

**Perancangan Rangkaian Cycloconverter Satu Fasa Menggunakan Metode
Phase Angle Control Berbasis Arduino**

SKRIPSI

*Diajukan untuk Memenuhi Sebagian dari Syarat Memperoleh Gelar
Sarjana Teknik Program Studi Teknik Elektro S1*



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**DEPARTEMEN PENDIDIKAN TEKNIK ELEKTRO
FAKULTAS PENDIDIKAN TEKNOLOGI DAN KEJURUAN
UNIVERSITAS PENDIDIKAN INDONESIA**

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**PERANCANGAN RANGKAIAN CYCLOCONVERTER SATU FASA
MENGUNAKAN METODE PHASE ANGLE CONTROL BERBASIS
ARDUINO**

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Sebuah skripsi yang diajukan untuk memenuhi salah satu syarat memperoleh gelar
Sarjana pada Fakultas Pendidikan Teknologi dan Kejuruan

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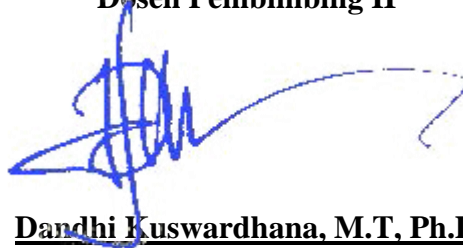
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ABSTRAK

Dalam penggunaan mesin-mesin industri, pada umumnya diperlukan frekuensi yang bervariasi pada sumber tegangan AC. Salah satu mesin modern yang memerlukan variasi frekuensi adalah alat Alat Pengangkut Sampah Otomatis di Sungai Terintegrasi Sistem SCADA (*Supervisory Control and Data Acquisition*) yang masih dalam tahap pengembangan. Alat ini menggunakan mesin motor induksi yang juga memerlukan variasi frekuensi untuk mengatur kecepatan motor. Namun, P.T PLN hanya menyediakan jaringan listrik standar nasional 220 V dengan frekuensi 50 Hz. Salah satu alat yang dapat digunakan untuk merubah nilai frekuensi adalah *cycloconverter*. *Cycloconverter* merupakan konverter AC-AC yang dapat merubah *Fixed Frequency* menjadi *Variable Frequency*. Penelitian ini membahas mengenai perancangan rangkaian *cycloconverter* satu fasa menggunakan metode *phase angle control* berbasis Arduino dengan mensimulasikan masing-masing rangkaian yang digunakan pada satu kesatuan sistem *cycloconverter*. Metode pengaturan frekuensi dan tegangan yang digunakan pada penelitian ini adalah metode *phase angle control* yang mampu mengatur penyalan komponen thyristor dengan pemberian pulsa pemicu berupa sudut tembak. Metode ini membutuhkan rangkaian pendukung berupa *zero crossing detector* yang mampu memberikan informasi posisi sudut pada nilai tegangan nol sumber tegangan AC. Didapatkan hasil berupa bentuk gelombang keluaran yang menunjukkan perubahan frekuensi $F/2$, $F/3$, $F/4$, dan $F/5$. Pada hasil pengukuran dapat disimpulkan hubungan sudut tembak yang diberikan berbanding terbalik dengan tegangan keluaran.

Kata Kunci: Frekuensi, *Phase Angle Control*, *Cycloconverter*, *Zero Crossing Detector*.

ABSTRACT

In the use of industrial machines, it is generally required a variant frequency from AC source voltage. One of modern invention which is requiring a variant frequency is Automatic River Waste Filter SCADA Integrated. This machine use induction motor which also require variant frequency to regulate the speed motor. However, P.T PLN only provides standard electrical voltage grid of 220 volts and 50 Hz frequency. One device which can be used to change the value of frequency is cycloconverter. Cycloconverter is an AC-AC converter which can change fixed frequency into variable frequency. This Study discusses about planning a one phase cycloconverter using phase angle control method based on Arduino by simulating each circuit used in system unit of cycloconverter. The method used for frequency and voltage regulation in this study is phase angle control which can control thyristor component switching by giving a pulse trigger of firing angle. This method requires a support circuit like zero crossing detector which can provide information of zero angle point on the AC source voltage. The results obtained are the output waveforms which shows frequency changes $F/2$, $F/3$, $F/4$, and $F/5$. On the measurements, there's conclusion in the relation of given firing angle is opposing with the value of output voltage.

Keywords: *Frequency, Phase Angle Control, Cycloconverter, Zero Crossing Detector.*

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