



COILSIM1D

*The simulation and optimization software
for the ethylene industry*



COILSIM1D

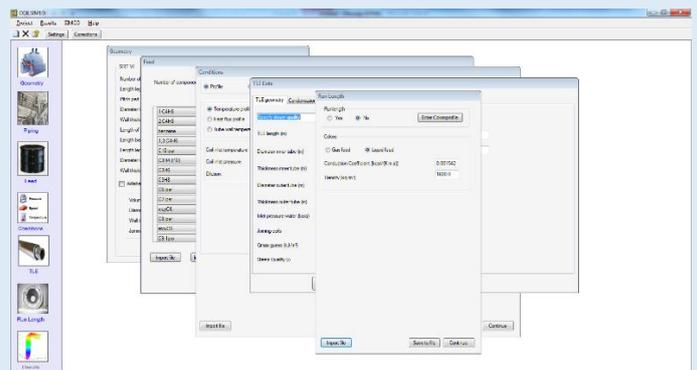
COILSIM1D boosts **profitability** of steam crackers by maximizing yields and optimizing the process, using highly **accurate** reactor simulations for a broad range of **feedstocks**, reactor **geometries** and operating **conditions**.

It is the result of more than **40 years** of expertise of the Laboratory for Chemical Technology (LCT) in independent research and **modeling** of thermal cracking reactions. The **microkinetic** model incorporated in COILSIM1D is the broadest and most **accurate** reaction **network** for steam cracking of hydrocarbons.

Main features

COILSIM1D combines a very user-friendly interface with its robust kinetic network to provide users with valuable results in just a few steps.

-  Reactor simulations are possible with different boundary conditions
 -  Fixed COT
 -  Fixed P/E or M/P
 -  Fixed conversion(s) or yields
-  Automatic or user-specified heat flux or temperature profiles
-  Feedstock reconstruction
-  Furnace simulations
-  TLE simulations
-  Run length simulations



SIMCO feedstock reconstruction

SIMCO allows users to obtain a detailed reconstructed composition of feedstocks ranging from light gases to heavy gas oils, based on common commercial indices. Sulfur-containing components can also be reconstructed



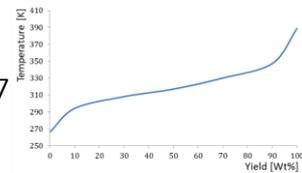
PONA(+), PIONA(+), SOA



Distillation data: TBP, ASTM D86, ASTM D2887



NMR data



Reconstructed feedstocks can be used directly as input for reactor simulations, or users can input a detailed feed composition manually.

Units	°C	Type	TBP
IBP	-10.3	40%	100.88
5%	32.37	50%	117.8
10%	58.63	60%	127.96
20%	62.99	70%	152.76
30%	96.99	80%	178.83

Component	wtwt	Conversion?
1C4H8	0.116	<input type="checkbox"/>
2C4H8	0.067	<input type="checkbox"/>
benzene	2.301	<input type="checkbox"/>
1,3C4H6	0.248	<input type="checkbox"/>
C10 par	4.122	<input type="checkbox"/>
C3H4 (PD)	0.048	<input type="checkbox"/>
C3H6	0.083	<input type="checkbox"/>
C3H8	1.282	<input type="checkbox"/>
C6 par	10.566	<input type="checkbox"/>
C7 par	5.015	<input type="checkbox"/>
mcyC5	5.033	<input type="checkbox"/>
C8 par	3.151	<input type="checkbox"/>
mcyC6	5.637	<input type="checkbox"/>
C9 par	1.129	<input type="checkbox"/>

Reactor geometry flexibility

Built-in geometries of the main reactors of various manufacturers are available. Other geometries can be easily implemented with the New coil geometry tool. Various coil materials and fins (straight, rifflled, spiral) are supported too.

	Axial position (m)	Diameter (m)	Angle bend (rad)	Radius bend (m)	Mass flow factor	Wall Thickness (m)	Tube Material	Tube Type	Fin distance (m)	Pitch (m)	Perimeter Ratio
1	0	0.00944	0	0	1	0.00007	800_800H	Smooth circular tube	0	0	1
2	1.14	0.00944	0	0	1	0.00007	800_800H	Smooth circular tube	0	0	1
3	1.957	0.00944	0	0	1	0.00007	800_800H	Smooth circular tube	0	0	1
4	2.652	0.00944	0	0	1	0.00007	800_800H	Smooth circular tube	0	0	1
5	3.362	0.00944	0	0	1	0.00007	800_800H	Smooth circular tube	0	0	1
6	3.951	0.00944	0	0	1	0.00007	800_800H	Smooth circular tube	0	0	1
7	4.768	0.00944	0	0	1	0.00007	800_800H	Smooth circular tube	0	0	1
8	5.463	0.00944	0	0	1	0.00007	800_800H	Smooth circular tube	0	0	1

Reactor simulations

A variety of routines are implemented in COILSIM1D, allowing users to easily study different aspects of their process



