Antti Roine, Tuukka Kotiranta, Matti Hietala,
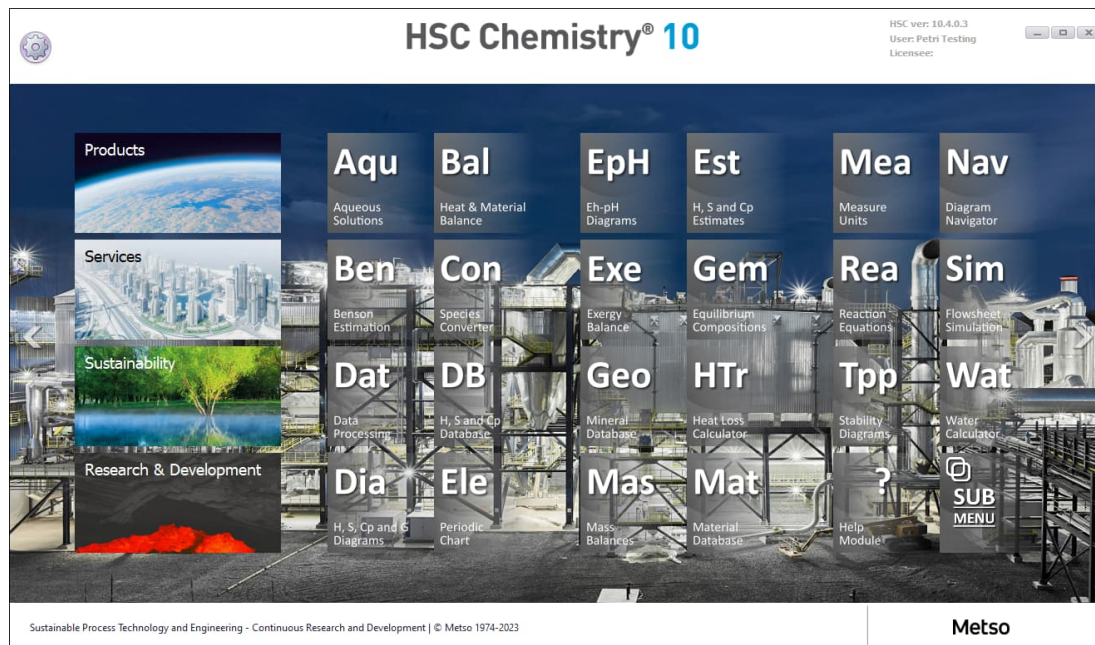Antti Remes, Petri Kobylin, Anna Kiraly

HSC Chemistry Training

HSC is quite easy to use. The HSC installation package contains separate manuals and calculation examples for all calculation modules and databases. In addition, free tutorials are available at Metso's YouTube channel. However, it is not easy to get a good overall picture of this extensive material package with all its application possibilities and the most typical calculation procedures. The HSC Chemistry training courses will help you to get more out of your HSC software.

1. Outline

Public HSC Chemistry courses are arranged once in a year in Finland. The next available dates can be checked from the HSC Chemistry Webshop. In addition to the public courses, we offer private on-site or online courses for the customers. These allow spending more on time on the issues that are important for the customer. The course contents are modified from the public courses according to the customer requirements.

Onsite training day consists of 8 working hours (with necessary breaks in between, see the daily schedule Table) with the lecturer.

Online training day consist of two 2-hour MS Teams session per day, with break between the sessions. It is assumed that participants will do exercises independently between and after the sessions.

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Outline

Course 1 – duration 2-5 days	Duration
HSC Basic + Sim Basic	1 day
Select also 1-4 workshops	
HSC Sim Pyro workshop	**2 days**
HSC Sim Hydro workshop	**2 days**
HSC Sim Dynamic workshop	1 day
HSC Sim Customer case workshop	1 day
Course 2 – duration 2-4 days	Duration
HSC Sim Mineral Processing	**2 days**
You can also select advanced option or workshop	
HSC Mineral Processing Advanced	1 day
HSC Sim Customer case workshop	1 day

