



# Dynamic flowsheet simulation system Dyssol Get started



## Dynamic simulation of complex process structures

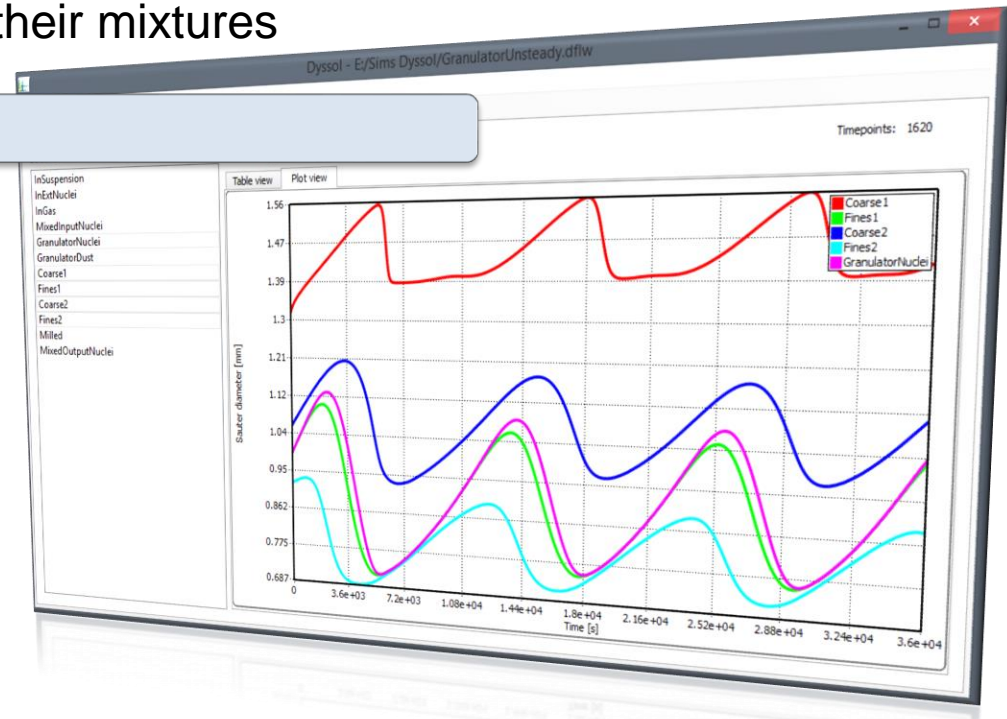
- Time-dependent parameters
- Waveform relaxation method

## Advanced treatment of the solid phase

- Multidimensional distributed parameters of solids
- Transformation matrices
- Solid, liquid, gaseous phases and their mixtures

## Extensibility of the system

- Sequential-modular approach
- High modularity
- Standardized APIs
- Templates for new units

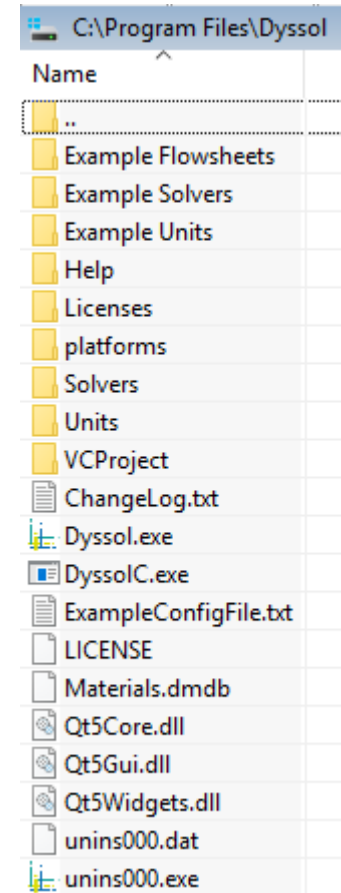




# Installation



- Folders:
  - **Example flowsheets** – flowsheet examples
  - **Example units** – source code of units (C++)
  - **Example solvers** – source code of solvers (C++)
  - **Help** – documentation files (pdf)
  - **Licenses** – information about licenses
  - **Solvers** – libraries of developed solvers
  - **Units** – libraries of developed units
  - **VCProject** – template project for Microsoft Visual Studio
- Files
  - **Dyssol.exe** – executable of Dyssol
  - **DyssolC.exe** – command line utility
  - **ExampleConfigFile.txt** – example configuration file for command line utility
  - **LICENSE** – license agreement
  - **Materials.dmdb** – default materials database
  - **unins000** – shortcut for Dyssol uninstaller

