

EXTENDED PROCESS SIMULATION SYSTEM

Windows Interface for XPSIM v.3.02

User Manual

Rev. 12.0

July 2024

Document History

Rev.	Date	Issue
0.0	March 31, ,2006	Draft
0.1	July 31, ,2006	Issued
0.2	October 20, ,2006	Issued
0.3	February 13, ,2007	Issued for version 1.03
0.4	June 21, ,2007	Issued for version 1.05
1.0	January 10, 2008	Issued for version 1.06
2.0	January 7, 2009	Issued for version 1.07
3.0	January 11, 2010	Issued for XPSIM version 1.08
4.0	April 1, 2011	Issued for XPSIM version 1.09
5.0	July 31, 2012	Issued for XPSIM version 2.00
6.0	October 17, 2013	Issued for XPSIM version 2.01
7.0	July 31, 2015	Issued for XPSIM version 2.02
8.0	January 11, 2017	Issued for XPSIM version 2.03
9.0	June 25, 2018	Issued for XPSIM version 3.00
10.0	May 2, 2021	Issued for XPSIM version 3.00 – mod. 06
11.0	July 13, 2022	Issued for XPSIM version 3.01
12.0	July 15, 2024	Issued for XPSIM version 3.02

XPSIM documentation

The set of XPSIM v. 3.02 documentation is listed in the table below.

No	Title	Rev.	Issue
1	Windows Interface for XPSIM v.3.02 (***)	12	Jul, 2024
2	User Manual - Keyword Input - Language Reference	10.0	Jun, 2022
5	Dynamic Simulation Options for XPSIM v.3.02 - Reference Manual	6	Jul, 2024
3	Installation Manual	14	Jul, 2024

(***) this document.

Abbreviation and acronyms

UoM	Units of Measure
UOP	Unit operation (e.g., valve, compressor, column, etc.)
Pfd	Process Flow Diagram

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1. General Information

This document provides basic information on the *XPSIM Windows Interface* application which drives the use of:

- XPSIM steady state simulation program
- XDSIM dynamic simulation program

in the Windows environment.

It describes the capabilities of the **XPSIM** windows interface and includes general instructions for using its features. It is directed primarily toward users already familiar with the *Microsoft Windows* interface, so detailed instructions for using the mouse, menus and other windows objects are not given.

This software application allows executing **XPSIM** simulation program in a MS Windows environment.

The user can:

- create new simulations and process flow diagrams (PFD)
- open and edit XPSIM/XDSIM input files
- inserting new streams and unit operations
- modify existing unit operations and change the PFD layout
- run the simulation
- view and print result data and files
- view and print results shown as graphs
- export stream data to MS Excel

In the following chapters, the main functions available are explained in detail.

<u>Remark</u>

Screen images and outputs, contained in this manual, can show version numbers lower than the current one (v. 3.02) and can be slightly different in their layout but are still valid in their structure.

1.1 XPSIM installation

The installation of XPSIM and its related documentation is described by the manual: XPSIM - EXTENDED PROCESS SIMULATION SYSTEM

Installation Manual - Version 3.02-Rev. xx – month, day year

2. User Interface

The **XPSIM Windows Interface** implements a multi-document interface (**MDI**) architecture that allows the user to work on multiple documents and views at the same time, with each document shown in its own window.

At a time, the number of open windows can be very large; for example if a simulation generates 20 graphs the user can, in principle, open each graph in a separate window and have 20 graph windows open.

The terms 'file', 'document' and 'window' may be considered synonyms because each document is usually contained/saved in a file and each document is shown in its own window.

The documents that may be viewed and/or edited are:

- *input files*
- process flow diagram (PFD) schemas
- *output files*
- graphs

This chapter describes how to start and exit **XPSIM** and describes some basic Windows features as they appear and are used in the XPSIM windows interface.

2.1 How to start XPSIM

To start the application the user can:

- double-click on the XPSIM icon on the desk-top
- launch the XPSIM application from the Start/Program Folder

The XPSIM welcome window will appear, as shown on Fig. 2.1.

2.2 Application Desktop

As usual, with applications that display multiple windows only one window is active at a time. The user may activate one window by simply clicking on it or selecting the desired window from the '*Window*' menu.

When the application is started, usually from the program folder or a program icon, the main window is presented (see next Fig. 2.1).

On the main window, the user may easily identify the following parts:

Title bar	the title bar is the horizontal bar at the top of the window; it displays the application name and the run identifier.
Menu bar	the menu bar is the horizontal bar below the title bar. It contains the names of the available menus.
Tool bar	the tool bar is the horizontal bar below the menu bar. It contains buttons that when clicked execute command (also available from the menu bar).

Status bar the status bar is the horizontal bar at the bottom of the main window. It displays help messages for menu items, and other information.

The menu bar is automatically updated to reflect the commands available, allowing the user to work on the active document (window).

Some drop-down menu operations are possible only after other operations have been performed. Following the Windows convention, when the status of the application does not permit the execution of a command, its name will appear grayed on the drop-down menu.

The user may begin edit this input files inserting the input statements or may open another input file.

2.3 Manipulating the main and child windows

Windows present on the top right corner the standard icons:

Maximize icon when pressed the window is enlarged to fill all the available client area of the main window.

Minimize icon when pressed the window is compressed to the dimension of a bar containing the window title and the standard buttons.

B Restore icon when pressed the window is resized to the dimensions it had previous of the last window size operation applied.

Close icon when pressed closes the window and the related document.

