengan menggunakan filter pasif, aktif dan hibrid dan pengukuran dengan filter hibrid dasil rancangan dengan beban dimiripkan dengan hasil pengukuran beban rumah tangga. Hasil simulasi menggunakan filter pasif yang ditala pada frekuensi 150 Hz THD_i sebelum dipasang filter 67,65% turun menjadi 57,07%, untuk dua unit filter ditala pada frekuensi 150 Hz dan 250 Hz, nilai THD_i berkurang dari 67,65% menjadi 49,20%. Sedang untuk 3 (tiga) unit filter pasif yang masing-masing ditala pada frekuensi 150 Hz, 250 Hz dan 350 Hz persentase THD_i berkurang dari 67,65% menjadi 48,93% dan untuk filter L seri nilai $\%THD_i$ dari 67,65%, menjadi 31,09%. Dengan menggunakan beban simulasi yang sama, simulasi dengan filter aktif diperoleh hasil penurunan THD_i arus dari 67,65% turun menjadi 21,13% dan simulasi menggunakan filter hibrid, filter pasifnya ditala pada frekuensi 150 Hz dan 250 Hz diperoleh hasil penurunan harmonik arus menjadi 17,73%. Hasil penelitian dilaboratorium dengan variasi beban diperoleh nilai persentase THD_i tanpa menggunakan filter terendah 40 %, rata-rata 88,10% dan tertinggi 149,80%. Selanjutnya untuk beban yang sama namun dipasang filter hibrid diperoleh nilai prosentase harmonik terendah 30 %, rata-rata 65% dan tertinggi 94,80%. Nilai pengurangan prosentase total distorsi harmonik dengan menggunakan filter hibrid terendah 10%, rata-rata 23,10% dan tertinggi 55,00%.

kata kunci : *harmonik, pengurangan, beban rumah tangga, filter*

ABSTRACT

Electric power system in ideal conditions distributes electric power that has sinusoidal current and voltage waveforms. In fact, the nature of nonlinear loads change the sinusoidal current and voltage waveform into a distortion current and voltage that contains harmonics. Electronic equipment used in average households is nonlinear loads resulting in significant current harmonic wave distortion. The objectives to be achieved in this research is to obtain harmonic content information generated by household customers installed of 450 VA and 900 VA power capacity. In order, to decrease the electrical power harmonic generated, first it was designed sumulation of active and passive filter as a hybrid filter, in order to obtain prototype design of harmonic filter in accordance with the THDi conditions of 450 VA and 900 VA household electricity customers. The research method was conducted by directly examining to the household electricity customers under the criteria of distribution network which is separated from industrial network, as well as customers who live around the electric power industry within no more than 20 meters from the power transformer. Processing field measurement data and performing simulations using passive, active and hybrid filters and measurement of the hybrid filter design resulted to with a load similar to the results of the household load measurement. The simulation results using a passive filter tuned to frequency of 150 Hz with THD_i before the filter installed was 67.65% reduced to 57.07% after the filter being installed, for two units filter tuned to frequency of 150 Hz and 250 Hz, THD_i value reduced from 67.65% to 49.20%. As for 3 (three) passive filter units, each tuned to frequency of 150 Hz, 250 Hz and 350 Hz, THDi percentage reduced from 67.65% to 48.93% and for filter L series $\%THD_i$ value is reduced from 67.65% to 31.09%. By using the same simulation loads, results declined THD_i currents from 67.65% reduced to 21.13% with an active filter and results declined THD_i currents into 17.73% using a hybrid filter, with passive filter tuned to a frequency of 150 Hz and 250 Hz. The results of laboratory research with varying loads obtained THD_i percentage values without using filters, the lowest was 40%, the average was 88.10% and the highest was 149.80%. Furthermore, for the same loads using hybrid filter obtained THD_i percentage values as follows, the lowest was 30%, the average was 65% and the highest was 94.80%.The reduction values of THD_i using a hybrid filter, the lowest was 10%, the average was 23.10% and the highest was 55.00%.

Keywords: harmonic, reduction, household loads, filter