Solution Cavern Placement of Solvay Process Solids - Development and Implementation of Cavern Placement Technology

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Abstract

General Chemical Canada Ltd. (GCCL), produces soda ash and calcium chloride at a chemical plant in Amherstburg, Ontario. As an alternative to surface waste beds, GCCL has been evaluating the feasibility of solution cavern placement of the inert solids generated through the Solvay process. Initial studies have concluded that geological conditions at the proposed site and material properties are favourable, and long-term environmental security is attainable. A recent three dimensional (3-D) seismic survey of the cavern field has allowed cavern positioning and volumes to be obtained, thus providing a bases for suitable placement locations. GCCL recognizes the environmental and economic benefits of solution cavern placement clearly out-weigh potentially problematic surface waste beds which currently consume hundreds of acres of high quality farmland. To this end, GCCL has initiated a multi-disciplinary engineering study in their efforts to obtain licensing from the Ontario Ministry of Environment and Energy.

Subterranean Waste Management Concepts (SWMC) and Maurice B. Dusseault Consulting Ltd. have been researching salt solution cavern and mine disposal for over 10 years. SWMC has been retained to delineate the engineering and operation aspects of solution cavern placement to obtain government approvals. Site specific studies include:

1. The time-dependent (creep) properties of the bedded salt;
2. The mechanical properties of the Solvay process solids;
3. The behaviour of a cavern filled with inert solids;
4. A mass-volume-time software program to control solids placement;
5. The geochemical properties of GCCL brines and Solvay process solids;
6. The flow behaviour of a slurry through a partially rubble filled cavern; and,
7. A detailed placement strategy for the operation, monitoring, and decommissioning.

The paper will provide an overview of the proposed placement strategy, GCCL operational requirements, and some quantitative results on a series of laboratory and physical simulations.