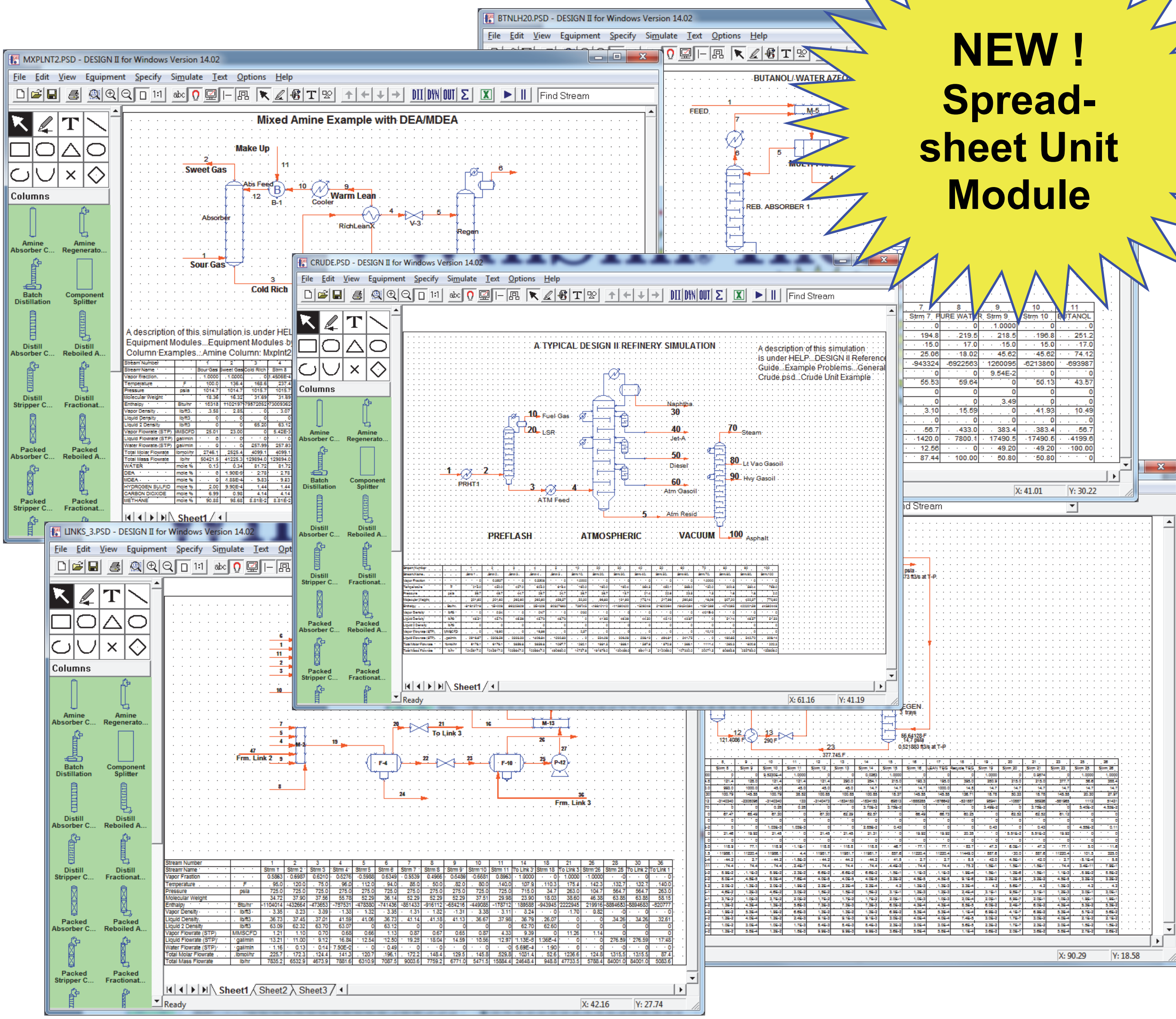
WinSim® Inc.



NEW ! Spread-sheet Unit Module

FREE TWO WEEK TRIAL

Advanced Process Simulation Solutions

TABLE OF CONTENTS

The Value of WinSim

WinSim Offers Engineers Many Reasons To Use Our Simulation Solutions

WinSim's Value

WinSim offers the highest-valued dynamic and steady-state simulation solution in the market. With DESIGN II, our clients reduce their simulation costs, not their capabilities.

WinSim's solution includes more than just a great simulator. WinSim offers the best and most responsive technical support in the business. 95% of technical support issues originating in North America are resolved within two business hours. 95% of technical support issues originating overseas are resolved within one business day.

WinSim's competitive pricing allows our clients to avoid resource limitations caused by restricted software access. DESIGN II for Windows can also be used for validation of legacy software.

WinSim's Market Position

With our powerful software, incredible technical support, and competitive pricing WinSim has met the industry's demand for a viable alternative in the simulation market. Focusing entirely on one product, DESIGN II for Windows, has allowed WinSim to pass savings in overhead costs along to our clients. The market has clearly taken notice. WinSim's market share has grown steadily over the past several years both in customer base and revenue.

Why WinSim?

No one else has the industry knowledge, proven experience, and competitive pricing. Our software, training, and support will help you immediately reduce simulation costs, increase equipment and economic performance, and identify critical process performance issues.

Why in the World is DESIGN II for Windows so Competitively Priced?

This is Our Core Competency. WinSim's entire focus is on the Design, Development, and Deployment of Advanced Process Simulation Solutions. DESIGN II for Windows is the only process simulator offered.

This is Our Corporate Direction. The management at WinSim has made a business decision to concentrate specifically on process simulation. This reduction in overhead costs is reflected in our competitive pricing.

This Created a Competitive Climate. WinSim's aggressive approach to "Minimize Our Costs, Maximize Our Solutions, and Optimize Our Customers Processes" has clearly provided a competitive alternative in the simulation market.

Who is WinSim Inc.?

The ChemShare Corporation started marketing the DESIGN program in 1969. In the 1970s, the Distill program was written and added to DESIGN to create the product DESIGN 2000. In the late 1970s / early 1980s, the Refine program was written and added to the DESIGN 2000 program to create the product DESIGN II. The DESIGN II name has been used to date even though the software has been through many generations in the time span.

In 1995, several ChemShare employees formed WinSim Inc. An agreement was reached with ChemShare Corporation to purchase an exclusive worldwide license to market and develop DESIGN II™ Simulation Systems. This action created the business structure to focus and build on the 26 years of ChemShare's outstanding service to simulation clients.

WinSim is solely dedicated to the furtherance of the DESIGN II for Windows software. Because of our focus, DESIGN II for Windows is the best value in the simulation market today.

Also, if you need a specialized application built in C++ or a Microsoft Excel spreadsheet using our calculation engine, just call us. We will gladly work with you on the user requirements and provide a quotation for the implementation.

Process Simulator Comparison

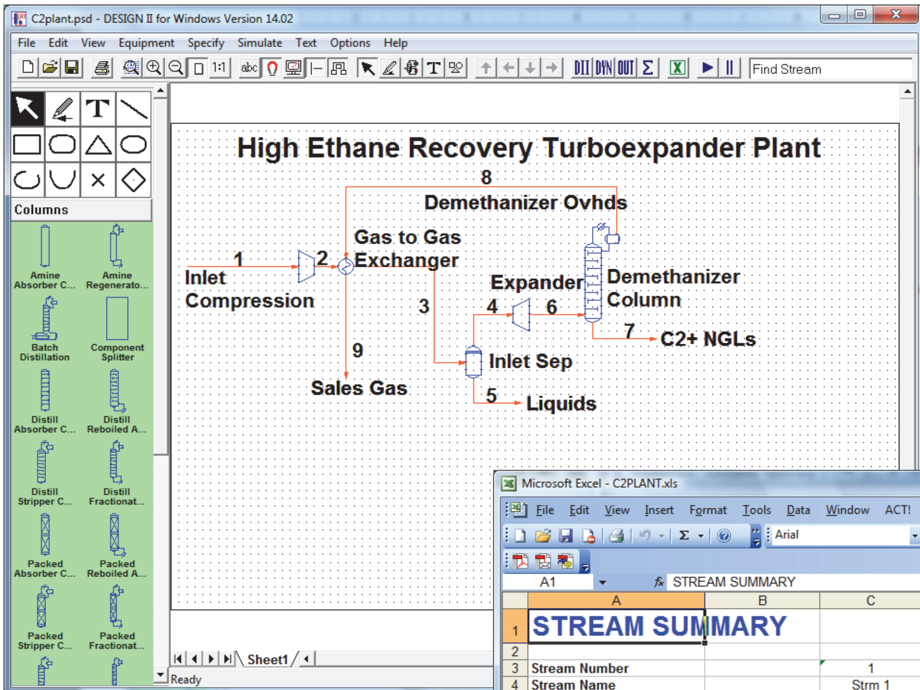
Category		*DESIGN II for Windows™*	Hysys ®	Pro/II	ProMax ®	Aspen Plus ®	Chem CAD
General	**1-Click Data Export to MS Excel**	✓	✓	✓	✓	✓	✓
	Component Library	✓	✓	✓	✓	✓	✓
	Thermodynamic Options	✓	✓	✓	✓	✓	✓
	Recycle Convergence	✓	✓	✓	✓	✓	✓
	Gas Processing	✓	✓	✓	✓	✓	✓
	Batch Simulation		+	+		+	+
	Dynamic Simulation	✓	+	+		+	+
	Heat Exchanger Rating	✓	+	+	✓	+	+
	Strong Electrolytes		+	✓		+	✓
	Pipeline Networks		+	+		+	+
	Mixed Amines	✓	+	✓	✓	+	
	Claus Process	✓	+	+	✓	+	+
Unit Modules	Rigorous Distillation Columns	✓	✓	✓	✓	✓	✓
	Batch Distillation Column	✓	+	✓		✓	✓
	Pipeline	✓	✓	✓	✓	✓	✓
	Heat Exchangers	✓	✓	✓	✓	✓	✓
	Flash	✓	✓	✓	✓	✓	✓
	Reactors	✓	✓	✓	✓	✓	✓
	Pumps & Compressors	✓	✓	✓	✓	✓	✓
	Storage Tanks	✓	✓	+		+	+
Interface	Windows Based GUI	✓	✓	✓	✓	✓	✓
	Text Based UI	✓					
Training	Onsite	✓	✓	✓	✓	✓	✓
	Offsite	✓	✓	✓	✓	✓	✓
	Seminar	✓	✓	✓	✓	✓	✓
Support and Upgrades	Usage Support	✓	✓	✓	✓	✓	✓
	Expert Process Support	✓	✓	✓	✓	✓	✓
	Support by Phone	✓	✓	✓	✓	✓	✓
	Support by E-mail	✓	✓	✓	✓	✓	✓

Legend
✓ Standard Feature
+ Available Feature for Additional License and/or Fee

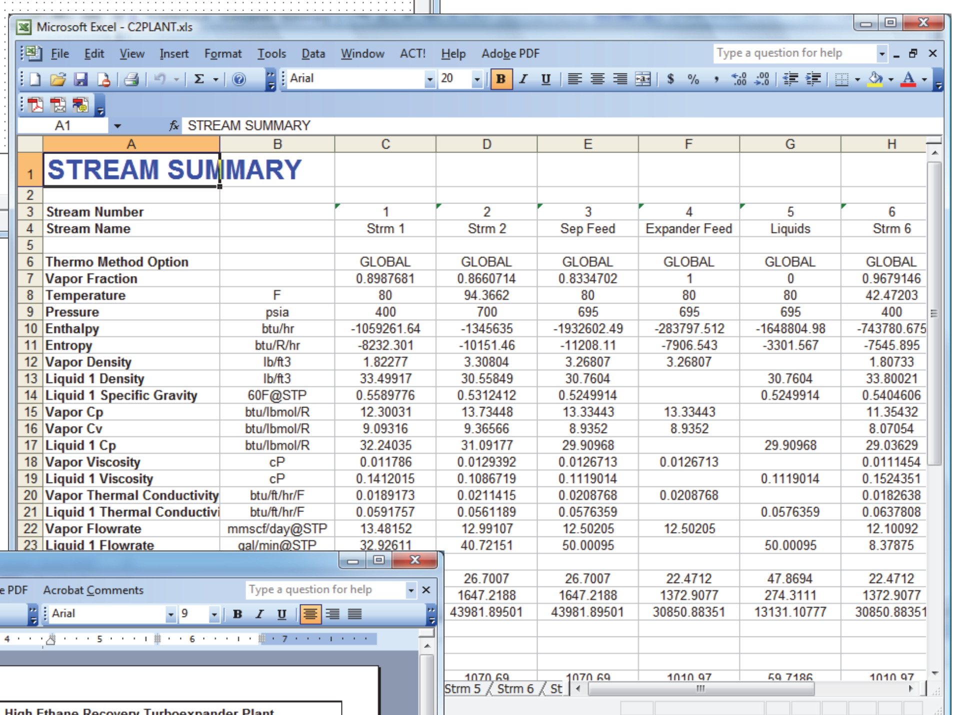
DESIGN II for Windows

THE WORKFLOW MODEL IS EASY AND FAST DUE TO WINDOWS BUILT IN FEATURES !

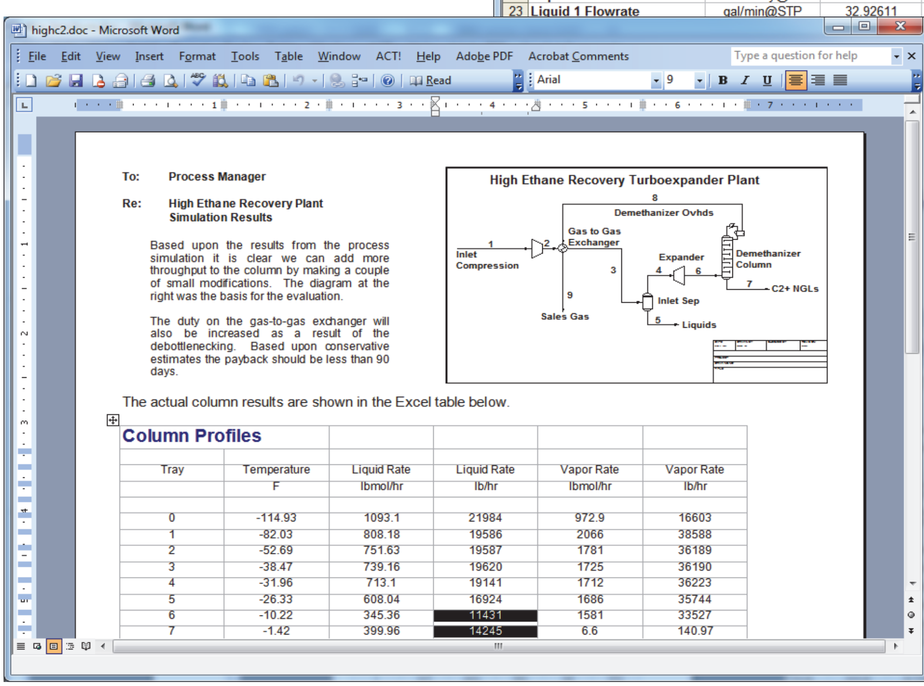
Build Flowsheet,



Transfer to Excel,



Create Report…



DESIGN II for Windows

Rigorous Process Simulation for Chemical and Hydrocarbon Processes including Refining, Refrigeration, Petrochemical, Gas Processing, Gas Treating, Pipelines, Fuel Cells, Ammonia, Methanol and Hydrogen Facilities

The Easy Way To Do Simulation

Microsoft® Windows® has become the standard for desktop graphical computing and WinSim's DESIGN II for Windows was the first process simulator developed specifically for Windows computing. DESIGN II for Windows has been leading the way in this technology since 1991.

Instant Usability

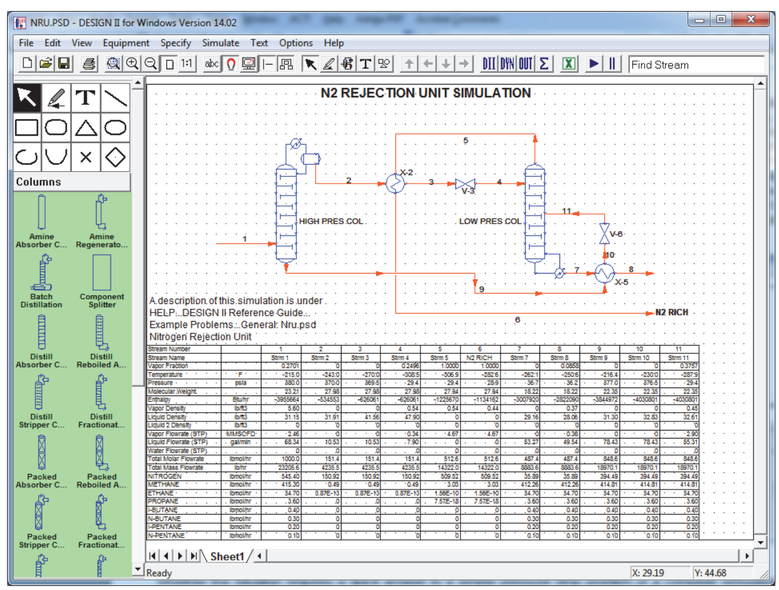
One click and you'll be convinced: DESIGN II for Windows is the easy way to do simulation. WinSim's original process simulator for Windows is intuitive and inter-operable with other Windows applications. Its look and feel provides an instant familiarity for experienced Windows users. The graphical interface means there are no special commands or function keys to remember. Just draw your flowsheet with point-and-click simplicity. Double click on flowsheet equipment and streams for specification dialog boxes to appear. Once your flowsheet is complete, DESIGN II for Windows will even validate your input before computing the simulation results. Export stream and equipment results to Microsoft Excel, or display the complete results as a text file. The simulation is fast, easy, and error free.

The Proven Pioneer of Simulator Engines - DESIGN II™

With a fifty plus year history of continued development and refinement, DESIGN II has long been a leader in process simulator innovation. Many DESIGN II features, such as Inline FORTRAN and rigorous column calculations, have set the standard for process simulation. Because of its proven strengths, DESIGN II is the simulation engine underlying DESIGN II for Windows. DESIGN II is a powerful and comprehensive process simulation computational engine, which performs complete heat and material balance calculations for a wide variety of pipeline and processing applications. The simulator's easy-to-create flowsheets allow process engineers to concentrate on engineering, rather than computer operations. A minimum amount of input is required to utilize DESIGN II for Windows. WinSim's simulator offers advanced features, such as sizing and rating of heat exchangers and separators, within the flowsheet. The DESIGN II for Windows database contains 1,200+ pure components, and others can be added via ChemTran. Also included is a crude library with 38 world crudes, already characterized and at your fingertips.

Applications:

- Physical Properties
- Two Phase Pipeline Modeling
- Expander and Lean Oil Plants
- Glycol Units
- Amine Units (Single and Mixed)
- Gathering & Transmission
- Rigorous Refinery Columns
- Petrochemical, Hydrocarbon, Refrigeration, Chemical, Ammonia, Methanol and Hydrogen Plants
- Heat Exchanger Sizing & Rating
- Separator Sizing & Rating
- VLE / LLE Data Regression
- Fuel Cell Systems



A Perfect Fit for Any Environment

Whether the situation requires a quick answer to a simple pressure drop problem or a complete simulation model of a large plant for operational engineering, DESIGN II for Windows is the perfect combination of power and ease-of-use. The size and complexity of the flowsheet, including the number of unit operations, streams, and components, is practically unlimited.

How To Test Drive DESIGN II for Windows

Try the Fully Working Version of DESIGN II for Windows For Free ! ! !

Are you looking for a rigorous yet fast and easy to use process simulator ?

You can now Test Drive the Professional version of DESIGN II absolutely free! The only difference between the Test Drive version and the purchased version of DESIGN II is the length of time your password will be valid.

It's as easy as 1-2-3

Visit our website at www.winsim.com. Follow the "Download Files" link to download the latest version of DESIGN II for Windows.

Follow the simple setup instructions

Once the installation is finished, double click on the DESIGN II for Windows icon placed on the desktop of your PC. You will see a unique Computer ID number generated by the program for your computer.

Get a test drive password

Take your Computer ID number back to the website and follow the "2 Week Password" link. A password will be automatically e-mailed to you.

