

**PENGOLAHAN AIR TERKONTAMINASI FLUIDA PANAS BUMI UNTUK
KEBUTUHAN AIR DOMESTIK DI DUSUN DARUM, DESA CANDI,
KECAMATAN BANDUNGAN, KABUPATEN SEMARANG, PROVINSI JAWA
TENGAH**

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INTISARI

Daerah penelitian merupakan daerah dengan manifestasi panas bumi berupa mata air panas, fumarol dan batuan teralterasi. Penduduk di sekitar daerah penelitian dalam upaya memenuhi kebutuhan air domestik mengambil dari sumber mata air yang berada di sekitar area panas bumi. Secara fisik, telah terjadi indikasi adanya penurunan kualitas air yaitu, air berbau, berasa seperti besi, dan berwarna. Penelitian dilakukan di Dusun Darum, Desa Candi, Kecamatan Bandungan, Kabupaten Semarang, Provinsi Jawa Tengah. Tujuan penelitian ini adalah untuk mengetahui karakteristik panas bumi dan dampaknya terhadap sumber air di sekitarnya untuk pemenuhan kebutuhan air domestik di Dusun Darum serta mengetahui arahan pengolahan air untuk pemenuhan kebutuhan domestik di lokasi penelitian.

Metode yang digunakan dalam penelitian ini yaitu survei dan pemetaan lapangan, uji laboratorium, analisis dan uji coba unit pengolahan. Uji laboratorium berupa uji geokimia air. Metode analisis untuk mengetahui karakteristik mata air panas dan dampaknya terhadap mata air di sekitarnya. Analisis karakteristik mata air panas dengan metode analisis geokimia air menggunakan diagram segitiga Cl-HCO₃-SO₄, *Geothermometer* Na/K, dan mengetahui kesetimbangan fluida air panas bumi menggunakan metode diagram Na-K-Mg. Hasil analisis karakteristik mata air panas kemudian dikorelasikan dengan data kualitas mata air di sekitar untuk mengetahui dampak fluida panas bumi terhadap air. Kemudian dilakukan analisis untuk mengetahui status mutu air dengan metode indeks pencemaran.

Hasil penelitian karakteristik mata air panas bumi memiliki tipe air sulfat (SO₄) yang menunjukkan zona *upflow* dengan suhu 350°C. Kesetimbangan fluida berada pada zona *immature water*. Korelasi keberadaan aktivitas panas bumi terhadap air yaitu adanya logam-logam terlarut dari batuan ke air yaitu Fe dan Mn yang dipengaruhi karena suhu yang tinggi sehingga mempercepat pelarutan. Hasil analisis kualitas air menunjukkan keadaan status mutu air tercemar ringan sehingga perlu pengolahan sebelum dikonsumsi. Unit pengolahan yang dipakai adalah aerasi dengan *tray aerator* dan filtrasi. Hasil uji coba unit aerasi-filtrasi menunjukkan efektivitas penurunan Fe dan Mn sebesar 87,90% dan 87,08%. Arahan pengolahan air dilakukan dengan membuat unit aerasi filtrasi dengan dimensi masing-masing unit yaitu : tray aerator (lebar 88 cm dan panjang 176 cm dengan masing-masing tray berjarak 30 cm sebanyak 4 tray) dan filtrasi (lebar 77 cm dan panjang 154 cm dengan tinggi media filter mangan zeolit 60 cm dan penyangga 10 cm).

Kata Kunci: *Fluida Panas Bumi; Mata Air; Kebutuhan Air Domestik; Pengolahan air Tray Aerator; Filtrasi; Fe (besi); Mn (mangan)*

**WATER TREATMENT OF WATER CONTAMINATED WITH GEOTHERMAL
FLUIDS FOR DOMESTIC WATER NEEDS IN DARUM HAMLET, CANDI
VILLAGE, BANDUNGAN DISTRICT, SEMARANG REGENCY, CENTRAL
JAVA**

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ABSTRACT

The study area is an area with geothermal manifestations in the form of hot springs, fumaroles and rock alterations. Residents around the research area in an effort to meet domestic water needs take from springs located around the geothermal area. Physically, there have been indications of a decrease in water quality which the water has smell, tastes like iron, and water has color. The research was conducted in Darum Hamlet, Candi Village, Bandungan District, Semarang Regency, Central Java. The purpose of this study is to determine the characteristics of geothermal heat and its impact on surrounding water sources to use domestic water needs in Darum Hamlet, also determine water treatment to meet domestic needs at the research site. .

The methods used in this study are field surveys and mapping, laboratory tests, analysis and trials of processing units. Laboratory tests in the form of water geochemical tests. Analysis method to find out the characteristics of hot springs and their effect on the springs. Analysis of hot spring characteristics by water geochemical analysis method using the Cl-HCO₃-SO₄ triangle diagram, Na /K Geothermometer, and knowing the fluid equilibrium of geothermal water using the Na-K-Mg diagram method. The results of the analysis of the characteristics of hot springs are then correlated with the quality data of the surrounding springs to determine the influence of geothermal fluid on water. Then an analysis is carried out to determine the status of water quality by the pollution index method.

The results of the study on the characteristics of geothermal springs have a sulphate water type (SO₄) which shows an up-flow zone with a temperature of 350°C. The equilibrium of the fluid is in the immature water zone. The correlation of the existence of geothermal activity to water is the presence of dissolved metals from rock to water, namely Fe and Mn which are influenced due to high temperatures so as to accelerate dissolution. The results of the water quality analysis show the state of the water quality status is lightly polluted so that it needs to be treated before consumption. The processing unit used is aeration with tray aerator and filtration. The results of the aeration-filtration unit trial showed the effectiveness of decreasing Fe and Mn by 87.90% and 87.08%. Water treatment are carried out by making filtration aeration units with the dimensions of each unit, namely: tray aerator (width 88 cm and length 176 cm with each tray spaced 30 cm as many as 4 trays) and filtration (width 77 cm and length 154 cm with a height of manganese zeolite filter media of 60 cm and a support of 10 cm).

Keywords: *Geothermal Fluids; Springs; Domestic Water Needs; Water Treatment; Tray Aerator; Filtration; Fe (iron); Mn (manganese)*