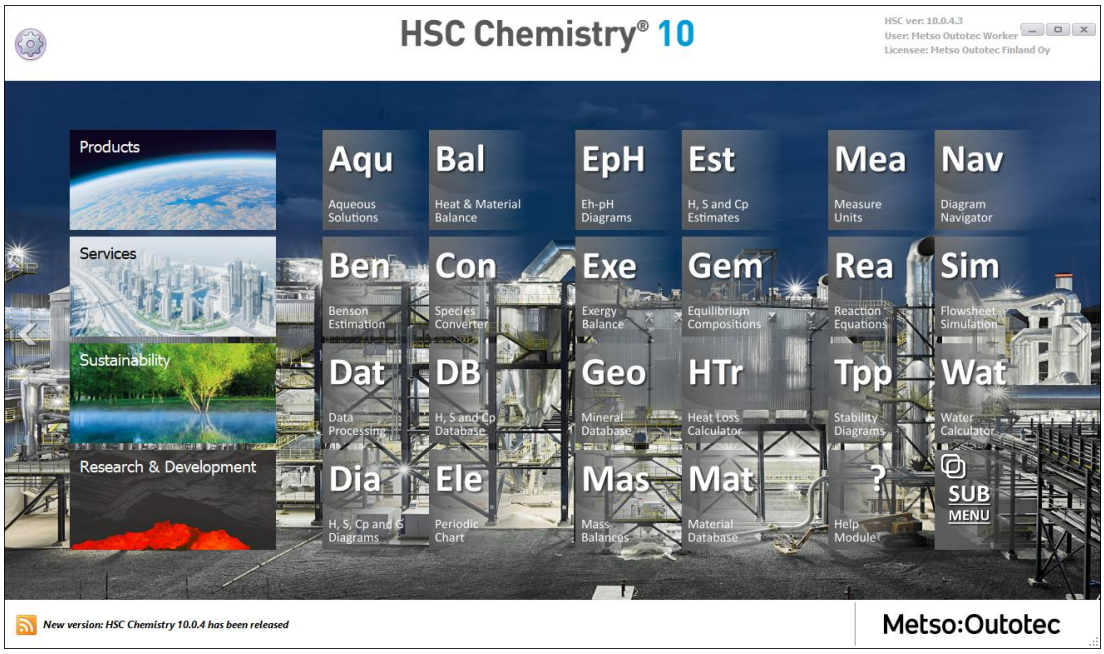
HSC Chemistry Public Courses 2024



Get more out of your HSC software and join the HSC courses at Espoo, Finland on June 3 – 13. Confirm your reservation by May 20, 2024 at the latest.

1. Outline

Ten different courses are available. We recommend everyone to start with the HSC Basic & Equilibrium as well as HSC Sim Basics courses, since this information is needed in the more advanced Mineral processing, Hydrometallurgy, and Pyrometallurgy courses. It is also possible to participate on the courses online via Teams; however, we highly recommend participating onsite to maximize the learning.

Course	Duration	Dates	Lecturer
HSC Basic & Equilibrium	1 day	June 3, 2024	Antti Roine & Petri Kobylin
HSC Sim Basics	1 day	June 4, 2024	Matti Hietala & Tuukka Kotiranta
HSC Sim Pyro	2 days	June 5 - 6, 2024	Matti Hietala & Jonna Piironen
HSC Sim Hydro	2 days	June 5 - 6, 2024	Tuukka Kotiranta
HSC Sim Pyro & Hydro Dynamic	1 day	June 7, 2024	Matti Hietala & Tuukka Kotiranta & Cesar Araujo
HSC Sim Mineral Processing	2 days	June 10 - 11, 2024	Caroline Izart & Antti Remes
HSC Sim Mineral Processing Advanced	1.5 days	June 12 – 13, 2024	Caroline Izart & Antti Remes
HSC Geo & Liberations	0.5 day	June 13, 2024	Jussi Liipo
Sustainable Processes with HSC Process Models	0.5 day	June 13, 2024	Jonna Piironen

2. Pre-requisites for the participants

- 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 or more (16 GB or above recommended) 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 registration

The price for the courses is 600 EUR per day per participant (VAT 0%). The price is same both for onsite and online participants.

