RINGKASAN

ANALISIS PENGARUH GANGGUAN SHORT CIRCUIT PADA FEEDER MILL E TERHADAP OPERASI RELAY BUCHHOLZ PADA TRANSFORMATOR AUXILIARY DI PLTU CIREBON POWER

Dwinanto Bathara

Penelitian ini membahas kejadian *false trip* pada relay buchholz di Unit Auxiliary Transformer (UAT) akibat gangguan hubung singkat pada Feeder Mill E di PLTU Cirebon Power pada 1 Mei 2025. Relay buchholz yang seharusnya mendeteksi gangguan internal justru terpicu oleh gangguan eksternal pada feeder, sehingga menyebabkan trip unit pembangkit tanpa adanya kerusakan internal transformator. Analisis dilakukan menggunakan perhitungan manual dan simulasi ETAP, serta divalidasi dengan data aktual. Hasil menunjukkan bahwa gangguan *line-to-line* menghasilkan arus hubung singkat sebesar 14,5 kA, dengan selisih kurang dari 10% dibandingkan hasil perhitungan dan simulasi. Nilai ini melebihi ambang teoritis 11,95 kA, sehingga menimbulkan gaya elektromagnetik yang memicu fenomena oil surge di dalam transformator. Hal ini menyebabkan relay buchholz langsung mengaktifkan trip dalam waktu sangat singkat (≈0,055 s) tanpa alarm. Evaluasi koordinasi proteksi menunjukkan bahwa relay buchholz bekerja lebih cepat dibandingkan proses isolasi gangguan (≈0,129 s). Pengujian pasca-gangguan menunjukkan kondisi transformator tetap normal, sehingga dipastikan terjadi *false trip* akibat efek mekanis arus transien eksternal. Penelitian merekomendasikan optimasi waktu kerja relay feeder dan evaluasi sensitivitas relay buchholz untuk meningkatkan keandalan sistem.

Kata kunci: *short circuit*, relay buchholz, *false trip*, *oil surge, unit auxiliary transformer,* gaya elektromagnetik

SUMMARY

ANALYSIS OF THE EFFECT OF SHORT CIRCUIT IN FEEDER MILL E ON BUCHHOLZ RELAY OPERATION IN AUXILIARY TRANSFORMER AT PLTU CIREBON POWER

Dwinanto Bathara

This research discusses a false trip event of the Buchholz relay in the Unit Auxiliary Transformer (UAT) caused by a short circuit fault on Feeder Mill E at PLTU Cirebon Power on May 1, 2025. The Buchholz relay, which is designed to detect internal transformer faults, was instead triggered by an external fault in the feeder, resulting in a unit trip without any internal transformer damage. The analysis was carried out using manual calculations and ETAP simulation, validated with actual field data. The results show that a line-to-line fault produced a short-circuit current of 14.5 kA, with a deviation of less than 10% compared to the calculated and simulated values. This current exceeded the theoretical threshold of 11.95 kA, generating electromagnetic forces strong enough to trigger an oil surge phenomenon inside the transformer. Consequently, the Buchholz relay activated the trip almost instantaneously (≈0.055 s) without a prior alarm signal. The protection coordination evaluation indicates that the Buchholz relay operated faster than the fault isolation process (≈0.129 s). Post-fault testing confirmed that the transformer remained in normal condition, proving that the event was a false trip caused by the mechanical effects of external transient currents. This study recommends optimizing the feeder relay operating time and evaluating the sensitivity of the Buchholz relay to improve system reliability.

Keywords: short circuit, buchholz relay, false trip, oil surge, unit auxiliary transformer, electromagnetic force