

RANCANG BANGUN UNIT PENGOLAHAN AIR BERSIH UNTUK MENURUNKAN KADAR MANGAN (Mn), BESI (Fe), DAN *ESCHERICHIA COLI* PADA SISTEM PAMSIMAS DESA SUTORAGAN, KEMIRI, PURWOREJO

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ABSTRAK

Latar Belakang: Air PAMSIMAS Desa Sutoragan, Kecamatan Kemiri, Kabupaten Purworejo, memiliki permasalahan kualitas air berupa kadar mangan (Mn), besi (Fe), dan *Escherichia coli* yang belum memenuhi persyaratan kualitas air. Hasil pemeriksaan awal menunjukkan kadar mangan sebesar 1,2 mg/L, besi sebesar 1,5 mg/L, dan *Escherichia coli* sebesar 101 CFU/100 mL. Kondisi tersebut memerlukan upaya pengolahan untuk meningkatkan kualitas air sehingga memenuhi persyaratan yang berlaku.

Tujuan: Mengetahui efektivitas rancang bangun unit pengolahan air bersih menggunakan kombinasi media filtrasi dan klorinasi dalam menurunkan kadar mangan (Mn), besi (Fe), dan jumlah *Escherichia coli* pada air PAMSIMAS Desa Sutoragan, Kecamatan Kemiri, Kabupaten Purworejo.

Metode: Penelitian ini merupakan penelitian pra-eksperimental dengan desain *One Group Pretest-Posttest*. Objek penelitian adalah air PAMSIMAS Desa Sutoragan dengan pengambilan sampel menggunakan teknik *grab sampling*. Penelitian dilakukan sebanyak enam kali pengulangan. Pemeriksaan kadar mangan (Mn), besi (Fe), dan *Escherichia coli* dilakukan sebelum dan sesudah pengolahan. Analisis data dilakukan menggunakan uji Shapiro-Wilk dan *Paired Sample t-Test*.

Hasil: Hasil penelitian menunjukkan bahwa rata-rata kadar mangan (Mn) mengalami penurunan dari 1,2000 mg/L menjadi 0,0200 mg/L, sedangkan kadar besi (Fe) menurun dari 1,5000 mg/L menjadi 0,0433 mg/L. Jumlah *Escherichia coli* mengalami penurunan dari 101 CFU/100 mL menjadi 0 CFU/100 mL. Hasil *Paired Sample t-Test* menunjukkan nilai signifikansi sebesar 0,000 ($p < 0,05$) pada kadar mangan, besi, dan *Escherichia coli*, yang menunjukkan adanya perbedaan yang signifikan antara sebelum dan sesudah pengolahan. Efektivitas penurunan kadar mangan sebesar 98,5%, besi sebesar 97%, dan *Escherichia coli* sebesar 100%.

Kesimpulan: Rancang bangun unit pengolahan air bersih menggunakan kombinasi media filtrasi *manganese greensand*, zeolit, karbon aktif, pasir silika, dan klorinasi efektif menurunkan kadar mangan (Mn), besi (Fe), dan jumlah *Escherichia coli* pada air PAMSIMAS Desa Sutoragan. Pengolahan tersebut menghasilkan kualitas air yang memenuhi persyaratan yang berlaku.

Kata Kunci: Air Bersih, Filtrasi, Klorinasi, Mangan, Besi, *Escherichia coli*, PAMSIMAS

DESIGN AND CONSTRUCTION OF A CLEAN WATER TREATMENT UNIT TO REDUCE MANGANESE (Mn), IRON (Fe), AND ESCHERICHIA COLI LEVELS IN THE PAMSIMAS SYSTEM OF SUTORAGAN VILLAGE, KEMIRI, PURWOREJO

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ABSTRACT

Background: The PAMSIMAS water supply system in Sutoragan Village, Kemiri District, Purworejo Regency, has water quality problems involving manganese (Mn), iron (Fe), and Escherichia coli levels that do not meet the applicable water quality requirements. Preliminary examination showed manganese levels of 1.2 mg/L, iron levels of 1.5 mg/L, and Escherichia coli levels of 101 CFU/100 mL. This condition requires water treatment efforts to improve water quality and ensure compliance with applicable requirements.

Objective: To determine the effectiveness of a clean water treatment unit using a combination of filtration media and chlorination in reducing manganese (Mn), iron (Fe), and Escherichia coli levels in the PAMSIMAS water supply system of Sutoragan Village, Kemiri District, Purworejo Regency.

Methods: This study was a pre-experimental study using a One Group Pretest-Posttest design. The research object was PAMSIMAS water from Sutoragan Village, with samples collected using the grab sampling technique. The study was conducted with six repetitions. Manganese (Mn), iron (Fe), and Escherichia coli levels were examined before and after treatment. Data were analyzed using the Shapiro-Wilk test and Paired Sample t-Test.

Results: The results showed that the mean manganese (Mn) level decreased from 1.2000 mg/L to 0.0200 mg/L, while the iron (Fe) level decreased from 1.5000 mg/L to 0.0433 mg/L. The Escherichia coli count decreased from 101 CFU/100 mL to 0 CFU/100 mL. The Paired Sample t-Test showed a significance value of 0.000 ($p < 0.05$) for manganese, iron, and Escherichia coli, indicating a significant difference between the conditions before and after treatment. The reduction efficiency was 98.5% for manganese, 97% for iron, and 100% for Escherichia coli.

Conclusion: The clean water treatment unit using a combination of filtration media consisting of manganese greensand, zeolite, activated carbon, and silica sand, followed by chlorination, was effective in reducing manganese (Mn), iron (Fe), and Escherichia coli levels in PAMSIMAS water in Sutoragan Village. The treatment produced water quality that met the applicable requirements.

Keywords: Clean Water, Filtration, Chlorination, Manganese, Iron, Escherichia coli, PAMSIMAS