The total fixed price of the course covers:

- The selected HSC training course
- Workbooks as printed copy (for those who participate onsite)
- Training and exercises in electronic forms
- 30 days course license
- Course certificates
- Lunches and refreshments

Course	Price
HSC Basic & Equilibrium	600 EUR
HSC Sim Basics	600 EUR
HSC Sim Pyro	1200 EUR
HSC Sim Hydro	1200 EUR
HSC Sim Pyro & Hydro Dynamic	600 EUR
HSC Sim Mineral Processing	1200 EUR
HSC Sim Mineral Processing Advanced	900 EUR
HSC Geo and Liberations	300 EUR
Sustainable Processes with HSC Process Models	300 EUR

Registration happens online at http://www.hsc-chemistry.com/webshop&subcat=8. Registration needs to be done latest May 20. In the registration phase, participants need to specify whether they attend onsite or online.

No refunds will be made for cancellations unless the whole course is cancelled by the organizer.

Holding onsite training courses is dependent on the COVID-19 situation and legislation of the country of origin and destination country, including company policies.

4. Daily schedule and venue

Time	Topic
8:30	Breakfast
9:00	Course starts
10:30 - 10:45	Coffee break
10:45	Course continues
12:00 - 13:00	Lunch break
13:00	Course continues
14:30 - 14:45	Coffee break
14:45	Course continues
17:00*	Course ends

*most likely 16:00

Aalto University
June 3-13, 2024 **Aalto University, Undergraduate center** (Google Maps) Otakaari 1 FI-02150 Espoo, Finland Otakaari 3 FI-02150 Espoo, Finland Rakentajanaukio 4 FI-02150 Espoo, Finland

Classroom locations can be checked from this map: https://www.aalto.fi/sites/g/files/flghsv161/files/2019-05/150901-ok1-kartat-vaaka_002_0.pdf

Course	Classroom	Note
HSC Basic & Equilibrium	Y307a, Otakaari 1	max. 40 participants
HSC Sim Basics	Y307a, Otakaari 1	max. 40 participants
HSC Sim Pyro	F175, Otakaari 3	max. 60 participants
HSC Sim Hydro	266, Rakentajanaukio 4	max. 40 participants
HSC Sim Pyro & Hydro Dynamic	F175a, Otakaari 3	max. 60 participants
HSC Sim Mineral Processing	U358, Otakaari 1	max. 50 participants
HSC Sim Mineral Processing Advanced	U358, Otakaari 1	max. 50 participants
HSC Geo and Liberations	U358, Otakaari 1	max. 50 participants
Sustainable Processes with HSC Process Models	U262, Otakaari 1	max. 30 participants