X

1 xPSIM v. 1.08	_ # X
Colore tree Colore tree Color	
Status Bar	SPSIM objects infos

Figure 2.1 - XPSIM main window with welcome dialog

2.4 Basic Commands and Functions

The base menu is active when there are no open documents (input files). It presents the following commands:

<u>File</u>

- New
- *Open* ...
- Close
- Print Setup ...
- ... list of recently-used files
- Exit

Dynamic

- Set Dynamic Simulation option
- P&I pages ...

Tools

- Open graph file ...
- Graph collection ►
- View graph results ...
- Property Tables ...

View

- Tool Bar
- Status Bar
- Application look ▶
- Large Uop palette buttons

<u>Help</u>

- Help topics
- About XpsimWin

All these commands are described in detail in the following paragraphs.

2.5 File menu	
New	opens a new empty simulation problem.
Open	opens an already existing simulation input. The standard 'File open' dialog is displayed to allow the user to select the desired input file.
Print setup	invokes the standard 'Print Setup' dialog. The user will so select the desired printer and the page layout. Vertical (portrait) or horizontal (landscape) page positions may be selected.
recently used files	the latest used files are listed under the 'File' drop down menu. By selecting one file-name, the file is automatically opened and displayed in a new window.
Exit	closes the main window and terminates the application. When selected, the user is requested to confirm this choice before all open documents are closed and the application terminated.

2.6 Options menu

The following general commands are available.

Dynamic simulation	activates / deactivates the Dynamic Simulation Option.
P&I pages ►	allows to create a new collection or to open an existing collection of P&I (<i>Process and Instrument diagram</i>) pages . Created P&I pages can be used in a dynamic simulation.

2.7 View menu

The following general commands are available.

Tool Bar	hides or shows the tool bar.
Status Bar	hides or shows the status bar
Application Look	set the look of the main window to the selected style
Large Uop palette butt	ons set toolbar and uop palette buttons to a lerger size

2.8 Tools menu

This menu allows to open graph collections and graph files generated by previous simulation. It is also possible to generate and/or edit P&I pages.

Open graph file	opens a graph file (.gph extension) generated in a previous Xpsim session.
Graph collection	this command opens graph collections (files with <i>.bgr</i> extension) allowing the user to view and or edit contained graphs.
View graph results	this command becomes available after a graph collection (<i>.bgr</i> file) is linked.
Property tables	allows to open and browse property table files (to be used by the OLGA or LedaFlow software) generated by Xpsim o by another application.

2.9 Main Interface Modes

For the definition of a simulation problem, the user may select one amongst three main modes of operation.

- 1. Supply data using two *logically connected* windows:
- 'Process Flow Diagram' window, and
- 'Simulation Data' window
- 2. Supply input data as a ASCII text file using keywords, based directly on the **XPSIM** simulation input language, based on a keyword format.

In the Process Flow Diagram the user can create streams and unit operations, connect them and build the topology of the plant, he wants to simulate.

In the 'Simulation Data' window the user specifies all the parameters of streams, unit operations, and other objects that are required to effectively run the simulation.

2.10 How to close XPSIM

To close the application the user should:

- Close all the windows related to the open problem.
- Close the main XPSIM window or select the '*Exit*' command from the **File** menu.

3. **Process Flow-Sheet creation**

This section describes how the user can create a diagram of the process to be simulated. This diagram is usually called '*Process Flow Sheet*' or '*Process Flow Diagram'* (*PFD*).

3.1 Starting a new PFD

When a new simulation is started, the following dialog is prompted:

Fig. 3.1 – Simulation type dialog

 Simulation data linked 	to PFD data (default)
C Keyword input file	
	Cancel

By selecting the 'simulation linked' mode two main windows are opened:

- process flow-sheet and data window
- simulation running window

Both windows are divided into parts which display separated data. They are presented with tabs, to activate each window the user can click on its tab.

They are positioned so as to occupy the upper and lower part of the main window (see next Fig. 3.2).

The two main windows, when opened, will appear as typically shown on next Fig 3.2

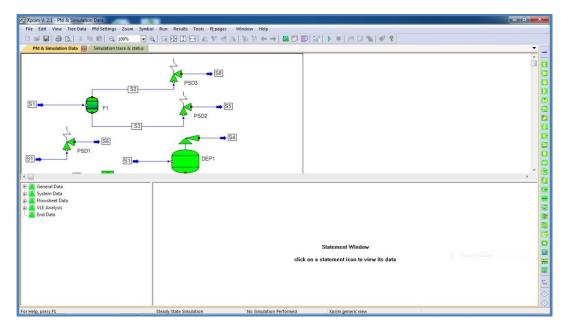


Fig.3.2 - Pfd and Simulation Data Windows

The "*process flow-sheet and data window*" (*PFD window*) is the main problem window, a problem is closed by closing this window.

The "simulation running window" is automatically created when the main window is created and destroyed when the main window is closed.

The user can change the dimension of the divided part by clicking on the separation borders and dragging them to the desired position.

3.2 File and other menus

The menu items, available when a PFD window is active, contain the following commands:

File

- Print, Print Preview, Print Setup...
- Exit

View

- Set zoom value, Set mesh
- Toolbar, Status Bar

Window

- Cascade
- Tile
- Arrange Icons

In this window the user can:

- create and place streams
- create and place unit operations
- connect stream and unit operations
- delete streams and unit operations

According to these operations simulation data are automatically created (or deleted) and input statements are prepared to be completed by the user.

