

RINGKASAN

ANALISIS KONTROL ARUS HISTERESIS PADA *CURRENT SOURCE INVERTER (CSI) COMMON EMITTER* DUA TINGKAT

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Di era modern, peningkatan kualitas daya listrik menjadi fokus penting, terutama untuk sistem energi terbarukan yang membutuhkan stabilitas dan efisiensi tinggi. Inverter sumber arus memiliki peran vital dalam konversi daya, tetapi kinerjanya sangat bergantung pada pengendalian arus yang akurat. Kualitas arus keluaran yang kurang optimal dapat menurunkan efisiensi dan stabilitas sistem secara keseluruhan. Kontrol arus histeresis adalah metode yang banyak digunakan karena kesederhanaan dan responsnya yang cepat. Namun, metode ini menghadapi tantangan berupa variasi frekuensi *switching* yang dapat memengaruhi efisiensi daya dan presisi kontrol.

Pada penelitian ini menerapkan kontrol arus histeresis pada *inverter* sumber arus *common emitter* dua tingkat. Simulasi dilakukan menggunakan perangkat lunak PSIM 9.1 untuk mengevaluasi efektivitas kontrol histeresis dalam mengelola daya keluaran. Pengujian meliputi analisis dengan arus dan pita histeresis yang bervariasi.

Berdasarkan hasil penelitian, kontrol histeresis dapat mengatur arus sesuai dengan arus referensi. Kemudian diperoleh rugi-rugi daya sebesar 42,53 W hingga 58,06 W, efisiensi daya berkisar antara 82,14% hingga 87,29%, nilai THD Iload berada pada rentang 3,61% hingga 13,42%, nilai THD Vload berada pada kisaran 17,02% hingga 41,68%, spektrum harmonisa Iload pada rentang 0,1% hingga 6,73%, dan spektrum harmonisa Vload pada rentang 0,17% hingga 7,60%. Hasil simulasi menunjukkan kontrol arus histeresis dapat mengendalikan *inverter* sumber arus *common emitter* dengan performa yang cukup baik.

Kata kunci : Inverter Sumber Arus, Kontrol Arus Histeresis, Rugi-Rugi Daya, Efisiensi Daya, *Total Harmonic Distortion (THD)*, Harmonisa

SUMMARY

ANALYSIS OF HYSTERESIS CURRENT CONTROL IN A TWO-LEVEL COMMON EMITTER CURRENT SOURCE INVERTER (CSI)

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In the modern era, improving the quality of electrical power has become a major focus, especially for renewable energy systems that require high stability and efficiency. Current source inverters play a vital role in power conversion, but their performance heavily depends on accurate current control. Suboptimal output current quality can reduce the overall system efficiency and stability. Hysteresis current control is a widely used method due to its simplicity and fast response. However, this method faces challenges such as switching frequency variations, which can affect power efficiency and control precision.

This research implements hysteresis current control on a two-level common emitter current source inverter. Simulations were conducted using PSIM 9.1 software to evaluate the effectiveness of hysteresis control in managing output power. The testing included an analysis with varying current and hysteresis bands.

Based on the research results, hysteresis control can regulate the current according to the reference current. The obtained power losses ranged from 42.53 W to 58.06 W, power efficiency ranged from 82.14% to 87.29%, the THD of I_{load} was between 3.61% and 13.42%, the THD of V_{load} ranged from 17.02% to 41.68%, the I_{load} harmonic spectrum was in the range of 0.1% to 6.73%, and the V_{load} harmonic spectrum ranged from 0.17% to 7.60%. The simulation results show that hysteresis current control can effectively manage the common emitter current source inverter with reasonably good performance.

Keywords : Current Source Inverter, Hysteresis Current Control, Power Losses, Power Efficiency, Total Harmonic Distortion (THD), Harmonics