Daily schedule outline

Time	Topic
8:30	Registration starts
9:00-10:30	Course starts
10:30-10:45	Coffee break
10:45-12:00	Course continues
12:00-13:00	Lunch break
13:00-15:00	Course continues
15:00-15:15	Coffee break
15:15-17:00	Course continues
17:00	Course ends

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September 8, 2023

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2. Pre-requisites for the participants

- For onsite courses customer takes care of the meeting room booking and corresponding costs. A good data projector with minimum resolution of WUXGA, 1920 x 1200 pix is required with proper on-screen.
- For online courses MS Teams should work on the participants laptops.
- The official language of the courses is English.
- All participants must bring their own laptops with Windows 7, 8, 10 or 11 (64 bit).
- A fast laptop with at least 8 GB memory and at least 10 GB free hard disk space is needed.
- External mouse is recommended for flowsheet drawing.
- The latest HSC version will be installed on the laptops and temporary user licenses are available for the participants. **NOTE: Participants must have full administrative rights for their computers to allow HSC installation**.
- Participants can test calculation examples on their PC, ask questions at any time, or just follow the presentations.

3. Pricing and quotations

The price includes training with lecturer(s), training exercises and workbooks in electronic form, and 30 days course license for the participants. The latest course prices can be checked form the [HSC Chemistry web shop](#).

In case you want to have training, please contact us (hsc@metso.com) **2 – 3 months** before the possible course date and specify:
1) Onsite or online course
2) Course modules to be included
3) Contact person, name, and email
4) Company details
5) Street address of the venue in case of onsite training

We will then provide you with an official quotation. After receiving the quotation, please provide us the official purchase order with signature **at least 1 month before** the course dates.

4. Different course modules

4.1. HSC Basic and Equilibrium
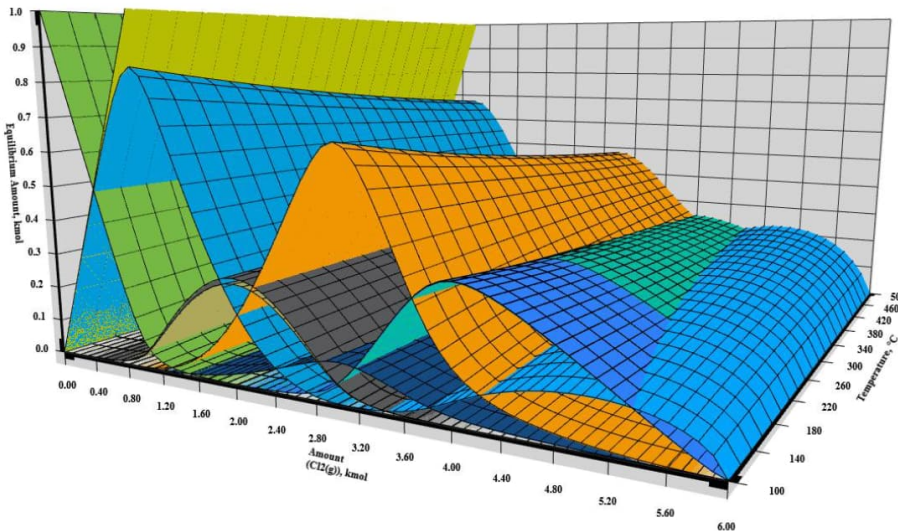
HSC Basic course focuses on general information, which is needed to specify a practical problem in the 23 calculation modules, run the calculations, and analyze the results. Participants will learn what can be done with the HSC package and some ideas on what cannot be done. These skills are also needed in the more advanced HSC Sim Hydro, Sim Pyro, and Sim Mineral Processing courses.

Most HSC users utilize perhaps only 1-2 of the HSC calculation modules. This course will help users to understand the capabilities of all 23 calculation modules and 12 databases. This course also provides an understanding of the potential applications of HSC.

The target of the Basic HSC Course is to teach the participants what can be done with the HSC package and what cannot be done. The course will focus on the most common questions and problems raised by HSC users over the last few years.

This course gives an overview of the basic HSC operation principles and the major procedures needed to solve more complicated problems with the HSC software. The course will also illustrate thermochemistry application possibilities in practical problems.

