The application of TSIM in defining sills in coal seams: A case study at Coppabella Mine

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INTRODUCTION

Thiel Surface Impedance Method (TSIM) is a surface electromagnetic device that uses VLF radio waves at a single frequency to measure apparent resistivity changes in the subsurface. The technique allows the interpreter to accurately delineate known geological features and identify previously unrecognised discontinuities.

The aim of the TSIM survey at Coppabella Mine was to determine areas of heavy intrusion in the coal. The survey was conducted in a grid pattern with 16 lines and a total line length of 3,600 m.

TSIM has been successfully used at Coppabella Mine to identify areas of low apparent resistivity occurring where intrusion is expected.

Key words: Apparent resistivity, coal, intrusion

SUMMARY

Thiel Surface Impedance Method (TSIM) is a surface electromagnetic device that uses VLF radio waves at a single frequency to measure apparent resistivity changes in the subsurface. The technique allows the interpreter to accurately delineate known geological features and identify previously unrecognised discontinuities.

The interpretation was based on the apparent resistivity results identifying resistive/conductive variation in the subsurface. Five main zones of interest were determined from the survey. These were areas of low apparent resistivity values, indicating that the coal seams are intruded in these areas.

METHOD AND RESULTS

TSIM is a shallow surveying technique, typically measuring to a depth of approximately 50m. TSIM is an electromagnetic surveying technique which receives and records information from single-frequency VLF (very low frequency, typically around 15 to 30 kHz) electromagnetic waves transmitted by a distant source, up to thousands of kilometres away.

Acquisition was completed along 16 lines, totally 3,600 km, with points taken every 5m, and the geographic location marked on a handheld GPS. The data was then compiled and modelled using the Geosoft Australia Pty Ltd Oasis Montaj software (Figure 1).

Figure 1: Modelled apparent resistivity results across the survey area

The results show five key areas of low apparent resistivity which area zones of interest (labelled Zone 1 to Zone 5), and a linear trending high apparent resistivity feature (Feature 1). The interpretations are based on apparent resistivity and phase angle anomalies observed along the TSIM traverses. The anomalies identified on these TSIM traverses indicate

Coppabella coal mine is located approximately 140km southwest of Mackay in eastern central Queensland within the eastern part of the Bowen Basin.

It was recognised that mining efficiency could be improved at Coppabella Mine by demarcating zones of minor intrusion from the more heavily intruded areas. The aim of the survey was to determine these more heavily intruded areas with a grid pattern survey of 16 lines, totalling 3,600m.

The data was modelled using the Geosoft Australia Pty Ltd Oasis Montaj software.
resistive/conductive variation in the subsurface. However, interpretation of geological features have been made based on the surface impedance anomalies and previously known geological information.

CONCLUSIONS

The zones of low apparent resistivity identified by the TSIM survey are bound by areas of high apparent resistivity. These indicate intrusion within the coal seams.

Feature 1 is a linear anomaly striking north-east south-west, and is likely to be the result of faulting.

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REFERENCES

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