

Mining research at Potash Company of America in New Brunswick

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Approximately 2 Mt of potash and 0.5 Mt of rock salt are currently being mined by Potash Company of America (PCA) from a Windsor Group evaporite structure north-east of Sussex, New Brunswick. Local diapirism and large scale recumbent folding of the north-east trending evaporites, together with variously scaled halokenetic features within the structure, have combined to produce an extremely complex potash ore body. A cut-and-fill mining method, using road header continuous miners, was designed to contend with rapid variations in ore width, azimuth and dip, and to maximize extraction from a deposit which is small relative to those in other potash districts.

A number of geotechnical research projects, partially funded by government agencies, have been designed to provide practical benefit to the mining operation. To aid in an understanding of the geomechanical aspects of the evaporite members being mined, a two year rock mechanics research programme has just been completed. This project, which included instrumentation, laboratory testing and computer simulation, provided input for rational mine layout and pillar design. Such data are critically important in mine design which must maintain the integrity of the pillars to preclude the possibility of hydraulic connection with the surrounding water bearing clastic sediments.

Failure horizons often related to thin clay seams above the ore zone together with shear surfaces within the ore are associated with local hanging wall instability. The need to understand and control such deformation, particularly in areas of flat (<30%)

ore has led to a research project to study the effectiveness of salt tailings as hanging wall support. The placement of tailings in potash stopes is an integral part of the cut-and-fill mining sequence but the support pressure which they provide to the evaporite back and overlying clastics is not known. This project, partially funded by New Brunswick Department of Commerce and Technology, will answer these questions and lead to improved placement techniques. In a related project, instrumentation is being developed along with CANMET to allow acquisition of high quality consolidation data from tailings within the stopes.

Also, as mining is taking place under the Trans Canada Highway and its associated strip development, an ongoing programme of surface subsidence monitoring is being conducted in association with the Survey Engineering Department of University of New Brunswick. This study involves the use of a network of high quality survey monuments, photogrammetry and GPS. Finite element models are being developed concurrently to provide quantitative subsidence prediction.

The high development cost of a typical potash mine, currently close to \$500 million, and the relatively low value of the ore necessitate maximum utilization of a limited reserve. Research projects such as these, which further the understanding of evaporite geomechanics, have become an essential part of efficient resource exploitation.