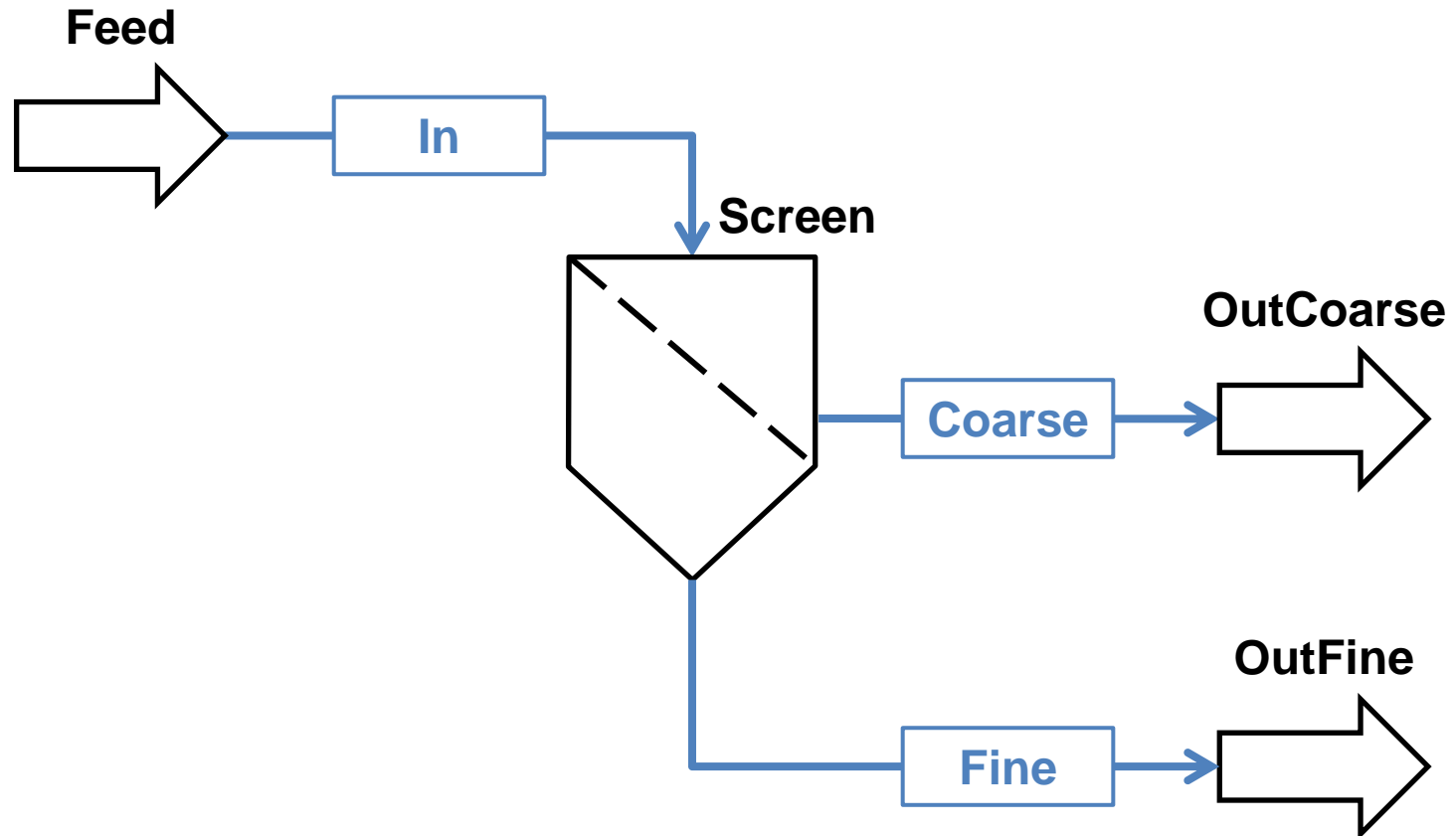




- \*.dflw – Dyssol flowsheet file:
  - Structure of the flowsheet
  - All flowsheet settings
  - Previous simulation results
  - HDF5 file format is used
- \*.dmdb – Materials database file
  - Compounds and their properties
  - Can be viewed or edited as a text-file or via a user interface



