

OPTIMALISASI PENGGUNAAN *ELECTRONIC OVER CURRENT RELAY* SEBAGAI PROTEKSI LEBIH ARUS PADA MOTOR 55 KW DI SISTEM COOLING TOWER PT INDAH KIAT PULP & PAPER PERAWANG

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ABSTRAK

Motor induksi tiga fasa merupakan salah satu peralatan utama yang banyak digunakan pada sistem industri, termasuk pada sistem *cooling tower* di PT Indah Kiat Pulp & Paper Perawang. Keandalan motor sangat dipengaruhi oleh sistem proteksi terhadap gangguan arus lebih (*over current*). Penggunaan *Electronic Over Current Relay* (EOCR) memberikan keunggulan dibandingkan *Thermal Overload Relay* (TOR) karena memiliki pengaturan parameter yang lebih lengkap, kemampuan monitoring arus secara *real-time*, serta waktu trip yang dapat disesuaikan. Penelitian ini bertujuan untuk menentukan setting EOCR yang optimal sehingga mampu memberikan proteksi lebih arus secara efektif tanpa menyebabkan *trip* yang tidak diperlukan. Metode penelitian yang digunakan meliputi observasi lapangan, studi literatur, pengumpulan data spesifikasi motor dan EOCR, pengukuran arus serta tegangan motor, analisis perhitungan arus nominal, penentuan setting EOCR, dan pengujian hasil optimalisasi. Objek penelitian adalah motor induksi tiga fasa ABB tipe M2QA250M4A berkapasitas 55 KW yang digunakan pada sistem *cooling tower* PT Indah Kiat Pulp & Paper Perawang. Hasil penelitian menunjukkan bahwa berdasarkan data nameplate motor dengan daya 55 KW, tegangan 380 V, faktor daya 0,88, dan efisiensi 92%, diperoleh arus nominal sebesar 103,13 A. Dengan penambahan faktor keamanan sebesar 10%, diperoleh setting *Over Current* (OC) EOCR sebesar 113 A, meningkat dari setting sebelumnya sebesar 90 A. Hasil pengukuran di lapangan menunjukkan arus operasi

motor berada pada kisaran 45,1–46,2 A dengan tegangan antar fasa 392,8–394,2 V, sehingga motor hanya bekerja sekitar 43,73% dari kapasitas nominalnya. Setelah dilakukan optimalisasi, parameter EOCR ditetapkan menjadi $OC = 113\text{ A}$, *Delay Time* (DT) = 5 detik, *Operation Time* (OT) = 5 detik, *Phase Loss* (PL) = ON, *Unbalance* (UB) = 30 detik, dan *Short Circuit* (SC) = 5 detik. Pengaturan tersebut mampu meningkatkan keandalan sistem proteksi motor, mengurangi kemungkinan *trip* yang tidak diperlukan, serta memberikan perlindungan yang lebih baik terhadap gangguan beban lebih, kehilangan fasa, ketidakseimbangan arus, dan hubung singkat.

Kata kunci: *Electronic Over Current Relay* (EOCR), motor induksi tiga fasa, over current, sistem proteksi, cooling tower.

***OPTIMIZATION OF ELECTRONIC OVERCURRENT RELAY
(EOCR) SETTINGS FOR OVERCURRENT PROTECTION OF A
55 KW MOTOR IN THE COOLING TOWER SYSTEM AT PT
INDAH KIAT PULP & PAPER PERAWANG***

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ABSTRACT

Three-phase induction motors are among the primary electrical machines widely used in industrial applications, including the cooling tower system at PT Indah Kiat Pulp & Paper Perawang. The reliability of these motors is highly dependent on an effective protection system against overcurrent faults. The use of an Electronic Over Current Relay (EOCR) offers several advantages over a Thermal Overload Relay (TOR), including more comprehensive protection features, real-time current monitoring, and adjustable trip-time settings. This study aims to determine the optimal EOCR settings to provide effective overcurrent protection while minimizing unnecessary tripping. This research employed an observational and analytical method consisting of field observations, literature review, data collection of motor and EOCR specifications, current and voltage measurements, nominal current calculations, EOCR setting determination, and performance evaluation after optimization. The object of this study was a 55 KW ABB M2QA250M4A three-phase induction motor used in the cooling tower system at PT Indah Kiat Pulp & Paper Perawang. The results showed that, based on the motor nameplate data of 55 KW output power, 380 V operating voltage, 0.88 power factor, and 92% efficiency, the calculated nominal current was 103.13 A. By applying a 10% safety margin, the appropriate EOCR overcurrent setting was determined to be 113 A, replacing the previous setting of 90 A. Field measurements indicated that the motor operated with

phase currents ranging from 45.1 A to 46.2 A and line voltages ranging from 392.8 V to 394.2 V, indicating that the motor was operating at approximately 43.73% of its rated capacity. After optimization, the EOCR parameters were configured as follows: Over Current (OC) = 113 A, Delay Time (DT) = 5 seconds, Operation Time (OT) = 5 seconds, Phase Loss (PL) = ON, Unbalance (UB) = 30 seconds, and Short Circuit (SC) = 5 seconds. These settings improved the reliability of the motor protection system, reduced unnecessary trips, and provided better protection against overload, phase loss, current unbalance, and short-circuit faults.

Keywords: *Electronic Over Current Relay (EOCR), three-phase induction motor, overcurrent protection, cooling tower, motor protection system.*