Read and work through the tutorial on our online help

While you are test driving, you may want to read and work through the interactive tutorial. Once you are in the program, you can find the tutorial by clicking on "Help" and then clicking on "Tutorial". Or, the tutorial is available on our website at http://www.winsim.com/tutorial/.

Try one of our 300 sample flowsheets

Also, WinSim has included over 300 examples of working flowsheets for you to look at. To view the example files, just click on File... Open Sample Flowsheets... and then you will see various files intuitively categorized.

Contact our technical support if necessary

When you need help with a detail or want a hint, just contact technical support at support@winsim.com, phone 281-545-9200 x106, or fax 281-545-8820. One of the best ways to get your point across is to email the flowsheet file to us.

Some of Our Process Industry Customers

DESIGN II for Windows Has Many Users With Widely Varying Needs

All trademarks represented on this page are the property of their respective owners.

What Some of our Customers Say about Us

DESIGN II FOR WINDOWS HAS DEDICATED FANS ! ! !

"The results generated by Design II are quite consistent with other, higher priced simulators. WinSim support has been very responsive to our needs, always responding quickly to requests for support. They have listened to our requests for additional features, continually adding new capabilities…"

John Estill
Ascent Engineering
Houston, TX

"The principal advantage of the software is its ease of use and excellent technical support. We have never waited more than a few hours to receive answers to our questions or help in getting a simulation to run. The thermodynamic packages available are second to none… The use of Chemtran data base files… alleviates the need to use expensive specialized software…

"We would recommend this software for… businesses, consultants or process engineers… this software is easily justified and is becoming the Gold Standard for those who want value and service in the same package!"

Murray Page P.E.
Principal
The Process Group, LLC
Irvine, CA

"Chem-Engineering Services replaced another process simulator used for 15 years with Design II … gaining tremendous new advantages.

WinSim Inc. Design II process simulation software offers users incredible chemical plant modeling… The software includes all unit operations of chemical engineering at incredibly low cost, compared with other vendors process engineering simulator software."

Glenn Combs
Process Technology Consultant
Chem-Engineering Services
Monroe, Louisiana

For the last fifteen years we use DESIGN II exclusively on ALL jobs.

As consultants to worldwide refiners and petrochemical plants we rely on predictions made by DESIGN II to design new processes and optimize existing ones."

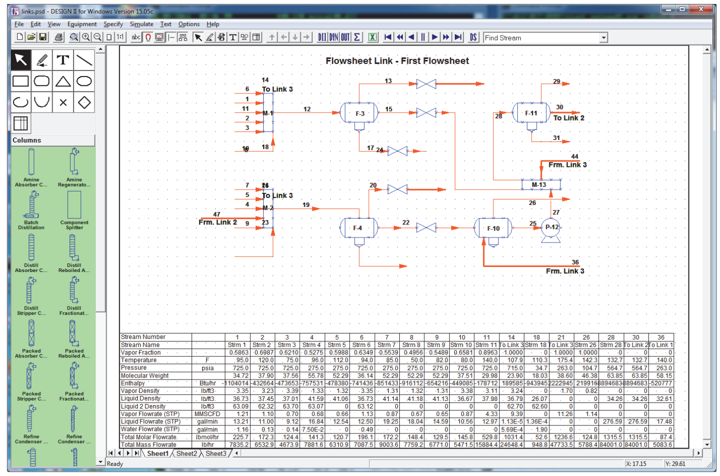
Raj D. Kulkarni, P. E.
President
Petro Project Engineering, Inc.
Houston, TX

Diagram User Interface

DESIGN II FOR WINDOWS OFFERS AN EASY TO USE AND POWERFUL USER INTERFACE

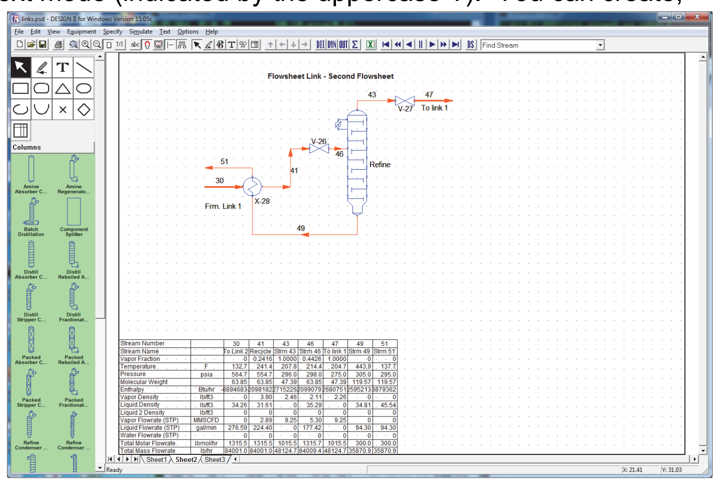
Easy and Powerful

DESIGN II for Windows contains an easy to use and powerful user interface for any version of Windows. You can model an unlimited amount of information since you can add many sheets to the flowsheet.



Controlled by a Toolbox

The user interface is controlled by the toolbox with several modes. The first mode is the selection mode (indicated by the left leaning arrow). You can individually select any item or a group of items in this mode. You can then modify, move or delete the item(s) that you have selected. The second mode is the stream mode (indicated by the drawing pen). You can create, append, delete, edit the properties or the view the simulation results of any selected stream in this mode. You can also change the placement and amount of line arrows for any stream. The third mode is the text mode (indicated by the uppercase T). You can create, append, delete or edit the properties of any selected text item in this mode. The fourth through ninth modes are the graphical drawing modes in which you can add lines, arcs, rectangles, circles, etc to the drawing. The tenth mode is the Table mode.



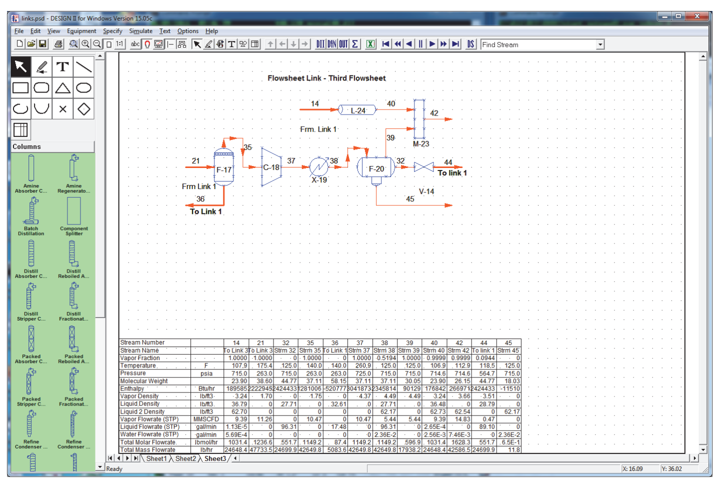
Note that you can drag a unit module symbol from the toolbox to the drawing in any mode. You can also delete, edit the properties or view the simulation results of any selected unit module while in selection mode.

Many Unit Module Symbols

There are 80+ symbols that can be used to model unit operations in the flowsheet. You can easily create new symbols and symbol libraries. You can also display simulation results on the flowsheet for each of the unit modules (such as duty, stages, name, number, etc…).

Stream Data Box

You can add a stream data box with stream simulation results to your flowsheet. You can display all streams on the sheet, all streams in the flow sheet, or display just selected streams. You can also change the dimensional units (with corresponding value changes) for many of the results. And you can create a Table on any sheet with your results on a time or case basis.



Results on the Fly

The flowsheet itself is interactive as you move the mouse about the flowsheet. Small windows (tooltips) are automatically displayed for you with information about the unit module or stream that the mouse is hovering over.

Continuing Streams from One Sheet to Another

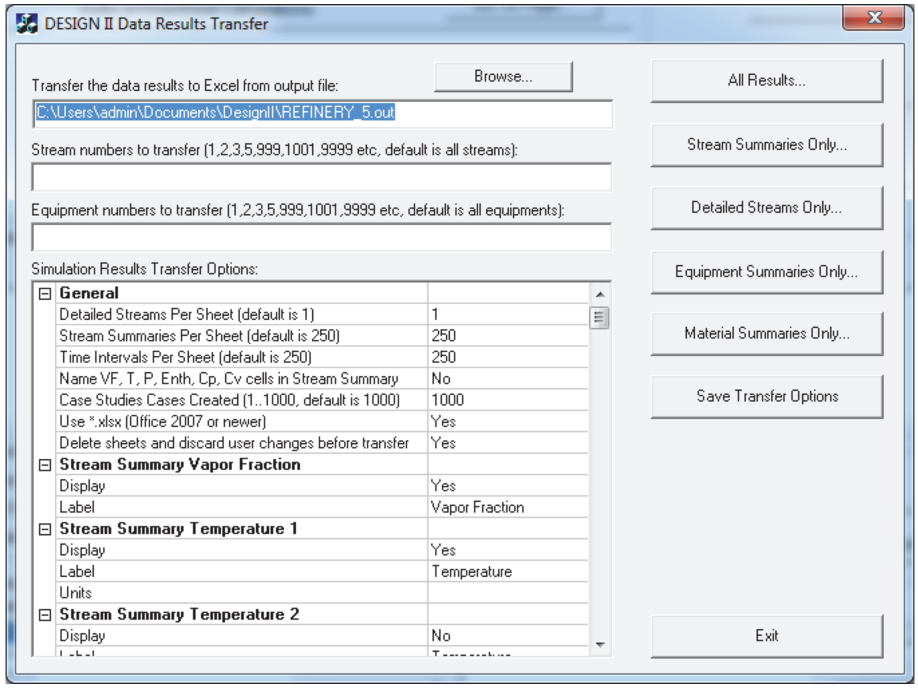
Streams can be continued from any sheet to any sheet by simply numbering the stream with the same number. The user interface will automatically make sure that the streams are connected to only one unit module at each end.

Feed and Product Streams

Any stream can be a feed or a product stream. No special symbols are needed to indicate that the stream is a feed or product, simply an unconnected end of the stream will tell the simulator that it is a feed or product.

Excel Results Transfer

DESIGN II FOR WINDOWS OFFERS FAST AND EASY RESULTS TRANSFER TO MICROSOFT EXCEL



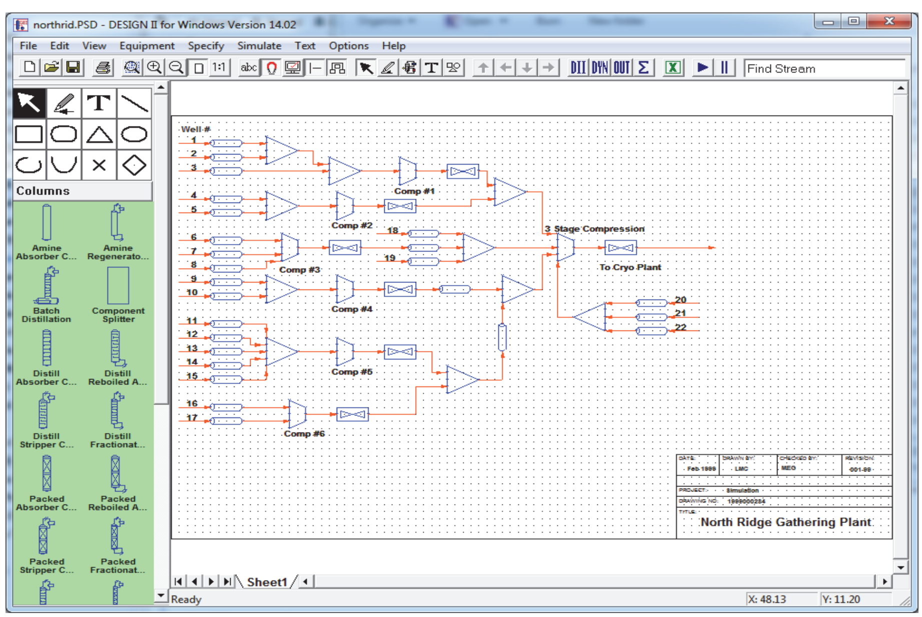
DESIGN II for Windows contains a high-speed application for sending ALL of your results data to Microsoft Excel with a single click. Upon your clicking a button, DESIGN II Excel Blaster will start Microsoft® Excel, open the old spreadsheet or create a new spreadsheet, and transfer the results of your current flowsheet into Excel. All of the results data transferred to Excel will be properly formatted and placed on appropriate pages. You can also select additional items to be displayed on the stream summary sheet with specified dimensional units.

You can choose to have five different types of your results data sent to Excel: the material balance, the stream summary data, the equipment data, the detail stream results data or all results. We use "all results" to refer to the sending of all your results data to Excel. You can also choose "configuration options" which allows you to select additional items and / or specify dimensional units.

The DESIGN II Excel Blaster is compatible with all English and International versions of Microsoft Excel Office 365, 2016, 2013, 2012, 2010, 2007, 2003, XP, 2000, 97 and 95.

Pipeline Modeling

DESIGN II FOR WINDOWS OFFERS ENGINEERS RIGOROUS SIMULATION OF PIPELINES



DESIGN II FOR WINDOWS provides complete pipeline modeling and sizing capabilities. This covers more than just simple pressure drop calculations. For example, both single and two-phase streams and networks can be sized to meet any of the following constraints:

- Pressure Drop
- Velocity
- Sonic Velocity Fraction
- Nominal Diameter

DESIGN II FOR WINDOWS also rigorously accounts all heat transfer and elevation changes associated with piping systems. Materials of construction that may be used range from aluminum to stainless steel.

You also get complete slug analysis for condensed liquids moving within piping systems. This is particularly important for light hydrocarbon streams such as those associated with natural gas gathering fields.

Exchange Data with Spreadsheet

You can Transfer Data To Or From Excel Before and After a Simulation

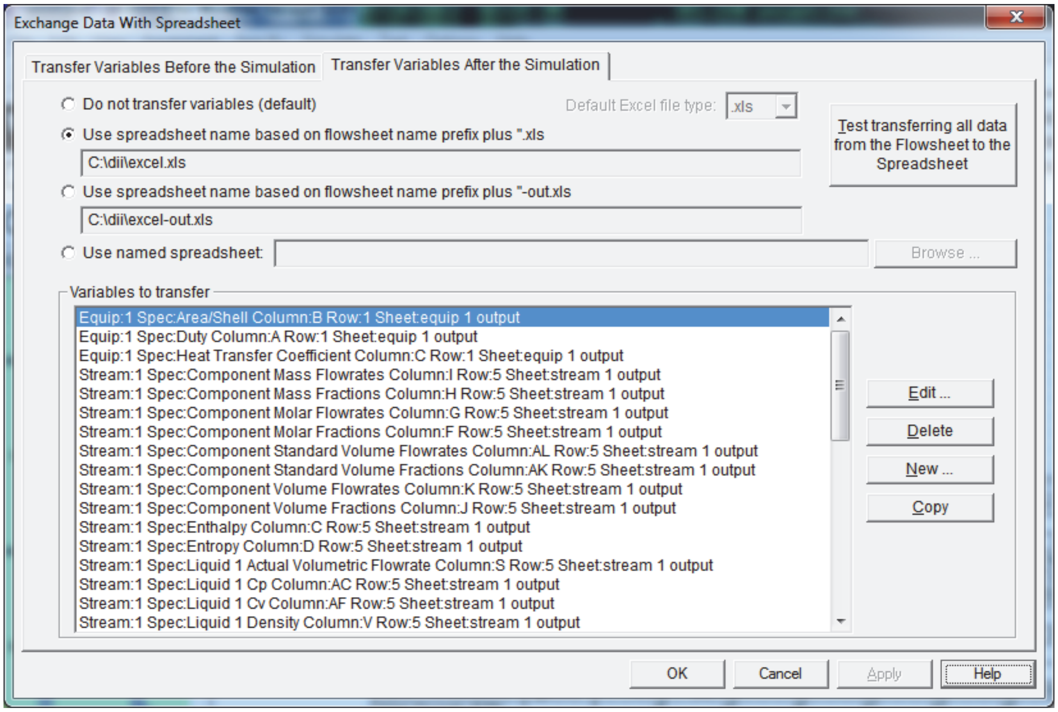
You can transfer specification data from an Excel spreadsheet to a flowsheet before running a simulation. You can also export calculated simulation results from a flowsheet to a spreadsheet after running a simulation. You control exactly which data items are transferred.

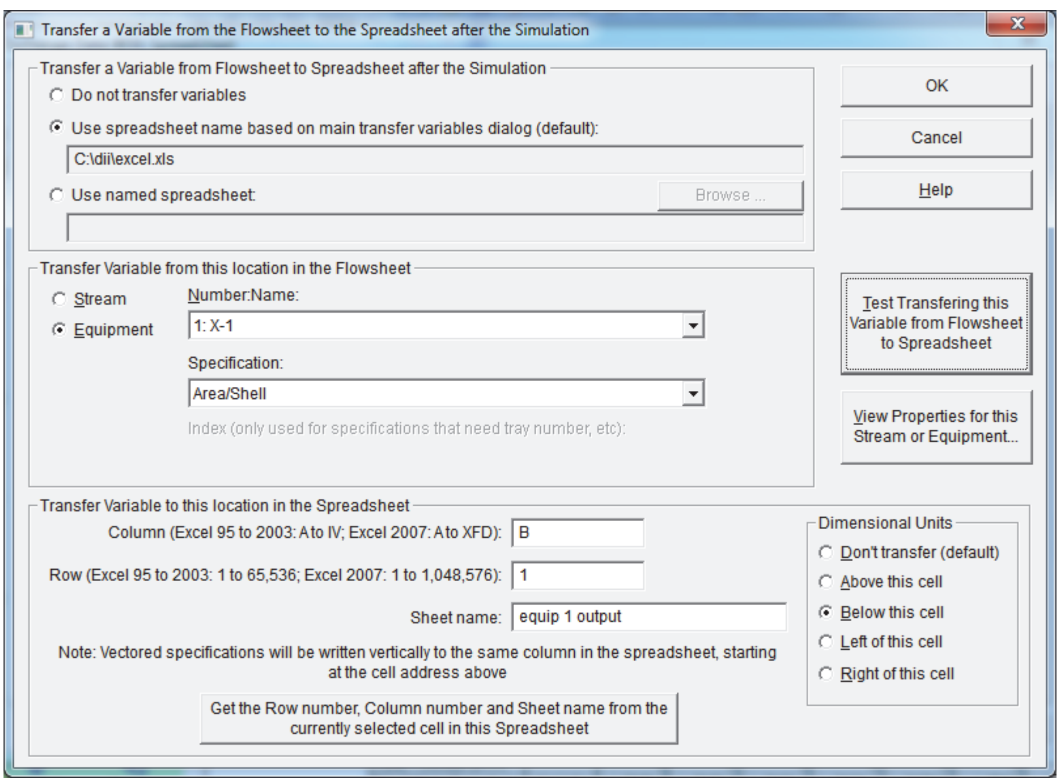
You can transfer data to/from streams, heat exchangers, air coolers and several other equipment modules. You can have several choices of spreadsheet files to use for both import and export of data. Each individual item can have its own spreadsheet file or use the general spreadsheet for that mode (import or export).

Note that all flowsheet validation logic will be run after the specification data is transferred from Excel to DESIGN II for Windows. Then the simulation calculation will be run if the flowsheet validation is successful.

Each item to be transferred will be selected based on a stream or equipment currently in the flowsheet and a specific item belonging to it. The Excel location will require specification of the sheet name, column and row. Dimensional units transfer is optional.

In addition, there is a test mode on all the dialogs to test transfer your data items independent of the simulation calculation.