# Screening process





- 1 Add **units** to the flowsheet and give them names
- 2 Add **streams** to the flowsheet and give them names
- 3 Select a **model** for each unit on the flowsheet
- 4 Connect **ports** of each unit to the streams
- 5 Setup **parameters** of units
- 6 Add **compounds** to the flowsheet
- 7 Add **phases** to the flowsheet
- 8 Specify **grids** for distributed parameters of solids
- 9 Setup **feeds** of inlets and **holdups** of units
- 10 Specify the simulation **time**
- 11 **Run** the simulation
- 12 **Analyze** the results





1 Add units to the flowsheet and give them names

1 Add 4 units

2 Rename units:

- Feed
- Screen
- OutCoarse
- OutFine

DoubleClick

The screenshot shows the Dyssol software interface. The 'Units' tab is active, displaying a list of units: 1 Feed, 2 Screen, 3 OutCoarse, and 4 OutFine. A blue arrow labeled '1' points to the '+' button in the 'Units' section. Another blue arrow labeled '2' points to the 'Screen' unit, with the text 'DoubleClick' next to it. A blue box highlights the unit names, with the text 'Rename units:' above it. The 'Unit parameters' panel on the right is empty, showing tables for 'Parameter', 'Units', and 'Value', and 'Time [s]', 'Units', and 'Value'.

Parameter	Units	Value
-----------	-------	-------

Time [s]	Units	Value
----------	-------	-------



2

Add streams to the flowsheet and give them names

Dyssol - D:/Sims Dyssol/Screen.dflw

File Setup Modules Tools Help

Flowsheet Simulator Streams Units

Units: + - ▲ ▼ Model

1 Feed

2 Screen

3 OutCoarse

4 OutFine

1 In

2 Coarse

3 Fine

Ports of Screen

Port name	Type	Connected stream
-----------	------	------------------

Unit parameters

Parameter	Units	Value
-----------	-------	-------

Time [s]	Units	Value
----------	-------	-------

1 Add 3 streams

2 Rename streams:

- In
- Coarse
- Fine

DoubleClick



3 Select a **model** for each unit on the flowsheet

1 Select the Feed unit

2 Select the InletFlow model from the list

3 Repeat for other units

Unit parameters

Parameter	Units	Value

Time [s]	Units	Value

- Feed – InletFlow
- Screen – Screen Plitt
- OutCoarse – OutletFlow
- OutFine – OutletFlow



4

Connect **ports** of each unit to the streams

Dyssel - D:/Sims Dyssel/Screen.dflw

File Setup Modules Tools Help

Flowsheet

Simulator

Streams

Units

Unit

1

2 Screen

3 OutCoarse

4 OutFine

Model

Screen Plitt

Ports of Screen

Port name	Type	Connected stream
1 Input	Input	In
2 Coarse	Output	Coarse
3 Fines	Output	Fine

Streams:

+

1 In
2 Coarse
3 Fine

Unit parameters

Parameter	Units	Value
1 Xcut	[m]	0.002
2 Alpha	[-]	8

Time [s]	Units	Value
----------	-------	-------

1 Select the Screen unit

2 Connect a stream to each port

3 Repeat for other units

Feed:

- InletMaterial – In

Screen:

- Input – In
- Coarse – Coarse
- Fines – Fine

OutCoarse:

- In – Coarse

OutFine:

- In – Fine



## 5 Setup parameters of units

Dyssol - D:/Sims Dyssol/Screen.dflw

File Setup Modules Tools Help

Flowsheet Simulator Streams Units

Unit **1** **Select the Screen unit** Model Screen Plitt

1  
2 Screen  
3 OutCoarse  
4 OutFine

Streams: + - ▲ ▼

1 In  
2 Coarse  
3 Fine

Ports of Screen

Port name	Type	Connected stream
1 Input	Input	In
2 Coarse	Output	Coarse
3 Fines	Output	Fine

Unit parameters **2** **Set Xcut**

Parameter	Units	Value
1 Xcut	[m]	0.002
2 Alpha	[-]	Use the table bel...