HSC Basic contents:
- General information required in most of the HSC modules
- Basic concept, HSC internal structure, user interface issues, etc.
- Some basic principles of thermochemistry related to HSC
- Internal structure of the HSC databases, chemical formula syntax, etc.
- Specification of phases and species, etc.
- Demonstration of the HSC calculation modules with workshop examples

HSC Equilibrium contents:
- Equilibrium calculations with HSC Gem module
- Exercise examples
- Excel Add-in functions
- Thermodynamics

4.2. HSC Sim Basic
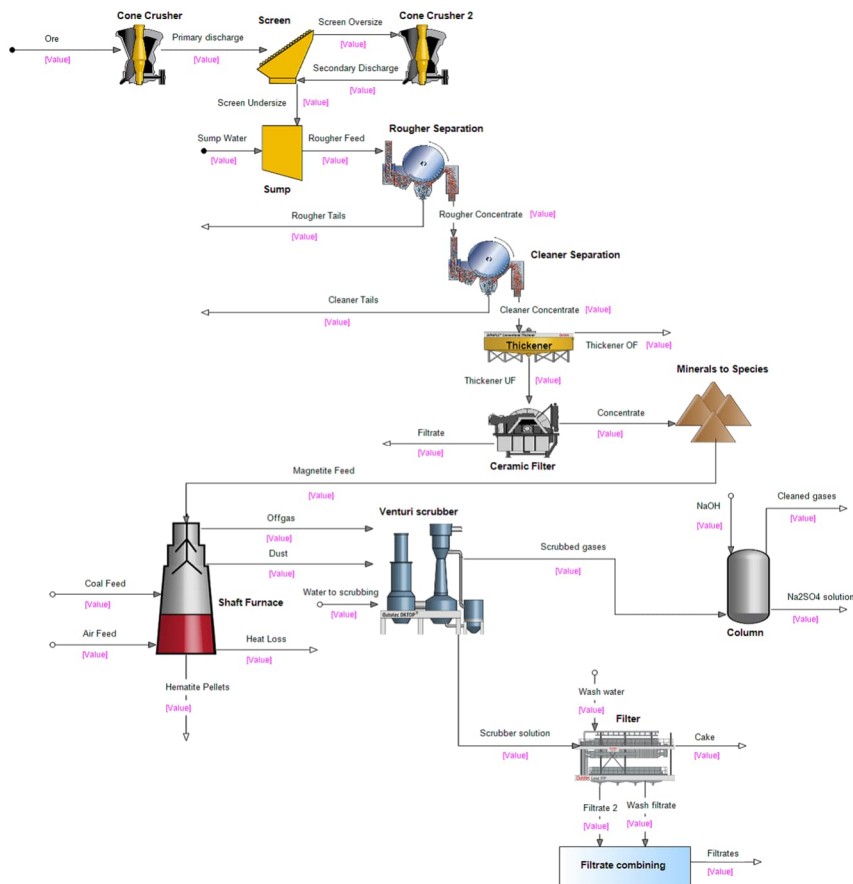
This course gives an overview of the basic HSC operation principles and the major procedures needed to solve more complicated problems with the HSC software. The course will also illustrate thermochemistry application possibilities in practical problems.

The Basic Course is intended for beginners and intermediate users of HSC. Earlier use of HSC Sim is not required. However, even more advanced users may find it useful because they will have the opportunity to raise questions concerning more difficult issues. The recommended duration of the course is 1 day.

Contents:
- Introduction to modelling with HSC Sim
    - Static flowsheet calculations
    - Dynamic flowsheet calculations
    - Elemental distribution unit operation model
    - Reaction unit operation model
    - Multiple specific unit operation models for handling particles
    - Different types of controls to set the model convergence
    - Calculating difference scenarios
    - Utilizing HSC Neural Networks with the flowsheet calculations
- Example exercises
    - Shaft Furnace
    - Gas Cleaning
    - Magnetite Concentration
- Combining models together in the same flowsheet