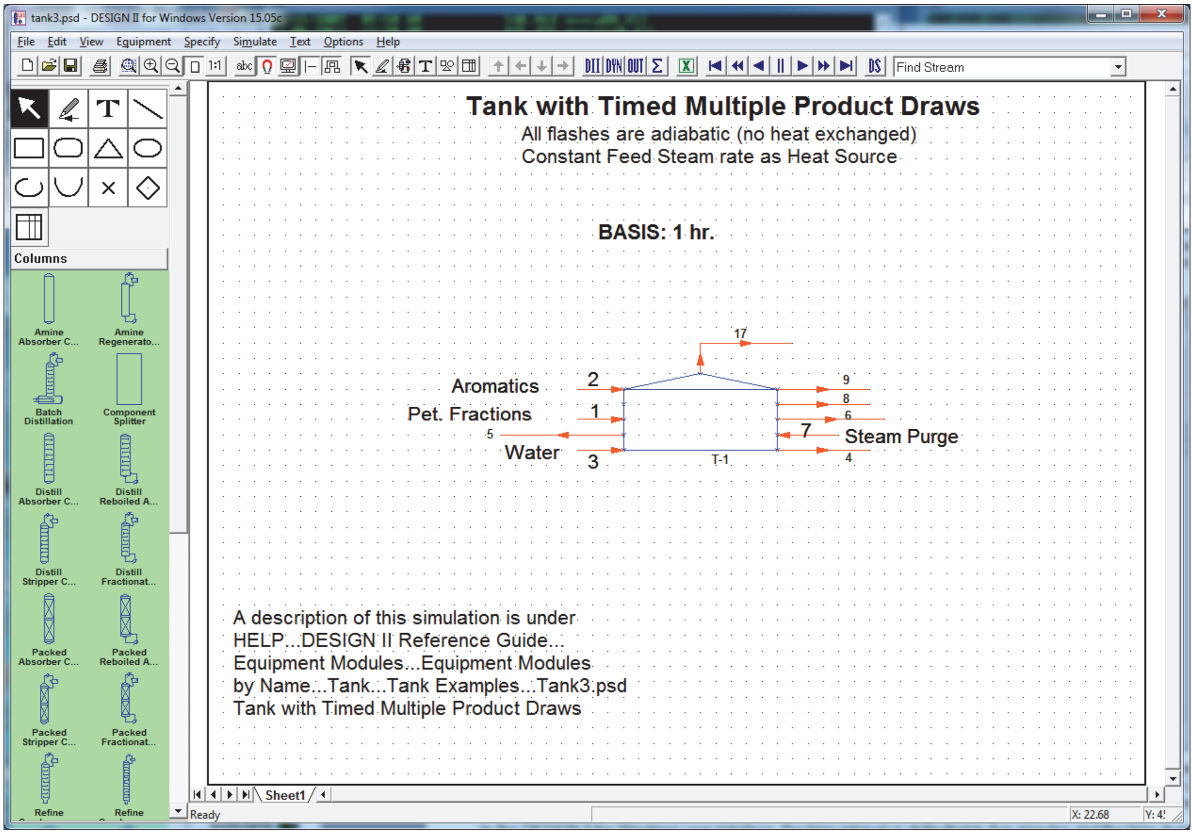




Dynamic Simulation

DESIGN II FOR WINDOWS OFFERS BOTH STEADY STATE AND DYNAMIC SIMULATION

As of version 11.00, DESIGN II for Windows contains a new flowsheet level implementation of Dynamic Simulation. Previous releases of DESIGN II contained two unit modules that incorporated time capabilities, the Depressurizer and the Batch Distillation Column. Both of these unit modules are still completely available and have not been changed at all. The new capability is that time awareness has been implemented at the flowsheet level.



The default simulation mode for DESIGN II is steady state. That is, all calculations will proceed until the entire flowsheet is in equilibrium or the user's specified maximum number of recycle iterations has been reached. If DESIGN II sees a time duration command and a time interval command, then it will automatically switch into dynamic simulation mode.

In the DESIGN II for Windows user interface, the time interval is defaulted to five minutes and the time duration is defaulted to sixty minutes. The time units can be any conventional time unit: seconds, minutes, hours, days or years. The time commands are controlled by the Specify / Dynamic Settings dialog. The user controls whether these commands are used by clicking on the DII button (or the Simulate / Execute Steady State… menu entry) or clicking on the DYN button (or the Simulate / Execute Dynamic… menu entry).

When DESIGN II switches into dynamic simulation mode, several things will automatically start to happen. First, the calculations will proceed normally until completion. At the end of the calculations, each stream will calculate the amount of material and energy that passed through that stream for that time interval. Then the normal material balance (molar and mass by component and then by node), energy balance and power balance reports will be calculated. Then a new section of reports specific to dynamic calculations will be generated: a material holdup report (molar and mass) and a dynamic material balance report (molar and mass by component and then by node). Note that the Tank unit module is the only unit module that will report material holdup for the dynamic material holdup calculations. Then DESIGN II will proceed onto the next time interval.

When DESIGN II has reached the time duration set by the user, another set of reports will be generated. The total dynamic material holdup by time interval is generated on a molar and mass basis. Also, the total dynamic material balance by time interval is generated on a molar and mass basis.

Please note that any or all of the feed streams in the flowsheet can be started and stopped at any time during the simulation.

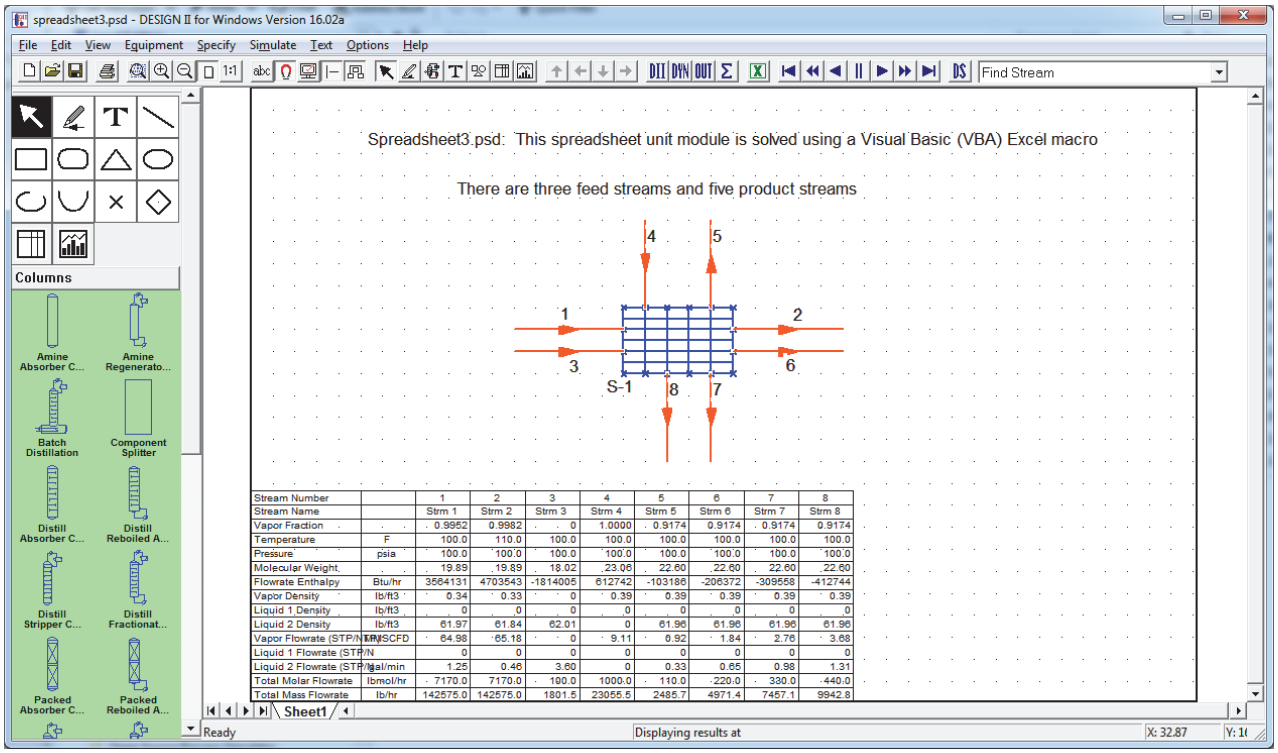
Spreadsheet Unit Module

DESIGN II FOR WINDOWS OFFERS A 100% USER CONFIGURABLE SPREADSHEET CALCULATION

As of version 16.00, DESIGN II for Windows contains a new Spreadsheet unit module capable of any calculation in an Excel spreadsheet that a person would want to make. The calculations in Excel can be in the macro language or in the VBA (Visual Basic for Applications) language. There are an unlimited number of inlet streams and an unlimited number of product streams, the order is specified by the user.

The calculations in the spreadsheet are totally the responsibility of the user. The user is not bound to molar or mass equilibrium, or enthalpic equilibrium. Anything can be calculated; anything can be changed. The temperature, pressure, enthalpy, quantity, and time dimensional units can be set to any value supported by the calculation engine. All of the dimensional units are made up using these basic choices, for instance, the flowrate unit are quantity over time.

After the calculation, the spreadsheet can be left open, saved and closed, or just closed (not saved). The calculation engine will use the outlet stream information to continue the flowsheet calculations. The default information about the outlet streams is the temperature, pressure, and component flowrates for each stream. Or, you can specify the vapor fraction, temperature or pressure, and the component flowrates for each stream.



Sample VBA code for spreadsheet3.psd:

```
Dim totalByComps(numComps) As Double
Dim I, j As Integer
    ' sum the flowrates for each component
For i = 1 To numComps
   totalByComps(i) = 0
   For j = 1 To numInlets
      ' totalByComps(i) = totalByComps(i) + Worksheets("inlet streams").Cells(11 + i, j)
   Next j
Next i

   ' temperature
Worksheets("outlet streams").Cells(7, 3) = Worksheets("inlet streams").Cells(7, 3) + 10#
Worksheets("outlet streams").Cells(7, 4) = Worksheets("inlet streams").Cells(7, 4)
Worksheets("outlet streams").Cells(7, 5) = Worksheets("inlet streams").Cells(7, 4)
Worksheets("outlet streams").Cells(7, 6) = Worksheets("inlet streams").Cells(7, 4)
Worksheets("outlet streams").Cells(7, 7) = Worksheets("inlet streams").Cells(7, 4)
```

Spreadsheet Unit Module (cont.)

DESIGN II FOR WINDOWS OFFERS A 100% USER CONFIGURABLE SPREADSHEET CALCULATION

spreadsheet3.xlsm - Excel

	A	B	C	D	E	F	G
1	**Inlet Stream(s)**				Design II DLL directory		C:\dii
2							
3	**Stream Number**		1	3	4		
4	**Stream Name**		Strm 1	Strm 3	Strm 4		
5							
6	**Vapor Fraction**		0.995150753	0	1		
7	**Temperature**	F	100	100	100		
8	**Pressure**	psig	85.304	85.304	85.304		
9	**Enthalpy**	Btu/hr	3564130.563	-1814004.517	612741.6127		
10	**Entropy**	Btu/hr/F	-10929.67784	-2889.931984	-1195.718371		
11	**Total Flowrate**	lb/hr	142575.1537	1801.534081	23055.49049		
12	**Component 1 Flowrate**	lb/hr	1801.534081	1801.534081	0		
13	**Component 2 Flowrate**	lb/hr	97862.17916	0	8021.490095		
14	**Component 3 Flowrate**	lb/hr	15034.0004	0	15034.0004		
15	**Component 4 Flowrate**	lb/hr	8818.800354	0	0		
16	**Component 5 Flowrate**	lb/hr	5811.999893	0	0		
17	**Component 6 Flowrate**	lb/hr	7214.6	0	0		
18	**Component 7 Flowrate**	lb/hr	6032.039795	0	0		

inlet streams | outlet streams

spreadsheet3.xlsm - Excel

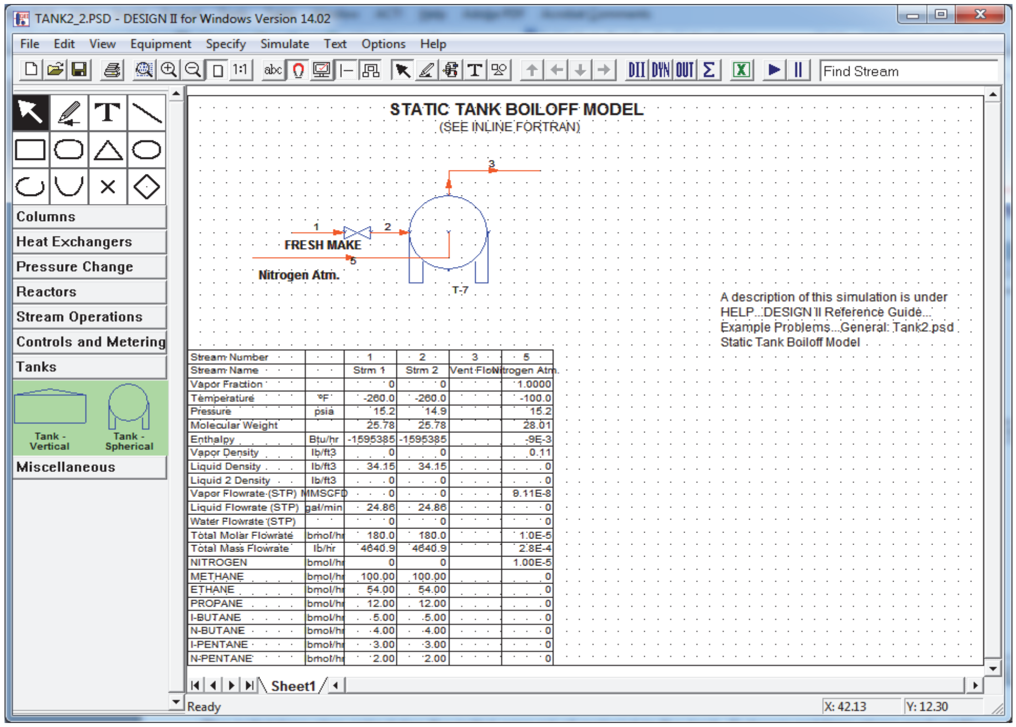
	A	B	C	D	E	F	G
1	**Outlet Stream(s)**				Design II DLL directory		C:\dii
2							
3	**Stream Number**		2	5	6	7	8
4	**Stream Name**		Strm 2	Strm 5	Strm 6	Strm 7	Strm 8
5							
6	**Vapor Fraction**		0.995150753	0.5	0.5	0.5	0.5
7	**Temperature**	F	110	100	100	100	100
8	**Pressure**	psig	85.304	85.304	85.304	85.304	85.304
9	**Enthalpy**	Btu/hr	3564130.563	-120126.2905	-240252.5809	-360378.8714	-480505.1618
10	**Entropy**	Btu/hr/F	-10929.67784	-408.5650355	-817.1300711	-1225.695107	-1634.260142
11	**Total Flowrate**	lb/hr	142575.1537	2485.702457	4971.404914	7457.107371	9942.809828
12	**Component 1 Flowrate**	lb/hr	1801.534081	180.1534081	360.3068162	540.4602243	720.6136324
13	**Component 2 Flowrate**	lb/hr	97862.17916	802.1490095	1604.298019	2406.447029	3208.596038
14	**Component 3 Flowrate**	lb/hr	15034.0004	1503.40004	3006.800079	4510.200119	6013.600158
15	**Component 4 Flowrate**	lb/hr	8818.800354	0	0	0	0
16	**Component 5 Flowrate**	lb/hr	5811.999893	0	0	0	0
17	**Component 6 Flowrate**	lb/hr	7214.6	0	0	0	0
18	**Component 7 Flowrate**	lb/hr	6032.039795	0	0	0	0

inlet streams | outlet streams

Tank Unit Module

DESIGN II for Windows Offers a Constant Volume Tank In Various Configurations

DESIGN II for Windows contains a Tank unit module for calculating the dynamic effects of feeds, accumulations and products from a constant volume tank. Temperature, pressure, composition and phases will be calculated over a period of time specified by the user for the entire flowsheet. Both pure components and mixed phases can be handled Tank unit module.

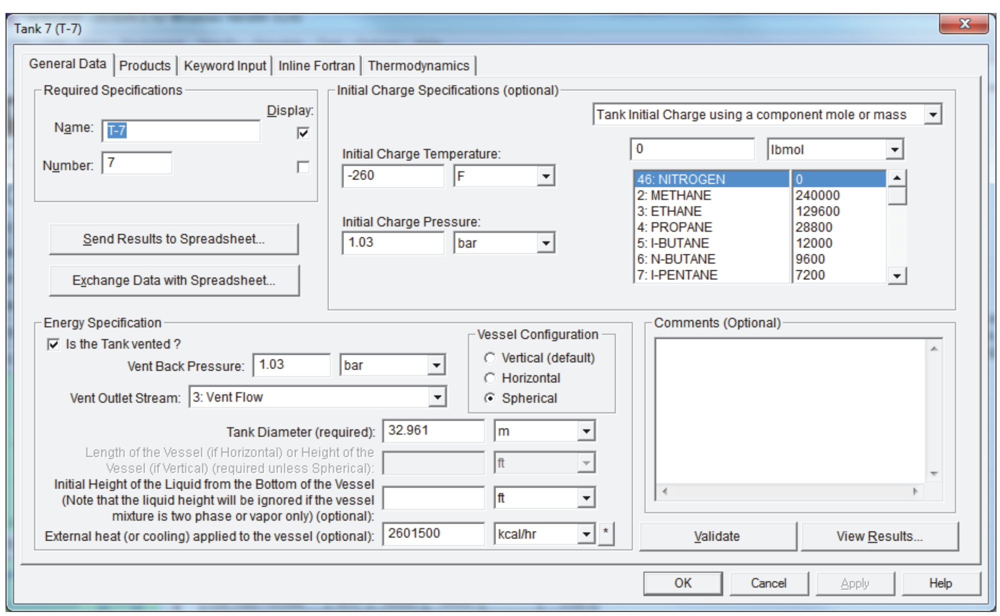


The Tanks geometry can be specified as horizontal, vertical or spherical. The diameter of the tank must be specified along with the length if the tank is vertical or horizontal.

The Tank will allow the user to specify an initial composition based on molar, mass, volumetric or fractional amount with pressure and temperature.

The initial time step calculates the initial amount of material in the tank. Subsequent time steps and additions from feed streams (if any), subtractions from product streams (if any), will calculate the resulting temperature, pressure and compositions of the tank. If there is a vent specified then the vent stream will allow vapor to bleed off to meet the vent pressure specification while maintaining adiabatic equilibrium.

The product streams can be specified using molar, mass or volumetric flowrates. The product streams can be started and/or stopped according to the user's time specifications. The liquid product streams will only run if there is liquid in the tank and the vapor product streams will only run if there is vapor in the tank. The product stream will only run if the start time is less than the current time and the stop time is zero or greater than the last time step value.



The Tank has an optional vent stream where all you have to do is specify the vent pressure. The Tank will automatically calculate the flow rate out the vent in order to keep the tank at the vent pressure. The physical size of the vent stream is not taken into account for how much material can flow out through.

There are three tank sample flowsheets in c:\Program Files (x86)\DesignII \samples\equipmnt\tank: tank1.psd, tank2.psd and tank3.psd.

Single and Mixed Amines

DESIGN II FOR WINDOWS OFFERS THE INDUSTRY'S FOREMOST RATE-BASED SINGLE AND BLENDED AMINE SIMULATOR FOR NATURAL GAS AND LPG TREATING APPLICATIONS

Rate Based Column Models

Accurate kinetic models are used to determine reaction rates and their impact on column operation. Rigorously accounting for the kinetic and hydrodynamic effects in selective gas treatment allows for the proper design and operation of treating units. Avoid under design (insufficient CO_2 pickup) or over design (excessive CO_2 removal, loss of selectivity and possible increased content of H_2S in sweet gas). Thermodynamic models (Kent-Eisenberg or Deshmukh-Mather) rigorously account for the ionic nature of the solvents, rates of mass transfer, heat transfer coefficients, and driving forces. Reaction kinetics will determine mass transfer enhancement factors and selective removal rates.

Selective Stripping and Solvent Formulation

By simulating processes that employ either a single amine or a binary blend of MEA, DEA, DGA®, DIPA, MDEA and Piperazine as solvents, DESIGN II FOR WINDOWS allows the selective removal of H_2S and CO_2. The user may, for example, debottleneck DEA columns or lower the CO_2 content of sweet gas from MDEA columns. This allows the engineer to reduce their amine operating cost by formulating a solvent that best meets their particular needs.