3.3 Pfd Toolbar

Logically connected to the Pfd window, the "*Pfd symbols*" palette is created and positioned, by defaults, on the right of the application window, as shown on Fig: 3.2.

The user can move its position using the '*Pfd toolbar*' command available under the 'View' menu'. Using this command, the toolbar may be placed on one of the four sides (right, left, top or bottom) of the Pfd window.

3.4 File Menu

Print this command invokes the standard 'Print' dialog for starting the printing process on the selected device. The PFD drawing is always printed in a single page and it is so scaled to fit the page size.

Print setup this command invokes the standard 'Print setup' for selecting the printer and the page layout. For printing PFD drawings the horizontal page layout is to be preferred.

3.5 Placing Unit Operations

On the right side of the main window, a **"Pfd palette"** is arranged; this is a vertical shaped window containing small icons for streams and unit operations.

The 'Pfd palette' is available only when the user's focus is on the Pfd window.

To place a unit operation in the Pfd window :

- click on the "pfd palette" the icon of the unit to be placed
- move the mouse cursor at the point of the Pfd where the unit is to be placed and leftclick.

When these actions are completed, the symbol of the selected Unit Operation appears on the PFD window.

Repeat these actions to place other unit operations.

If the selected unit operation requires additional parameters to be fully specified, a dialog box is prompted to the user before the unit operation symbol is created.

For example, when a **FLASH** unit operation is placed on the Pfd the following dialog is presented to the user.

The dialog requires the specification of the number and type of product streams.

Fig. 3.3 - FLASH unit specification dialog

Select flash type					8		23
O 1 product str	eam						
○ vapor and lic	juid product	ΠH	lorizontal				
C vapor and tv	vo liquid products						
_ Liquid/l	iquid separation type-					1	
CW	ater/hydrocarbon	0	Generic Liq	juid/Li	quid		
	1		_	_			
	OK		Cance	el			

The symbol of the unit operation is created with small size to minimize possible overlaps with the symbols of other units. The user can then change its initial size using the symbol resizing handles or the '*Scale symbol*' function.

Xpsim 1 - Pfd & Simulation Data	bol Run Results Tools Pipages Window Help I 한 53 위치 고 한 조 에너 () 2 한 슈 나 幽 即 副 说: () 이 (2 한 편 이 (2 한)	- 0 X
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Fig. 3.4 - PFD Window after creation of a Flash Unit

When a unit operation is placed on the "Pfd window", the corresponding object is automatically created in the *Simulation Data* tree view.

So, as shown on Fig. 4, a **FLASH** symbol has been placed on the Pfd window, and the corresponding **FLASH** object appears in the *Simulation Data* tree view.

3.6 Deleting Unit Operations

To delete a unit operation placed on the Pfd, you should do the following actions :

- left-click on the unit operation symbol to identify it (a rectangle, drawn with a dot line, will appear around the selected symbol).
- press the 'Canc' button on the keyword.

A warning message box appears to ask for confirmation of the delete request.

- select **OK** to complete the operation
- select **Cancel** to ignore the delete request.

Deleting a unit operation can also be performed by selecting the **Delete** command in the **Edit** menu.

3.7 Placing a Stream

The first icon in the 'Pfd palette' is associated to process streams.

To create a stream in the Pfd window, the user should do as follows :

- *left-click* on the Stream icon to activate the 'Stream placement' operation.
- *left-click* on the 'Pfd window' to define the *initial point* of the stream path.
- *left-click* as many times as required to define the other *vertices* of the stream path.
- *right-click* to define the *end-point* of the stream path.

To cancel stream creation, the user can click on any point outside the 'Pfd window' During these actions a 'draft' version of the stream path appears on the window.

When the stream drawing action is complete, the stream path is drawn on the Pfd Window, as shown in the next Fig. 3.5

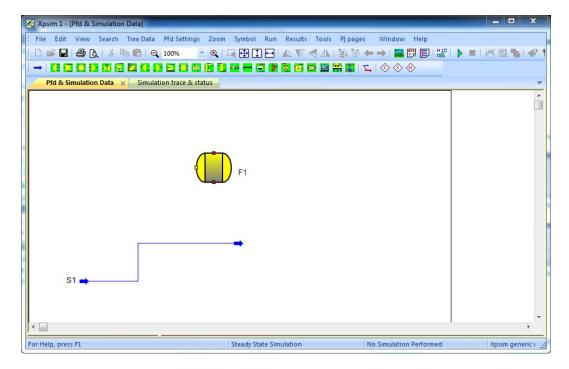


Fig. 3.5 - A stream Path in the Pfd Window

In this figure, stream S1 is placed on the Pfd window as an unconnected object.

Unlike the case of unit operations, when a stream is created in the Pfd Window, the relevant stream object **is not automatically generated** in the 'Simulation Data' window.

3.8 Connecting Streams to Unit Operations

As may be seen on the previous figure, the unit operation symbol shows handles (in the form of square colored boxes) that represents the connection points of feed and product streams.

Feed stream handles are drawn using a **yellow** color, whereas *product stream handles* are shown as **red** boxes.

When the mouse cursor is placed or passes over a connection box its shape is changed from 'arrow' to 'cross'.

- To draw a **feed stream** the user should start at a free point of the Pfd and place the endpoint of the stream path on a **'feed handle'**
- To draw a **product** stream the user must begin a stream path on a '**product handle**' and place the end-point at a free pfd point.
- To draw a stream connecting two Unit Operations the user must start the stream at a **'product-handle'** and place the last point of the stream path on a **'feed-handle'** of another Unit.

