MODELING ASPECTS OF TAILINGS DISPOSAL FACILITY DESIGN – PREDICTION OF
STORAGE CAPACITY

Presented By:

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Description:

The short course presents the current state of practice for sedimentation, consolidation and desiccation analyses with an emphasis on predicting tailings settlements, an essential component for the successful Tailings Disposal Facility (TDF) design. The theoretical framework for the analyses will be covered at a basic level including conventional consolidation approach, as well as the more advanced concepts based on material coordinates in order to provide practitioners with tools to perform different types of settlement analyses. The course will cover both the experimental and analytical procedures used for testing of tailings materials in order to obtain relevant material characteristics for numerical modeling. Participants will be provided with simple spreadsheet based algorithms to solve typical consolidation problems encountered in tailings disposal and closure operations. In addition, participants will be provided with the beta version of a more advanced software for solving one-dimensional and three-dimensional consolidation problems.

Agenda:

The intent of the course is to provide participants with a working knowledge on how to collect necessary data for storage capacity calculation, how to select representative samples for testing and how to analyze and interpret results of the analyses. The participants will be given “hands-on” introduction in using advanced consolidation models, though additional training might be needed to perform the analyses independently.

Schedule:
8:30-9:00 Introduction, parameters required for TDF design and operation (van Zyl, Znidarcic)

9:00-10:00 Theoretical background, Terzaghi and Gibson consolidation models (Znidarcic)

10:00-11:00 Simplified solutions to predict tailings settlements. Foundation displacements and effects to tailings dam stability. Design practices to minimize pore pressure generation and simplified tailings settlement estimates during operation and post-closure. (van Zyl, Znidarcic, Gjerapic)
11:00-12:00 Testing methods for obtaining consolidation properties for tailings, experimental procedures and parameter selection (Znidarcic, Gjerapic)

1:30-3:00 Simple spreadsheet based consolidation calculations and introduction of a comprehensive numerical consolidation model. Examples of actual projects (Znidarcic, Gjerapic)

3:00 – 4:00 Large-strain consolidation model, “hands-on” example demonstration (Znidarcic).

4:00-5:00 Further analysis of tailing consolidation behavior in situ, example problems with an opportunity for individual practice, disposal strategies and further developments (Znidarcic, Gjerapic, van Zyl)

Presenters

**Dr. Dirk van Zyl** is the Professor and Chair of Mining and the Environment, Norman B. Keevil Institute of Mining Engineering, University of British Columbia, Vancouver, Canada.

Qualifications:
B.Sc., Civil Engineering, 1972, University of Pretoria, South Africa
B.Sc. (Honours), Civil Engineering, 1974, University of Pretoria, South Africa
M.S., Civil Engineering, 1976, Purdue University
Ph.D., 1979, Purdue University
Executive Master of Business Administration, 1998, University of Colorado

Areas of expertise: Life cycle systems; the contributions that mining makes to sustainable development; Mine earth structures (tailings, heap leach and rock management facilities)

Project experience: He has been involved internationally in many mining projects focusing on mine earth materials. These projects covered the whole mining life cycle, from exploration to closure and post-closure, in a large range of climatic and geographic environments. His present research is in the area of oil sand tailings, the contributions that mining makes to sustainable development as well as the application of life cycle assessment to mine earth structures.

**Dr. Dobroslav Znidarcic** is a Professor, University of Colorado Boulder, Colorado.

Qualifications:
B.Sc., Civil Engineering, 1972, University of Zagreb, Croatia
M.S., Civil Engineering, 1978, University of Zagreb, Croatia
Ph.D., 1982, University of Colorado, Boulder

Areas of expertise: Flow processes in soils, seepage, soil consolidation, unsaturated soils, slope stability, laboratory testing, numerical modelling, centrifuge modelling of soil mechanics problems.
Project experience: He has been involved internationally in many mining projects focusing on consolidation and desiccation of mine tailings. These projects covered both material testing and storage capacity predictions including post deposition and closure settlement predictions. His present research is in the area of oil sand tailings, dredged spoils disposal and consolidation of materials in geotubes.

Dr. Gordan Gjerapic is a Senior Engineer, Golder Associates Inc., Lakewood, Colorado, USA.

Qualifications:
B.Sc., M.Eng. Civil/Structural Engineering, 1996, University of Zagreb, Croatia
M.S., Geotechnical Engineering, 1998, University of Colorado, Boulder, Colorado, USA
Ph.D., 2001, University of Colorado, Boulder, Colorado, USA

Areas of expertise: geotechnical and environmental aspects of mining projects involving foundation and embankment stability, water balance designs with an emphasis in consolidation, and unsaturated flow modelling. Regularly involved in the reclamation and design of mining facilities (heap leach, waste rock piles, tailings impoundments, underground openings). He specializes in testing and modelling of geotechnical materials subjected to large strain consolidation.