Real Column Simulation

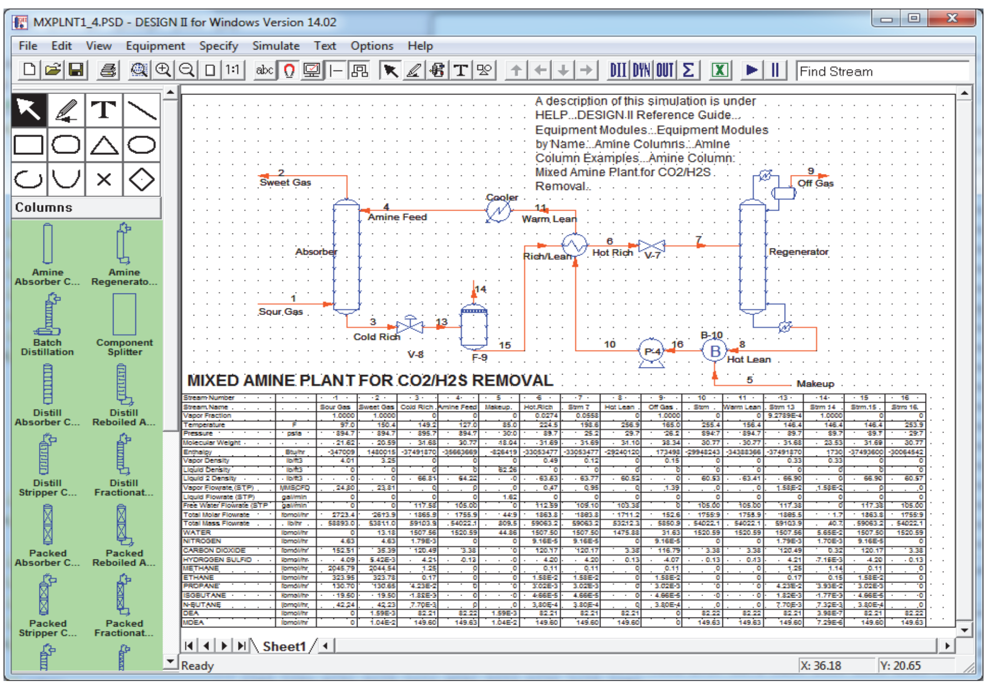
Both trayed and packed columns are modeled by describing their actual configuration. Packed columns need not be converted to trays (HETP) or the actual trays to equilibrium trays; DESIGN II FOR WINDOWS calculates the actual mass transfer in a section of packing or on a real tray. You can specify the pressure drop over the entire column, the pressure drop per tray, or request the program calculate the pressure drop. The column parameters are outlined below.

Trayed Columns:

- Number of Actual Trays
- Tray Area Percent
- Tray Type
- Tray Spacing
- Weir Height
- Number of Passes

Packed Columns:

- Packing Depth
- Packing Type
- Packing Size
- Packing Factor
- Specific Area
- Multiple Packing Sections



Preset Flowsheets

Because these applications are rigorous, the flowsheets can be very sensitive on convergence. With DESIGN II FOR WINDOWS you can work with one of our many already converged flowsheets and modify the input to fit your own data. Or, you may build a flowsheet and create your own unique process.

Applications

Sour Natural Gas Treating, Sour LPG Treating, Tail Gas Treating, Off-Gas Upgrading, and more.

Petroleum Crude Processing

DESIGN II FOR WINDOWS OFFERS ENGINEERS RIGOROUS SIMULATION AND OPTIMIZATION OF ONE OR MORE DISTILLATION COLUMNS RECEIVING HIGH HYDROCARBON FEEDS WITH COMPLEX HEAT TRAINS FOR MAXIMUM PRODUCT RECOVERY AND HEAT LOSS MINIMIZATION

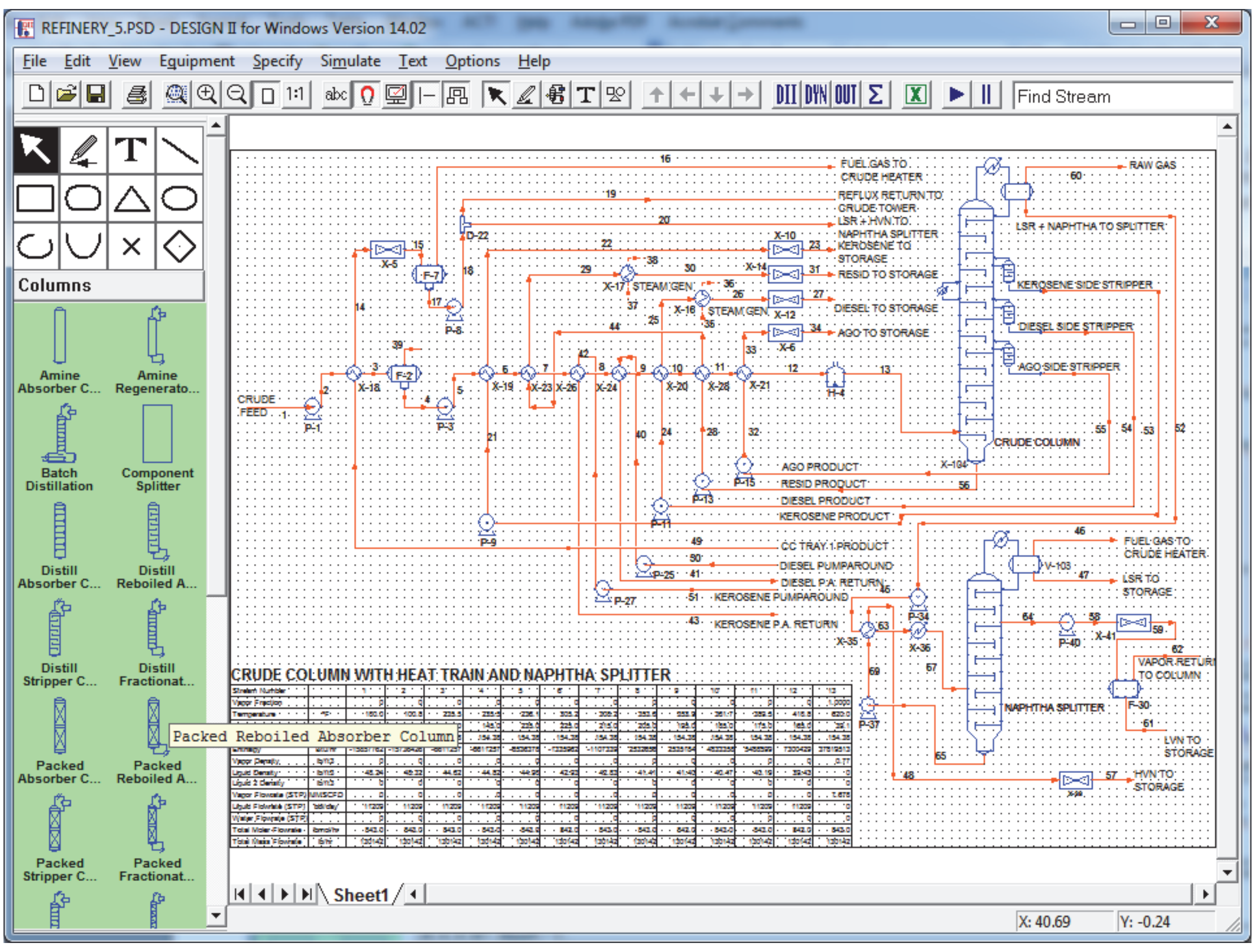
Crude Feed Streams

DESIGN II FOR WINDOWS can simulate multiple crude feeds into the process. The hydrocarbon feeds are typically characterized by TBP, ASTM D-86/1160 or D-2887 distillation curves. DESIGN II allows entry of as much information as you have for your feed(s), from the minimum required details to define a feed (distillation curve, bulk gravity, temperature, pressure and flow rate) to more elaborate data such as sulfur weight percent curves, viscosity curves, pour point and metals content. You can also choose to map all your crude feeds onto a single set of petroleum fractions (blending) or to map each crude feed stream onto a unique set of petroleum fractions.

Refine Columns

The Refine Columns are used for rigorous simulation of distillation columns receiving high hydrocarbon-content feeds. Many common refinery units can be modeled including pre-flash towers, atmospheric columns, vacuum columns, FCC main fractionators and quench columns. Multiple side strippers, pumparounds, and side heaters / coolers can be added to the main column configuration for a rigorous simultaneous calculation. Refine Columns can be used for designing or modifying refinery fractionators with very good results. It is possible to duplicate the operation of existing units within a few percent of actual plant data.

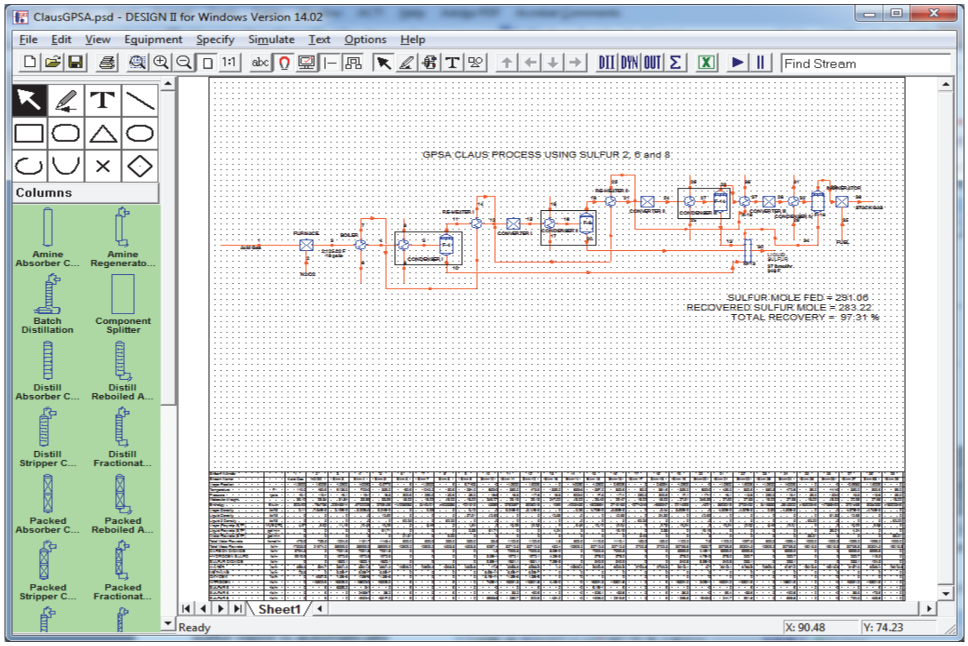
The simulator can match many important operational parameters, such as tower temperatures, reflux ratio, product rates and property specifications. Significant discrepancies are usually due to inaccuracies in data collection, but may be due to operational problems. In these cases a Refine Column may be used to identify the source of the problem and determine the solution.



Sulfur Recovery Process

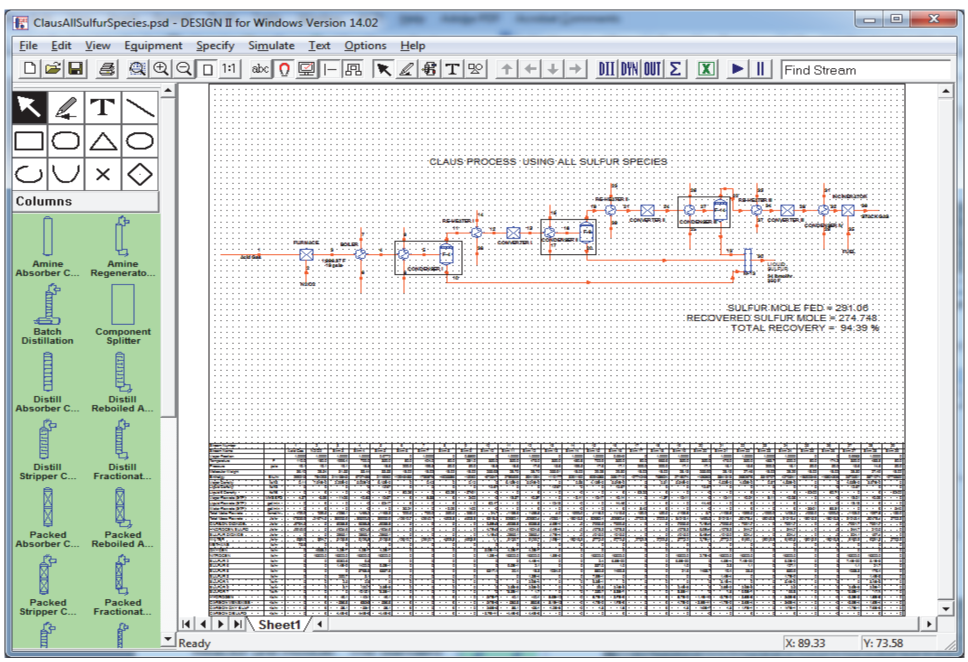
DESIGN II for Windows Offers Engineers Rigorous Simulation and Optimization of Claus Plants

The Claus process is the most significant gas desulfurizing process, recovering elemental sulfur from gaseous hydrogen sulfide. First invented over 100 years ago, the Claus process has become the industry standard. The multi-step process recovers sulfur from the gaseous hydrogen sulfide found in raw natural gas and from the by-product gases containing hydrogen sulfide derived from refining crude oil and other industrial processes. The final step involves oxidation of the hydrogen sulfide.



Gases with a H_2S content of over 25% are suitable for the recovery of sulfur in Claus plants. These gases may also contain hydrogen cyanide, hydrocarbons, sulfur dioxide or ammonia. They mainly originate from physical and chemical gas treatment units (Coastal AGR, Genosorb 1753, Selexol, Rectisol, Purisol and amine scrubbers) in refineries, natural gas processing plants and gasification or synthesis gas plants. The sulfur recovered in Claus plants is used for manufacturing sulfuric acid, medicine, cosmetics, fertilizers and rubber products.

DESIGN II supports the sulfur polymers Sulfur 2, Sulfur 3, Sulfur 4, Sulfur 5, Sulfur6, Sulfur 7 and Sulfur 8. In the liquid phase, all sulfur is modeled as Sulfur 8.   In the vapor phase, the sulfur vapor is automatically redistributed into the seven sulfur polymers when temperature or pressure has been changed in a unit module.



For the combustion reactor, hydrogen sulfide is combusted with oxygen to form sulfur dioxide ($2H_2S + 3O_2 \rightarrow 2SO_2 + 2H_2O$). For the catalytic reactor, sulfur dioxide is combusted with hydrogen sulfide to form atomic sulfur and water ($2H_2S + SO_2 \rightarrow 3S + 2H_2O$). Both of these reactors are modeled in DESIGN II using the Equilibrium Reactor unit module. The standard flash unit modules are used to separate the liquid sulfur from the vapor streams.

The GPSA Data Book Claus Process (ClausGPSA.psd)

This sample flow sheet models the Claus Process in the GPSA data book using Sulfur 2, Sulfur 6, and Sulfur 8.

The GPSA Data Book Claus Process (ClausAllSulfurSpecies.psd)

This sample flow sheet models the Claus Process in the GPSA data book using Sulfur 2, Sulfur 3, Sulfur 4, Sulfur 5, Sulfur 6, Sulfur 7, and Sulfur 8.

Ammonia Plant Modeling

DESIGN II FOR WINDOWS OFFERS ENGINEERS RIGOROUS SIMULATION AND OPTIMIZATION OF AMMONIA, METHANOL AND HYDROGEN PLANTS

The Ammonia process (as simulated by the flowsheets in c:\Program Files (x86)\DesignII \samples\ammonia) consists of four different flow sheet PSDs. These include: Front End, CO2 Removal, Ammonia Synthesis Section and the Ammonia Refrigeration System. Each of these different sections is interlinked and together simulate a 1,500 ton per day ammonia plant.

Synthesis Gas Preparation (Front-End) Process (frontend.psd)

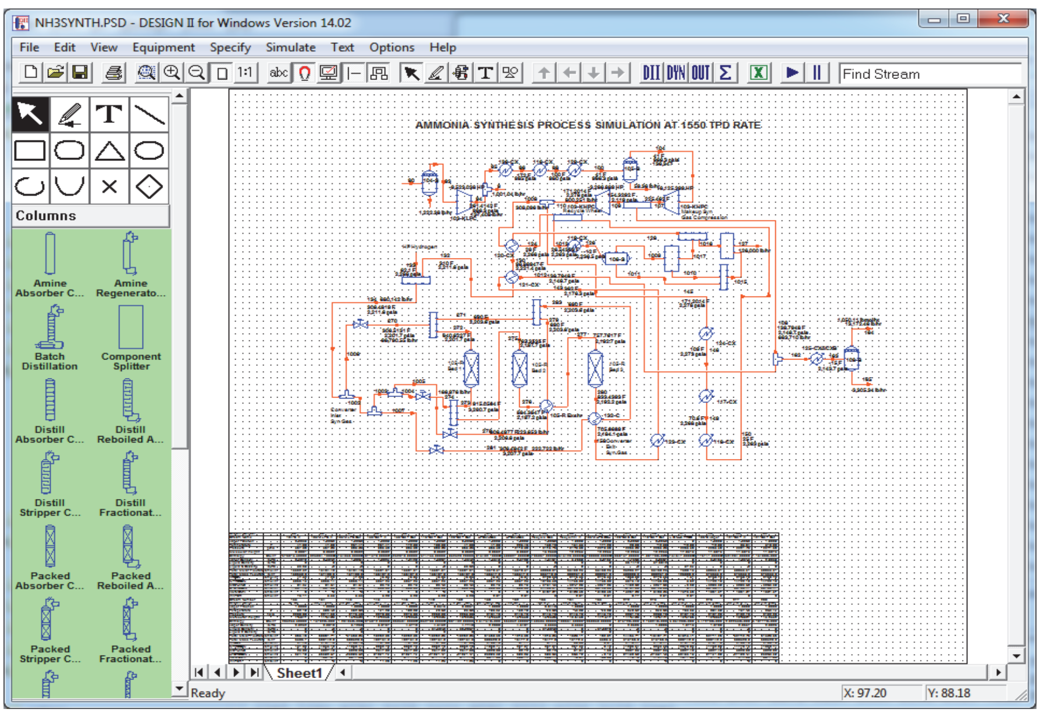
Design II provides thermodynamic, equilibrium and component material balance calculations for all ammonia plant technologies including processes which incorporate various combinations of feedstock preheating, steam-hydrocarbon and auto-thermal reforming, waste heat steam generation, carbon-monoxide shifting, boiler water preheating, carbon dioxide removal, methanation, synthesis gas cooling and condensate recovery.

CO2 Removal Process (co2remvl.psd)

Design II provides accurate assessment of carbon-dioxide removal systems modeling including thermodynamic, vapor liquid equilibria and component balances for diverse arrangements of lean solvent pumping, high pressure carbon dioxide absorption, lean/rich solvent heat exchange, rich solvent stripping, carbon dioxide cooling, condensate separation and solvent heat rejection.

Ammonia Synthesis Process (nh3synth.psd)

Design II readily handles ammonia synthesis equipment calculations, including predictions of energy usage, reaction equilibria, thermodynamics, component balances and vapor-liquid equilibrium for complex plant arrangements and technologies which incorporate synthesis gas multi stage compressors with inter-cooling, synthesis gas cooling using water and refrigeration chilling, refrigeration recovery exchange, ammonia product separation, process heating and cooling, inter-cooled and quench ammonia converters with internal exchangers, steam generation and boiler water preheating, synthesis gas purge and the synergies of recycle of synthesis gas.



Ammonia Refrigeration Process (nh3refrg.psd)

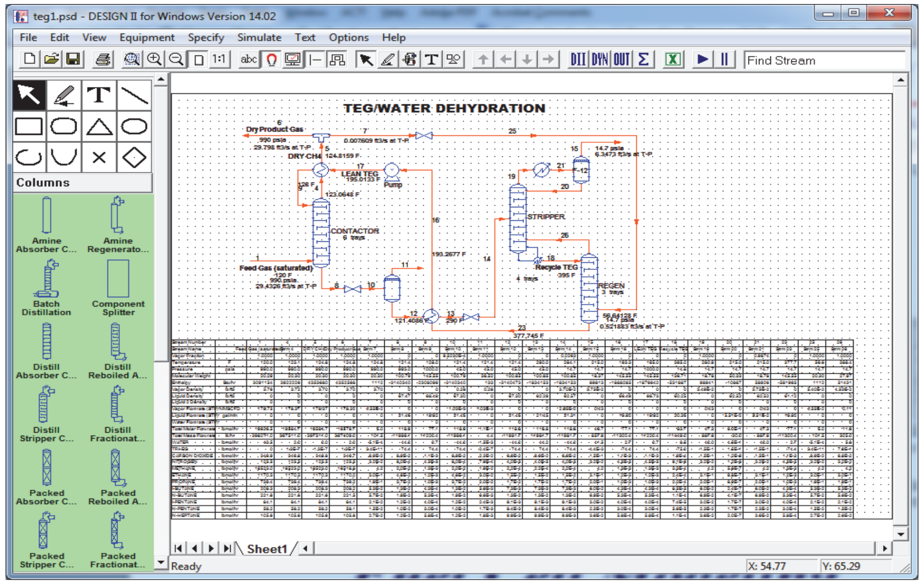
Design II rigorously models energy usage, vapor-liquid equilibria, thermodynamics and component balances for multi-stage refrigeration systems using inter-cooled compressors rejecting heat from process gas chillers via refrigerant ammonia condensing, including ammonia product let-down, flash drum equilibria and loads, inerts purge gas rejection, hot/cold ammonia product pumps and flash drum liquid and vapor flows.