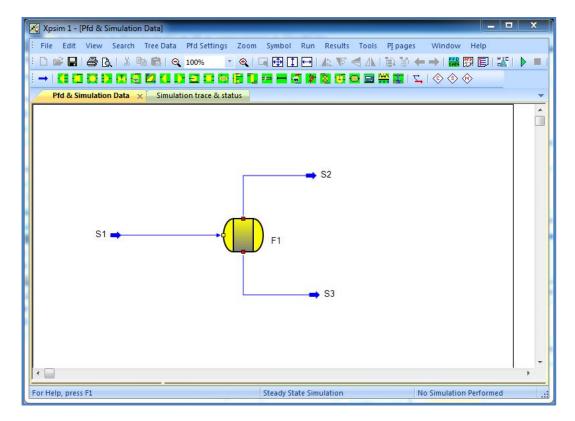


Fig. 3.6 - Connected Streams and Unit Operation in the Pfd Window

3.9 Deleting a Stream

To delete a stream on the Pfd the user must first *'highlight'* the selected stream by clicking on it. The stream color will change from the 'normal' status to the 'selected' one. (default colors are respectively blue and red).

Then user can then:

- a) press the 'Canc' button.
- b) start the Delete command from the Edit menu

The following dialog-box will appear to ask the user which action he wants to perform.

Del	ete stream 'S2' 🛛 😵 🖾
	Pfd only
	Pfd and Simulation Data
	Cancel

The user may cancel the operation or:

- delete the stream only in the Pfd document.
- delete the stream in the Pfd document and its data, if any, in the 'Simulation Data' document.

3.10 Operations on streams

After a stream has been selected (highlighted), the user, may right-click on it to bring-up a context-type menu, as shown on the next figure.

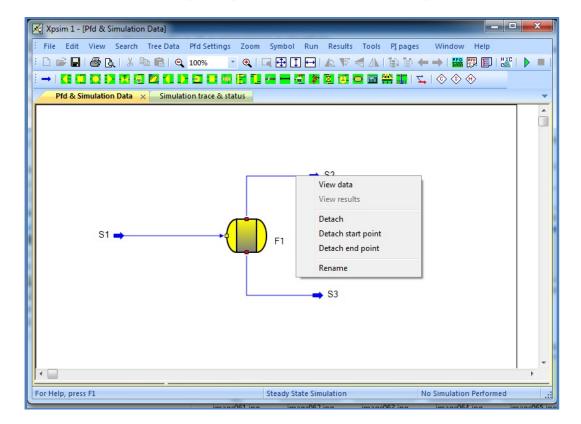


Fig. 3.7 – A pfd snap-shot with the stream menu displayed

From this menu the user may select one of the following operations :

View dataask the program to display, in the 'Simulation Data' window,
stream data supplied by the user, if any.Detachdetach stream initial and end points, if connected to unit
operations.

Detach start point	detach stream start point, if connected to a unit operation as a product stream.
Detach end point	detach stream end point, if connected to a unit operation as a feed stream.
Rename	to rename the selected stream. The following dialog-box is then

prompted when this function is selected.

name selected	stream	2
Actual name	S2	
New name	S2	
OK		Cancel

3.11 Changing stream connections and path

The user can change the path of streams and their connection to the unit operation symbols. Moving the mouse pointer over a stream path the user may see its shape change according to the position of the mouse.

The cursor, when positioned over stream end, appears as an \mathbf{k}_{S} symbol.

If placed over stream path segments, the cursor will appear as a double pointed arrow:

- t vertical when placed over horizontal segments
- \leftrightarrow horizontal when placed over vertical segments.

Moving stream end

By clicking on a free stream end, the user can drag its position to a new place or connect it to a unit operation.

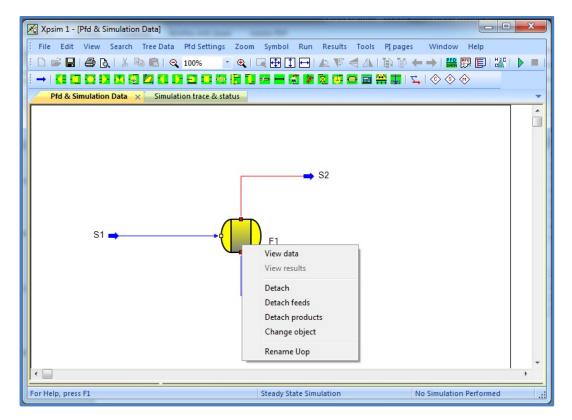
Stream ends, connected to unit operations, may not be moved and must be previously detached using the relevant commands.

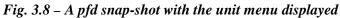
Moving path segments

By clicking on a path segment the user can drag its position to a new location. The stream path is redrawn taking into account this new position. Vertical segments may be moved either left or right with respect to the original position, whereas horizontal segments may be moved up or down.

3.12 Actions on Unit Operations

The user can right-click on a symbol of a Unit Operation in order bring-up a context-type menu.





From this menu the user may select one of the following operations.

View data	to display, in the 'Simulation Data' window, the parameters and other values related to this unit operation.
Change Object	to display the relevant dialog-box for changing the parameters that define the structure of the symbol or its form. E.g., the user may change the number of feeds/products of an heat-exchanger or the number of trays of a column.
Detach	to detach the unit from all streams (feeds and products) connected to it.
Detach feeds	detach all streams connected as feeds to this unit.
Detach products	detach all streams connected as products to this unit.
Rename	to rename the unit operation.