**3** **Select Alpha**

Sharpness of cut  
Min = 0  
Max = 100

**5** **Set alpha**

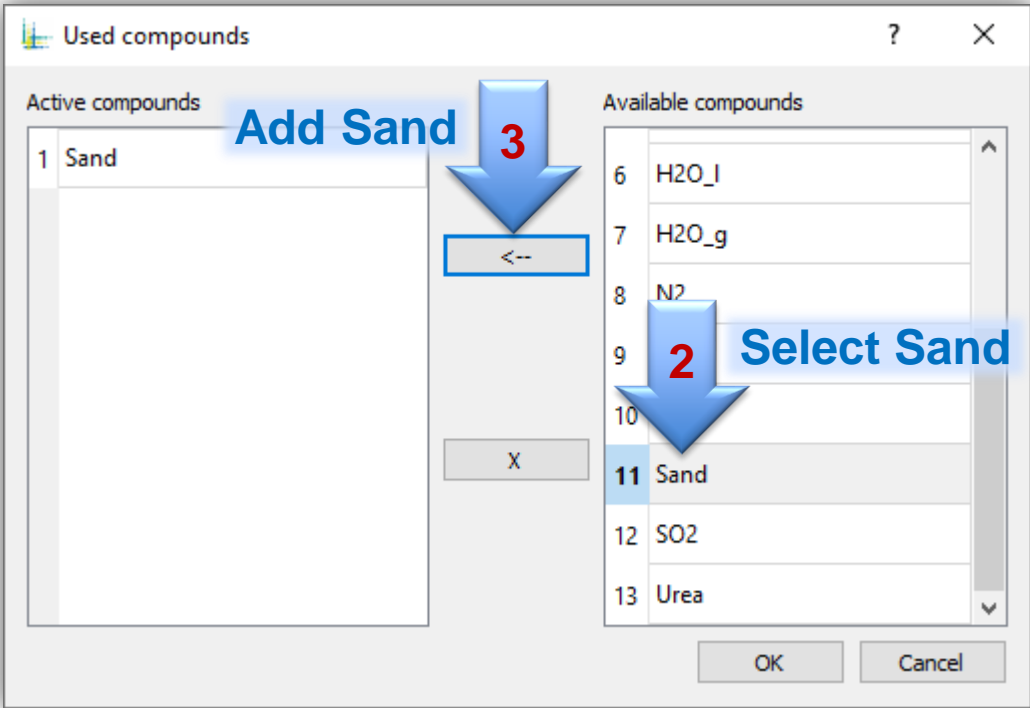
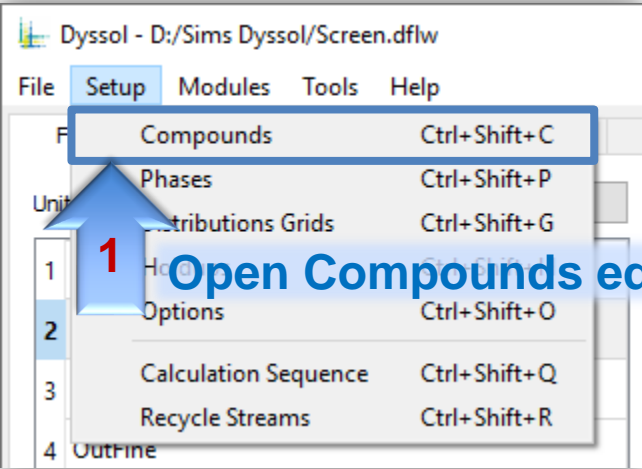
Time [s]	Alpha [-]	Value
0	[-]	10
60	[-]	9
180	[-]	8