Chemical Plant Modeling

DESIGN II for Windows can model many types of chemical processes besides the Ammonia processes.

Natural Gas Dehydration

DESIGN II OFFERS MANY METHODS FOR MODELING REMOVAL OF WATER FROM NATURAL GAS



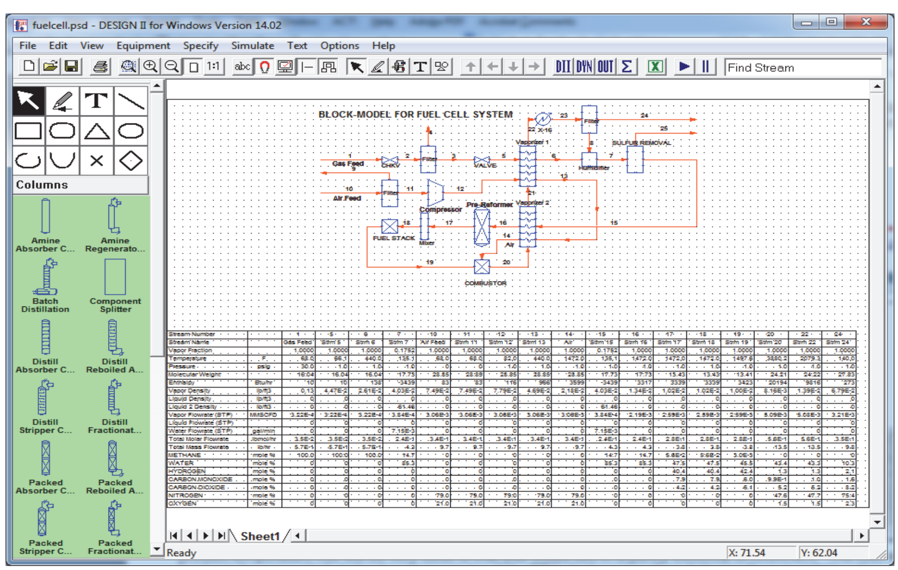
Typically, natural gas must be dehydrated before it is injected into a pipeline. Formation of liquid water in natural gas pipelines can lead to corrosion and compressor problems. Liquid water in natural gas can also lead to formation of natural gas hydrates, solid forms of natural gas, at temp-eratures up to 70 F (21 C). The most common method of removing water from natural gas is the stripping gas process utilizing Tri-ethylene Glycol (TEG). For natural gas with high BTEX content, the Drizo process can also be modeled.

DESIGN II has a custom set of binary interaction parameters built in it for use with the Modified Peng-Robinson thermodynamic k-value method. These binary interaction parameters (BIPs) modify the thermodynamic flash calculations so that the TEG to hydrocarbon component interactions are modeled correctly.

DESIGN II can also predict the formation of natural gas hydrates for any stream in the flowsheet. And, DESIGN II can be used to predict the natural gas hydrate inhibition effects of injection of ethylene glycol (EG), di-ethylene glycol (DEG), tri-ethylene glycol (TEG) or methanol (MeOH).

Fuel Cell Modeling

DESIGN II FOR WINDOWS OFFERS ENGINEERS RIGOROUS SIMULATION OF FUEL CELLS



DESIGN II FOR WINDOWS provides fuel cell modeling and sizing capabilities. This covers multiple reactor types such as equilibrium reactors and reformers, multiple heat exchanger types, line pressure drop, valves, compressors, pumps, etc. DESIGN II FOR WINDOWS also rigorously accounts all heat transfer and material transfer changes for the entire flowsheet.

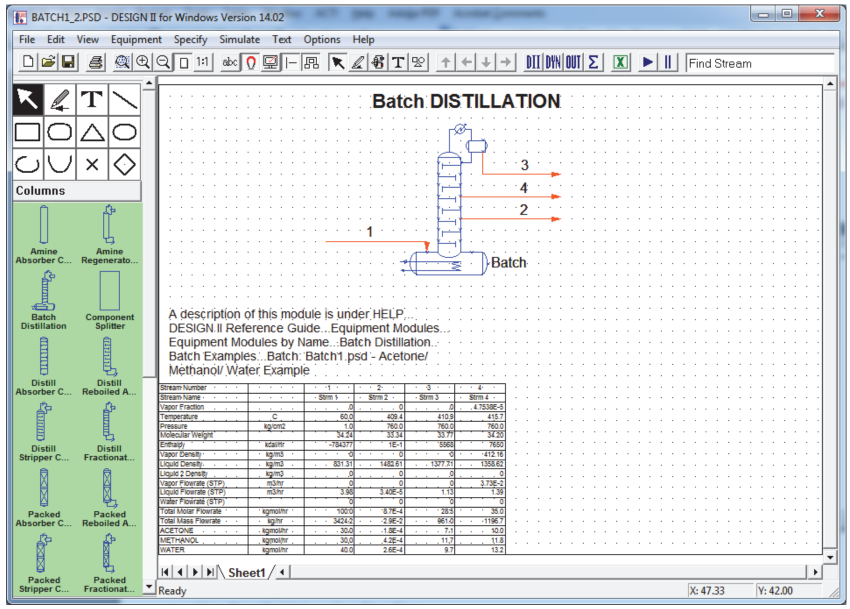
Production and translation of electrical energy to heat is modeled via one or more equilibrium reactors that redistribute all atomic species among the specified molecular species to achieve the most thermodynamically stable molecular compositions (via Gibbs Free Energy of minimization). All the necessary heat and reaction change will be calculated from the pure component database properties and the product temperature rise will be very close to that you would see in a purely electrical environment. The loss or gain of heat can be accounted via heat exchangers (as duty -BTUs lost or gained) and placing them in right locations within the flowsheet scheme that would balance the overall heat transfer.

Batch Distillation Column

DESIGN II FOR WINDOWS OFFERS ENGINEERS RIGOROUS BATCH DISTILLATION COLUMNS

The Batch Distillation Column unit module provides the following features:

- Batch and Continuous Feeds
- Total or Partial Condenser
- Single or Multiple Product Collection Tanks for Each Product Draw
- Rigorous Kinetic Modeling of Reactions
- User Specified Events or Change Column Operations
- Variable Feed and Product Draw Rates
- Total Reflux Conditions Specification
- Cumulative or Instantaneous Product Composition Specifications
- Liquid Hold Up Profile Specification
- Pressure Profile Specification
- Conditional Logic Available to Control Feeds, Products and Events
- Converges Column to a large Variety of Heat and Mass Balance Specifications
- Step Functions
- Ramp Functions
- Several Integration Methods Available
- User Specified Integration Step Size
- Flexible Reporting Features
- Flexible Plotting Features



Because of the unsteady state nature of batch distillation, streams should be considered to be tanks which serve to hold feeds or collect products.

In the example c:\Program Files (x86)\DesignII\samples\equipmnt\batch\batch1.psd, an initial charge of acetone, methanol and water is to be batch distilled and the resulting overhead product collected at different stages into separate tanks.

The first event models the initial boil-up period when the column operates at total reflux and without any product removal. This is required since the initial composition on every stage is the same as that entered for the initial column charge. Product draw off should not occur until steady state conditions have been reached within the column. When the column is operating at total reflux only one heat and material balance specification is required, which in this case is the reboiler duty. The initial charge composition is defined by stream number 1 in the General section and the total charge in the column by the total holdup.

The second event starts immediately after the first event has terminated. Overhead product is collected instantly and continues until the tank composition of the most volatile component, acetone, drops to 73 mole %. In this case the column requires two heat and material balance specifications - reboiler duty and reflux ratio. The pressure and holdup information entered for the first event continues throughout the second event.

In the third event, overhead product is collected into two separate tanks with the changeover occurring after 0.35 hours from the start of this event. The latter of these tanks, represented by stream number 4, collects the highest concentration of the second most volatile component, methanol. The heat and material balance specifications, pressure and holdup information from the second event are repeated in this event. The event stops after 0.8 hours of operations.

Distillation Columns

DESIGN II FOR WINDOWS OFFERS ENGINEERS SEVERAL RIGOROUS DISTILLATION COLUMNS

The Distillation column module is used for rigorous simulation of absorbers, fractionators, strippers and other types of single-column configurations. Most single-column units can be modeled, including demethanizers, stabilizers, sour water strippers, amine contactors and regenerators, and azeotropic distillation towers. This module can be used for design, modification, or optimization of rigorous distillation columns. Extensive thermodynamic options are available. With the use of the proper option, the operation of existing units can be duplicated within several percent of actual plant data.

Column Types

The Distillation module offers a great deal of flexibility in the definition of column configurations. Eight major column types are available distinguished by the presence or absence of condensers or reboilers: Absorber (no condenser and no reboiler), Absorber with Reboiler, Presaturator (absorber with or without reboiler), Liquid-Liquid (an absorber with liquid feed to the top and liquid feed to the bottom), Stripper (partial condenser but no reboiler), Stripper with Total Condenser, Partial Fractionator (partial condenser and reboiler) and Total Fractionator (total condenser and reboiler). Additionally, an essentially unlimited number of feeds, feed components, products, trays, and heaters/coolers are allowed.

Product Specification and Column Control

The flexibility of the Distillation module also includes the control of the fractionation process. Component purities, recoveries, or ratios can be specified directly in top, bottom, or side products. Product rates can be set in mass, molar, or volumetric units. Reboiler or condenser temperatures and duties can be specified as can reflux ratio or reflux flow rate. Additional specifications can be created with Inline FORTRAN.

Calculation Techniques

Four methods are available for solving the rigorous tray-to-tray heat and material balances for your column: Regular, Super, Super Plus and Sum Rates. The trays, partial condensers, and reboilers are modeled as equilibrium stages. Special commands allow the convergence algorithms to be fine tuned to meet user specified tolerances.

Water K-values And Decant

The K-value option you choose for your simulation normally determines whether water (if present) is treated as miscible or immiscible in the column. Free water is not decanted automatically. If you specify a water decant from the condenser or any tray(s), the amount of free water formed at the temperature and pressure of the condenser or tray is calculated automatically. You may also specify the solubility of water in the reflux returning to the column. The default solubility will be based on the water-in-kerosene chart from the API Technical Data Book. You can enter an estimate for the fraction of free water in the liquid on the trays. You can also check for free water on trays where no decants have been established.

Step-by-Step Procedure

Specifying a rigorous Distillation column with DESIGN II is simple when following. The procedure is summarized below:

- Define the column type by selecting the combination of condenser and/or reboiler.
- Add required column configuration commands.
- Determine the number of heat and material balance specifications required based on the column type and select the one(s) for your simulation.
- Add any side draws, heaters/coolers, intercoolers, and water decant commands.
- Add optional commands as needed for additional calculations such as reboiler or condenser curves CO2 freeze prediction, extra plots, column sizing, internal stream reports and others.

Several Distillation Examples

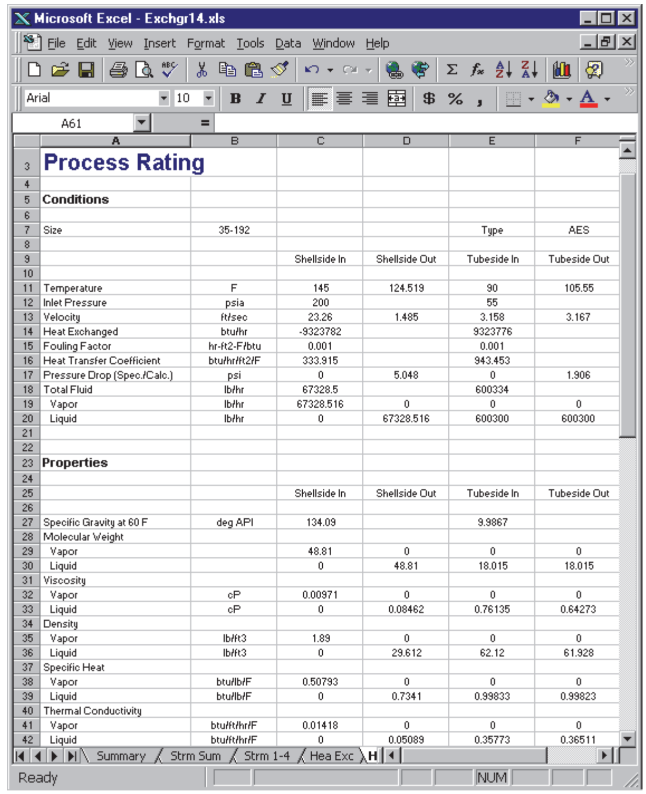
Distil1.psd - Absorber MEA Treating
Distil2.psd - Lean Oil Absorber with Presaturator
Distil3.psd - Cryogenic Demethanizer with Side Heater
Distil4.psd - Inline Fortran to meet Reid Vapor pressure specification
Distil5.psd - Liquid-Liquid Extraction
Distil6.psd - Sour Water Stripper
Distil7.psd - Partial Condenser with Three Side Draw Products
Distil8.psd - Partial Condenser: Sour Water Stripper with CO2
Distil9.psd - Total Condenser: Split Propylene from Propane
Packed Column.psd - Sour Water Stripper using packing instead of trays

Heat Exchangers

DESIGN II FOR WINDOWS OFFERS ENGINEERS RIGOROUS SIMULATION OF MANY TYPES OF HEAT EXCHANGERS

Shell and Tube Heat Exchanger

The Shell and Tube heat exchanger module simulates two process streams exchanging heat with each other. This usually involves a heat recycle situation with one of the streams coming from downstream in the process. DESIGN II has built-in rating calculations for shell and tube heat exchangers. Any single phase counter-current exchanger, and any type E or type F shell two-phase exchanger, can be rated in the flowsheet. The rating calculations automatically handle boiling or condensation occurring in either the shell-side or the tube-side of a heat exchanger. No special commands are required to indicate a two-phase stream.



	A	B	C	D	E	F
3	**Process Rating**					
4						
5	**Conditions**					
6						
7	Size	35-192			Type	AES
8						
9			Shellside In	Shellside Out	Tubeside In	Tubeside Out
10						
11	Temperature	F	145	124.519	90	105.55
12	Inlet Pressure	psia	200		55	
13	Velocity	ft/sec	23.26	1.485	3.158	3.167
14	Heat Exchanged	btu/hr	-9323782		9323776	
15	Fouling Factor	hr-ft2-F/btu	0.001		0.001	
16	Heat Transfer Coefficient	btu/hr/ft2/F	333.915		943.453	
17	Pressure Drop (Spec./Calc.)	psi	0	5.048	0	1.906
18	Total Fluid	lb/hr	67328.5		600334	
19	Vapor	lb/hr	67328.516	0	0	0
20	Liquid	lb/hr	0	67328.516	600300	600300
21						
22						
23	**Properties**					
24						
25			Shellside In	Shellside Out	Tubeside In	Tubeside Out
26						
27	Specific Gravity at 60 F	deg API	134.09		9.9867	
28	Molecular Weight					
29	Vapor		48.81	0	0	0
30	Liquid		0	48.81	18.015	18.015
31	Viscosity					
32	Vapor	cP	0.00971	0	0	0
33	Liquid	cP	0	0.08462	0.76135	0.64273
34	Density					
35	Vapor	lb/ft3	1.89	0	0	0
36	Liquid	lb/ft3	0	29.612	62.12	61.928
37	Specific Heat					
38	Vapor	btu/lb/F	0.50793	0	0	0
39	Liquid	btu/lb/F	0	0.7341	0.99833	0.99823
40	Thermal Conductivity					
41	Vapor	btu/ft/hr/F	0.01418	0	0	0
42	Liquid	btu/ft/hr/F	0	0.05089	0.35773	0.36511

Plate-Fin Heat Exchangers

The Plate-Fin Exchanger module can be used to simulate multiple stream exchangers. This type of exchangers allows multiple hot and cold streams to exchange heat with a maximum heat transfer surface area. The module calculates the heat and material balance from known input stream information and the specifications to be met. DESIGN II has built-in rating calculations for Brazed Aluminum Plate-Fin heat exchangers. The rating calculations automatically handle boiling or condensation occurring in either the hot-side or the cold-side streams of the heat exchanger.

Multiple Pass Shell and Tube Heat Exchangers

The LNG Exchanger module is used to specify heating or cooling of up to twenty tube side streams and twenty shell side streams. Each tube-side stream can have either the same outlet specification or entirely different specifications. Tube side outlet streams may be recycled back and mixed with a single shell side feed stream.

Air-Cooled Heat Exchanger

The air-cooled heat exchanger module allows you to rigorously model and rate air coolers or air condensers. You can specify the process side and/or the air side of the air cooler. The air side of the air cooler can be modeled as a utility stream (automatically calculated) or it can be a process stream (specified conditions). You can specify all the physical characteristics of the air cooler (tubes, fins, fans, power, passes, etc) or use the default values when rating is calculated.

Refrigerant Heat Exchanger

Refrigerant exchangers are similar to counter-current heat exchangers with the refrigerant entering at the bubble point and leaving at the dew point. The temperature or pressure of the refrigerant is calculated along with the flow rate required and all corresponding properties. The properties of the process stream out are calculated. The duty, area, and corrected LMTD are calculated and reported in the equipment summary.

Water-Cooled Heat Exchanger

Water-cooled exchangers are handled as single-stream exchangers. The water temperatures in and out are specified for the heat exchanger, rather than specifying the stream temperature and pressure. The amount of water is calculated as part of the heat exchanger output, in lieu of specifying it on a flow command or reporting it in the final stream summaries. Therefore, the water stream in and out of the water-cooled exchanger does not need to be included as part of the flowsheet. Also, water does not have to be added as a component in the flowsheet simulation. The amount of water required to condense the process stream is calculated along with the duty, area, corrected LMTD, and outlet stream properties for the process stream.

Single Stream Temperature Change

In many process simulations, only one side of the exchanger is of interest. For example, you may be interested only in process-stream temperature adjustment, instead of the amount of utility required for the heat exchange. Usually, exchangers that use a heating or cooling substance to adjust the temperature of a process stream can be modeled by specifying only one stream in and one stream out. This greatly reduces the complexity of the simulation. In this case, the duty and/or temperature out of the exchanger are calculated along with all the properties of the outlet stream.

