EVALUASI KELAYAKAN PELAPISAN *SILICONE RUBBER* PADA ISOLATOR *LONGROD* SUTT 150 KV SANUR – GIANYAR BERDASARKAN ASPEK PEMELIHARAAN

Sinung Abi Rachman : 202410008

Dibawah Bimbingan :

Prof. Ir. Syamsir Abduh, M.M., Ph.D., IPU., ASEAN.Eng

ABSTRAK

Kinerja isolator *longrod* pada SUTT 150 kV Sanur - Gianyar Line 2 dipengaruhi oleh polusi dan kelembapan lingkungan pesisir. Penelitian ini mengevaluasi kelayakan pelapisan RTV *silicone rubber* melalui perbandingan teknis tiga jenis isolator, analisis faktor *eksploratif*, analisis ekonomi *incremental* kondisi *before-after*, dan integrasi indeks teknis-ekonomi. Lima tower digunakan sebagai pasangan lokasi dengan parameter tahanan isolasi, arus bocor, intensitas korona, dan kenaikan suhu. Dibandingkan keramik tanpa pelapisan, RTV *silicone rubber* menurunkan arus bocor rata-rata 32,11%, intensitas korona 97,77%, dan kenaikan suhu 80,67%, tetapi tahanan isolasinya 74,07% lebih rendah. Pada objek penelitian tidak terdapat gangguan isolator yang tercatat selama periode pengamatan. Oleh karena itu, biaya gangguan tidak diperlakukan sebagai arus kas aktual, tetapi dianalisis melalui skenario sensitivitas hipotesis 1, 3, 5, dan 6 kejadian per tahun untuk menggambarkan rentang potensi konsekuensi ekonomi. Pada horizon 15 tahun dan diskonto 8%, kondisi *before* memiliki PV biaya pembersihan Rp243.046.397. Kondisi *after* RTV *silicone rubber* menghasilkan NPV *incremental* -Rp24.453.603, BCR 0,91, IRR 6,47%, dan *simple payback period* 9,42 tahun; sedangkan polimer menghasilkan NPV -Rp267.753.603, BCR 0,48, IRR -2,19%, dan *simple payback period* 17,99 tahun. Dengan Economic Index berbasis LCC *base case*, *Feasibility Index* diperoleh sebesar 69,10 untuk RTV *silicone rubber*, 53,64 untuk polimer, dan 50,72 untuk keramik tanpa pelapisan. Hasil tersebut menempatkan RTV *silicone rubber* sebagai alternatif prioritas yang layak : pelapisan memberikan manfaat pada parameter permukaan, tetapi indikator ekonomi absolut pada diskonto 8% belum sepenuhnya memenuhi kriteria investasi.

Kata Kunci - isolator *longrod*, RTV *silicone rubber*, arus bocor, *Life Cycle Cost*, kelayakan.

EVALUATION OF THE FEASIBILITY OF *SILICONE RUBBER COATING* ON 150 KV *LONGROD* SUTT INSULATORS IN SANUR - GIANYAR LINE 2 BASED ON MAINTENANCE ASPECTS

Sinung Abi Rachman : 202410008

Dibawah Bimbingan :

Prof. Ir. Syamsir Abduh, M.M., Ph.D., IPU., ASEAN.Eng

ABSTRACT

The performance of long-rod insulators on the Sanur - Gianyar 150 kV transmission line (Circuit 2) is influenced by pollution and humidity in the coastal environment. This study evaluates the feasibility of RTV silicone rubber coating through a technical comparison of three insulator types, exploratory factor analysis, an incremental "before-and-after" economic analysis, and a techno-economic integration index. Five towers were used as matched test locations, with parameters including insulation resistance, leakage current, corona intensity, and temperature rise. Compared to uncoated ceramic, RTV silicone rubber reduced average leakage current by 32.11%, corona intensity by 97.77%, and temperature rise by 80.67%, although its insulation resistance was 74.07% lower. No insulator-related outage was recorded for the study object during the observation period. Therefore, outage cost was not treated as an actual cash flow; instead, hypothetical sensitivity scenarios of 1, 3, 5, and 6 events per year were used only to illustrate the potential range of economic consequences. Over a 15-year horizon with an 8% discount rate, the "before" condition resulted in a cleaning cost Present Value (PV) of IDR 243,046,397. The "after" condition (RTV silicone rubber) yielded an incremental NPV of -IDR 24,453,603, a BCR of 0.91, an IRR of 6.47%, and a simple payback period of 9.42 years; meanwhile, the polymer option yielded an NPV of -IDR 267,753,603, a BCR of 0.48, an IRR of -2.19%, and a simple payback period of 17.99 years. Based on the LCC base-case Economic Index, the Feasibility Index was calculated at 69.10 for RTV silicone rubber, 53.64 for polymer, and 50.72 for uncoated ceramic. These results position RTV silicone rubber as a conditionally feasible priority alternative: it improves surface-related technical performance, while the absolute economic indicators at an 8% discount rate do not yet fully satisfy the investment criteria.

Keywords - LongrodIinsulator, RTV silicone rubber, leakage current, Life Cycle Cost, feasibility.