3.13 Pfd settings

The user can specify a number of features when drawing the Process Flow Diagram, the following options are available:

Pfd Size

at any time the user can change the size of the pfd by using this function. The following dialog is presented to the user requesting the specification of the new pfd size.

Fig. 3.10 – Pfd size specification dialog

Standard	A4 Horz (210 mm x 297 mm)	•
C User define	d	
Height, mm		
Length, mm		

Enlarging the pfd size is always allowed.

A reduction of the pfd size is rejected when some units lay outside the new desired size.

Font height

the user can modify the default value of the height of the font used to draw stream and unit names. Font height is given in 0.1 millimeters units, using the following dialog box.

Set Pfd font height	8 22
Font height (decimill	imeters) 40
ОК	Cancel

Background color the default background color of the Pfd window is white. The user may select a different color. Using this option the 'Standard Color Dialog' is prompted so the user may choose one of the Windows base color or define a user color.

White background selecting this command the user resets the background color to white.

Stream Settings

The user can specify a number of options related to stream drawing by selection the "Stream ..." command. The following dialog is prompted.

Fig. 3.10 – Stream settings dialog

Stream Settings	
Color Line Width Label position	
Actual selected colors	
Normal	
Highlighted	·
Recycle	·
OK Annul	la Applica ?

Line colors the user can modify the standard colors used for drawing streams in the standard or highlighted status. Care should be applied to avoid inconsistencies with the back-ground color.

Line width

the user can modify the width of the lines that represent a stream for both the screen and the printer. Stream lines are specified in 'pixels' for the Pfd window or in deci-millimeters for printing.

Color Line Width Label position	
Line width	
For screen, pixels units	
For printer, decimillimeters	
Arrow Size	
G Small C Larre	
C Large	
t∙ Smail (Large	
t∙ small (Large	

Label position

The user can set the position of the stream label with respect to the stream line.

Color Line Width Label position	
Label Position	
⊂ Up	
Middle	
C Down	
Label Border	

The '**Middle'** option is the default. In this case the stream label is drawn on the path line. By selecting the other options the stream label is drawn above or below the stream line.

When the stream label is placed on a vertical segment of the stream line, the '**Up**' option will draw the label on the *left* whereas the '**Down**' option will draw the label on the *right*. When the 'Label border' is checked the stream label is enclosed in a rectangular polygon.

Unit Operation Options

The user can specify the border line width and the filling color for Unit Operation symbols.

Unit color/line width the user can modify the color used to fill the unit operation symbols and the width of the border lines. To change the default selections user interacts with the following dialog-box.

Unit Operation Settings			×
Color Border Width			1
Normal color		T	f.
Selected color			
ок	Annulla	Applica	?

3.14 Zoom specification

The user can set the size of the Pfd image on the screen by defining the zoom level.. This helps the user either to focus on one or more objects or to view many objects and the connecting streams.

Set zoom

this command displays a Dialog Box with which the user can specify the zoom value. The initial zoom value is set at 100. See the next figure.

Set Pfd zoom value

Fig. 3.11 - Pfd zoom definition dialog

🔍 Zoom in	using this command the user can reduce the zoom by 5%. The user can also click the related icon on the tool-bar
🔍 Zoom out	with this command the user can enlarge the size of the image by 5% .
🕀 Fit to window	this command adapts the global Pfd image to the current window size.
🖶 Fit to width	with this command the users adapts the global Pfd image to the current window width.
I Fit to height	with this command the users adapts the global Pfd image to the current window height.
G Fit to rect	with this command the users zooms a selected rectangle of the Pfd to the available size of the current window.

3.15 Pfd scrolling

The user can scroll the Pfd window by using either the mouse or the keyboard. With the mouse the user can click on the scrolling bars (horizontal and vertical) that appear at the bottom and right side of the windows.

With the keyboard the user can use the following keys

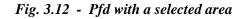
- ↑ up, to scroll the pfd upwards
- \downarrow down, to scroll the pfd downwards
- \rightarrow right, to scroll the pfd right.

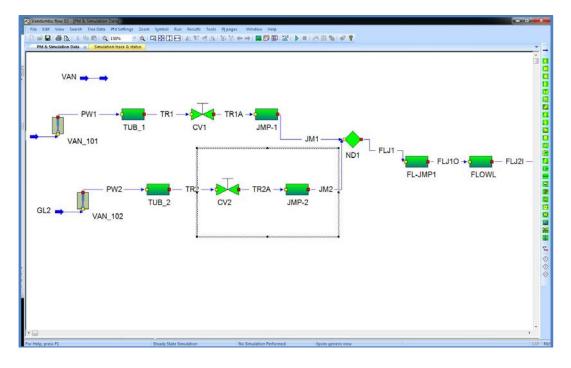
 $\leftarrow \qquad \text{left, to scroll the pfd left.}$

In addition, one can use the commands:

Page up Page down	to scroll one page up to scroll one page down.
TT	

Hometo scroll the pfd to the upper-left corner.Endto scroll the pfd to the bottom-right corner.





3.16 Symbol manipulation

The user can apply reflections and rotations to the symbol of a Unit Operation in order to draw a Pfd schema in an easy way.

These operations help the user in changing the direction of the feed and product streams to obtain a simpler and clearer pfd drawing. Usually, the base version of the symbol presents feed and product streams with a **left-to-right** direction, so the connection of recycle streams would be difficult if stream directions could not be reversed.

The following commands are available under the 'Symbol' menu item.