Available Unit Modules

DESIGN II FOR WINDOWS OFFERS ENGINEERS MANY UNIT MODULES TYPES FOR SPECIFIC USES

Column Calculations

Amine Column – rate based model of Absorber and Regenerator used with the Mixed Amine Thermodynamics
Batch Distillation – performs unsteady state heat and material balance calculations for batch processes
Component Splitter - sends a specified fraction of each component in the feed to the first output stream
Distillation Column - Absorbers, Fractionators, Strippers and other types of single-column configurations
Packed Column – Absorbers, Fractionators, Strippers and other columns using structured or unstructured packing
Refine Column – preflash towers, atmospheric columns, vacuum columns, FCC main fractionators and quench columns
Shortcut Fractionator – simulates a simple distillation column with one feed and a top and bottom product
Stream Manipulator - modify stream component flowrates by a single factor for all components or by an individual factor

Heat Exchange

Air-Cooled Exchanger - Rejects heat from a fluid directly to ambient air, can be sized as air cooler or air condenser
Double Pipe Exchanger – A single pipe inside another pipe; 1 or 2 phase
Fired Heater - calculate the fuel consumption and heater duty when a process stream is heated to a given temperature
Heat Exchanger – single stream or two stream shell and tube; 1 or 2 phases can be rated; water, refrigerant or air cooled
LNG Exchanger - heating or cooling of up to twenty tube side and shell side streams with different specifications
Multiple Flashes - isothermal, adiabatic, isentropic, molar or mass liquid fraction, bubble or dew point or water dew point
Plate-Fin Exchanger - multiple hot and cold streams have heat exchange with maximum surface area with/without rating

Pressure Change

Compressor - compresses a vapor to a specified outlet pressure or to a pressure limited by a specified work available
Depressuring - calculates pressure buildup in a closed vessel until the pressure reaches the value specified for the set pressure of the relief valve; the conditions during the blow down period after the valve opens are shown
Expander - isentropic expansion of liquid, vapor, or two-phase streams to a specified outlet pressure
Expander Compressor - uses the calculated work by the expander as the maximum available work for the compressor
Expander Pump - uses the calculated work by the expander as the maximum available work for the pump
Flash - can specify pressure, temperature, duty, bubble point, dew point and separate to vapor, liquid 1 and liquid 2 phase
Line Pressure Drop - calculate pressure drops due to friction and elevation change (if any) in transmission lines or plant piping of specified length and diameter; also calculates back pressure, diameter case studies, and liquid holdup
Multiple Flashes - isothermal, adiabatic, isentropic, molar or mass liquid fraction, bubble or dew point or water dew point
Polytropic Compressor - single stage of a centrifugal compressor/pump based on manufacturer's performance curves
Pump - pumps a liquid to a specified outlet pressure or to a pressure limited by a specified work available
Valve - adiabatic (constant enthalpy) pressure reduction of a stream which can be vapor, liquid, two-phase or three-phase

Reactors

Continuous Stirred Tank Reactor - steady state flow of species and uniform concentrations of species and temperature
Equilibrium Reactor - calculate gas-phase reactions of multi-component systems on adiabatic or isothermal basis
Hydrotreater - hydrogenation of olefinic and aromatic crudes; desulfurization and denitrogenation of high-sulfur crude
Plug Flow Reactor - single-phase reactions using reactor dimensions, stoichiometric coefficients, and rate expressions
Reactor - calculate stoichiometric distribution of components for adiabatic or isothermal conditions with six subtypes
Stream Manipulator - modify stream component flowrates by a single factor for all components or by an individual factor

Stream Operations

Component Splitter - sends a specified fraction of each component in the feed to the first output stream
Divider - divides a stream into two to six other streams of the same composition, temperature, and pressure
Flash - separate vapor and liquid phase, can size to a vertical or horizontal vapor-liquid or vapor-liquid-liquid separator
Line Pressure Drop - Calculate pressure drops due to friction and elevation change (if any)
Mass Balance - set the flow rate of a recycle loop and/or calculate the makeup flow rates for a recycle loop
Mixer - mix multiple input streams adiabatically to the lowest inlet stream pressure or the specified pressure out
Multiple Flashes - isothermal, adiabatic, isentropic, molar or mass liquid fraction, bubble or dew point or water dew point
Multiple Phase Flash - rigorously separate multiple phase streams
Phase Envelope - calculate dew and bubble points for specified pressures and plot the phase envelope (any system)
Phase Map - calculate dew points, bubble points and constant liquid fraction lines for hydrocarbon systems
Stream Manipulator - modify stream component flow rates by a single factor for all components or by an individual factor
Valve - adiabatic (constant enthalpy) pressure reduction of a stream which can be vapor, liquid, or two-phase

Available Unit Modules (continued)

DESIGN II FOR WINDOWS OFFERS ENGINEERS MANY UNIT MODULES TYPES FOR SPECIFIC USES

Controls and Metering

Controller - measure stream information and change it via unit module calculation perturbation to a given target
Flow Meter - calculate the size of the orifice, flow rate of the stream, or the pressure drop across the orifice

Tank

Vertical, Horizontal, Spherical – constant volume tank for material accumulation and sendoff at specific times

Other

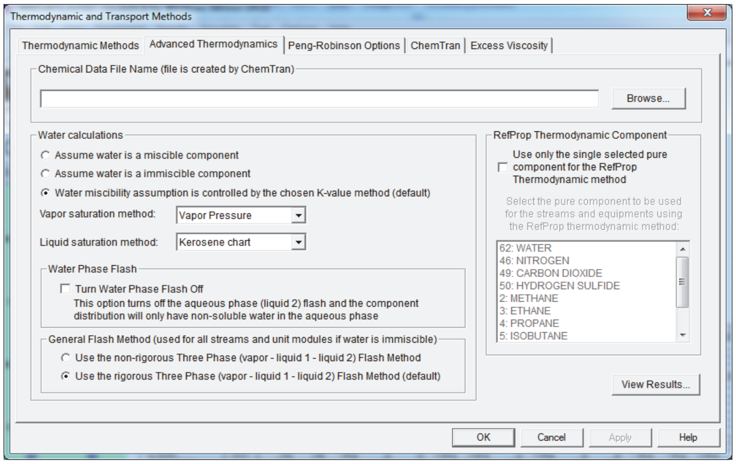
Add Module – you can write custom inline Fortran code for calculating just about any specialized process
Spreadsheet Module – you can write custom VBA code for calculating just about any specialized process

Multiple Phase Flash

DESIGN II SUPPORTS MANY TYPES OF FOUR PHASE FLASHES

DESIGN II has several types of flashes:

- Isothermal (constant temperature and constant pressure)
- Adiabatic (constant enthalpy and constant pressure or temperature)
- Isentropic (constant entropy and constant pressure or temperature)
- Bubble point (all liquid and solid with an incipient vapor phase and constant temperature or pressure)
- Dew Point (all vapor with an incipient liquid phase and constant temperature or pressure)
- Vapor Fraction (constant vapor fraction and constant pressure or temperature)
- Volumetric (constant volume and constant enthalpy)



DESIGN II has a full four phase (Vapor, Liquid 1, Liquid 2, and Solid) flash built into it for all thermodynamic calculations. DESIGN II will determine the appropriate component distribution between the vapor, liquid 1 (hydrocarbon liquid) and liquid 2 (aqueous liquid) phases using K-values from the current K-value method for the vapor – liquid 1 flash and the API Sour method for the vapor - liquid 2 phase. Note that you also turn off the aqueous phase (vapor - liquid 2) flash. If so, the component distribution will only have non-soluble water in the aqueous phase.

If water is miscible, then the flash will only distribute to two phases (vapor and liquid 1). If the flash detects that there is non-soluble water, a warning message will be printed. If water is immiscible, then the flash will distribute components to the vapor, liquid 1 and liquid 2 phases. Water miscibility is generally controlled by current K-value method but this can be over-ridden by the user. With many of the K-value methods in DESIGN II, water is designated as the immiscible component. By default, when water is immiscible, any non-soluble water will form an aqueous liquid phase. The user still has the option of specifying water miscibility in the general section or for any equipment / feed stream.

The four phase flash is split into two stages. The first stage calculates a preliminary component distribution to the four phases. The second stage uses the first stage results as a starting point and calculates a rigorous component distribution to all the four phases. If water is immiscible, the four phase flash also will move one other immiscible component from the liquid 1 phase to the liquid 2 phase if present in sufficient quantity. The other immiscible component list consists of EG (ethylene glycol), DEG (di-ethylene glycol), TEG (tri-ethylene glycol), PEG (propylene glycol), and MeOH (methanol).

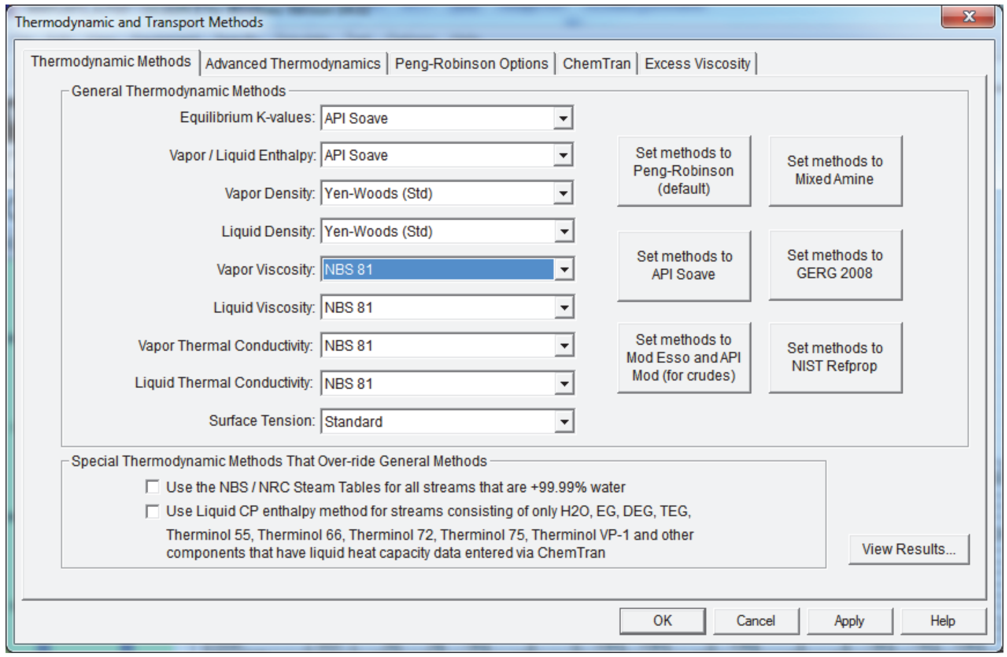
Many components are supported with data for solids: CH4 to n-C10H22, iso-Butane, iso-Pentane, H2O, H2S, CO2, N2, O2, Carbon, Ammonia, He, Ethanol, Methanol, H2, MEA, DEA, TEA, MDEA, DIPA, Piperazine, DGA, and DMPEG . All missing pure component and petroleum fraction solid properties have estimation methods. Mixture compensation is used when calculating the pure component freezing points by phase using phase fugacity to solid fugacity to get an accurate freezing point for each component. The solid flash can be turned off if desired.

Thermodynamic Methods

DESIGN II OFFERS A RICH SELECTION OF THERMODYNAMIC AND TRANSPORT METHODS

DESIGN II has a comprehensive set of K-value, Enthalpy, Density, Transport (Viscosity and Thermal Conductivity) Properties, and Surface Tension of mixture correlations. DESIGN has a built in pure component database of over 1,200 components and new components can be easily added.

These correlations can be used to model processes ranging from gas processing to refinery operations to petrochemicals and specialty chemicals. General recommendations as to the applicability of particular correlations are given in the online help and user manuals.



Any K-value, enthalpy or density commands entered in the general section apply to all calculations within the simulation. You can also enter K-value, enthalpy, density or transport commands for any specific equipment module or any specific feed stream. The two stream heat exchanger also allows separate specification of the thermodynamic methods for the shell side and the tube side. Water miscibility can also be controlled for any unit module or feed stream.

29 Hydrocarbon K-value, Enthalpy and Entropy Methods

These include API Soave, BWR (Benedict-Webb-Rubin), BWRS (Benedict-Webb-Rubin-Starling), Esso (Maxwell-Bonnell), GERG 2008, Grayson-Johnson (API), Kent-Eisenberg (Mixed Amines), LKP (Lee-Kesler-Ploecker), NIST RefProp, Peng-Robinson, Peng-Robinson-Stryjek, Predictive Peng-Robinson, RK (Redlich-Kwong), Soave (Soave-Redlich-Kwong), Steam Tables, SKD (Soave-Kabadi-Danner) and Tabular K-Values.

24 Chemical K-value, Enthalpy and Entropy Methods

These include DMPEG, Sour Water API, Edwards, Edwards Sour, Henry's Gas Law, Ideal Vapor, MEA or DEA, NRTL (Renon), Solids, UNIFAC, UNIQUAC, Vapor Pressure and Wilson.

18 Density Methods

You can specify separate density methods for the vapor phase and the liquid hydrocarbon phase. The density methods include AGA, API Soave, BWR, BWRS, Corresponding States, COSTALD, GERG 2008, Ideal, Lee-Kesler-Ploeker, Mixed Amines, Modified Peng-Robinson, NIST RefProp, Peng-Robinson, Redlich-Kwong, Soave, Soave-Kabadi-Danner, Soave-Redlich-Kwong and Yen-Woods (Std).

9 Viscosity Methods

You can specify separate viscosity methods for the vapor phase and the liquid hydrocarbon phase. If you do not choose a viscosity method then DESIGN II will automatically choose the appropriate method for you. The viscosity methods include API, Dean and Stiel, LN Average, NBS81, Twu, Mod API, Mixed Amines and NIST RefProp.

9 Thermal Conductivity Methods

You can specify separate thermal conductivity methods for the vapor phase and the liquid hydrocarbon phase. If you do not choose a thermal conductivity method then DESIGN II will automatically choose the appropriate method for you. The thermal conductivity methods include API, C. C. Li, LN Average, NBS81, Mixed Amines, NIST RefProp, TEMA 68 and 78.

4 Surface Tension Methods

The surface tension methods include API, Molar Average, Mixed Amines and NIST RefProp.

Feed Stream Specifications

DESIGN II OFFERS SEVERAL WAYS TO SPECIFY A FEED STREAM OR A RECYCLE STREAM

You can specify a feed or recycle stream via one of the following methods:

- Do not initialize the stream (this is the default method)
- Use the specified Temperature and Pressure
- Use the specified Pressure and Vapor Fraction (Temperature is a guess)
- Use the specified Temperature and Vapor Fraction (Pressure is a guess)
- Use results from a Reference stream for this stream's specifications

The stream flow rate can be specified via one of the following methods:

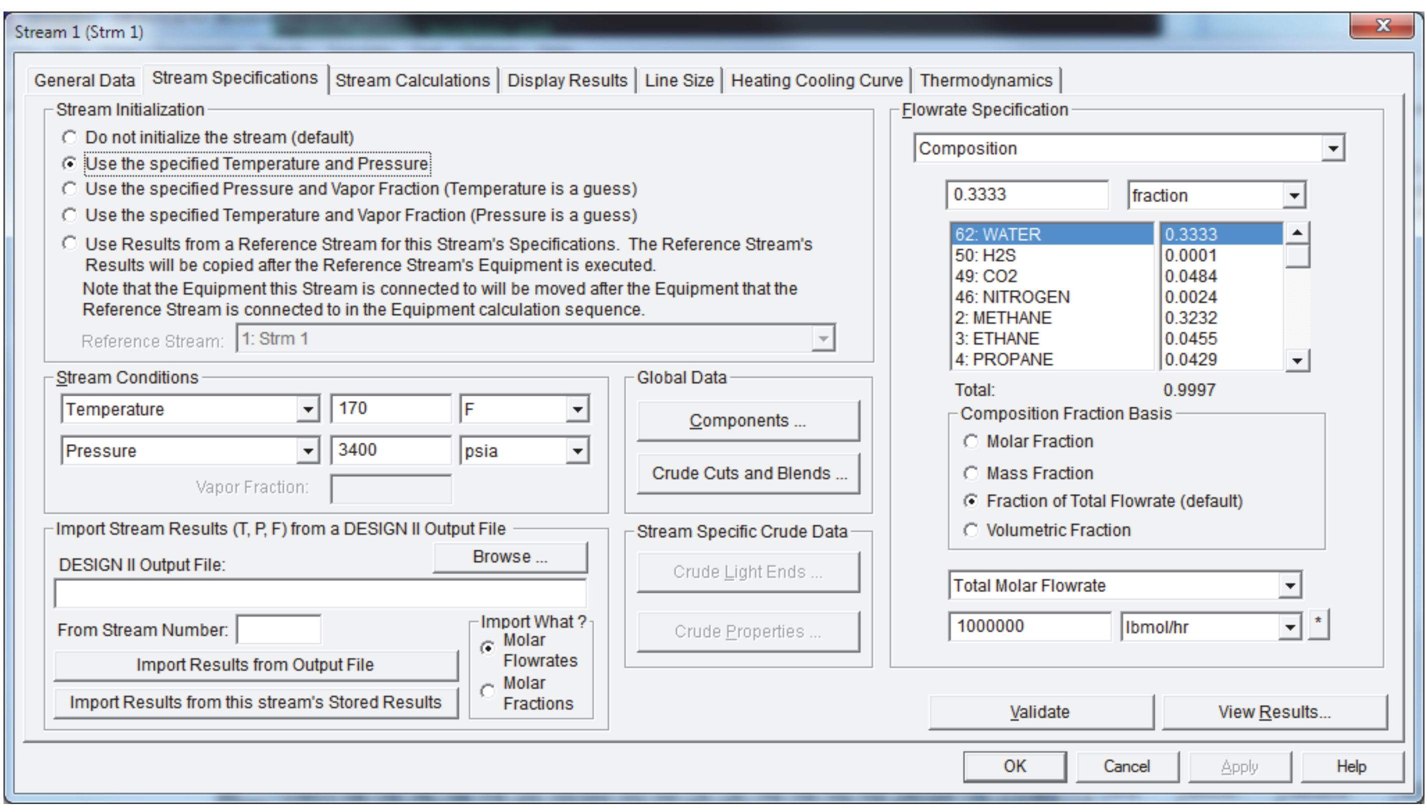
- Composition (fraction, percent, ppm) with a total molar, mass, vapor, liquid or actual volumetric flow rate
- Component molar, mass, vapor or liquid volumetric flow rate
- Crude Oil TBP curve with separate dry liquid volumetric flow rate and water flow rate specifications
- ASTM D-86 or D-1160 (760 or 10 mm) curve with dry liquid volumetric flow rate and water flow rate specifications
- Pseudo-Component volumetric percents with dry liquid volumetric flow rate and water flow rate specifications
- Crude Oil Library (one of 38 different world crude: Abu Dhabi – Murban, Rocky Mountain Sweet, Saudi – Light, etc)
- ASTM D-2887 TBP curve with separate dry liquid volumetric flow rate and water flow rate specifications

Dimensional Units

DESIGN II has full support for a comprehensive set of dimensional units for each specification such as temperature (4), pressure (26), molar flow rate (3), mass flow rate (4), vapor flow rate (5), liquid flow rate (5), etc.

Thermodynamic Methods

DESIGN II allows the user to flash any feed stream in any thermodynamic method other than the default thermodynamic method. If the connected unit module uses a different method then DESIGN II will automatically re-flash the stream.

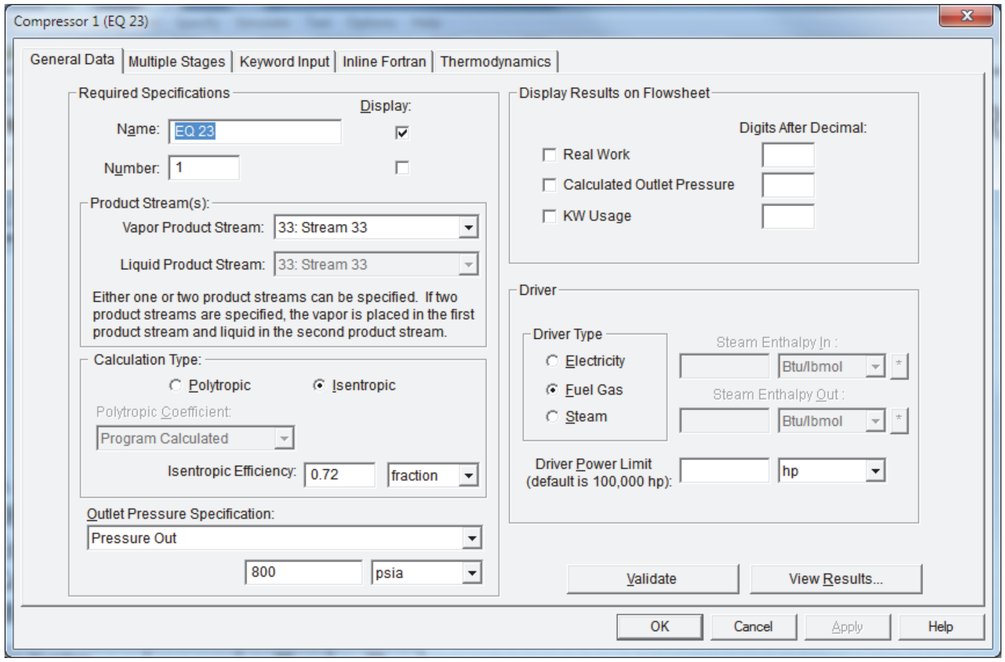


Unit Module Specifications

DESIGN II Offers Specific Dialogs For Each Type Of Unit Module

All of the unit modules in DESIGN II for Windows feature a custom designed tabbed dialog for that unit module. Each of the tabbed sheets allows complete specification of the unit module for all required and optional specifications.

