

ABSTRAK

PT. IPI Medan mengolah berbagai bentuk atau model bahan baku kertas sesuai permintaan konsumen berupa produk jadi. Pengoperasian beban induktif dan beban *non linier* seperti motor AC tiga fasa, motor DC, *solenoid valve*, *contactor* dan peralatan produksi seperti mesin gelombang (*corrugator*), mesin *digital printing* dan mesin *flexo* akan mengakibatkan rendahnya faktor daya sistem dan adanya kandungan harmonisa dalam sistem kelistrikan industri. Besar faktor daya dan kandungan harmonisa pada sistem kelistrikan industri didapatkan melalui pengukuran menggunakan alat ukur *Power Quality Analyzer* pada panel SDP no.5 PT. IPI Medan. Titik pengukuran dilakukan pada beban satu dan beban dua sebelum pemasangan kapasitor bank dan setelah pemasangan kapasitor bank. Hasil pengukuran faktor daya sebelum dan sesudah pemasangan kapasitor bank sebesar 0,531 dan 0,96 *lagging*, nilai THD_v sebelum dan sesudah pemasangan kapasitor bank sebesar 6,017% dan 1,844% serta nilai THD_i sebelum dan sesudah pemasangan kapasitor bank sebesar 27,35% dan 20,828%. Nilai THD_v hasil pengukuran sudah sesuai dengan standar IEEE 519-2014 namun dikarenakan nilai THD_i yang besar dan tidak sesuai standar IEEE 519-2014, diperlukan filterisasi harmonisa. Filter pasif *single tuned* adalah filter sederhana yang digunakan untuk mengurangi arus harmonisa dari orde tertentu yang tidak sesuai dengan standar acuan yang berlaku. Penelitian ini menjelaskan penggunaan filter pasif *single tuned* di PT. IPI Medan. Reduksi harmonisa tersebut dilakukan dengan merancang filter yang digunakan untuk mengetahui persentase penurunan harmonisa sebelum dan sesudah menggunakan filter pasif *single tuned* pada PT. IPI Medan yang disimulasikan menggunakan program Matlab/simulink. Pemasangan tiga buah filter pasif *single tuned* pada rangkaian simulasi diperoleh hasil simulasi yang menunjukkan faktor daya sistem mengalami kenaikan dari 0,531 *lagging* menjadi 0,916 mendekati *unity* dimana sudah sesuai dengan target penelitian dan memenuhi standar SPLN. Hasil simulasi juga menunjukkan besar harmonisa setelah dilakukan filterisasi nilai total distorsi harmonisa arus dan tegangan sebesar 8,805% dan 1,117% terjadi penurunan THD_i dan THD_v sebesar 32,19% dan 18,56% serta masing-masing orde pada beban telah memenuhi standar IEEE 519–2014. Simulasi menunjukkan bahwa menggunakan filter pasif *single tuned* dapat mereduksi harmonisa sekaligus meningkatkan faktor daya sistem menjadi lebih baik.

Kata Kunci: Reduksi Harmonisa, Filter Pasif *Single Tuned*, Koreksi Faktor Daya

ABSTRACT

PT. IPI Medan processes various forms or models of paper raw materials according to consumer demand in the form of finished products. Operation of inductive loads and non-linear loads such as three-phase AC motors, DC motors, solenoid valves, contactors and production equipment such as machines corrugators, digital printing machines and flexo machines will result in low system power factor and the presence of content harmonics in industrial electrical systems. The power factor and harmonic content in industrial electrical systems are obtained through measurements using a Power Quality Analyzer on the SDP panel no. 5 PT. IPI Medan. The measurement points are carried out at load one and load two before the installation of the capacitor bank and after the installation of the capacitor bank. The results of the measurement of the power factor before and after the installation of the capacitor bank are 0.531 and 0.96 lagging, the value of THD_v before and after the installation of the capacitor bank is equal to 6.017% and 1.844% and the value of THD_i before and after the installation of the capacitor bank by 27.35% and 20.828%. The value THD_v of the measurement results is in accordance with the IEEE 519-2014 standard, but due THD_i to the large value and not according to the IEEE 519-2014 standard, harmonics filtering is required. Single tuned passive filter is a simple filter used to reduce harmonic currents of a certain order that are not in accordance with the applicable reference standard. This study describes the use of single tuned passive filters at PT. IPI Medan. Harmonic reduction is done by designing a filter that is used to determine the percentage of harmonic reduction before and after using a single tuned passive filter at PT. IPI Medan which is simulated using the Matlab/simulink program. Installation of three single tuned passive filters in the simulation circuit obtained simulation results which showed the system power factor increased from 0.531 lagging to 0.916 close to unity which is in accordance with the research target and meets the SPLN standard. The simulation results also show the harmonics after filtering total value of the current and voltage harmonic distortion of 8.805% and 1.117%, a decrease of THD_i and THD_v by 32.19% and 18.56% as well as each order in the load has complied with IEEE 519–2014 standards. Simulations show that using a single tuned passive filter can reduce harmonics while increasing the power factor of the system for the better.

Keywords: Harmonic Reduction, Single Tuned Passive Filter, Power Factor Correction