Product distribution



Yield maximization



User defines the relative importance of products



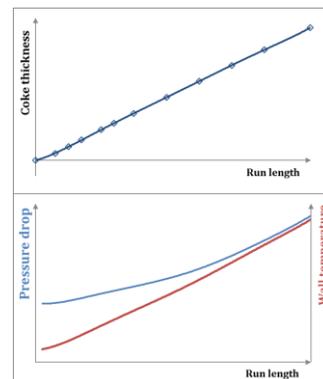
Run length simulations



Specific coke deposition models for gaseous and liquid feeds



User-defined operational limitations (T, P)



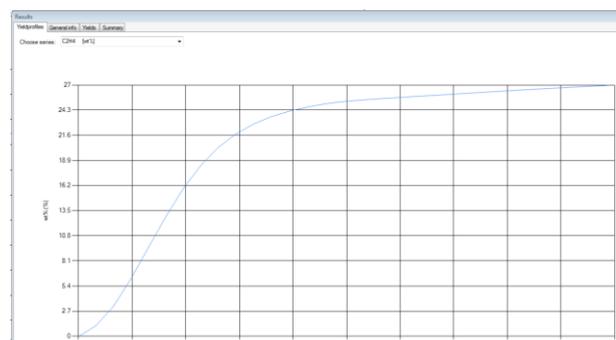
An adiabatic volume can be included downstream of the reactor, enabling users to evaluate the effect of transfer lines on product composition.

The main simulation results are conveniently summarized in a table and presented graphically, allowing users to rapidly obtain a general overview of the outcome of the simulation.

Coil		Adiabatic Volume	
Inlet Temperature (°C)	654.4	Inlet Temperature (°C)	880.1
Outlet Temperature (°C)	880.1	Outlet Temperature (°C)	880.1
Inlet Pressure (atm)	2.009	Inlet Pressure (atm)	1.701
Outlet Pressure (atm)	1.701	Outlet Pressure (atm)	1.7014
Residence time (s)	0.3626	Residence time (s)	0.000
Pressure drop (atm)	0.308	Pressure drop (atm)	1.701

Complete Reactor		Results	
Inlet Temperature (°C)	654.4	Steam Dilution (wt%)	0.3800
Outlet Temperature (°C)	880.1	PIE	0.1817E-01
Inlet Pressure (atm)	2.009	MP	5.573
Outlet Pressure (atm)	1.7014	Molar Conversion (%)	69.76
Residence time (s)	0.3626	Mass Conversion (%)	69.76
Pressure drop (atm)	0.3076		

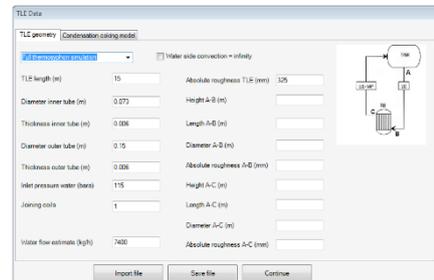
Coking		Heat transfer	
Coking rate (mm/month)	4.273	Heat Duty (kJ/s)	3.469
Maximum wall temperature (°C)	904.57	Absorbed heat per unit of HC flow (kJ/kg)	4163
		Average heat flux to hot surface (kJ/(m ² ·s))	9.362



TLE simulations

COILSIM1D incorporates a TLE simulation module that enables users to carry out simulations using different boundary conditions:

-  Specific mass flow of water
-  Specific steam quality
-  Full thermosyphon simulation



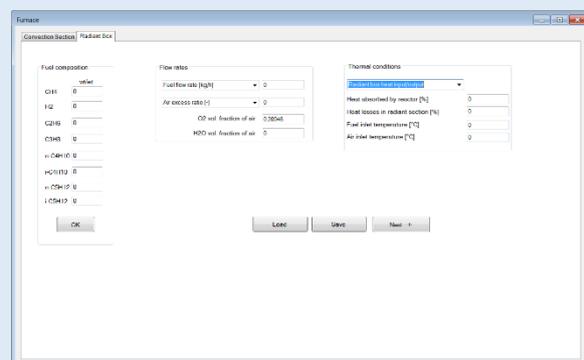
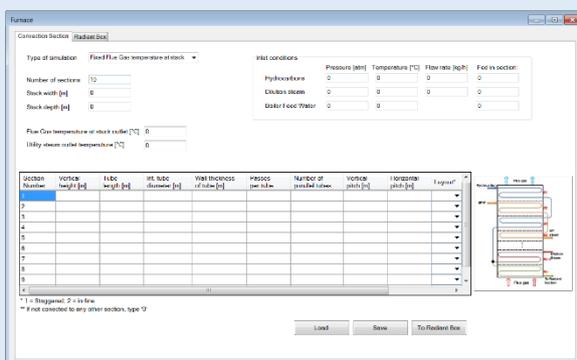
A specific model for the deposition of condensation coke is implemented for the TLE, providing users with a very accurate tool for the estimation of run length based on the intensity of fouling in this section.

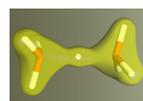
Furnace simulations*

It is the newest addition to COILSIM1D. It simulates both the radiant and convection sections of a cracking furnace, allowing users to estimate process parameters of interest:

-  Flue gas temperature
-  Utility steam production

COILSIM1D supports different tube bundle arrangements and allows users to customize the fuel gas composition





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