In addition, there is a sheet for adding Inline Fortran commands to be processed before, during or after the calculation of the unit module. And there is a sheet for specifying specific thermodynamic and/or transport property methods if desired.

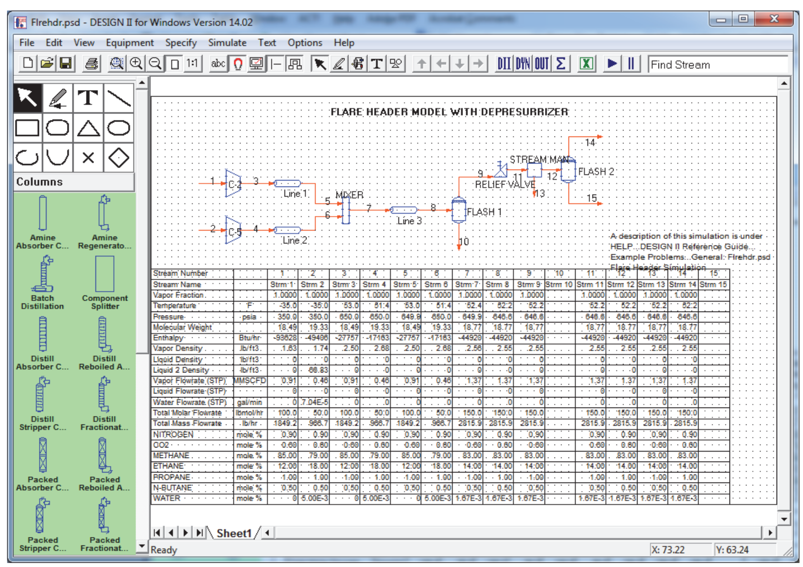


When you click OK or Apply on the dialog, your specifications will be analyzed and validated. If any problems are noted then you will be prompted to fix each until all issues have been cleared.

Depressuring Unit Module

DESIGN II Offers Calculation of a Relief Valve Blow Down Event

Depressuring systems are used extensively in process plants for protecting vessels from over pressure. Over pressuring has many causes, such as external fire, exothermic reactions, loss of power, inadequate cooling, and blocked lines. Depressuring systems are needed to prevent equipment from rupturing and to provide safety for plant personnel. API RP-520 recommends that vessel pressure should be reduced to 100 PSIA or 50% of design pressure, whichever is lower, in fifteen minutes.



The depressuring analysis is based on a vessel which is exposed to an external fire. The program calculates the pressure buildup in the closed vessel until the pressure reaches the set pressure of the valve. The conditions during the blow down period after the opening of the depressuring valve are also calculated. The blow down period is divided into several time intervals with important variables reported for each interval.

One inlet and one or two outlet streams will be attached to the unit module. The second stream, if present, will print stream properties for the vent gas stream at the time of maximum flowrate. The temperature, pressure and composition of the inlet stream are assumed to be the operating conditions of the vessel. A flash is performed to determine the vapor and liquid compositions and initial flow rates. The vessel diameter, the vessel orientation, vessel length, and the liquid height can also be specified for the analysis to give more meaningful results.

Inline Fortran

DESIGN II FOR WINDOWS OFFERS A BUILT-IN PROGRAMMING TOOL FOR YOUR CUSTOM CALCULATIONS

The process simulator also has a built-in Fortran interpreter for adding custom calculations to any or all unit modules so you can perform just about any calculation you need. Inline Fortran enables integration of Fortran commands directly into a DESIGN II simulation file. Custom tailored process simulations that meet exact requirements can be developed by:

- Modifying the existing DESIGN II equipment module calculations (using the GET/SET commands)
- Developing subroutines, subroutine libraries and creating your own equipment modules
- Accessing DESIGN II internal subroutines and functions.

DESIGN II makes these operations easy to implement by using simple keyword phrases. These statements can be used to perform operations on practically any parameter or values associated with a flow sheet simulation. In particular, equipment and stream parameters can be obtained from the internal storage areas of DESIGN II and stored back into these areas with Fortran statements. Almost any legal Fortran operation can be performed with these parameters, including algebraic statements, loops, conditional jumps, etc. All of these statements can be placed directly in the equipment module. The DESIGN II simulation program offers a wealth of equipment module and stream property calculations, equipment sizing and rating, and full flow sheeting capabilities, such as handling recycle convergence, optimization, and case studies. With Inline Fortran, you have the power to extend calculations even further. You can define your own proprietary reaction calculations, create your own Distillation product composition specifications, and define additional stream property calculations or special reports and much more.

All Fortran statements are compiled during run time by the DESIGN II internal compiler, immediately after the DESIGN II input data has been processed. Then the code is linked to the DESIGN II program to form an executable "module".

Custom Stream Properties

DESIGN II OFFERS MANY SPECIAL CALCULATIONS FOR FLOWSHEET STREAMS

DESIGN II has several automatic calculations for all streams in a flowsheet:

- Composition and Flow Rate, Enthalpy, Entropy, Density and Heat Capacity by phase on molar basis
- Composition and Flow Rate, Enthalpy, Entropy, Density and Heat Capacity by phase on mass basis
- Volumetric Flow Rate at stream temperature and pressure and at standard conditions
- Viscosity, Thermal Conductivity and Surface Tension by phase
- Mixture Critical Pressure and Mixture Critical Temperature
- Mixture Dew Point, Mixture Bubble Point and Mixture Water Dew Point temperatures at the stream pressure
- Mixture Vapor Pressure at the stream temperature
- CO2 Solid formation, Wobbe Index, Methane Number, Gross and Net Heating Value

DESIGN II has several optional calculations for any or all streams in a flowsheet:

- Phase Map and/or Phase Envelope (temperature – pressure diagram)
- Hydrate Formation Temperature (at stream pressure) and/or Hydrate Formation Pressure (at stream temperature) with optional curves
- Pressure – Enthalpy diagram with Temperature isotherms
- Reid Vapor Pressure
- D-86 Petroleum for both Liquid (water free basis) and Vapor phases
- Bulk Properties for the Inlet Streams to Heat Exchangers and Internal streams of the Distillation Columns
- Vapor and Liquid Partial Numerical Derivatives (dP/DT)v and (dP/dV)t
- Latent Heat of Vaporization for the Mixture

ChemTran ™

DESIGN II FOR WINDOWS OFFERS ENGINEERS CUSTOM PROPERTY GENERATION

The CHEMTRAN program, which furnishes properties required by process simulators, is integrated into DESIGN II FOR WINDOWS. CHEMTRAN is the best tool available for determining properties in non-ideal chemical or hydrocarbon systems where unusual properties must be taken into account. CHEMTRAN increases your process engineering productivity by automating the time consuming task of predicting and correlating the thermophysical properties of pure components and component mixtures.

Pure Components

CHEMTRAN contains one of the largest commercially available pure component databases. Included are complete thermophysical properties for 1,200+ pure components. The molecular structure input simplifies the application of group contribution techniques for physical property estimation.

Component Mixtures

ChemTran supports almost any data regression methodology. Its regression methods include binary, ternary, quaternary, etc. Regression methods estimate the thermophysical properties of the most common varieties of equilibrium data. These methods handle V-L-E, L-L-E, V-L-L-E, and V-L-L-L-E data.

Usability

ChemTran features easily understood dialog or keyword data inputs and easy-to-read, well-formatted output. Data may be regressed using eleven popular equations; thus your needs are always properly met. Documentation of each capability is organized under easy-to-locate headings. Guidance for using each specific feature is complete and easily understood.

Input Data:

- Normal boiling point
- Dipole Moment
- Association Parameter
- Parachore
- Molecular weight
- Acentric factor
- Critical pressure
- Critical temperature
- Critical volume
- Solubility parameter
- Molecular structure

Mixture Data Methods:

- Regressing experimental data
- Binary interaction parameters
- UNIFAC group contribution method
- Regular solution theory

Estimation:

- Normal boiling point
- Critical pressure
- Solubility parameter
- Ideal gas heat capacity
- Vapor pressure
- Thermal conductivity
- Critical temperature
- Acentric factor
- Surface tension
- Viscosity
- Enthalpy

Regression:

- Ideal gas heat capacity
- Vapor pressure
- Density
- Thermal conductivity
- K-values
- Latent heat
- Surface tension
- Viscosity
- Vapor and Liquid Enthalpy

Correlations:

- Peng-Robinson
- Modified Peng-Robinson
- Soave
- API Soave
- Renon (NRTL)
- Wilson
- Uniquac
- Edwards (Electrolytes)
- BWR/BWRS
- Soave Kabadi Danner
- Vapor Phase Association

Sample ChemTran Files

CHEMTRAN includes 25 sample input files for either defining new components or defining new mixture properties in c:\Program Files (x86)\DesignII\samples\chemtran.

Dialog Input

CHEMTRAN data can be specified and embedded in a DESIGN II flow sheet via the dialogs in the graphical user interface. The dialogs allow full specification of new components and/or mixture properties.

Link2WinSim

THE DESIGN II SIMULATOR KERNEL CAN BE EMBEDDED IN YOUR COMPANY'S IN-HOUSE VISUAL BASIC OR VISUAL C++ SOFTWARE FOR FLASHES AND PROPERTY CALCULATIONS

Microsoft Visual Basic Interface

DESIGN II has a complete interface for any Visual Basic program (or VB compatible environment) to directly call the flash methods in the simulator kernel. The Design II DLL is a dynamic link library that contains 100% of the functionality of Design II for Windows in a form that can be used directly by other programs. All of the chemical compounds, property calculations and equipment simulations are included in the DLL, but only those parts needed – most often flashes and property calculations – are exposed for each client. This permits WinSim to charge much less for Design II DLL than for Design II for Windows. Clients can provide Design II DLL's as a part of their sales force automation packages for hundreds of laptops at affordable prices.

Visual Basic is the glue

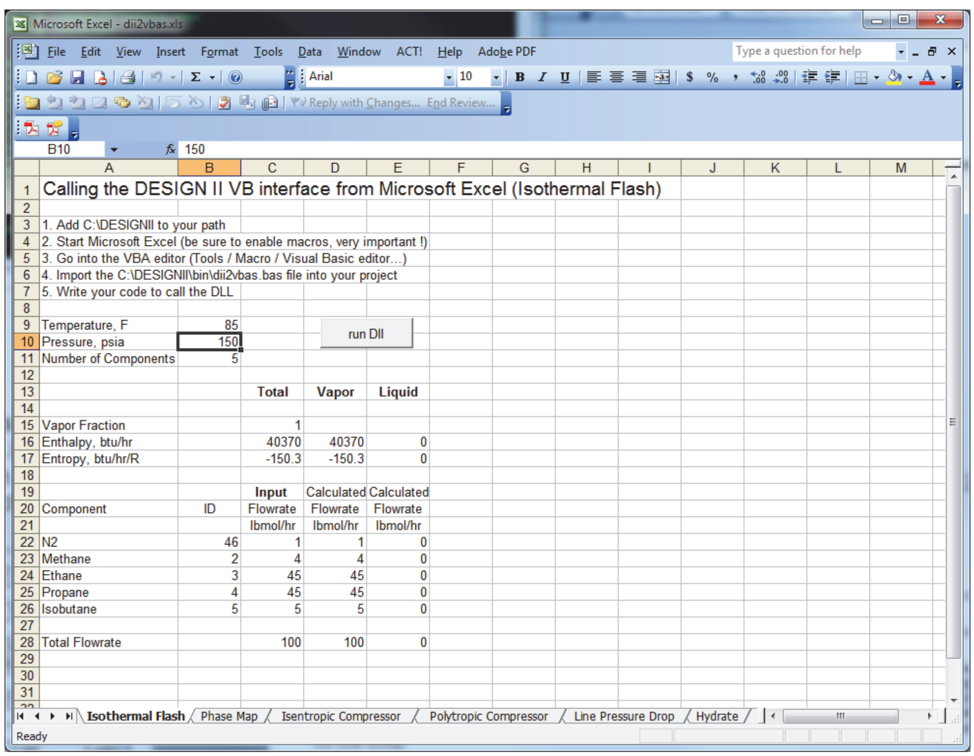
Microsoft's Visual Basic (VB) is a programming methodology that lets programmers quickly create easy-to-use programs that have a Windows® look-and-feel. A great advantage of VB is that it can "call" DLL's. VB is the glue that holds together the manufacturer's classic detailed design programs, many written in Fortran, with needed parts of WinSim's world-class calculation engine to give a better, more accurate and much quicker "quotation machine".

Targeted manufacturers and suppliers

The Design II DLL is targeted at those companies with internal, proprietary programs for detailed design of piping, equipment or suppliers for process plants, but need a key element of Design II such as its extensive thermodynamic property methods and database. Examples include pump, compressor and heat exchanger manufacturers and consumable suppliers such as those that sell mixed amines for gas treating.

Imagine How WinSim's Powerful Calculation Engine Can Be Combined With Yours

Sales force automation is but one of the many ways the Design II DLL can be used. For example, the piping and detailed equipment design departments of E & C companies can incorporate rigorous thermodynamic and fluid flow methods from Design II into their design programs. Anytime some of the powers of a world-class simulation engine can be combined with your programs using VB, Lab-View® or other glue that can call DLL's, the possibilities can only be imagined and only by you.



Microsoft Visual C++ Interface

In addition to the Visual Basic interface, DESIGN II for Windows also includes an interface for embedding the DESIGN II DLL in Visual C++ programs. A sample Visual C++ application calling the DESIGN II simulator kernel is also included in the standard software distribution.

Microsoft Excel VBA Interface

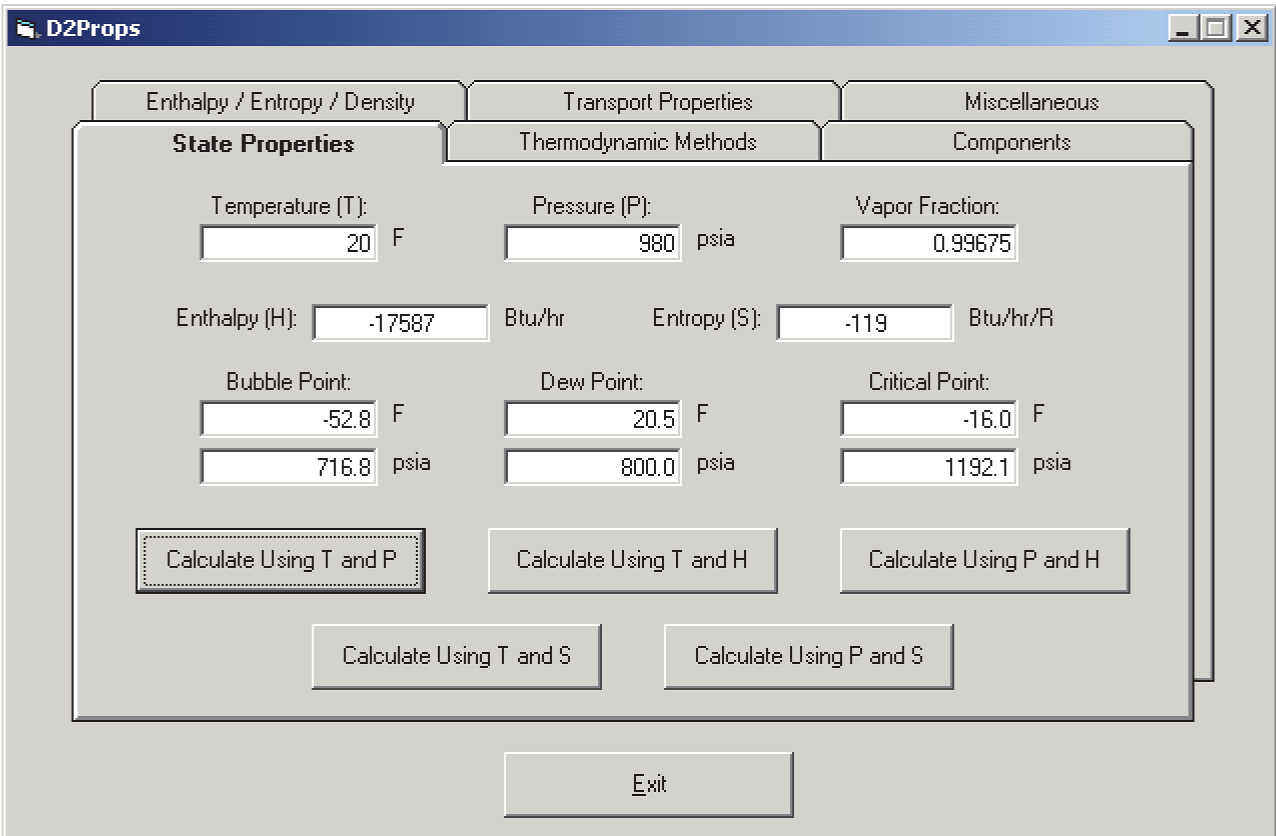
In addition to the Visual Basic interface, the DESIGN II DLL can be called from any Microsoft Excel spreadsheet. A sample Microsoft Excel spreadsheet for calling the DESIGN II simulator kernel is also included in the standard software distribution, dii2vbas.xls. Several sample calculations are present in the spreadsheet.

Link2WinSim (continued)

Sample VB Application with source code

A sample Visual Basic application using the DESIGN II DLL has been included in the software distribution in the BIN subdirectory. The name of the sample application is D2PROPS. Full source code is included in the D2PROPS.FRM file. The Visual Basic project files of D2PROPS.VBP and D2PROPS.VBW are also included.

The following figure is a screen shot of D2PROPS after the given mixture has had its phase split and properties calculated to 20 F and 980 psia.



If you need a specialized application built in C++ or a Microsoft Excel spreadsheet using our calculation engine, just call us. We will gladly work with you on the user requirements and provide a quotation for the implementation.

DESIGN II for Windows - Advanced Features:

Flowsheet Optimization - Flowsheet Optimization is a powerful feature in DESIGN II to simplify a cumbersome and time-consuming process engineering task. Simple keywords are used to identify the design variables that can be varied to maximize or minimize the objective function (subject to the specified constraints of the process).

Case Study - The Case Study section allows an engineer to run a number of similar simulation cases at once in order to assess the sensitivity of a flowsheet to changes in variables, or to produce a number of design cases. Case study allows you to present your results in data tables and plots for efficient analysis. This will reduce both the engineering and computer time required to evaluate different design options. Up to 25 cases may be specified in one Case Study. All parameter changes will be implemented, and the entire flowsheet will be recalculated, with each new parameter setting.

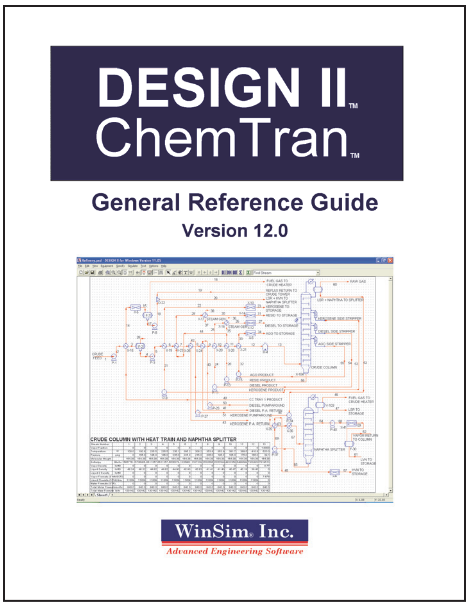
Process Line Sizing - Single and two-phase lines can be sized to meet your specification of pressure drop, velocity, sonic velocity fraction or nominal diameter.