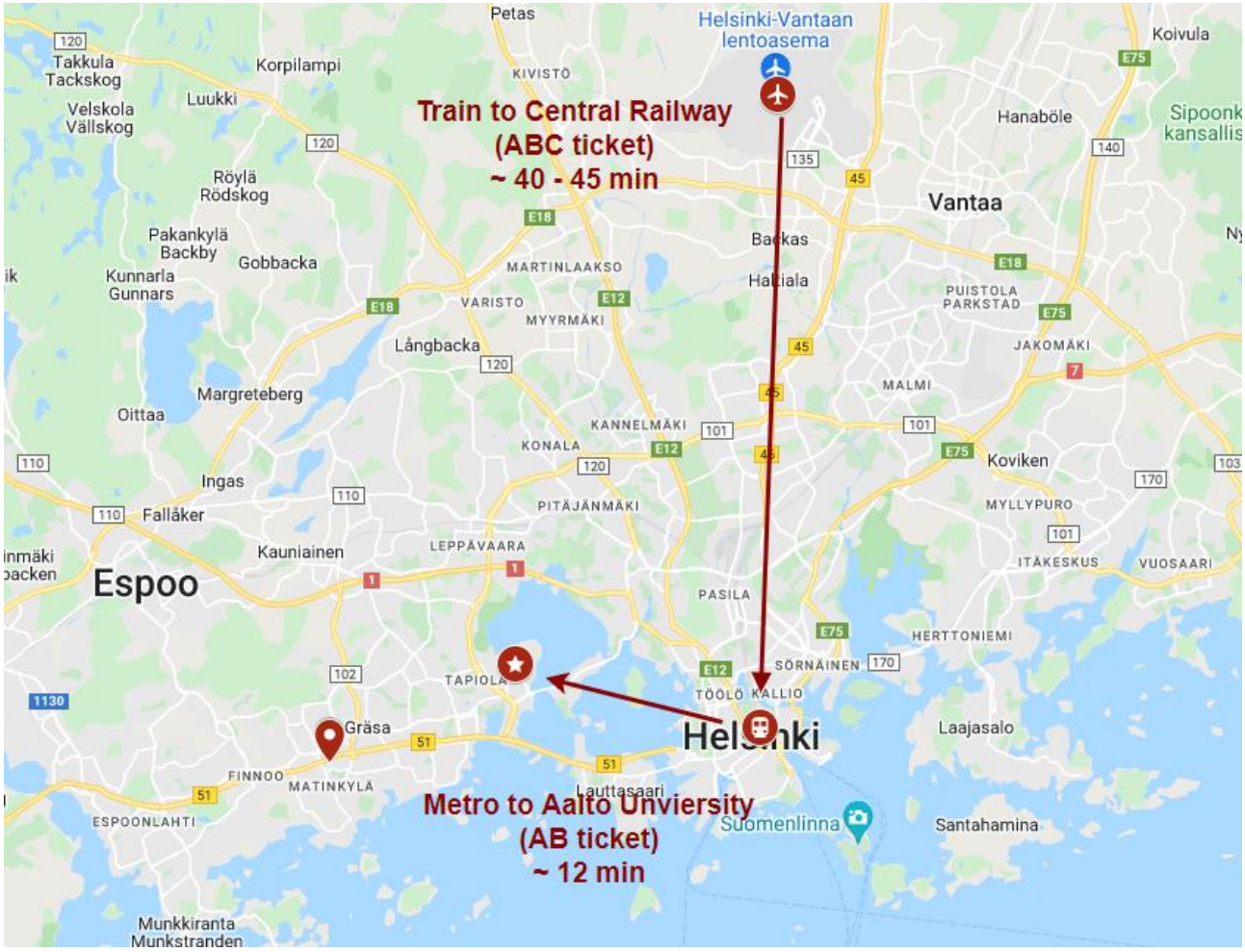
5. Hotels, flights, and local info

Please make your own hotel and flight reservations.

Public transportation is good in Capital Region of Finland. All the different tickets (bus, train, tram, or metro) need to be purchased from the HSL mobile application which you need to download beforehand (https://www.hsl.fi/en). Aalto University can be reached easily from airport: first train to Helsinki Central Railway Station, from where metro to Aalto University (metro towards Matinkylä).

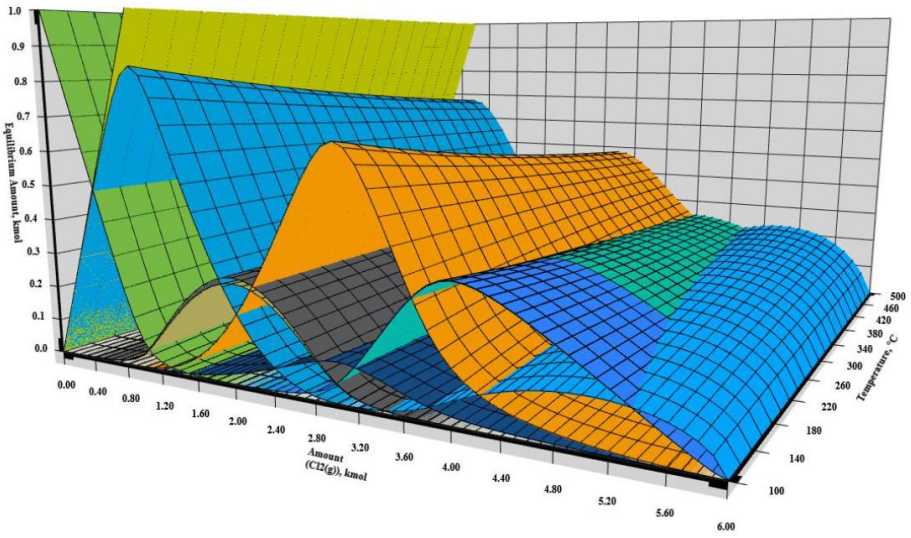
Aalto University campus map can be seen here: https://www.aalto.fi/sites/g/files/flghsv161/files/2022-05/051322_Aalto_Otaniemi_Campus_0.pdf

We have listed all our recommended hotels, restaurants, and sightseeing in the following Google maps: https://www.google.com/maps/d/edit?mid=1KA9sVi4tw4_WTp1-V6J7Xvy312IxkmGg&usp=sharing



4. Courses

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.

