

RINGKASAN

Sehubungan dengan adanya program Pemerintah Kabupaten Kulon Progo, DI Yogyakarta untuk mengembangkan *Geoheritage* yaitu pariwisata tambang yang salah satunya berada pada bekas tambang mangan di Desa Hargorejo, Kecamatan Kokap, maka perlu ditinjau kembali mengenai kekuatan massa batuan disekitarnya. Bekas tambang mangan tersebut rencananya akan direkonstruksi ulang dan dijadikan objek pariwisata yang menarik. Oleh karena itu, diperlukan studi klasifikasi massa batuan untuk menentukan sistem pemberaian yang tepat pada penambangan mangan di masa kini.

Pengujian di laboratorium yang dilakukan antara lain pengujian sifat fisik, sifat mekanik, *brittleness test*, *drill test*, dan *abrassion test*. Data yang diperoleh dari hasil pengujian tersebut dikorelasikan dan dikaji untuk mengetahui sistem pemberaian yang tepat berdasarkan Grafik Kemampugalian (Pettifer dan Fookes, 1994), *Excavatability Index* (Kirsten, 1982), dan hubungan antara klasifikasi massa batuan dengan kemampugarian (Singh dkk,1987). Metode penerowongan yang digunakan berdasarkan nilai *Rock Mass Rating* (RMR). Nilai RMR untuk kondisi masing-masing kondisi pelapukan yaitu, RMR batuan segar = 54 (kelas batuan sedang), RMR batuan semi lapuk = 44 (kelas batuan sedang) dan RMR batuan lapuk = 35 (kelas batuan buruk. Berdasarkan nilai RMR, metode penerowongan yang sesuai adalah *partial face method*. Kemajuan penggalian pada kondisi batuan segar dan semi lapuk sebesar 1,5-3 m, sedangkan kemajuan penggalian pada kondisi batuan lapuk sebesar 1-1,5 m dengan penyanggaan tiap 10 m kemajuan penggalian.

Berdasarkan analisis kemampugalian, batuan mangan pada masing-masing kondisi pelapukan tergolong *easy ripping* – *very hard ripping* sehingga masih dapat dilakukan penggalian. Alat gali yang direkomendasikan yaitu alat tradisional (palu, linggis, sekop), serta alat mekanis, yaitu *roadheader*. *Roadheader* yang disarankan adalah *roadheader light duty machines* dengan kemampugalian < 80 MPa dan berat alat mencapai 8-40 ton. Berdasarkan nilai UCS 1,8-17,21 MPa, alat *cutting* yang dapat digunakan yaitu *wedge tooth*, *drag*, *chisel*, *radial picks* dan *forward attack picks* dengan sistem *ripping*.

ABSTRACT

The Government of Kulon Progo, Yogyakarta has a program to develop Geoheritage tourism, which is located in the former Kliripan manganese mine in Hargorejo Village, Kokap. It needs further research about the rock mass strength surrounding former Kliripan manganese mine. Former manganese mine is planned to be reconstructed and turned into an attractive tourism objects. Therefore, research are necessary to determine the rock mass classification excavation system right on manganese mine in the present.

Laboratory tests undertaken including physical properties, mechanical properties, brittleness test, drill test, and abrasion test for intact rock. Data obtained from these test results correlated and examined to determine the excavation system based on Excavatability graph (Pettifer and Fookes, 1994), Excavatability Index (Kirsten, 1982), and the relationship between rock mass classification with excavatability (Singh et al, 1987). Based on the excavatability analysis, manganese rocks at each weathering conditions relatively easy ripping to very hard ripping so it is possible to excavate using mechanical excavation.

Tunneling method used is based on the value of Rock Mass Rating (RMR). The value of RMR for each weathering condition i.e., RMR for fresh rock = 54 (fair rock), RMR for semi weathered rock = 44 (fair rock) and RMR for weathered rock = 35 (poor rock). Based on the value of RMR, the most suitable tunneling method is partial face method. The advance for fresh rock and semi weathered rock are about 1.5-3 m. It needs to immediately support after excavating process completed 10 m from face. The advance for weathered rock is about 1-1.5 m. In excavating weathered rock, it is needed to install supports during excavation 10 m from face.

There are two type of excavating methods for partial face method which are conventional method (such as hand method) and mechanical method. Mechanical excavators recommended is roadheader. It is recommended to use light duty roadheader machines for rock condition UCS below 80 MPa and range of weight about 8-40 tons. Based on UCS 1.8 up to 17.21 MPa, cutting tool that can be used are wedge tooth, drag, chisel, radial picks and forward attack picks with ripping-type cutting system.