A Reflect across Y axis	the symbol is reversed across a vertical line. The direction of feed and product streams attached horizontally is reversed.		
d Reflect across X axis	the symbol is reversed across a horizontal line. The direction of feed and product streams attached vertically is reversed.		

🕼 Rotate +90°	the symbol is rotated 90 degrees <i>counter-clockwise</i> .
V Rotate -90°	the symbol is rotated 90 degrees clockwise.

These actions cannot be applied to any symbol of the process unit operations. Actions that are not permitted are shown grayed (disabled) in the drop-down menu.

Remark

Independently of the sequence used to apply these actions to the unit operation symbol, the final symbol shape is generated by applying reflections before rotations.

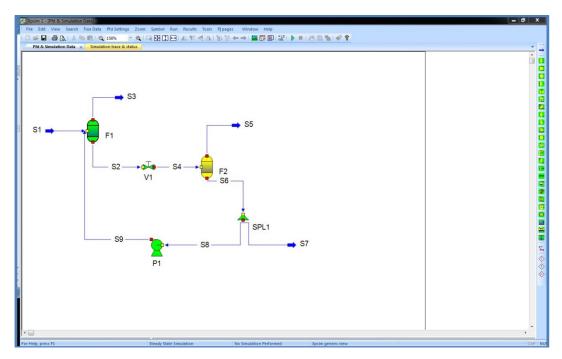


Fig. 3.13 - A Pfd with the Pump symbol reflected

3.17 Moving Unit Operations

The user can move the position of the symbol of a unit operation after it has been placed on the Pfd. This action may be performed either using the mouse or the keyboard.

Using the mouse

- left-click on the symbol of the Unit Operation to be moved, when clicking a border is drawn around the selected symbol.
- holding the left-button down move the symbol, whose frame border will follow the mouse cursor.
- Release the left-button of the mouse at the point where the Unit Operation is to be placed.

Each time the symbol is moved, the program re-calculates the path of all streams connected with the Unit Operation moved.

Feed and product streams not connected to other units are re-drawn keeping their current path.

Feed and product streams connected to other units are rerouted automatically by program and their path is updated accordingly.

Using the keyboard

- left-click on the symbol of the Unit Operation to be moved, when clicking a border is drawn around the selected symbol.
- by pressing once or more times the up, down, left or right keys of the keyboard move the symbol of the unit do the desired place.
- left-click with the mouse on a empty point of the pfd to release the selection of the unit operation.

Using the keyboard the symbol location is moved one cell for each keystroke received.

Feed and product streams not connected to other units are drawn keeping their current path. The path of feed and product streams connected to other units is stretched keeping its current form as far as possible. When this is not possible the path is recalculated by program.

3.18 Changing the size of Unit Operations symbols

The user can change the size of the symbols of Unit Operations after it has been placed on the Pfd.

This can be done in two different ways.

Using the mouse and resizing handles

To perform this action the user must click on the unit operation symbol. With this action a border with four handles at its corner appears. The user must click on one of the handles and, holding the left button down, extend or reduce the frame size.

After the left mouse button is released, the unit operation symbol is redrawn according to the new size. In general the X and Y dimensions may be changed independently but they will be always multiple of the basic dimension.

At the completion of the operation the path of streams connected to the unit operation is automatically redefined.

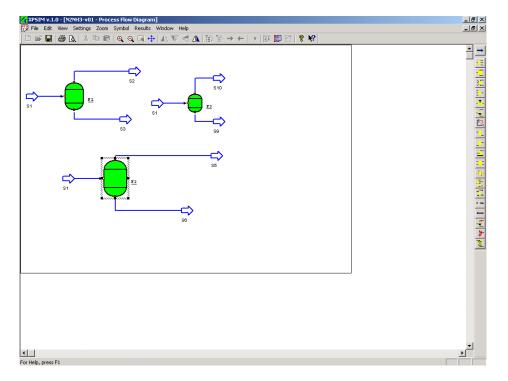
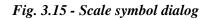


Fig. 3.14 - Unit operation with resizing handles

Modifying scale factors

When a unit operation symbol is selected the user can invoke the 'Scale symbol ...' function under the Symbol menu.

The following dialog box appears and the user can modify the scaling factor for the X and Y dimensions.



Set scale factors	
X, width scale factor	1
Y, height scale factor	2 +
ОК	Cancel

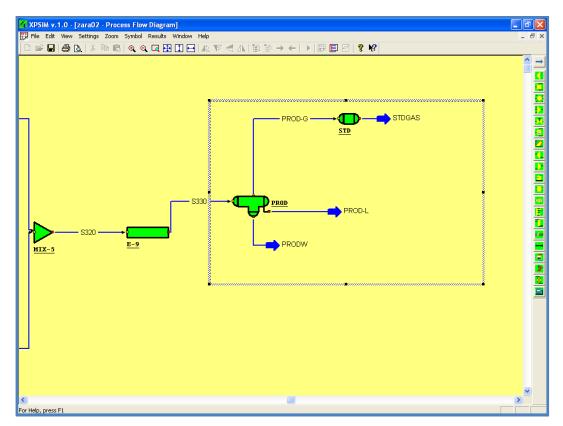
3.19 Moving groups of units

It is possible to move on the process flow diagram a group of unit operations.

To perform this operation the user must first select a region of the pfd that includes two or more unit operations.

By clicking within the selected region the selection frame appears and the region may be dragged to the new desired position.

Fig. 3.16 – Pfd with two selected units



3.20 Deleting a group of units

It is possible to delete from the process flow diagram a group of unit operations.

