

ABSTRAK

Air merupakan sumber daya vital yang harus dijaga kualitasnya. Penelitian ini bertujuan mengidentifikasi variabel-variabel yang berpengaruh terhadap kualitas air produksi PDAM Kota Padang dan mengevaluasi kestabilan proses pengolahan air secara statistik. Data yang digunakan merupakan hasil uji laboratorium terhadap 20 variabel kualitas air periode Februari–Juli 2024. Metode yang digunakan meliputi *Principal Component Analysis* (PCA), analisis faktor, dan diagram kendali Hotelling's T^2 . Hasil PCA menghasilkan tujuh komponen utama, yang kemudian dianalisis lebih lanjut dengan analisis faktor dan mengelompokkan tujuh variabel terpilih ke dalam tiga faktor utama, yaitu faktor Kekerasan dan Kandungan Ion Terlarut dalam Air, Kejernihan dan Partikel Tersuspensi, dan Kandungan Anion dalam Air. Nilai reliabilitas ketiga faktor menunjukkan konsistensi yang cukup baik. Hasil pengendalian kualitas multivariat menunjukkan masih adanya observasi di luar batas kendali, menandakan proses belum stabil secara statistik. Temuan ini dapat menjadi acuan PDAM dalam memfokuskan pengendalian pada variabel-variabel yang paling berpengaruh guna menjaga mutu air yang aman bagi masyarakat.

Kata kunci: Analisis Komponen Utama, Analisis Faktor, Hotelling's T^2 , Pengendalian Kualitas Multivariat, Kualitas Air.

ABSTRACT

Water is a vital resource whose quality must be consistently maintained. This study aims to identify the variables that influence the quality of water produced by PDAM Kota Padang and to evaluate the statistical stability of its treatment process. The data used were obtained from laboratory tests on 20 water quality variables during the period of February to July 2024. The methods employed include Principal Component Analysis (PCA), factor analysis, and the Hotelling's T^2 control chart. PCA results produced seven principal components, which were further analyzed using factor analysis and grouped into three main latent factors: Hardness and Dissolved Ion Content in Water, Clarity and Suspended Particles, and Anion Content in Water. The reliability values of these three factors indicated good internal consistency. The multivariate quality control results showed several observations falling outside the control limits, indicating that the process is not yet statistically stable. These findings are expected to serve as a reference for PDAM to focus monitoring and control efforts on the most influential variables to ensure safe and consumable water quality for the community.

Keywords: *Principal Component Analysis, Factor Analysis, Hotelling's T^2 , Multivariate Quality Control, Water Quality.*