Short Course Summary

Title

Building Dynamic, Probabilistic Simulation Models for Mine Water and Waste Management Using GoldSim

Goals and Description of the Course

The primary goal of this Course is to **provide an introduction to the use of probabilistic, dynamic simulation for mine water and waste management.** By necessity, in order to be "hands-on", the Course will focus on the use of a specific tool (GoldSim), but will cover many topics required to carry out such analyses using any similar tool. Although the Course is primarily designed for those who are new to probabilistic simulation, more experienced modelers (including existing GoldSim users) are also likely to find the Course to be of value. Although this approach can be applied to both water and material balance and water quality modeling, given the time constraints, the Course will focus on water and material balance modeling.

GoldSim is perhaps the most widely used tool (the most widely used alternative being spreadsheets) for building water balance (and water quality) models for mines. It has been used at hundreds of mine sites worldwide by the world's largest mining companies, as well as by nearly 100 consulting firms that support the industry.

The specific objectives of the Course are as follows:

- To provide an overview of the kinds of mine water and waste management problems that can be addressed using dynamic, probabilistic simulation.
- To explain the fundamental concepts associated with dynamic, probabilistic simulation, including a detailed explanation of how simulation tools carry out their calculations. This is critical; as a general rule, you should not use "black boxes" to build models. If you don't understand how a tool works, you should not use it.
- To teach the basic concepts required to allow attendees to actually build some simple water balance models during the Course (using GoldSim).
- To discuss some of the most critical issues that need to be properly addressed when building realistic mine water and waste management models (e.g., representing stochastic rainfall and runoff, representing time-variable stage-storage curves associated with tailings facilities, representing control logic used for pumping).

This Course is primarily intended for engineers who are actually responsible for building water management models for a mine. However, the Course will be structured so that it will be of value to others who do not need to actually build the models, but need to understand how to use them.

Tentative Agenda

Morning

- Brief Overview of GoldSim applications – *provides a quick overview of the kinds of things you can do with GoldSim*

- GoldSim Quick Tour –*building a number of quick models to illustrate basic concepts that we will focus on the rest of the day*
- Introduction to GoldSim user interface
- Using basic GoldSim elements – *fundamental to all models*
- Running dynamic simulations – *basic concepts for how GoldSim time steps and represents complex dynamic systems; without fundamental understanding of this, you cannot build complex models*
- Modeling material flows – *fundamental to all water and material balance models*
- Displaying and manipulating results – *including exporting to spreadsheets*

Afternoon

- Creating hierarchical models – *required to build complex models*
- Modeling feedback loops and recirculating systems – *critical for all water balances and plant operations models*
- Modeling response surfaces using Lookup Tables – *powerful way to represent complex relationships and/or external modeling results*
- Simulating discrete events - *used to simulate rule-based triggers (e.g., on/off switches), system failures, upsets, etc.; critical to realistically simulating plant operations*
- Representing calendar-based data
- Entering time series into GoldSim – *including importing from spreadsheets*
- Basic probabilistic simulation concepts – *focusing on representing stochastic processes (e.g., rainfall, equipment failure, variability in input streams, variability in chemical concentrations, etc.)*
- Discussion and Questions

There will be mid-morning and mid-afternoon coffee breaks, and lunch will be provided.

Software/Hardware Requirements

Each attendee should have their own laptop with the GoldSim software installed.

GoldSim Technology Group will provide free, fully-functional 60-day licenses to all attendees that can be used during the Course (and afterward). Note also that GoldSim provides free (longer term) Academic licenses to students and instructors.

Note: To save time, GoldSim should be installed and activated on attendee's computers prior to the Course. We will provide instructions to all attendees prior to the Course.

Instructors

Rick Kossik

Rick Kossik is the President and co-founder of the GoldSim Technology Group. He has a wide variety of experience in the fields of probabilistic risk analysis, simulation and decision analysis, and has spent most of his career developing and applying probabilistic simulation techniques to complex systems. He is

one of the original co-developers of GoldSim, and has applied the software to evaluate complex engineering and business applications worldwide, including the evaluation and design of options to support the closure of hazardous waste disposal facilities, evaluation of management alternatives at mine sites, and long-term strategic planning for large manufacturing companies. He has also delivered over a hundred workshops and seminars describing simulation techniques and the use of the GoldSim software tool in North America, Europe, Australia and Asia.

Rick received his BS in Atmospheric and Oceanic Science from the University of Michigan in 1984 and his MS in Civil Engineering (focusing on water resources and hydrodynamics) from MIT in 1986.

Jason Lillywhite

Jason Lillywhite is a senior water resources specialist at GoldSim Technology Group, and has been with the company for 8 years. Prior to working at GoldSim, Jason spent 10 years working for CH2M HILL as a water resources modeler, much of that time using GoldSim. He is experienced in water resources modeling applications including water supply and demand simulation and forecasting, reservoir operations, water rights allocation, pump station operations, pipe hydraulics, unsteady open channel flow modeling, dam break analysis, and other applications related to storm water, rainfall runoff, pipe networks, and water reuse analysis.

Jason received his BS in Civil and Environmental engineering from Brigham Young University in 2000 and his MS in Civil and Environmental engineering with a water resources focus from University of Utah in 2008.