

# Simulator for the Final Disposal

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Everything should be made as simple as possible, but not simpler.  
*Albert Einstein*

## Numerola Oy

- Offers R & D services based on modelling and computing
- 12 experts in mathematics, statistics, natural sciences and software engineering
- Extensive development of in-house computational software
- Maker of more than 50 simulators for industry

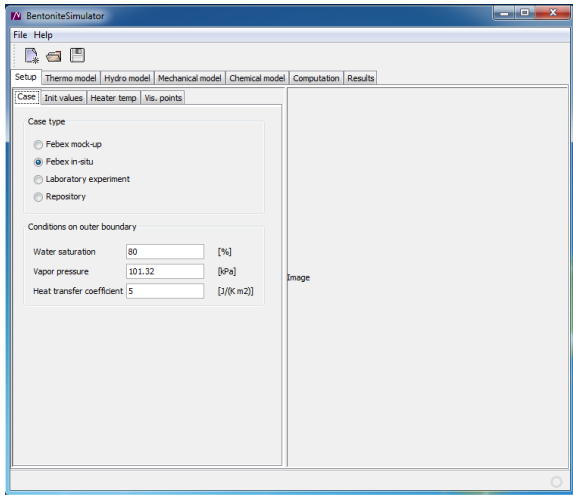
## Purpose of the Simulator

- Simulate final disposal scenarios with varying hydrological, mechanical, chemical and biological conditions
- Integrate modelling knowledge into one easy to use software environment
- Validate models by simulating bentonite experiments
- Uncertainty quantification: Determine computationally how uncertainty in the model input affect the computed results

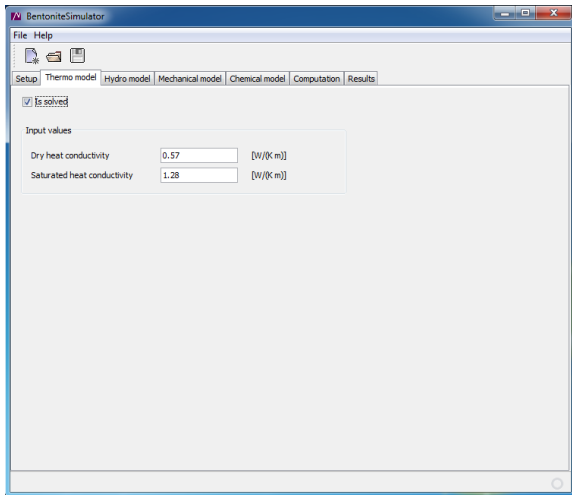
## Users of the Simulator

Experts and researchers of nuclear waste management. Simulator is designed for a wider audience than a single research consortium.

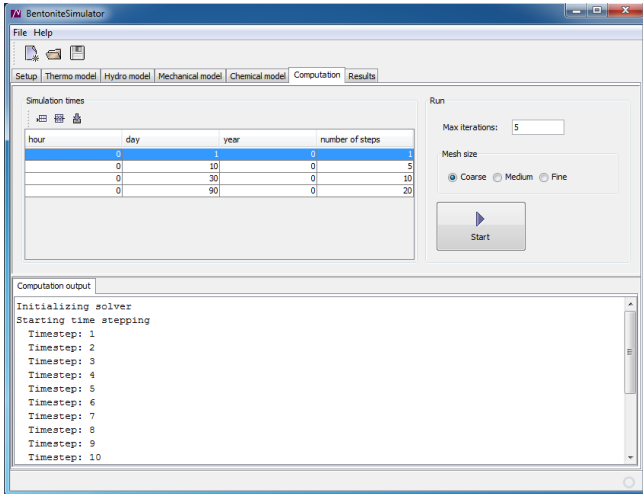
## Front Page of the Simulator



## Model Page (Thermal Model)



# Computation



The screenshot shows the 'BentoniteSimulator' application window with the 'Computation' tab selected. The interface includes a menu bar (File, Help), a toolbar, and several panels.

**Simulation times**

hour	day	year	number of steps
0	1	0	1
0		10	5
0		30	10
0		90	20

**Run**

Max iterations:

Mesh size

Coarse  Medium  Fine

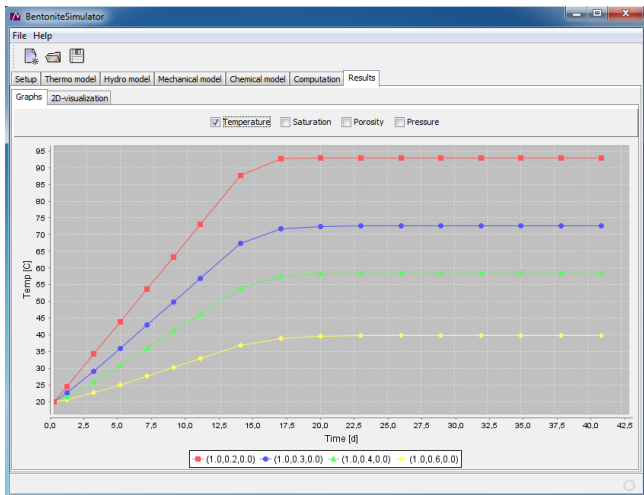
**Computation output**

```

Initializing solver
Starting time stepping
Timestep: 1
Timestep: 2
Timestep: 3
Timestep: 4
Timestep: 5
Timestep: 6
Timestep: 7
Timestep: 8
Timestep: 9
Timestep: 10
    
```



# Visualization



## Software Components

- THMC-models: In-house Numerrin4 modelling language
- GUI: In-house Java components
- Visualization: In-house and VisIt (freeware)
- Server technology and parallel computing: In-house

## Plan 2012

- Bring models of the simulator up to date
- Emphasis on implementation of models and model parameter estimation, because "Simulator is only as good as its models"

## Plan 2013–2014

- From in-house software into generally useful software
- Needs analysis and usability
- Visualization and server technology
- Model development