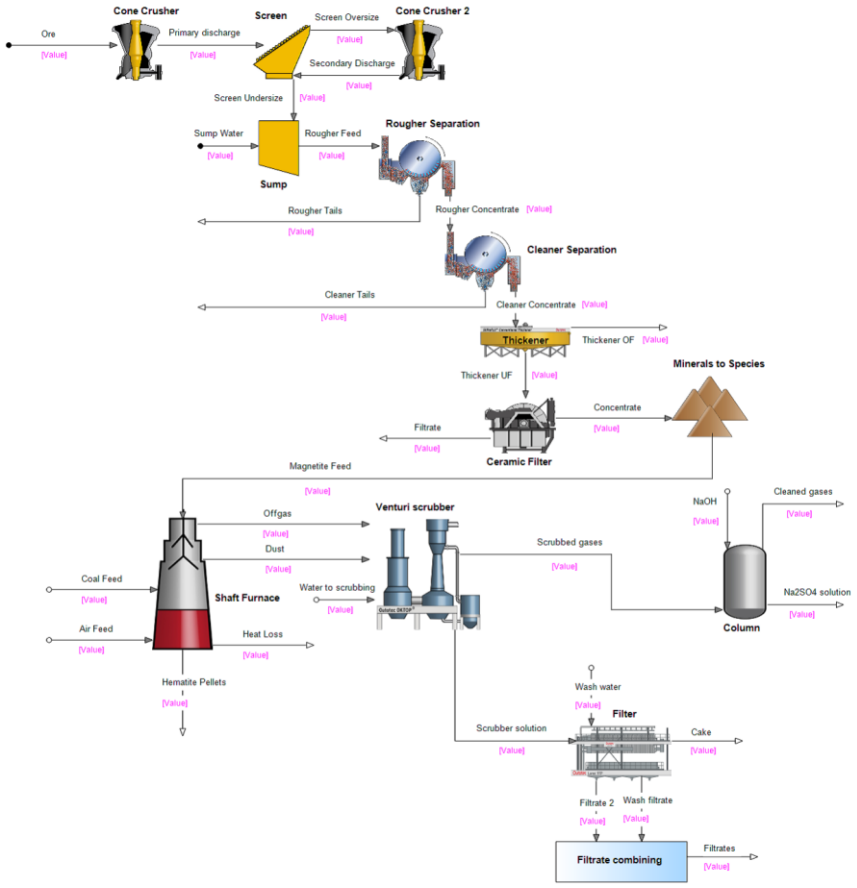
HSC Basic contents:

- 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 Basics



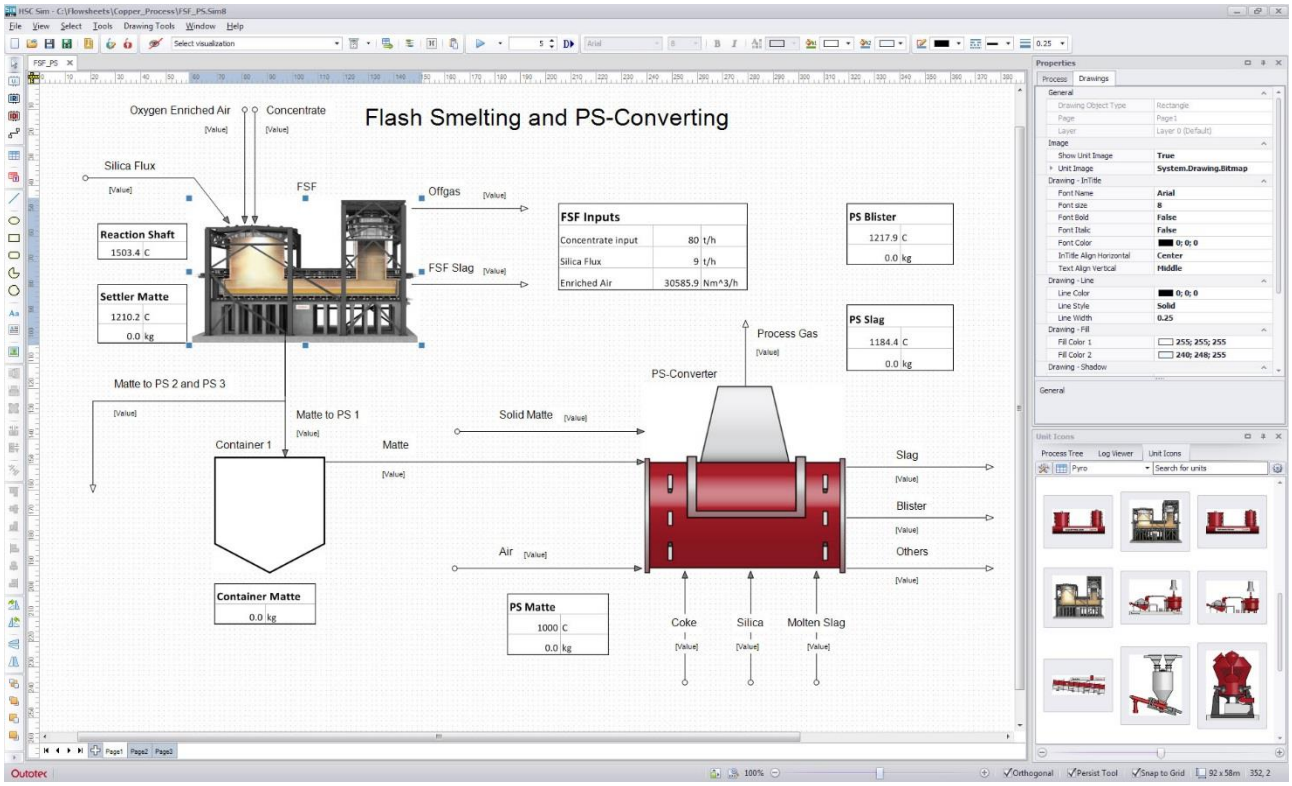
This course gives an overview of the basic HSC operation principles and the major procedures needed to solve more complicated problems with the HSC software. The course will also illustrate thermochemistry application possibilities in practical problems.

