ABSTRAK

Pemutus Tenaga (PMT) memiliki peran penting dalam menjaga keandalan sistem tenaga listrik, terutama saat melakukan pemutusan arus normal maupun arus gangguan. Pada proses pemutusan tersebut dapat muncul *Transient Recovery Voltage* (TRV), yaitu tegangan pemulih transien yang terjadi pada celah kontak PMT setelah arus terputus. Apabila nilai puncak TRV atau *Rate of Rise of Recovery Voltage* (RRRV) melebihi kemampuan PMT, maka dapat terjadi *restrike*, kegagalan pemutusan, serta gangguan pada sistem tenaga listrik. Penelitian ini bertujuan untuk mengetahui kondisi operasi yang menghasilkan puncak TRV dan RRRV paling kritis, serta mengevaluasi kinerja metode *grading resistor*, *grading capacitor*, dan *RC snubber* dalam meredam TRV pada PMT SF_6 150 kV di Gardu Induk Cigereleng. Penelitian dilakukan melalui simulasi menggunakan PSCAD dengan skenario switching normal, gangguan satu fasa ke tanah (1LG), dan gangguan tiga fasa (3PH). Simulasi dilakukan pada kondisi tanpa peredam dan dengan penambahan metode peredaman. Hasil simulasi menunjukkan bahwa kondisi paling kritis terjadi pada gangguan 3PH di busbar dengan puncak TRV sebesar 322,45 kV dan RRRV sebesar 4506 kV/ms. Grading resistor efektif menurunkan puncak TRV hingga 72,62%, grading capacitor mampu menurunkan RRRV hingga 99%, sedangkan RC snubber memberikan kinerja yang lebih seimbang. Dengan demikian, penerapan metode peredaman dapat menurunkan risiko kegagalan operasi PMT akibat TRV.

Kata Kunci : *Transient Recovery Voltage*, Pemutus Tenaga, *Grading Resistor, Grading capasitor, RC Snubber.*

ABSTRACT

Circuit breakers play an important role in maintaining the reliability of electric power systems, especially during normal current interruption and fault current interruption. During the interruption process, Transient Recovery Voltage (TRV) may occur across the circuit breaker contacts after the current is interrupted. If the TRV peak or the Rate of Rise of Recovery Voltage (RRRV) exceeds the capability of the circuit breaker, restrike, interruption failure, and disturbances in the power system may occur. This study aims to determine the operating condition that produces the most critical TRV peak and RRRV, and to evaluate the performance of grading resistor, grading capacitor, and RC snubber methods in damping TRV on a 150 kV SF_6 circuit breaker at Cigereleng Substation. The study was conducted through simulation using PSCAD with normal switching, single line-to-ground fault (1LG), and three-phase fault (3PH) scenarios. The simulations were carried out under conditions without damping and with the addition of damping methods. The simulation results show that the most critical condition occurs during a 3PH fault on the busbar, with a TRV peak of 322.45 kV and an RRRV of 4506 kV/ms. The grading resistor effectively reduces the TRV peak by up to 72.62%, the grading capacitor reduces the RRRV by up to 99%, while the RC snubber provides more balanced performance. Therefore, the application of damping methods can reduce the risk of circuit breaker operation failure caused by TRV.

Keyword **:** *Transient Recovery Voltage*, *Circuit Breaker*, *Grading Resistor, Grading capasitor, RC Snubber.*