ABSTRAK

STUDI KARAKTERISTIK DAN PENENTUAN ZONA *CLAY CAP* DAN RESERVOIR LAPANGAN PANAS BUMI "MFG", BENGKULU

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Lapangan Panas Bumi "MFG" di Kabupaten Lebong, Bengkulu, yang dikelola PT Pertamina Geothermal Energy Tbk., menunjukkan ketidaksesuaian antara model konseptual eksisting dengan data terbaru, khususnya dalam penentuan batas *clay cap* dan reservoir. Studi sebelumnya menunjukkan bahwa pendekatan berbasis temperatur saja tidak cukup akurat, sehingga diperlukan integrasi data geofisika dan sumur terkini untuk memperbaiki model sistem panas bumi.

Penelitian ini menggunakan metode kualitatif dengan analisis data sekunder dari PT Pertamina Geothermal Energy Tbk., meliputi: (1) geokimia fluida manifestasi untuk menentukan tipe fluida dan suhu reservoir, (2) interpretasi data magnetotelurik (MT) untuk identifikasi resistivitas bawah permukaan, (3) evaluasi data sumur (stratigrafi, alterasi, *lost circulation*, serta tekanan dan temperatur), dan (4) sintesis data untuk membangun model konseptual terbaru. Integrasi data 3G (geologi, geokimia, geofisika) dan uji sumur dilakukan untuk memvalidasi batas *clay cap* dan reservoir.

Hasil penelitian menunjukkan bahwa sistem panas bumi "MFG" merupakan sistem vulkanik bersuhu tinggi (±300°C) dengan dominasi air. Zona *clay cap* berasosiasi dengan alterasi smektit pada batuan tufa dan breksi tufa (*Upper Suban Agung Volcanic*). Nilai resistivitas akurat dalam penentuan *clay cap* karena sesuai dengan data sumur (<10 Ωm). Sedangkan reservoir (suhu 250-300°C) dicirikan oleh alterasi epidot pada batuan lava andesit (*Hululais Volcanic*) dan dikontrol oleh permeabilitas sekunder dari Sesar Normal Cemeh dan Sesar Dekstral Agung Hilir. Nilai resistivitas tidak dapat mendeliniasi batas reservoir dengan akurat. Revisi model mengungkap aliran fluida dari *upflow* di selatan (Khuluk Beriti) ke *outflow* di utara (Semelako), dengan sumber panas berupa intrusi granodiorit. Hasil ini memperbaiki ketidakakuratan model sebelumnya dan memberikan rekomendasi untuk eksplorasi lanjutan.

Kata kunci: alterasi hidrotermal, *clay cap*, magnetotelurik, panas bumi, reservoir.

ABSTRACT

STUDY OF CHARACTERISTICS AND DETERMINATION OF CLAY CAP AND RESERVOIR ZONES IN THE "MFG" GEOTHERMAL FIELD, BENGKULU

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The "MFG" Geothermal Field in Lebong Regency, Bengkulu, operated by PT Pertamina Geothermal Energy Tbk., shows discrepancies between existing conceptual models and actual data, particularly in defining clay cap and reservoir boundaries. Previous studies by Dwikorianto et al. (2023) demonstrated that temperature-based approaches alone are insufficiently accurate, necessitating the integration of recent geophysical and well data to improve the geothermal system model.

This study employs qualitative methods using secondary data from PT Pertamina Geothermal Energy Tbk., including: (1) fluid geochemistry of surface manifestations, (2) magnetotelluric (MT) data interpretation for subsurface resistivity mapping, (3) well data evaluation (stratigraphy, alteration, lost circulation, and pressure-temperature measurements), and (4) data synthesis to develop an updated conceptual model. Integration of 3G data (geology, geochemistry, geophysics) and well tests was conducted to validate clay cap and reservoir boundaries.

Results indicate that the "MFG" system is a high-temperature (±300°C) volcanic-dominated system with water as the primary fluid. The clay cap correlates with smectite alteration in tuff and tuff breccia (Upper Suban Agung Volcanic). Resistivity values accurately determined the clay cap as they matched well data (<10 Ωm). In contrast, the reservoir (250-300°C), characterized by epidote alteration in andesite lava (Hululais Volcanic), is controlled by secondary permeability from the Cemeh Normal Fault and Agung Hilir Dextral Fault. Resistivity values could not accurately delineate reservoir boundaries. The revised model reveals fluid flow from the southern upflow (Beriti Volcano) to the northern outflow (Semelako), driven by granodiorite intrusion. These findings correct previous model inaccuracies and provide recommendations for further exploration.

Keywords: *geothermal, hydrothermal alteration, magnetotelurik, reservoir, clay cap.*