**4** **Add 2 time points**

+ -

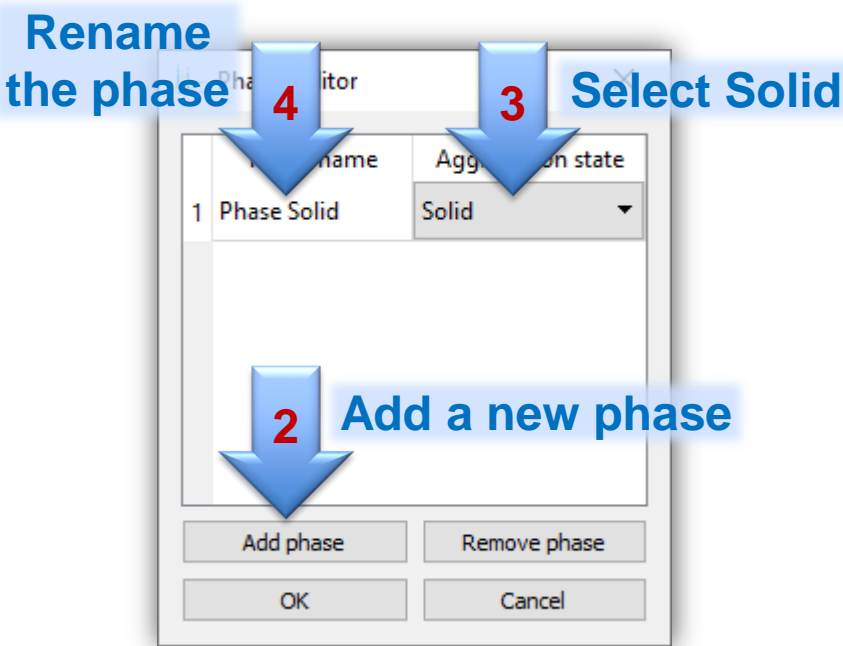
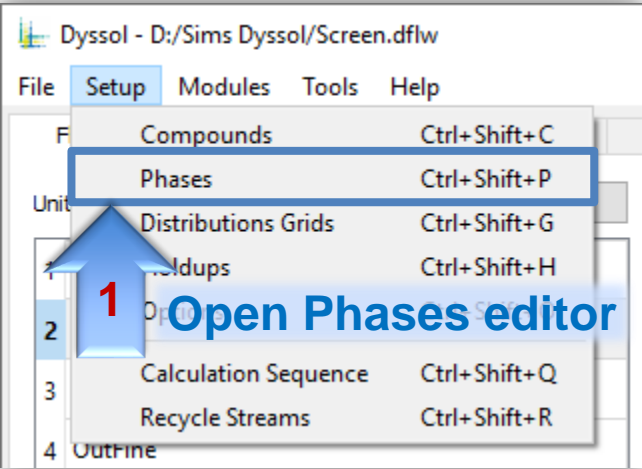


6 Add compounds to the flowsheet





7 Add phases to the flowsheet





8 Specify grids for distributed parameters of solids

Dyssol - D:/Sims Dyssol/Screen.dflw

File Setup Modules Tools Help

Compounds Ctrl+Shift+C  
Phases Ctrl+Shift+P  
Distributions Grids Ctrl+Shift+G  
Holdups Ctrl+Shift+H  
Calculations Ctrl+Shift+O  
Recycle Streams Ctrl+Shift+R  
Outline

1 Open Grid editor

Grid specification

Distributions

1 Compounds  
2 Size

3 Select Size

4 Set Equidistant

5 Set 100 classes

6 Set limits

- Min = 0 mm
- Max = 4 mm

Entry: Symbolic Classes: 1

Entry: Numeric Classes: 100

Type: Equidistant Units: mm

Min: 0 Max: 4

1 0  
2 0.16  
3 0.2  
4 0.24  
5 0.28  
6 0.32  
7 0.36  
8 0.4  
9 0.44  
10 0.48