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 course duration 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



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.

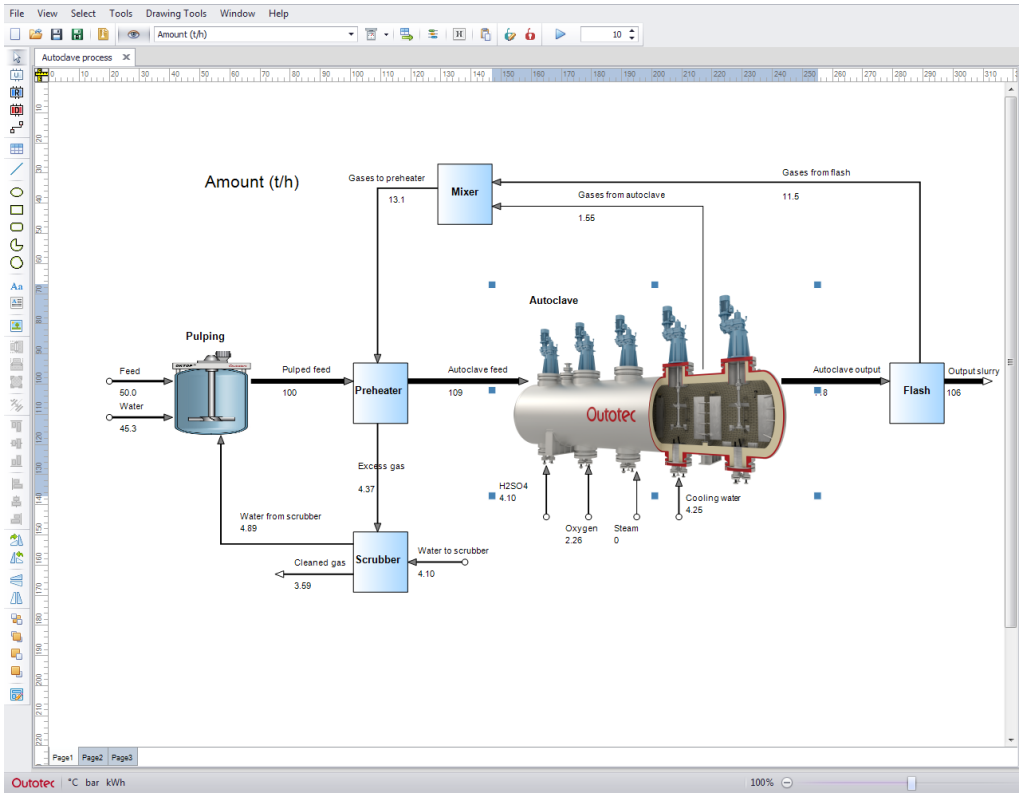
The course covers a general introduction to the Sim Flowsheet module with several demonstrations and provides an understanding of the potential applications of the Sim Distribution mode. The target of this course is to acquire the versatile skills to use and create Sim Distribution mode applications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

