COAL STRENGTH EVALUATION FROM BOREHOLES

EVALUATION DE LA RESISTANCE DU CHARBON BASE SUR L’ECHANTILLONNAGE DES TROUS DE FORAGE D’EXPLORATION

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Summary

The exploration boring of the coal fields in Western Canada suggest the possibility of evaluating in-seam coal strength by:
- Logging of coal core.
- Geophysical borehole logging.
- Phenomenological observations of boreholes.

Four categories of coal strength and the associated mechanical stability were proposed. There are:
- Excessive strength, sudden and violent deformations.
- Moderate strength, stable yielding deformations.
- Low strength, unstable fracturing.
- Very low or no strength, coal extrusion.

The categories of coal could be determined by criteria based on proposed indices.

1. Introduction

The syngenetic and epigenetic mechanism of sedimentation and structural deformation of coal seams resulted in various types of coal strength and associated mechanical stability conditions. This has been confirmed during diamond exploration drilling (fig. 1) which has been carried out in order to estimate the resource potential of various coal fields in Western Canada (Jeremic, 1981).

Under this circumstance, the utilization of the exploration boring has been extended from the estimation of coal reserves to the determination of its strength and behaviour under superimposed stress conditions.

2. Coal samples from boreholes

It is common knowledge that there is a direct relationship between structural defects of recovered core samples and rock strength. The exploration diamond drilling in Western Canada suggests that present geotechnical indices for the determination of the rock strength from core samples is not adequate and in many cases it is irrelevant for coal strength estimation (Jeremic 1980/2).

For this reason, studies were limited to more convenient criteria for the evaluation of coal strength based on the relationship between coal drillability (mechanical cuttibility), core recovery, core fragmentation and coal lithology. To back up in situ investigations, the coal strength and behaviour have been studied by laboratory testing of core samples (table 1).

After compilation of laboratory testing the geotechnical indices have been finalized for the evaluation of coal strength by four principal categories. The main goal of coal strength categorization is simplicity with a possibility of in situ determination during exploration boring. The distinguishable differences between individual coal strength categories have been also demonstrated during geophysical logging and phenomenological investigations as further discussed below.

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Fig. 1: Rig for diamond drilling (Mount Head coal basin, W. Canada).

Fig. 2: Hard coal recovered in the core cylinder.

Fig. 3: Semi-hard coal recovered in discs and split cylinders.

Fig. 4: Soft coal recovered as fragmented coal.

Fig. 5: Very soft coal recovered from the sludge of boring fluid.