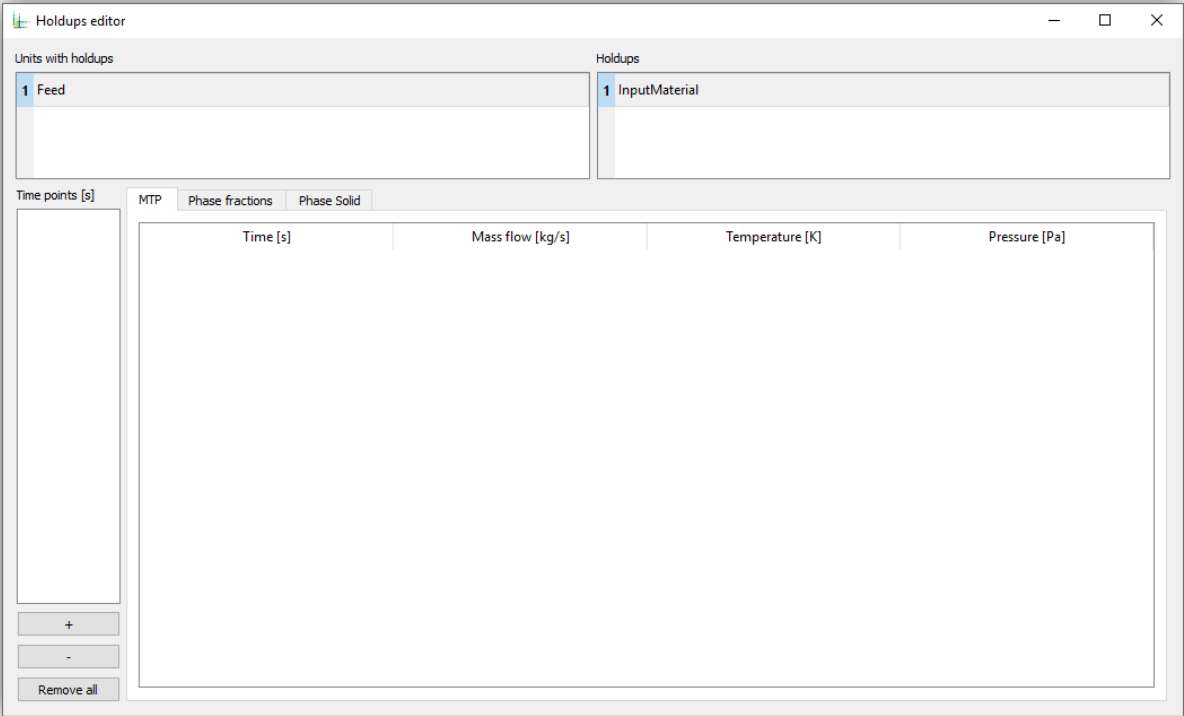
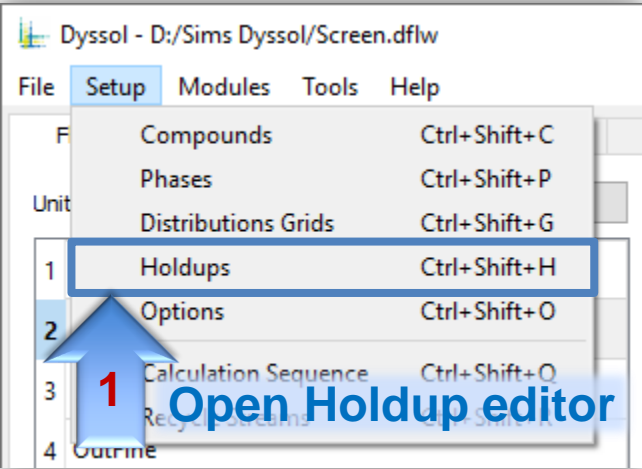
Units to display: mm

OK Cancel Apply





9 Setup feeds of inlets and holdups of units





9

Setup feeds of inlets and holdups of units

Holdups editor

Units with holdups

1 Feed

2 Select the Feed unit

Holdups

1 InputMaterial

3 Select the InputMaterial holdup

Time point

0

4 Add a time point

MTP

Phase fractions

Phase Solid

	Time [s]	Mass flow [kg/s]	Temperature [K]	Pressure [Pa]
1	0	10	300	100000
		5 Set the mass flow		