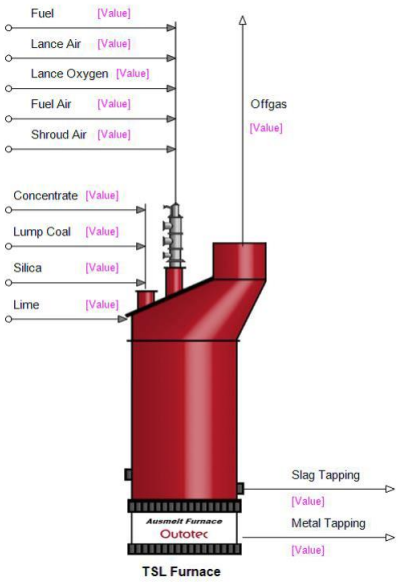
The course covers a general introduction to the Sim Flowsheet module with several demonstrations and provides an understanding of the potential applications of the Sim Reactions mode. The target of this course is to acquire the versatile skills to use and create Sim Reactions mode applications and analyse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

4.5. HSC Sim Pyro & Hydro 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.

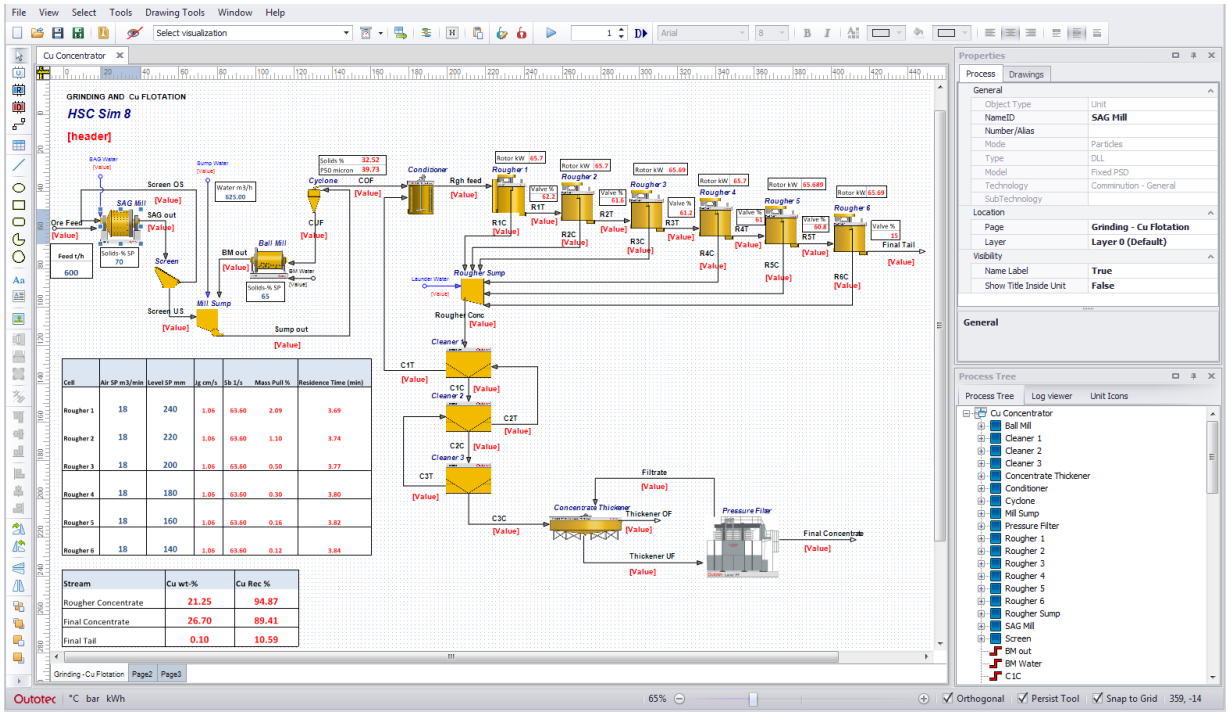
Contents:

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

Metso

HSC Chemistry
11/14
Anna Kiraly
April 22, 2024

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.