4.3. HSC Sim Pyro Static
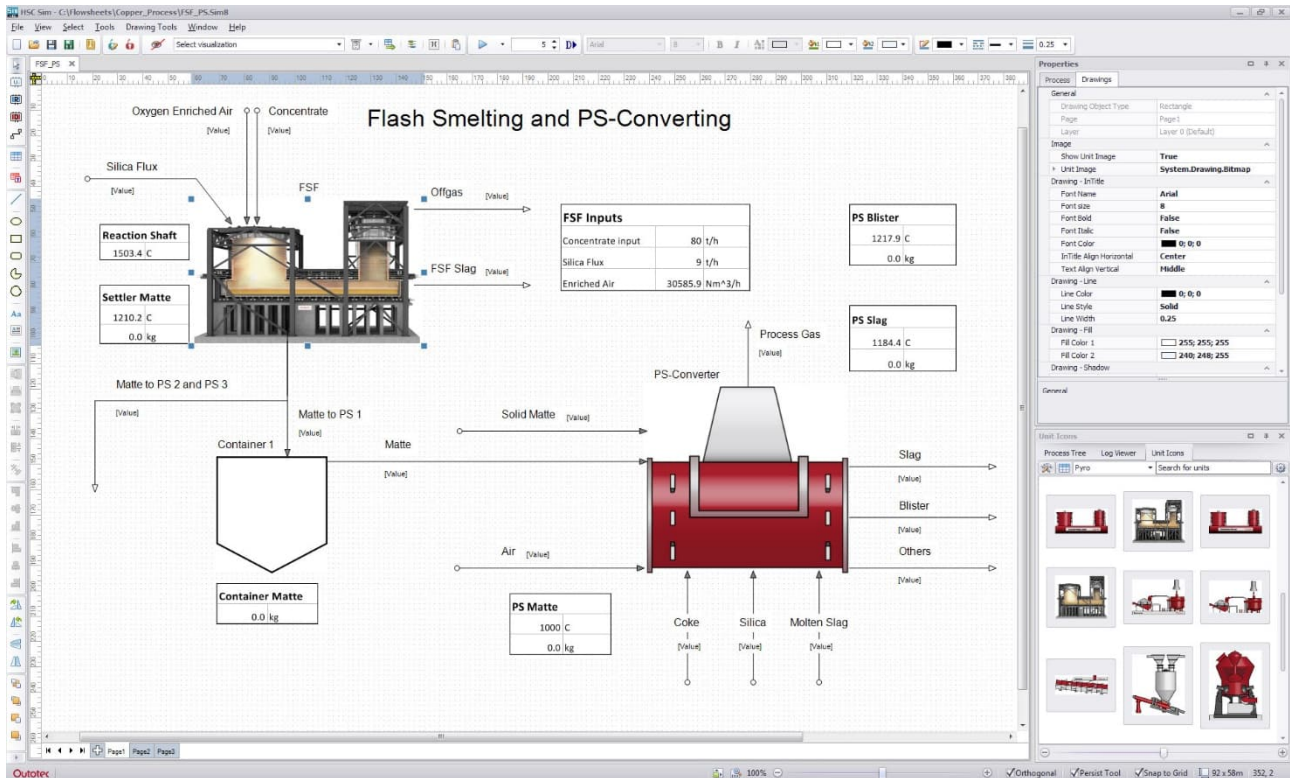
This course focuses on HSC Sim distribution mode applications. Typically, these are used to simulate pyrometallurgical processes, but they may also be applied in many other areas.

The course covers a general introduction to the Sim Flowsheet module with several demonstrations and provides an understanding of the potential applications of the Sim Distribution mode. The target of this course is to acquire the versatile skills to use and create Sim Distribution mode applications and analyse the results.

The course is suitable for metallurgists, researchers and process engineers who understand the basics of pyrometallurgy. Earlier use of HSC Sim is not required. The recommended duration of the course is 2 days.