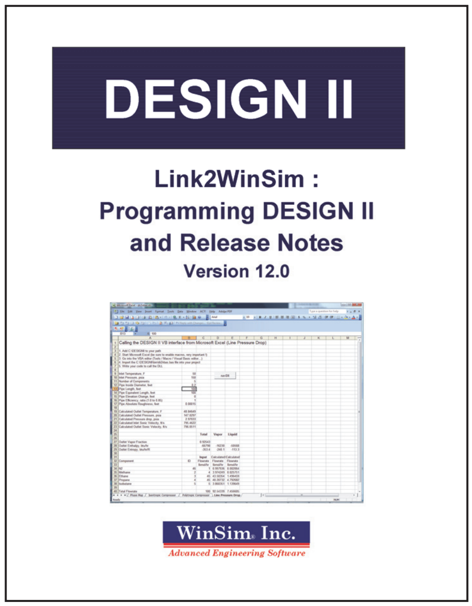
Online Help and Manuals

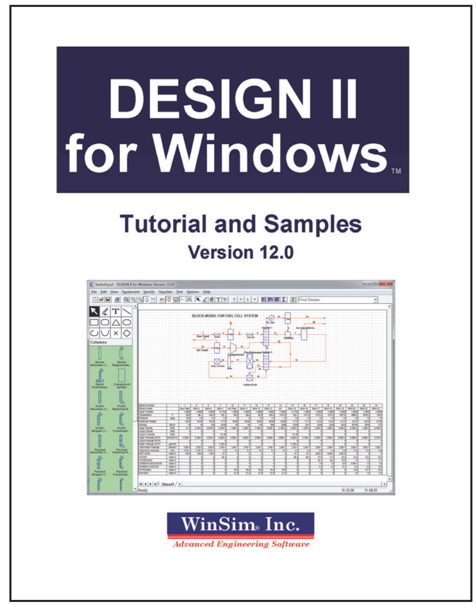
DESIGN II INCLUDES FULL ONLINE HELP AND MANUALS IN BOTH PDF AND PAPER

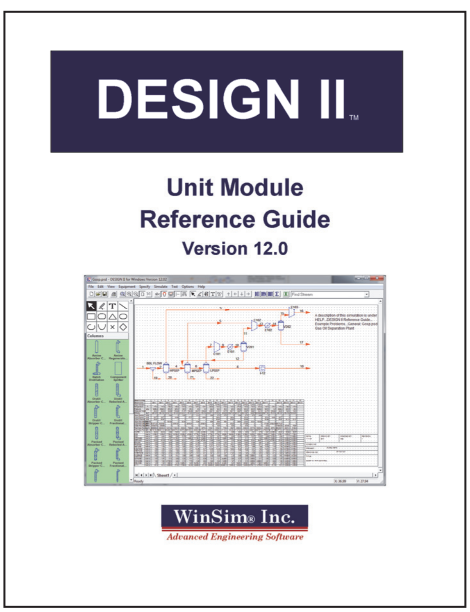
DESIGN II for Windows includes a help button on each dialog that will bring up the online help. The online help has both information about the dialogs and hyperlinks into the more detailed online help. The help is also distributed via user manuals which are available for perusing from the Help pull down menu via Adobe Acrobat.

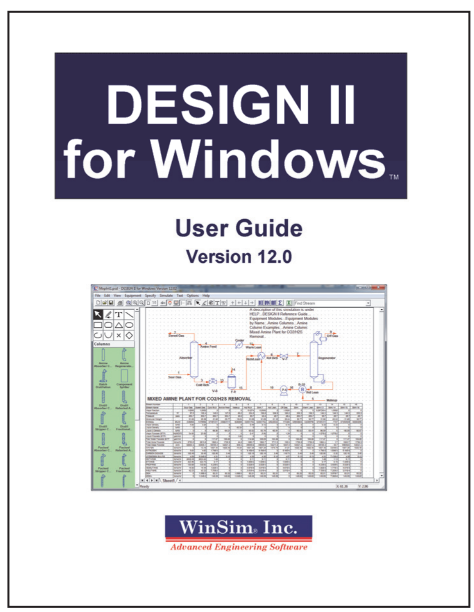
DESIGN II for Windows also includes PDF files of all the user manuals in the software distribution. We also distribute perfect bound copies of the manuals to all new customers. You can also get the perfect bound copies of the newest manuals from www.lulu.com (Lulu is a print on demand publisher).











DESIGN II History

DESIGN II FOR WINDOWS IS CONSTANTLY REFINED AND IMPROVED WITH YEARLY UPDATES AND MAINTENANCE RELEASES AS NEEDED (USUALLY MONTHLY)

A few high points from our online release notes file (c:\Program Files (x86)\DesignII\relnotes.html)

16.00: Oct 2019 – Converted the three phase flash to four phase by adding solids, Added Spreadsheet unit module
15.00: July 2016 – Added a new Table Object to the user interface and a new DataSet storage capability
14.00: Nov 2014 – Added a floating roof option and up to 100 timed product stream specifications to the Tank unit module
12.00: Aug 2013 – Added new Dimensional Units System and Pressure – Entropy / Pressure – Density tables and charts
11.00: Sep 2011 – Added Dynamic Simulation, Tank unit module and DMPEG thermodynamic method, GUI toolbox
10.20: Aug 2010 – Added two way Exchange of data with Spreadsheet and additional Packed Column unit modules
10.12: Jan 2010 – Added creation of custom symbols and symbol libraries, Drag and drop of symbols to flowsheet
10.10: Nov 2009 – Added DXF file export, multiple view results windows, Storage of multiple simulation results
10.00: Nov 2008 – Merged the line arrows into streams, Added GERG 2004 and REFPROP thermodynamic methods, Added Packed Column unit module, increased number of pure components in database to 1126
9.52: Feb 2008 – Added support for the Claus Process including Sulfur 2, 3, 4, 5, 6, 7 and 8
9.50: Nov 2007 – Converted the initial isothermal flash from two phase plus free water to three phase, ChemTran dialogs
9.41: Feb 2007 – Added calculation of hydrate inhibition using Ethylene Glycol
9.40: Dec 2006 – Added drawing elements to the graphical user interface and Predictive Peng-Robinson thermo method
9.33: Jun 2006 – Added ASTM D-2887 crude feed data entry and Piperazine to the Mixed Amine thermodynamic method
9.30: Mar 2006 – Split the Density method choices into Vapor and Liquid and added Compressor-Expander unit module
9.20: May 2005 – Added Tool tips to user interface and the BTEX components to the Mixed Amine thermo method
9.13: Jul 2004 – Added API (-200 F liquid) and ASME (32 F liquid) options to the enthalpy base calculations
9.10: Apr 2004 – Added Mass Balance unit module and enhanced many unit module dialogs in the user interface
9.00: Aug 2003 – Converted the user interface from 16 bit to 32 bit, added undo and redo, added a three phase flash
8.51: Oct 2002 – Added phase map to the Visual Basic / C++ interface, add new flow rate specifications for streams
8.50: Sep 2002 – Updated Depressurizer unit module calculation to latest API 520 document, new unit module dialogs
8.45: May 2002 – Added embedding of ChemTran input files to the DESIGN II input files
8.40: Jan 2002 – Added multiple sheet capability to the graphical user interface, converted kernel to double precision
8.31: Dec 2000 – Increased the maximum number of components from 150 to 1000, increased the maximum number of petroleum fractions from 75 to 600, increased maximum number of crude feed streams to 100
8.30: Nov 2000 – Added new dialogs, add new liquid enthalpy method, add support for DIPPR equations to ChemTran
8.25: Feb 2000 – Converted the results data Excel transfer program to an external program for greater speed
8.21: Oct 1999 – Added several new functions to the Visual Basic interface to the simulator kernel
8.20: Sep 1999 – Added new Air Cooler unit module, new user interface dialogs,
8.19: May 1999 – Added a new Visual Basic interface to the simulator kernel
8.18: Mar 1999 – Converted the simulator kernel to a Win32 DLL for future external interfaces
8.11: Dec 1998 – Added several new items to be displayed in the stream data box
8.10: Nov 1998 – Added Plate Fix Heat Exchanger unit module with two phase rating
8.03: May 1998 – Added the capability of reading a DESIGN II input file into the user interface
8.00: Feb 1998 – Merged the Gasplant Plus program into DESIGN II to create the Mixed Amine thermodynamic Methods and the Mixed Amine columns (absorber and regenerator)
7.50: Jul 1997 – Added a stream data box to the graphical user interface, updated Reid Vapor Pressure calculation
7.41: Aug 1996 – New COSTALD density method, added stream names
7.40: May 1996 – Added flow sheet linking capability to support large simulations, head curves for polytropic compressor
7.32: Oct 1995 – Expanded maximum flow sheet components from 75 to 150
7.30: Jun 1995 – Added the data results transfer to Excel, converted the simulator kernel to a Windows program, can have up to 9,999 streams and/or unit modules in a single simulation (up from 999)
7.10: Oct 1994 – Converted the simulator kernel to virtual memory allocation for unlimited size flow sheets
7.00: Jan 1994 – Merged DESIGN II for Windows, DESIGN II and ChemTran into a single product, added online help, added gauge pressure units
6.0: 1991 – Added AGA Density method, SKD equation of state, Batch Distillation unit module, Windows user interface
5.0: 1989 – Case Study, Flow Meter unit module, Electrolyte thermodynamics, Modified Peng-Robinson equation of state
4.0: 1988 – Additional Inline Fortran commands
3.0: 1986 – Added Inline Fortran, DesignMaster, MixMaster, DESIGN II/PC
2.0: 1985 – Crude Oil library, Phase Map unit module, Depressuring unit module, Equilibrium Reactor unit module
1.0: 1984 – The REFINE column and crude feeds program were merged into DESIGN 2000 to create DESIGN II
1975 – The DISTILL column program was merged into DESIGN to create DESIGN 2000
1969 – The DESIGN program first offered on the University Computing Company (UCC) time sharing services

100s of Sample Flowsheets

DESIGN II FOR WINDOWS INCLUDES MORE THAN 300 FULLY WORKING FLOWSHEETS

c:\Program Files (x86)\DesignII\samples 19 DESIGN II flow sheets and 11 DESIGN II input files
c:\Program Files (x86)\DesignII\samples\ActivatedMDEA 4 DESIGN II flowsheets
c:\Program Files (x86)\DesignII\samples\ammonia 12 DESIGN II flow sheets
c:\Program Files (x86)\DesignII\samples\brochure 14 DESIGN II flow sheets
c:\Program Files (x86)\DesignII\samples\casestdy 4 DESIGN II flow sheets
c:\Program Files (x86)\DesignII\samples\CEP_Oct2005 6 DESIGN II flow sheets
c:\Program Files (x86)\DesignII\samples\chemtran 5 DESIGN II flow sheets and 26 ChemTran input files
c:\Program Files (x86)\DesignII\samples\coal 1 DESIGN II flow sheet
c:\Program Files (x86)\DesignII\samples\dynamic 6 DESIGN II flow sheets
c:\Program Files (x86)\DesignII\samples\equipmnt 150 DESIGN II flow sheets in 39 sub-directories
c:\Program Files (x86)\DesignII\samples\flare 2 DESIGN II flow sheets
c:\Program Files (x86)\DesignII\samples\fortran 9 DESIGN II flow sheets
c:\Program Files (x86)\DesignII\samples\fuelcell 3 DESIGN II flow sheets
c:\Program Files (x86)\DesignII\samples\gasproc 22 DESIGN II flow sheets and 5 ChemTran input files
c:\Program Files (x86)\DesignII\samples\general 33 DESIGN II flow sheets and 6 ChemTran input files
c:\Program Files (x86)\DesignII\samples\gerg2008 3 DESIGN II flow sheets
c:\Program Files (x86)\DesignII\samples\lng 3 DESIGN II flow sheets
c:\Program Files (x86)\DesignII\samples\lpg 2 DESIGN II flow sheets
c:\Program Files (x86)\DesignII\samples\optimize 2 DESIGN II flow sheets
c:\Program Files (x86)\DesignII\samples\pipeline 8 DESIGN II flow sheets
c:\Program Files (x86)\DesignII\samples\power 1 DESIGN II flow sheet
c:\Program Files (x86)\DesignII\samples\reverse_calc 2 DESIGN II flow sheets
c:\Program Files (x86)\DesignII\samples\sizeline 9 DESIGN II flow sheets
c:\Program Files (x86)\DesignII\samples\sulfur 4 DESIGN II flow sheets
c:\Program Files (x86)\DesignII\samples\thermodynamics 38 DESIGN II flow sheets in 36 sub-directories

Features and Specifications

Flowsheet Features

Steady State Simulation Analysis
Automatic Data Export to Microsoft® Excel
All User Manuals in Windows Help Files and in Adobe PDF files
Compatible with Windows 10, 8, 7, Vista, and XP, both x64 and x86
Diagram User Interface with Multiple Rename-able Sheets (up to 1,024)
Automatic Recycle Analysis of Unit Module Calculation Order and Recycle Streams
Advanced Recycle Convergence (Wegstein, Simultaneous Convergence or Direct Substitution)
Manual Unit Module Calculation Order
Manual Designated Recycle Streams
Input / Output Dimensional Units Control (US (STP), Metric (NTP or STP), SI (NTP or STP) standards along with individual unit control for all specs)
Material Balance (mole and mass by component, mole and mass by Module)
Energy Balance by Module
Stream Summary and Detailed Analysis
300+ Sample Flowsheets

Special Features

Dynamic Simulation Analysis
Time Duration and Time Interval
Sour Gas / LPG Treating using Amines (Single or Mixed): MEA, DEA, MDEA, DGA, DIPA, Piperazine
Claus Process with Automatic Redistribution of S2, S3, S4, S5, S6, S7 and S8 in the Vapor Phase
Case Studies
Inline Fortran
Flow Sheet Optimization (Min / Max)
Unit Specific Thermodynamic Properties
Feed Stream Specific Thermodynamic Properties
Lost Work Analysis
ChemTran Data Regression tool
Solids Handling
Simulator Kernel is callable from Visual Basic, Visual C++, and Excel VBA or any program that supports a VB interface
Feed Stream On / Off Time Control

Stream Calculation Features

Saturate Feed Streams with Water
CO_2 Freeze prediction
Hydrate Pressure / Temperature Prediction (Methanol or Ethylene Glycol inhibition if present)
Hydrate Pressure and Temperature Curves
Phase Envelope and Phase Map
Critical Properties Calculation
Gross and Net Heating Values
Reid Vapor Pressure (ASTM 323, API 5B1.1 API5B1.2)
Dew / Bubble Points and Wobbe Index
Water Dew Point
Stream Vapor Pressure
Sonic Velocity
Bulk Properties for External Programs
Process Line Heating or Cooling Curves
Process Line Sizing with three diameters
Print Phase Map or Phase Envelope
Pressure-Enthalpy Diagram with Isotherms
Vapor or Liquid Partial Numeric Derivatives
Cetane Index
Latent Heat of Vaporization

Features and Specifications

Unit Module Operations

Add Block (User Specified Calculations)
Air Cooled Heat Exchanger
Amine Columns
  Absorber with optional side feed
  Regenerator with optional side draw
  Real Trays or Packing
Batch Distillation
Component Splitter
Compressor (Polytropic or Isentropic)
Compressor-Expander
  Polytropic or Isentropic Efficiency
Controller (equipments or streams)
Chemical Reactors
  Stoichiometric, CO Shift, Methanation,
  Plug Flow Reactor, Continuous Stirred
  Tank Reactor, Ammonia Synthesis,
  Secondary Reformer, Steam Reformer,
  Methanol Synthesis
Depressurizer with time analysis
Distillation Column
  Absorber (Two or Three Phase)
  Absorber with Reboiler
  Stripper, Stripper with Total Condenser
  Liquid - Liquid Extraction
  Partial or Total Fractionator
  Multiple Feeds / Side Draws / Heaters
  Intercoolers / Water Decants / Coolers
  Column Profile, Efficiency Specifications
Divider (single or many product streams)
Double Pipe Heat Exchanger
Equilibrium Reactor
Expander / Expander Compressor / Pump
Fired Heater
Flash Separator (two or three phase)
Flowmeter
Heat Exchanger (single or two stream)
Hydrotreater
Line Module / LNG Exchanger
Mass Balance
Mixer (up to six feed streams)
Multiple Flashes or Multiple Phase Flash
Packed Column (same as Distillation)
Phase Envelope or Phase Map
Plate-Fin Heat Exchanger
Polytropic Compressor / Pump
Pump (Isentropic)
Refine Column
  Total or Partial Condenser
  Pumparound Reflux
  Pumparound Total or Partial Condenser
  Side Strippers, Multiple Feeds
  Steam Feed / Four Reboiler Types
  Product Quality Specifications
  Side Draws / Heaters / Coolers
  Feed & Product Heating/Cooling Curves
Shortcut Fractionator
Spreadsheet (User Specified Calculations)
Stream Manipulator
Tank (single or mixed phase)
Valve

Thermodynamic Methods

Hydrocarbon Enthalpy / K Values

API SOAVE
BRAUN K-10
BWR (Benedict-Webb-Rubin)
BWRS (Benedict-Webb-Rubin-Starling)
Chao-Seader
Corresponding States
Curl-Pitzer
Deshmukh-Mather (Mixed Amines)
ESSO (Maxwell-Bonnell)
ESSO Tabular
GERG 2008
GPA Water
Grayson-Johnson (API)
Grayson-Streed
Kent-Eisenberg (Mixed Amines)
KVAL (ChemShare)
LKP (Lee-Kesler-Ploecker)
NIST RefProp database 23
Modified ESSO
Modified Peng-Robinson (Stryjek)
Peng-Robinson
PPR (Predictive Peng-Robinson)
RK (Redlich-Kwong)
SOAVE (Soave-Redlich-Kwong)
Steam Tables
SKD (Soave-Kabadi-Danner)
Tabular K
Water / HC Solubilities
Yen-Alexander

Chemical Enthalpy / K Values

API SOUR (Sour Water-API)
CHEMICAL THEORY Vapor
DMPEG
Edwards / Edwards Sour
Excess Latent
Excess Tabular
GERG 2008
HAYDEN O'CONNEL Vapor
Henry's Gas Law (K*P)
Ideal Vapor
Ideal K-values
Margules
MEA or DEA
Mixing Rules (Yen-Woods, EOS)
NIST RefProp
NRTL (Renon)
Regular Solution
SOURK (Sour Water-Beychok)
UNIFAC
UNIQUAC
Van Laar
Vapor Pressure
VLE / LLE Unifac
Weak Electrolytes
Wilson

Density Property Methods

AGA, API SOAVE (API-SRK)
BWR (Benedict-Webb-Rubin)
BWRS (Benedict-Webb-Rubin-Starling)
COPE (Corresponding States density data)
COSTALD (Corresponding States liquid D)
GERG 2008, Ideal Densities
LKP (Lee-Kesler-Ploecker)
Mixed Amines, Modified Peng-Robinson
NIST RefProp, Peng-Robinson
Predictive Peng-Robinson
RK (Redlich-Kwong), Soave-Kabadi-Danner
SOAVE (Soave-Redlich-Kwong)
STD (Yen-Woods)

Component Data

1200+ Pure Components
Crude Assay Data (TBP, D-86, D-1160,
  Pseudo Volumes, D-2887)
Crude Library (38 World Crudes)
Crude Automatic Light End Analysis
Distillation Curve Input and Output
Up to 15 sets of User-Defined Curves for
  Viscosity, Pour Point, Sulfur and other

Transport Property Methods

Surface Tension

API, Molar Average, Mixed Amines

Thermal Conductivity

API, C.C.LI, LNAV, NBS81,
Mixing Method 3, TEMA 68 & TEMA 78,
Mixed Amines, NIST RefProp

Viscosity

API, Dean & Stiel, LNAV,
Mixing Method 2, TWU, MOD API,
NBS81, Mixed Amines, NIST RefProp

CHEMTRAN Property Generation

User Defined Components
Component Property Data Regression
VLE, LLE and VLLE Mixture Data
  Regression
Property Estimation Based on Component
  Structure

Equipment Performance

Distillation / Mixed Amine / Refine Columns
  Tray by Tray Hydraulics and Tray Sizing
Flowmeter Sizing
Heat Exchanger Rating
  All Shells: Single Phase,
  E and F Shells: Single & Two Phase
  Plate-Fin, Air Cooler: Single & Two Phase
Line Module (Single, Two or Three Phase)
  Heat Transfer to Surroundings,
  Pipe Segment Specifications, Pressure
  Drop Tables, Slug Flow Analysis
Polytropic Compressor Analysis with
  Speed Curves
Separator Sizing (Horizontal or Vertical)

In Over 75 Countries Spanning 54 Years, Thousands of Companies in the Chemical Process Industries Have Been Using Our Solutions!

DESIGN II FOR WINDOWS is available on our website 24 hours a day, and may be downloaded for upgrading or evaluation. If you are interested in DESIGN II FOR WINDOWS and would like more information, please contact WinSim Inc. via any of the following:

Corporate Headquarters:

WinSim Inc.
8653 FM 2759 Road
Richmond, Texas 77469
Phone: 281-545-9200
Fax: 281-545-8820

Website: www.winsim.com
e-mail: sales@winsim.com
support@winsim.com

WinSim® Inc.
Advanced Engineering Software