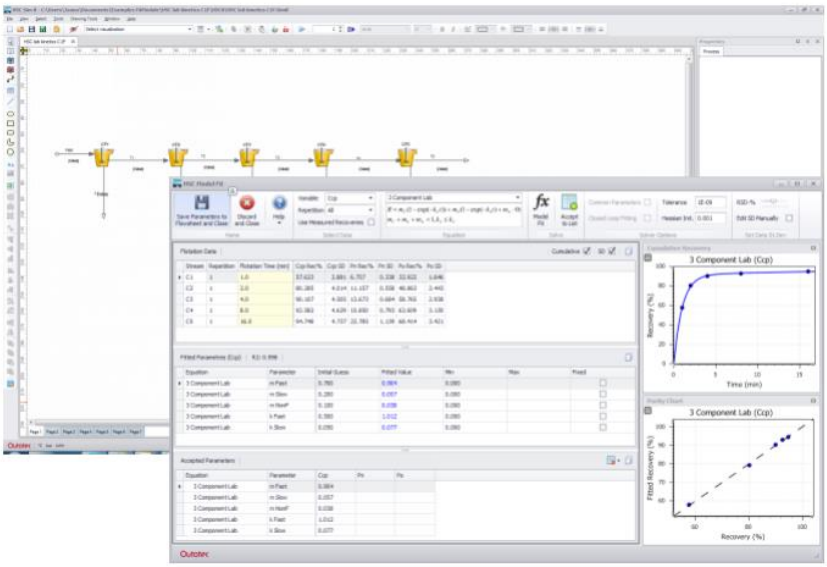
The course gives an overview of the basic HSC Sim operating principles and the major procedures required to solve more complicated problems. The course will also illustrate the potential applications of HSC Sim mineral processing by means of practical problems. The target of this course is to acquire 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.

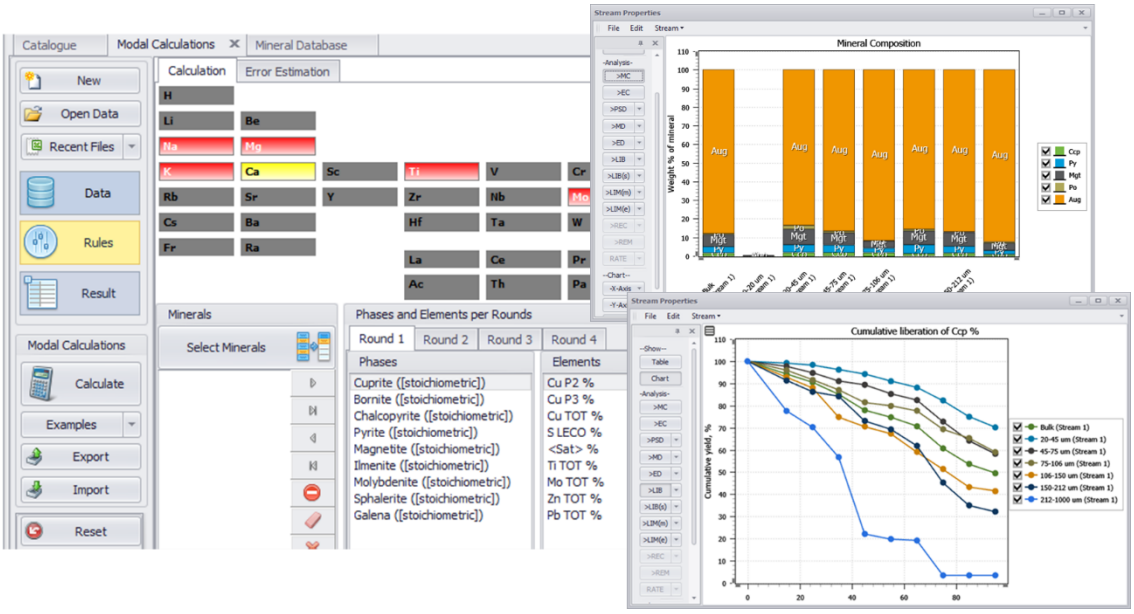
The course gives knowledge of processing experimental data with HSC modules, and more detailed information of the Sim Flowsheet module's advanced tools. The course is suitable for metallurgists, researchers and process engineers who understand the basics of minerals processing.

Earlier use of HSC Sim is recommended. The recommended duration of the course is 1,5 days, 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. HSC Geo & Liberations



Geometallurgy requires a practical, fast, and inexpensive method to quantify mineral compositions. This is possible using the HSC Geo module in HSC.

