

INTISARI

RANCANG BANGUN ALAT UKUR SALINITAS DAN KADAR LOGAM MANGAN (Mn) DALAM AIR TANAH DI PESISIR KOTA TEGAL DAN PERKAMPUNGAN INDUSTRI KECIL (PIK) LOGAM DESA PESAREAN, KABUPATEN TEGAL

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Salinitas air tanah pada wilayah pesisir Kota Tegal dan kadar logam Mangan air tanah yang tercemar akibat aktivitas industri pengecoran logam di Desa Pesarean memerlukan pengujian laboratorium secara berkala. Pengujian tersebut membutuhkan waktu yang lama dan biaya yang mahal, sehingga diperlukan alat ukur dengan metode yang mudah, murah, dan ergonomis. Tujuan penelitian ini untuk merancang, membuat, mengkalibrasi, menganalisis hasil pengujian, membuat akuisisi data dari alat ukur salinitas dan kadar logam Mn. Komponen *prototype* yaitu sensor salinitas, sensor logam Mn, arduino nano V3, Wemos D1 R1 Mini, RTC DS3231, *microSD reader* dan LCD.

Metode yang digunakan dengan prinsip konduktivitas yaitu dengan dua elektroda yang dicelupkan pada larutan sampel. Analisis data dengan perhitungan regresi polinomial, nilai eror, akurasi, standar deviasi. Kalibrasi hasil laboratorium pada enam sampel menggunakan alat standar Refraktometer dan UV-VIS.

Hasil pengujian, *prototype* bekerja dengan baik untuk mengukur salinitas dan kadar logam Mn dalam air tanah dengan nilai minimum yang dapat terukur sebesar 0,02. Hasil kalibrasi sensor salinitas diperoleh eror tertinggi 0,1%, akurasi 99,89%, R^2 0,9998 dan pada sensor logam Mn dihasilkan eror 2%, akurasi 98%, R^2 0,9988. Hasil pengukuran kadar salinitas dan logam Mn tertinggi pada sampel Perumahan Martoloyo yaitu $(16,8 \pm 0,07)$ ‰ kategori kritis di RT.3/11 (S2) dan $(3,3 \pm 0,2)$ ppm di RT.4/11 (S3), sedangkan pada sampel Desa Pesarean sebesar $(1,42 \pm 0,03)$ ‰ kategori rawan di RT.36/8 (S14) dan $(18,8 \pm 0,4)$ ppm di RT.36/8 (S16). Peta sebaran nilai salinitas divisualisasikan warna ungu sedangkan kadar logam Mn warna merah. Akuisisi data hasil pengukuran disimpan pada *microSD*, data *real time* di *Blynk* dan LCD.

Kata kunci : salinitas, logam Mangan, arduino nano, sensor konduktivitas, sensor soil moisture, Blynk

ABSTRACT

DESIGN OF MEASURE INSTRUMENT FOR SALINITY AND MANGANESE METAL (Mn) IN GROUNDWATER IN COASTAL TEGAL CITY AND SMALL METAL INDUSTRY AREA (PIK) PESAREAN VILLAGE, TEGAL DISTRICT

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The salinity of groundwater in the coastal area of Tegal City and levels of groundwater Manganese which are polluted due to metal casting industry activities in Pesarean Village require periodic laboratory testing. This test requires a long time and is expensive, so a measuring device with an easy, inexpensive and ergonomic method is needed. The purpose of this research is to design, manufacture, calibrate, analyze test results, make data acquisition from salinity and Mn measuring instruments. The prototype components are a salinity sensor, Mn metal sensor, Arduino nano V3, Wemos D1 R1 Mini, RTC DS3231, microSD reader and LCD.

The method used is the conductivity principle by immersing two electrodes in the sample solution. Data analysis by calculating polynomial regression, error value, accuracy, standard deviation. Calibration of laboratory results on six samples using a standard tool Refractometer and UV-VIS.

The test results showed that the prototype worked well for measuring the salinity and metal content of Mn in groundwater with a measurable minimum value of 0.02. The results of the calibration of the salinity sensor obtained the highest error of 0.1%, accuracy of 99.89%, R^2 of 0.9998 and the Mn metal sensor resulted in an error of 2%, accuracy of 98%, R^2 of 0.9988. The results of the measurement of the highest salinity and Mn levels in the Martoloyo housing sample were $(16.8 \pm 0.07) \text{ }^{\circ}/_{00}$ in the critical category in RT. 3/11 (S2) and $(3.3 \pm 0.2) \text{ ppm}$ in RT. 4/11 (S3), while in the sample of Pesarean Village it was $(1.42 \pm 0.03) \text{ }^{\circ}/_{00}$ vulnerable category in RT. 36/8 (S14) and $(18.8 \pm 0.4) \text{ ppm}$ in RT. 36/8 (S16). The map of the distribution of salinity values is visualized in purple, while the Mn content is red. The data acquisition of measurement results are stored on microSD, real time data on Blynk and LCD.

Keywords: *salinity, Manganese metal, Arduino nano, conductivity sensor, soil moisture sensor, Blynk*