

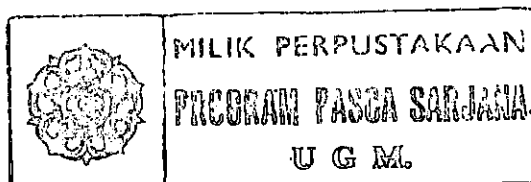


## INTISARI

Penelitian ini dilakukan untuk mengetahui efektivitas penggunaan pengendali SSSC untuk memperbaiki stabilitas dinamik pada sistem tenaga. Plant yang dikendalikan berupa sistem tenaga *single-machine infinite-bus* (SMIB) dan sistem multi-mesin dengan jumlah generator tiga unit. SSSC difungsikan sebagai pengganti pengendali konvensional yang dipergunakan untuk menentukan sinyal kendali ke sistem eksitasi, medan dan generator.

Sistem pengendali SSSC adalah suatu *solid-state* inverter sumber tegangan yang di kopling dengan transformator dan dihubung seri dengan jaringan transmisi. SSSC menginjeksikan tegangan yang hampir sinusoidal dan magnitudenya variabel. Tegangan injeksi ini hampir quadratur dengan arus jaringan, karena itu mengemulasi reaktansi kapasitif atau induktif, sehingga mempengaruhi aliran daya dalam jaringan transmisi. Guna mengetahui kinerja pengendali dilakukan pengujian dengan perubahan tegangan referensi, beban dan mode osilasi.

Efektifitas penerapan pengendali SSSC untuk memperbaiki watak stabilitas dinamik sistem tenaga, terhadap tiga jenis pengujian, dilakukan dengan mengamati tanggapan sistem pada perubahan sudut torsi, tegangan dan kecepatan rotor. Hasil pengujian menunjukkan bahwa pengendali SSSC memberikan redaman yang lebih baik dibandingkan dengan pengendali konvensional yang terlihat dari penurunan *overshoot* dan *settling-time*. Besarnya persentase penurunan *overshoot* berkisar antara 16,80%-23,25% pada osilasi sudut torsi. Penurunan *settling-time* berkisar antara 81,18%-86,36%. Untuk sistem tiga-generator, besarnya persentase penurunan *overshoot* berkisar antara 8,27%-12,80% pada sudut torsi, 4,00%-52,18% untuk perubahan tegangan terminal, dan 11,52%-14,42% untuk perubahan kecepatan rotor. Penurunan *settling-time* pada tanggapan tegangan terminal berkisar antara 50,00%-62,82%.





## ABSTRACT

The objective of this research is to investigate the effectiveness of the SSSC damping controller to improve the dynamic stability in power system. The controlled plant is a single-machine infinite-bus system and tested on multi-machine power systems with number of alternator three-unit. SSSC controller replaces the conventional controller which is used for tuning signal control to excitation, field, and alternator systems.

The SSSC, a solid-state voltage source inverter coupled with a transformer, is connected in series with a transmission line. An SSSC injects an almost sinusoidal voltage, of variable magnitude. This injected voltage is almost in quadrature with the line current, thereby emulating an inductive or acapacitive reactance, influences the electric power flow in the transmission line. The performance of the controller investigated with some test i.e. changing of reference voltage test, load test and oscillation mode.

The effectiveness of the application of SSSC damping controller to improve the dynamic stability of power systems can be observed from the system response under the test i.e. torque angle deviation, teminal voltage deviation, and rotor speed deviation. The testing result show that the proposed SSSC damping controller can give better damping for all parameters observed than the damping given by conventional controller. It can be seen from reducing of overshoot and settling-time of the system response. For single-machine infinite-bus the percentage of overshoot reducing for torque angle oscillation respectively is between 16.80%-23.25%. The settling time reducing for acceleration oscillation response is between 81.18% to 86.36%. For three-alternator systems the percentage of overshoot reducing for torque angle oscillation, terminal voltage, rotor speed and respectively is between 8.27%-12.80%, 4.00%-52.18% and 11.52%-14.42%. The settling time reducing for voltage terminal response is between 50.00% to 62.82%.