Contents:
- Introduction to making Sim Pyro unit operations
    - Making the unit
    - Defining input and output
    - Defining the unit operation
    - Defining a control
- Example exercises
    - Gold Distribution
    - Simple burner
    - Mixed Wizard
    - Post-Combustion
    - CO Burner
    - Copper Rotary Furnace
    - Iron Process
    - Imported Units (Gradual Oxidation)
    - Slag Leaching (extra)

4.4. HSC Sim Pyro Dynamic
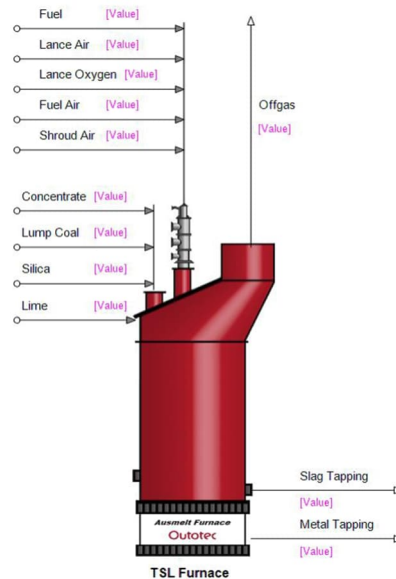
This course focuses on HSC Sim distribution mode applications in the dynamic mode.

During this training session the user will become more familiar with the HSC Sim Dynamic Unit for species that is commonly used for modelling smelting operations. Although this training document is not comprehensive in all the features that the Dynamic units offer, it attempts to showcase the significant functions and differences as compared to the HSC Static units so a passing familiarity with the use of HSC Sim with those units would be useful.

The course is suitable for metallurgists, researchers and process engineers who understand the basics of pyrometallurgy. Earlier use of HSC Sim is recommended. The recommended duration of the course is 1 day.

Contents:
- Introduction to making dynamic simulations
- Dynamic dialog
- Dynamic unit for working species models
- TSL Lead Smelting – Multi-Stage Batch Simulation exercise example

4.5. HSC Sim Hydro
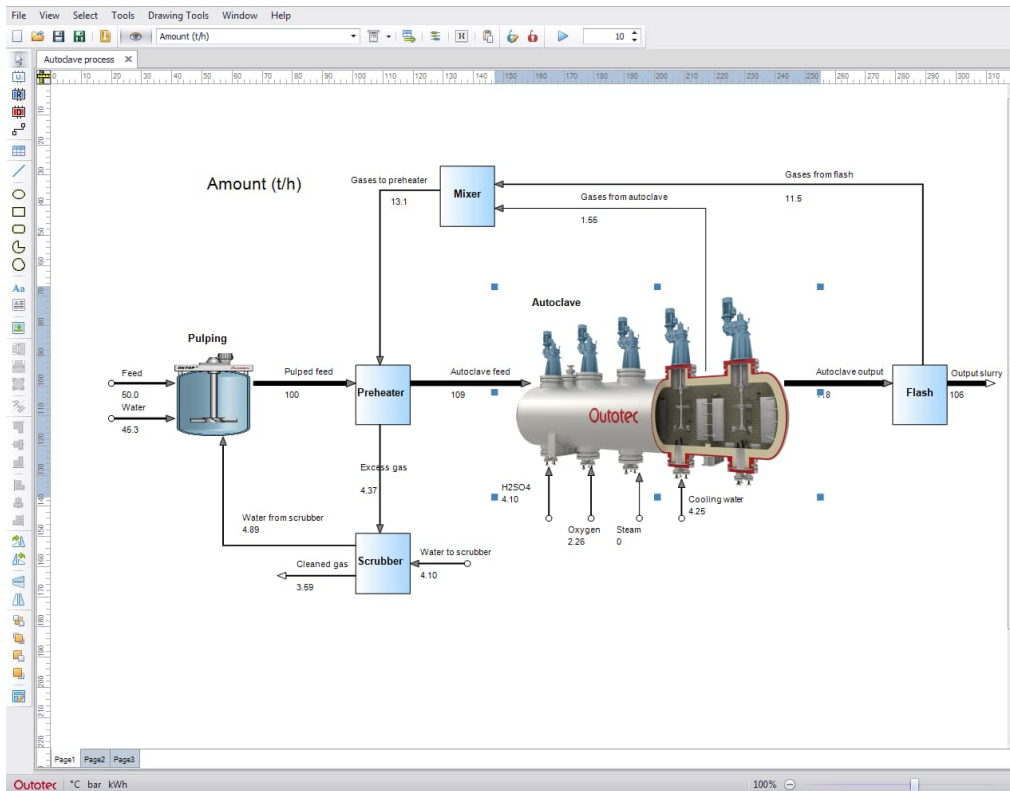
This course focuses on HSC Sim reaction mode applications. Typically, these are used to simulate hydrometallurgical processes, but they may also be applied in many other areas.