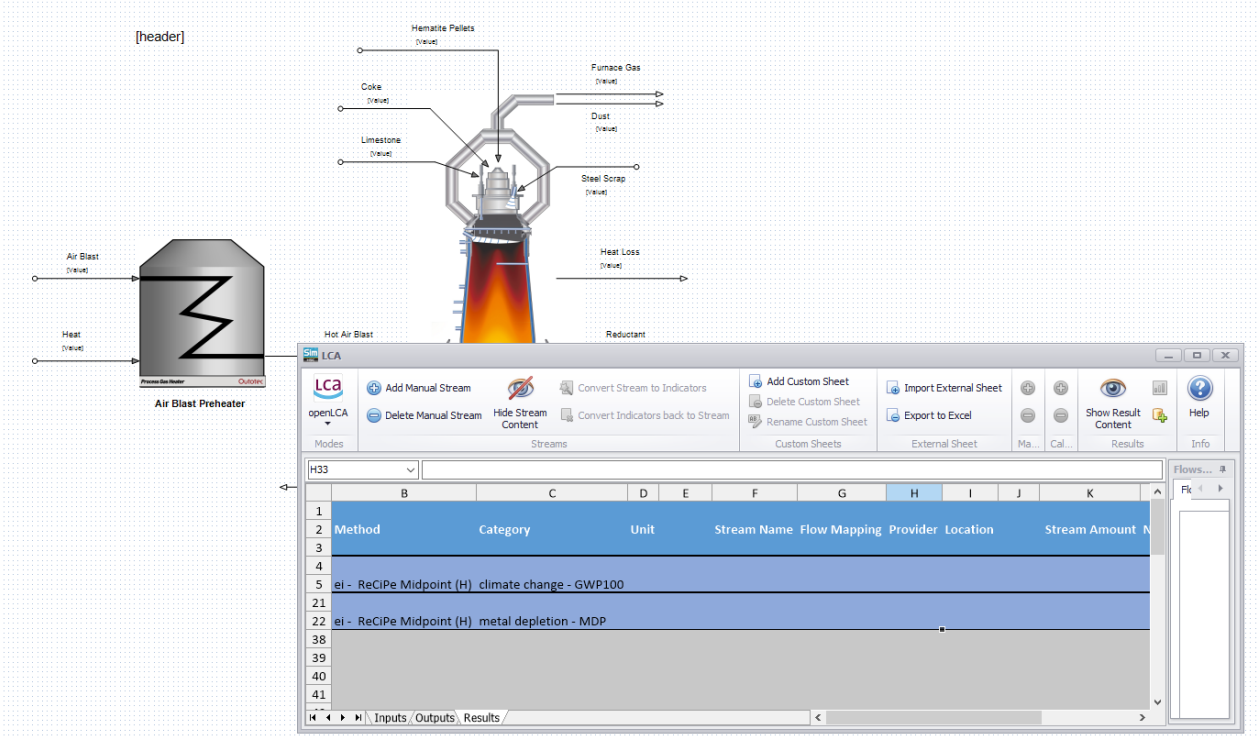
HSC Geo & Liberations course gives knowledge of using mineralogy to link geology and mineral processing together. The course is suitable for geologists, metallurgists, researchers, and process engineers who understand the basics of minerals processing.

Earlier use of HSC Sim is recommended. The recommended duration of the course is 0,5 day, depending on required scope.

Contents:

- Element to Mineral conversion
  - Basic concepts of element to mineral conversion (EMC) with HSC Geo
  - Mineral database
  - Examples of case studies
- Practical exercises
  - Importing mineralogical data
  - Performing Element to Mineral Calculations
  - Using mineralogical information
  - Back calculated chemical composition
  - Importing and processing liberation data

4.9. Sustainable Processes with HSC Process Models



The mining, minerals and base metals industry has a significant impact on the environment. Sustainable Processes with HSC Process Models course studies how environmental footprints of processes can be calculated via the LCA principle on the HSC Sim.

The course gives knowledge of Lifecycle assessment (LCA) principle and how it can be utilised in HSC Sim to calculate environmental footprints of processes. Using the ready-made flowsheets done in the previous courses, there is possible for users to calculate environmental footprints for different process models.

In the exercises we will utilise the open source software openLCA (https://www.openlca.org/) and free databases (https://nexus.openlca.org/databases). If you already have purchased own database i.e. ecoinvent, these can be utilised in the exercises as well. Earlier use of HSC Sim is recommended. The recommended duration of the course is 1 day.

Using the earlier made flowsheets from the previous courses

Contents:

- Introduction to LCA
- Calculating environmental footprints based on the earlier done HSC Sim models
- Further analysis in openLCA