

Pemodelan sistem geothermal lapangan "D" dengan simulator tough2 dan itough2 = Modeling of geothermal system at field "D" using tough2 and itough2 simulator.

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Abstrak

Sistem panasbumi lapangan "D" merupakan sistem panasbumi tipe kaldera yang terbentuk karena aktivitas tektonik dan vulkanik. Formasi batuanannya merupakan formasi sedimen berumur tersier di bagian bawah, dengan formasi batuan beku berumur kuartar di bagian atasnya. Manifestasi permukaan yang ada berupa fumarol di atas Gunung Taf dan Gunung "D" serta mata air panas pada arah tenggara dari pusat sistem. Data MT menunjukkan adanya up-dome shape sedangkan data gravity menunjukkan keberadaan reservoir yang ditandai dengan anomali gravitasi rendah. Untuk memahami karakteristik reservoir, letak sumber panas, serta hidrogeologi, dilakukan pemodelan sistem panasbumi lapangan "D". Pemodelan dilakukan secara forward dengan software TOUGH2 dan inversi dengan software iTOUGH2. Input pemodelan forward dibuat berdasarkan data geologi, geofisika, geokimia, dan data sumur.

Output yang dihasilkan digunakan sebagai input untuk proses inversi dengan tujuan optimalisasi model Natural State yang ingin dicapai. Ketercapaian kondisi natural state ditunjukkan dengan adanya kesesuaian antara profil temperatur sumur dengan hasil pemodelan. Hasil pemodelan menunjukkan bahwa sumber panas berada di bawah Gunung Taf dan Gunung "D", dengan outflow ke arah tenggara, serta keberadaan zona recharge di sebelah barat daya dari sistem. Top reservoir diperkirakan berada pada elevasi 0 m. Dari profil temperatur juga diberikan rekomendasi wilayah yang tepat sebagai sumur produksi dan sumur reinjeksi.

.....Geothermal system at field "D" is a caldera-type system which was developed by volcanism and tectonism activities. The "D" area composed of pre-Tertiary-Tertiary sedimentary formation in the lower part, and unconformably covered by Quaternary volcanic rock formation. Surface manifestations present in this area are fumaroles right above Mount Taf and Mount "D" and hot-springs in north east and south east direction from the center of the system. MT data inform the present of up-dome shape, while gravity data show the reservoir location with low gravity anomaly. For understanding the characteristic of reservoir, heat source location, and hydrogeology, the modeling of geothermal system at field "D" was conducted using TOUGH2 and iTOUGH2 simulator in forward and inverse modeling respectively. Input for forward modeling were composed based on geological, geophysical, geochemical and well-bore data.

The calculated output from forward modeling was then used as input data for inversion process in order to optimize the Natural State condition being obtained. Natural State condition is reached when the temperature profiles of the model show relatively good agreement with measured temperature from wells. The result indicates that the heat source is located beneath Mount Taf and Mount "D", with present outflow to the south east and north east direction outward the system, while recharge zones are located at south west and north west from the system. Top of reservoir was estimated to be 200 m above sea level.

Recommendation for production and reinjection wells is also given based on measured temperature profiles.