The course covers a general introduction to the Sim Flowsheet module with several demonstrations and provides an understanding of the potential applications of the Sim Reactions mode. The target of this course is to acquire the versatile skills to use and create Sim Reactions mode applications and analyse the results.

The course is suitable for metallurgists, researchers and process engineers who understand the basics of hydrometallurgy. Earlier use of HSC Sim is not required. The recommended duration of the course is 2 days.

Contents:
- Introduction to making Sim Hydro unit operations
  - Example definition: Leaching example
  - Drawing units and streams
  - Unit type selection and variable list
  - Unit model
  - Feed streams (Input sheet)
  - Controls (Controls sheet)
  - Running the model – results
- Example exercises
  - External control
  - Energy balance
  - Gypsum precipitation
  - Copper solvent extraction
  - Autoclave
    - Scenario editor
    - Creating stream tables
- Adding new compounds to HSC Database
- Using equilibrium calculation in Hydro models

4.6. HSC Sim Mineral Processing Basic
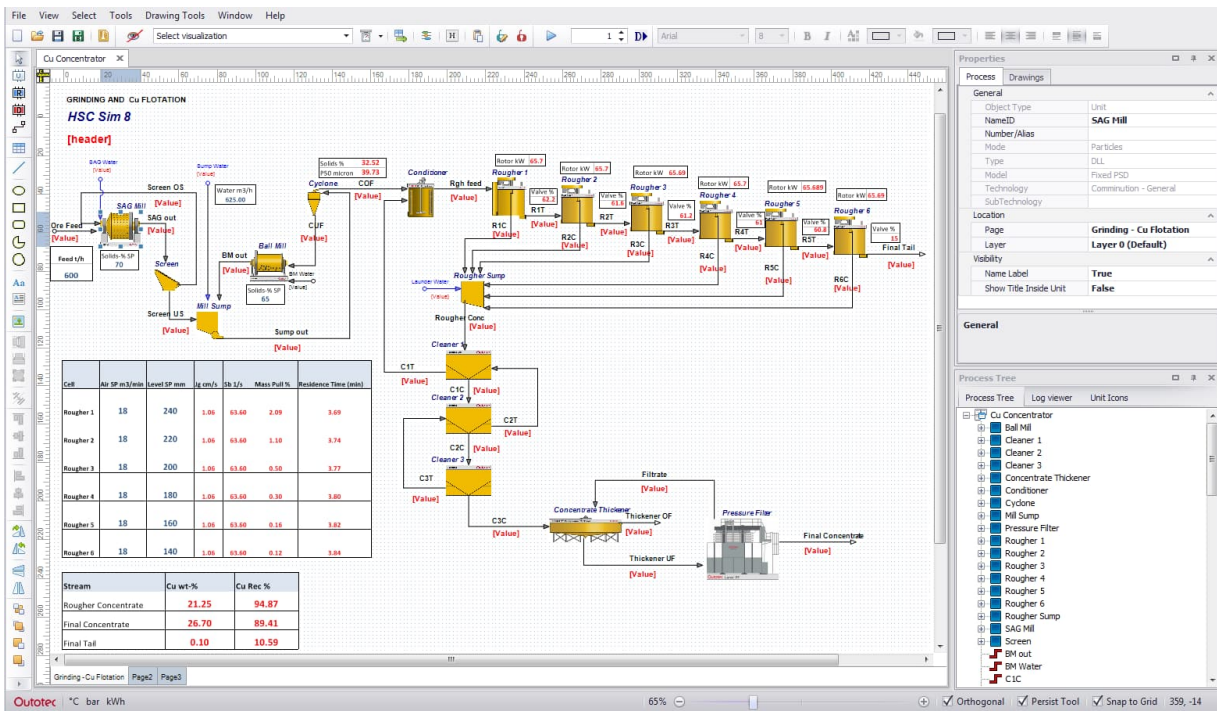
The course focuses on HSC Sim Particles mode applications. Typically, these are used in minerals processing simulations, but they may also be applied in many other areas, e.g. recycling.

