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**Evaluasi Akurasi Sistem Supervisory Control And Data Acquisition (SCADA) dalam Pemantauan Kinerja
SPAM Kamijoro DIY**
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

INTISARI

SPAM Kamijoro merupakan infrastruktur strategis untuk mendukung target 100% akses air minum aman dalam RPJPN 2025–2045. Kinerja SPAM perlu dievaluasi secara berkala dari aspek kualitas maupun kuantitas, terlebih karena operasionalnya sudah dikendalikan oleh sistem *Supervisory Control and Data Acquisition* (SCADA). Penelitian ini bertujuan mengevaluasi efektivitas unit pengolahan terhadap baku mutu Permenkes No. 2 Tahun 2023, menilai akurasi sensor SCADA beserta implikasinya bagi pemeliharaan peralatan, mengevaluasi kemampuan produksi terhadap kebutuhan air pokok daerah layanan, serta merumuskan rekomendasi peningkatan kinerja.

Penelitian ini menggunakan metode deskriptif-kuantitatif. Data primer berupa pengujian sampel air pada sembilan titik unit pengolahan dan data survei kebutuhan air nyata masyarakat sambungan rumah. Data sekunder meliputi hasil uji laboratorium, data historis SCADA bulan Januari–April 2026, dan *as-built drawing*. Analisis kualitas dilakukan melalui perhitungan efisiensi penyisihan, kepatuhan baku mutu, dan perhitungan presisi dan akurasi sensor SCADA yang mengacu pada ISO 5725-1:2023 dan kriteria USGS. Analisis kuantitas dilakukan dengan menghitung neraca *supply-demand*, melakukan verifikasi *demand* riil masyarakat, dan perhitungan potensi pengembangan melalui optimalisasi pola produksi.

Hasil menunjukkan unit pengolahan efektif menyisihkan kekeruhan hingga 97,91% pada unit sedimentasi. Air olahan memenuhi baku mutu untuk mayoritas parameter, kecuali sisa klor yang berlebih di reservoir (1,4 dan 0,6 mg/L), namun terlalu rendah di titik pelanggan (<0,03 mg/L), sehingga ditemukan *total coliform* 20 CFU/100 ml. Evaluasi SCADA menemukan bias sistematis, bias acak, dan indikasi *last value hold* pada beberapa sensor. Dari aspek kuantitas, produksi memenuhi 2.421 Sambungan Rumah eksisting pada Februari–April, namun defisit 146,2 m^3/hari pada Januari. Verifikasi kebutuhan menunjukkan bahwa rata-rata jumlah jiwa/SR adalah 3 jiwa/SR dengan kebutuhan air sebesar 0-150 liter/orang/hari, yang mana dipengaruhi oleh keberadaan sumber air alternatif. Rekomendasi peningkatan kinerja meliputi penyesuaian dosis klorin, rekalibrasi dan pembersihan sensor, perbaikan sistem komunikasi SCADA, penambahan Sambungan Rumah, serta optimalisasi pola pemakaian pompa.

Kata kunci: SPAM Kamijoro, kualitas air, kuantitas air, SCADA, Permenkes No. 2 Tahun 2023

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ABSTRACT

The Kamijoro Drinking Water Supply (SPAM Kamijoro) is a strategic infrastructure supporting the target of 100% safe drinking water access under the National Long-Term Development Plan (RPJPN) 2025-2045. Its performance needs to be evaluated periodically in terms of both quality and quantity, particularly because its operation is already controlled by a Supervisory Control and Data Acquisition (SCADA) system. This study aims to evaluate the effectiveness of treatment units against the quality standards of Minister of Health Regulation (Permenkes) No. 2 of 2023, assess the accuracy of SCADA sensors along with its implication for equipment maintenance, evaluate the production capacity against the basic water demand of the service area, and formulate recommendations for performance improvement.

This study employed a descriptive-quantitative method. Primary data consisted of water sample testing at nine treatment unit points and survey data on the actual water demand of household connection customers. Secondary data included laboratory test result, historical SCADA data from January to April 2026, and as-built drawings. Quality analysis was conducted through calculation of removal efficiency, quality-standard compliance, and the precision and accuracy of SCADA sensors, referring to ISO 5725-1:2023 and USGS criteria. Quantity analysis was carried out by calculating the supply-demand balance, verifying the community's actual demand, and estimating development potential through optimization of the production pattern.

The results show that the treatment units effectively remove turbidity by up to 97,91% at the sedimentation unit. The treated water met the quality standards for most parameters, except for residual chlorine, which was excessive in the reservoir (1,4 and 0,6 mg/L) but too low at customer points (0,03 mg/L), resulting in the detection of total coliform of 20 CFU/100 ml. The SCADA evaluation identified systematic bias, random bias, and indications of last-value hold in several sensors. In terms of quantity, production met the needs of the 2.421 existing household connections from February to April, but experienced a deficit of 146,2 m^3/day in January. The demand verification showed that the average number of persons per household connection was 3 persons/SR, with water demand ranging from 0-150 liters/person/day, which was influenced by the availability of alternative water sources. Recommendations for performance improvement include adjusting the chlorine dose, recalibrating and cleaning sensors, improving the SCADA communication system, adding household connection, and optimizing the pump operation pattern.

Keywords: SPAM Kamijoro, water quality, water quantity, SCADA, Permenkes No. 2 Tahun 2023