

ABSTRAK

**KLASIFIKASI TINGKAT DEGRADASI ISOLATOR *REACTOR*
CURRENT LIMITED BERBASIS CITRA *PHASE-RESOLVED PARTIAL*
DISCHARGE MENGGUNAKAN *CONVOLUTIONAL NEURAL NETWORK*
(2026: xvi + 61 Halaman + Daftar Gambar + Daftar Tabel + Lampiran)**

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Klasifikasi tingkat degradasi isolasi pada reactor current limited berdasarkan citra *Phase-Resolved Partial discharge* (PRPD) menggunakan metode *Convolutional Neural Network* (CNN) dilakukan untuk mengidentifikasi kondisi isolasi yang dikategorikan ke dalam tiga kelas, yaitu Good, Moderate, dan *Bad*. Penelitian ini menggunakan dataset citra PRPD yang melalui tahapan prapemrosesan, pembagian data latih dan data uji, serta pelatihan model CNN dengan optimasi Stochastic Gradient Descent with Momentum (SGDM). Evaluasi kinerja model dilakukan menggunakan metrik akurasi, precision, recall, F1-score, dan *Confusion Matrix*. Hasil penelitian menunjukkan bahwa model CNN menghasilkan validation accuracy sebesar 95,45% dan testing accuracy sebesar 80%, dengan kelas Moderate memiliki performa terbaik dengan recall mencapai 100%, kelas Good menunjukkan performa yang relatif baik, sedangkan kelas *Bad* memiliki tingkat kesalahan klasifikasi tertinggi akibat kemiripan pola PRPD antar kelas. Secara keseluruhan, model CNN mampu mengekstraksi fitur penting dari citra PRPD dan melakukan klasifikasi tingkat degradasi isolasi secara efektif, meskipun peningkatan kinerja masih dapat dilakukan melalui penambahan data, penyeimbangan distribusi kelas, dan pengoptimalan arsitektur model.

Kata kunci: PRPD, CNN, Degradasi Isolasi, Klasifikasi, *Reactor Current Limited*

ABSTRACT

CLASSIFICATION OF INSULATION DEGRADATION LEVELS OF A REACTOR CURRENT LIMITED BASED ON PHASE-RESOLVED PARTIAL DISCHARGE IMAGES USING CONVOLUTIONAL NEURAL NETWORK

2026: xvi +61 Page + List of Pictures + List of Tables + List of Appendix)

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Classification of insulation degradation levels in a reactor current limited based on Phase-Resolved Partial discharge (PRPD) images using a Convolutional Neural Network (CNN) was conducted to identify insulation conditions categorized into three classes: Good, Moderate, and Bad. This study utilized a PRPD image dataset that underwent preprocessing, dataset splitting into training and testing sets, and CNN model training using Stochastic Gradient Descent with Momentum (SGDM) optimization. Model performance was evaluated using accuracy, precision, recall, F1-score, and Confusion Matrix metrics. The results indicate that the CNN model achieved a validation accuracy of 95.45% and a testing accuracy of 80%, where the Moderate class demonstrated the best performance with a recall of 100%, the Good class showed relatively strong performance, and the Bad class exhibited the highest misclassification rate due to similarities in PRPD patterns across classes. Overall, the CNN model was able to effectively extract important features from PRPD images and perform insulation degradation classification, although further improvements can be achieved by increasing dataset size, balancing class distribution, and optimizing the CNN architecture.

Keywords: *PRPD, CNN, insulation degradation, classification, reactor current limited*