This course gives an overview of the basic HSC Sim operating principles and the major procedures required to solve more complicated problems. The course will also illustrate the potential applications of HSC Sim mineral processing by means of practical problems. The target of this course is to acquire the versatile skills to use and create Sim Particles mode applications for minerals processing and analyse the results.

The course is suitable for metallurgists, researchers and process engineers who understand the basics of minerals processing. Earlier use of HSC Sim is not required. The recommended duration of the course is 2 days.

Contents:
- Working with ready-made simulation
    - Basic usage of HSC Sim 10 and understand what can be done with HSC Sim
    - Cell references, running scenarios
- Creating a simulation model – flotation flowsheet balance
    - Drawing of a flowsheet with HSC Sim
    - Defining the feed stream: stream setup
    - Setting controls
    - Using unit models & simulating
- Kinetic flotation circuit model
    - Introduction to kinetic flotation modelling
- Comminution circuit with size classes
    - Feed composition with size fractions
    - Element to mineral conversion
- Grinding – flotation – dewatering
    - Element to mineral conversion
    - Water balance
- Flotation circuit design and scale-up
    - Plant design: scale-up of laboratory tests and selecting flotation cells

4.7. HSC Sim Mineral Processing Advanced
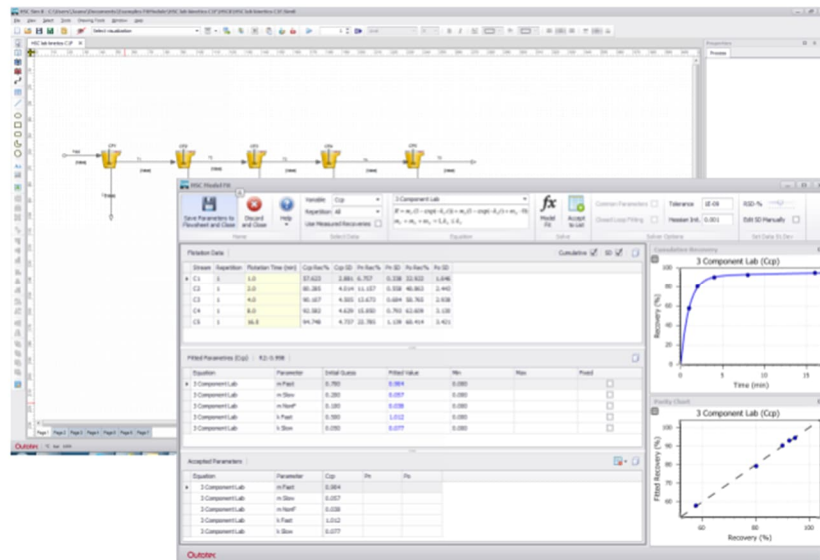
The Advanced Course for Mineral Processing studies HSC Sim Particle mode application more deeply covering data reconciliation with HSC Mass Balance and model fitting of flotation data with HSC Sim Model Fit.

The Advanced Sim Course gives knowledge of processing experimental data with HSC modules, and more detailed information of the Sim Flowsheet module's advanced tools. The course is suitable for metallurgists, researchers and process engineers who understand the basics of minerals processing.

Earlier use of HSC Sim is recommended. The recommended duration of the course is 1 day, depending on required scope and if some own mass balancing, model fitting and simulation model cases are to be covered.

Contents:
- Mass balancing
    - Basic concepts of data reconciliation with HSC Mass Balance
    - Balancing of laboratory assays
    - Mineral based balancing: flotation kinetic test data
    - Sized balances
    - Plant wide balance: Au concentrator case
- Flotation kinetic modelling
    - Rougher flotation
    - Sequential selective flotation
    - Open loop cleaner repetitions
    - 1st cleaner kinetic test
    - Closed loop cleaner repetitions (locked cycle)
- Process plant sampling
- Advanced simulation
- Creating dynamic HSC Sim simulation models (optional)

4.8. Customer Case Workshop