

Intisari

Pada hari Rabu 28 Oktober 2015 telah terjadi gangguan berupa terbakarnya *Vacuum Circuit Breaker* (VCB) di *switchgear 10,5 kV incoming breaker* UST B Unit 5 PT. Indonesia Power Unit Pembangkitan Suralaya. Hal ini kemudian membuat unit 5 *trip* dan mengganggu suplai listrik di Pulau Jawa-Madura-Bali. Penelitian ini bertujuan untuk mengevaluasi kemampuan VCB dalam memutus arus gangguan dengan cara membandingkan hasil simulasi dan hasil perhitungan terhadap *rating* VCB yang terbakar.

Metode yang digunakan adalah menyimulasikan lokasi gangguan dengan bantuan *software* ETAP 12.6.0. Simulasi yang dilakukan berupa *load flow analysis* dan *short circuit analysis* 3 fasa. Simulasi *load flow analysis* dilakukan untuk mengetahui kesesuaian rangkaian simulasi yang telah dibuat terhadap pengoperasian normal kinerja sistem. Kemudian ditentukan lokasi simulasi gangguan hubung singkat 3 fasa yang berada di daerah *switchgear 10,5 kV incoming breaker* UST 5B. Hasil simulasi hubung singkat tersebut akan dibandingkan kembali terhadap perhitungan *manual* untuk diketahui kesesuaian rangkaian gangguan terhadap rangkaian simulasinya.

VCB yang terpasang saat terjadinya gangguan memiliki *rating* arus kontinyu 3000 A dan *rating* hubung singkat 37 kA. Hasil simulasi *Load Flow Analysis* menunjukkan bahwa nilai magnitudo arus beban *switchgear* 5B dalam kondisi normal adalah 1057,9 A. Sedangkan nilai magnitudo hasil simulasi *Short Circuit Analysis* 3 fasa *switchgear* 5B adalah 45 kA. Hasil perhitungan *manual* saat terjadinya gangguan hubung singkat 3 fasa *switchgear* 5B adalah 44,648 kA. Dari hasil perhitungan dan simulasi tersebut diketahui bahwa terjadi kesalahan dalam pemilihan *rating* VCB 2B2B dikarenakan nilai *rating* hubung singkat-nya berada di bawah nilai hasil simulasi.

Kata kunci : *Switchgear, Vacuum Circuit Breaker, ETAP 12.6.0, Load Flow Analysis, Short Circuit Analysis*

Abstract

On Wednesday, October 28th 2015, there was a disruption on the 10.5 kV UST B incoming breaker switchgear Unit 5 of PT. Indonesia Power Suralaya Unit Pembangkitan that caused its Vacuum Circuit Breaker (VCB) to burn. The following circumstances later on made The Unit 5 poorly malfunctioning and inevitably disrupting the electricity supply across the Java-Madura-Bali islands. This study aimed to further evaluate the capability of a VCB in cutting off the fault current by comparing both the simulation and calculation results toward the burned VCB rating.

The concept used was simulating the location of disturbance with a handful assistance from the ETAP 12.6.0 Software. Therefore, the simulation was carried out in the form of load flow analysis and 3-phase short circuit analysis. The load flow analysis simulation was conducted to determine the simulated series compatibility which had been completed under the normal operating performance system. Later, it was decided the location of 3-phase short circuit disturbance which was located on the 10.5 kV UST B incoming breaker switchgear Unit 5. The short circuit simulation result would later be compared with the manual calculation, so the disruption series compatibility on the series would be revealed.

The VCB installed when the disruption occurred had a continuous current rating of 3000 A and short circuit rating of 37 kA. The Load Flow Analysis simulation result indicated that the switchgear 5B load current magnitude value in normal state was 1057.9 A. Furthermore, the magnitude value resulted from the 3-phase short circuit analysis of switchgear 5B was 45 kA. Meanwhile, the manual calculation result when the 3-phase short circuit disruption on switchgear 5B occurred was 44.648 kA. From the calculation and simulation is known that an error occurred in the selection rating of VCB 2B2B because the rate short circuit current of VCB are under the simulation results .

Keywords : *Switchgear, Vacuum Circuit Breaker, ETAP 12.6.0, Load Flow Analysis, Short Circuit Analysis*