To perform this operation the user must first select a region of the pfd that includes two or more unit operations.

By clicking the **CANC** (cancel) button of the keyword or by selecting the **Delete** command from the **edit**, the user may delete all the unit operations selected.

The user is requested to confirm the operation.

In addition of the unit operation all the streams which interconnect the deleted unit operations are also deleted.

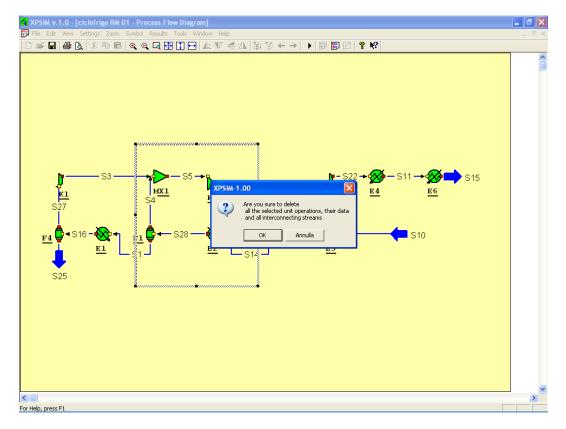


Fig. 3.17 – Deleting a group of units

3.21 Changing scale factors of a group of units

When a group of units is selected the user can change in a single operation the scale factors of all the selected units.

The user is prompt with the dialog box described in the paragraph **3.18 Changing the size** of Unit Operations symbols

The user can define the scale factors for the length and height of all the selected symbols.

3.22 Shifting Unit Operations and Streams

In defining a plant simulation the user can add unit operations and streams up to fill all available space on the pfd sheet. When this limit is reached the user can change the pfd format widening the available space for placing unit operations and connections.

In the case a user needs to insert elements at the left or at the top of the pfd, he may shifts all the unit operation using the :

"Shift Uop & Streams ..." command.

This command prompts the following dialog box, where the user can specify the shift he requires.

Shift all the PFD objects		
Up or down C Up O Down	Height, mm	20
Left or Right	Length, mm	30
ОК		Cancel

Fig. 3.18 – Pfd shift all objects dialog

3.23 Renaming Unit Operations

A command is available for renaming unit operation under the 'Edit' menu.

Fig. 3.19 – Unit Operations rename dialog

R	ename ur	nit operations		×
	Id V-2 EX-1 C-1 COND MX-1 E-1	Type FLASH FLASH EXPANDER COLUMN HEATEXCH MIXER HEATEXCH	Enter new name and push button	
		ОК	Cancel	

The user can click on a selected unit id causing its name to appear in the edit field. The user can then change the name and perform the rename action by clicking the 'Rename' button.

3.24 Renaming Streams

A similar function is available for renaming the streams.

The following dialog appears by invoking the 'Rename streams' command under the Edit menu.

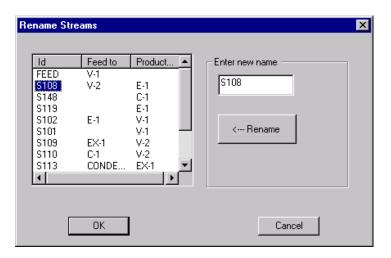


Fig. 3.20 – Streams rename dialog

The user can click on a selected stream id causing its name to appear in the edit field. The user can then modify the name and perform the rename action by clicking the 'Rename' button.

3.25 Finding an object

This function is provided to easily locate a unit operation or a process stream on pfd schemas containing a large number of elements.

Find/loc	ate a pl	fd object			×
Unit op	eration	Stream			
	'				1
	No	Id	Туре		_
	1	F1 V1	FLASH VALVE		
	2 3	F2	FLASH		
	4	SPL1 P1	SPLITTER PUMP		
	ľ		1000		
		OK	Annulla	Applica	?

Fig. 3.21 – Find anobject dialog

By selecting a unit operation and clicking the OK button, the unit is selected on the pfd and the drawing is scrolled so that the unit appears approximately at the center of the pfd window.

When a stream is selected in the dialog, the pfd is scrolled in order to present the stream approximately at the center of the pfd. If the stream is a product the unit operation that generate this stream is selected. If the stream is a feed, the inlet unit operation is selected.

3.26 View commands/options

The 'View' menu contains some commands that may be used to change or update the view of the Pfd document.

Available commands are :

- Freeze Process Flow Diagram
- Set Pfd size
- Refresh drawing
- View Uop connections
- Stream start/end points
- View External references
- Mesh
- Pfd toolbar

Freeze Process Flow Diagram

this command freezes the process flow diagram so that changes to its graphical structure are not allowed. A '*check mark*' appears

on the left of the command line if already selected. Select the command once more to unset this option.

- **Set Pfd Size** using this option the user may extend the Pfd size or reduce the size of the current pfd..
- **Refresh Drawing** selecting this command the Pfd is cleared and completely redrawn. This command is useful when, changing the focus between windows, the Pfd drawing is not completely drawn or is not visible.
- Meshselecting this command a mesh is drawn over the pfd. This option
may be useful to for aligning unit operation symbols and stream
paths.
- **Uop connections** this command activates or de-activates the drawing of the boxes used as handles to define the locations where streams may be attached to Unit Operations.

Stream start/end points

this command activates or de-activates the drawing of the boxes used ad handles of initial and final points of each stream path.