+

-

Remove all



9

Setup feeds of inlets and holdups of units

Holdups editor

Units with holdups

1 Feed

Holdups

1 InputMaterial

6 Select Phase fractions

Time points [s]

0

MTP

Phase fractions

Phase Solid

Time [s]

1 0

1

Phase Solid

7 Set the mass fraction of the solid phase

+

-

Remove all



9

Setup feeds of inlets and holdups of units

Holdups editor

Units with holdups

1 Feed

Holdups

1 InputMaterial

Set the mass fraction of Sand

8 Select Phase Solid

9

11 Select the Size distribution

10 Select the Sand compound

12 Open the distributions editor

13 Setup the distribution

14 Apply changes

Time points [s]

0

Selected time point

0

Phase Solid

Mass fraction

1

Compound: Sand

Rows: Size

Columns: Total mixture

PSD type: q3

PSD grid: Diameter

q3 [1/m]

0.00076 : 0.0008

0.0008 : 0.00084

0.00084 : 0.00088 [m]

0.00088 : 0.00092 [m]

0.00092 : 0.00096 [m]

0.00096 : 0.001 [m]

0.001 : 0.00104 [m]

0.00104 : 0.00108 [m]

0

5.50788E-5

0.000175225

0.000538488

0.00158568

0.0044225

0.01108

0.0318493

Insert distribution

Remove all

Distributions sequence

1 Compounds

2 Size

Distribution

Normal

D50

0.002 [m]

Standard deviation

0.0002 [m]

OK

Cancel

Apply



10 Specify the simulation time

Dyssol - D:/Sims Dyssol/Screen.dflw

File Setup Modules Tools Help

Flowsheet

Simulator

Streams

Units

End simulation time [s] 240 Start simulation

Simulation log

1

Set the simulation time

Time window start [s]

Time window end [s]

Time window length [s]

Iteration number

Window number

Unit

Simulation started [h:m:s]

Elapsed time [h:m:s]

Clear simulation results

Clear recycle streams

Clear simulation results and recycle streams



11 Run the simulation

Dyssel - D:/Sims Dyssel/Screen.dflw

File Setup Modules Tools Help

Flowsheet Simulator Streams Units

End simulation time [s] 240 Start simulation

Simulation log

Simulation started at 11:23:11 on 07.05.2019  
Initialization of flowsheet is started  
Initialization of flowsheet is finished  
  
Initialization of Feed (InletFlow)...  
Simulation of Feed (InletFlow): [0, 240]...  
Initialization of Screen (Screen Plitt)...  
Simulation of Screen (Screen Plitt): [0, 240]...  
Initialization of OutFine (OutletFlow)...  
Simulation of OutFine (OutletFlow): [0, 240]...  
Initialization of OutCoarse (OutletFlow)...  
Simulation of OutCoarse (OutletFlow): [0, 240]...  
Finalization of Feed (InletFlow)...  
Finalization of Screen (Screen Plitt)...  
Finalization of OutFine (OutletFlow)...  
Finalization of OutCoarse (OutletFlow)...  
Saving new initial values of tear streams...  
  
Simulation finished at 11:23:11 on 07.05.2019 in 0.007 s

1 Run the simulation

2 Wait until the simulation is finished

Time window start [s]	0
Time window end [s]	0
Time window length [s]	5.15645e-312
Iteration number	0
Window number	0
Unit	OutCoarse
Simulation started [h:m:s]	11:23:11
Elapsed time [h:m:s]	00:00:00

Clear simulation results

Clear recycle streams

Clear simulation results and recycle streams



## 12 Analyze the results

Dysslol - D:/Sims Dysslol/Screen.dflw

File Setup Modules Tools Help

Flowsheet Simulator Streams Units

Streams

Parameter: Mass flow

Timepoints: 4

Ctrl + Click

1 Select three streams

2 Select the Mass flow parameter

3 Compare the results

	Time [s]	In Mass flow [kg/s]	Coarse Mass flow [kg/s]	Fine Mass flow [kg/s]
1	0	10	5.15027	4.84973
2	60	10	5.13132	4.86868
3	180	10	5.10946	4.89054
4	240	10	5.10946	4.89054



12 Analyze the results