View external references

this command activates or de-activates the drawing of dash lines representing external references between unit/control operations and other unit operations/streams. External references exist when simulation parameters of one object (e.g. a SPEC statement of a CONTROL unit) refers to a parameter of another object (e.g. the pressure of a stream).

- Tool barthis command shows or hides the toolbars of the main window
and the Pfd palette. It may be used to force the reshow of the Pfd
palette in case it becomes not visible.
- **Pfd Toolbar** the user may move the position of the 'Pfd toolbar' using this command. The submenus (right, left, top or bottom) provide the choice to place the toolbar at one of the four sides of the Pfd window.

NOTE

The 'Freeze' command is useful to stop unwanted changes that can be made by clicking with the mouse over streams or unit operations.

4. Simulation Data

This chapter provides general information about basic functions used to create a process simulation by:

- providing the required input parameters and data
- running the simulation
- analyzing possible input errors.

XPSIM organizes input data in *'statements'* which are grouped in *Input Categories'*. Some statements are automatically created by the windows interface as result of some user actions (e.g., creation of a unit operation on the pfd); other must be explicitly created by the user.

Though simulation data may be entered in *any order*, the user is advised to follow some basic criteria.

The simulation data window is divided in two parts:

- the left part shows the list of all the input statements defined for executing the simulation. Statements defined by the user are shown in a **'tree view'**, similar to that presented in the MS-Windows 'file manager'. The term **'data tree'** will be used to identify this part.
- the right part shows the data of one selected input statement and allows the user to insert, modify or delete the parameters related to this statement. This part will be called **'statement window'** in the following documentation.

Statements defined by the user are shown in a **'Tree view'**, similar to that presented in the MS-Windows 'file manager'.

XP5IM v.1.0 - [Xpsim1 - Simulat File Edit View Data Run Re					_ 8 _ 8
			♥ ╡ ⚠ 🕲 🐌 → ← → 🛱		
General Data		- Run specification			<u>_8×</u>
DESC	No	Keyword	Value	Description	
DIMENSION	1	ID=		Job identification no	
Flowsheet Data	2	CUSTOMER=		Customer name	
FLASH - F1	3	USER=		User name	
FLASH - F2	4	PROJECT=		Project description	
SPLITTER - SPL1	5	PROBLEM=		Problem description	
E PUMP - P1	6	CASE=		Case identifier	
Help, press F1					<u> </u>

Figure	4.1	Simulation	data	window
1 isuic	7.1	Simulation	uuuu	m intao m

Input statements are hierarchically organized in:

- categories
- main statements
- parameter statements

The input categories provided by XPSIM are:

- 1) General Data
- 2) Petroleum Data
- 3) Pure Component Data
- 4) Thermodynamic Data
- 5) System Data
- 6) Experimental Data
- 7) PVT Analysis
- 8) Default Data
- 9) Flowsheet Data
- 10) Recycle Data
- 11) Network Data
- 12) Vle Analysis
- 13) Output Data
- 14) Input Data End

When a new simulation problem is opened, the following categories, required by any simulation, are automatically created:

- General Data
- System Data
- Flowsheet Data
- Input Data End

The **'Input Data End'** category is empty; it does not include any sub-statement and defines the end of the input statements.

By clicking on the '+' or '-' icons, the user can expand or collapse each statement or category showing or hiding all the related sub-statements.

Each statement is shown as a line built-up by:

- an icon
- a descriptive text

See for example the **RUN** and **FLASH** statements shown in the previous Fig. 4.1.

By clicking on the **'statement text'**, the statement data/parameters are displayed in the right part of the 'Simulation Data' window, i.e. in the 'Statement Window'.

Two commands:

- Expand input tree
- Collapse input tree

are available on the View menu for working on the data tree.

These same commands are represented by two icons on the application toolbar:

Expand may be used to expand the statement tree to show all the main statements associated to each category

Collapse may be used to collapse the statement tree to the base status where only the 'categories' are shown.

4.1 Inserting new categories

To insert a new input category, the user must **right click** with the mouse at a free point at the bottom of the 'tree view'.

A context menu appears showing the available input categories. Input categories already inserted by the user will not appear in the selection menu.

D╒┛╔ѽҲӂѩӹҁӏѹӿ҈ҁҵҼҴѲ҂Ѵ╡Ѧ҈ѷѷ҄Ҁ┿╔╔Ӫҋ҅҅҂≡ҏ҄҄҄ѧѴ҄Ҟ	. 7 🔀					K XPSIM v.1.07 beta - [Xpsim 1 - Simula
Image: Second Data Image: Comparison of this run Image: Comparison Data Image: Comparison of th	_ @ X					10
Personani Data Personan		+ 📴 🗉 🔁 💒 + = 2 🗔 🗣 📍	- A 🖉 🗛 🗛 🖬 🗲		00% -	
Point No Reyord Yalue Description 1 ID* Pain identification 2 CUTTORER: Customer name 3 USER* User name 4 ROJECT* Froject description 5 FROJECT* Problem description 6 Case Case identifier	- a 🛛		nation for this run	UN - General infor	= R	General Data
A A A A A A A A A A A A A A A A A		Description	Value	Reyword	No	-E DESC
Centroper Centroper		Pun identification		ID-	1	
Petrolos 3 Jose* Outer Project description Foundation 5 \$PoolE2* Project description 6 CASE* Case identifies		Customer name		CUSTOMER-	2	- CHEMCOMP
Proverbeet Data 4 PROJECT ** Project description 5 PROBLEM* Problem description 6 CASE* Case identifies		User name		USER=	3	THERMSET
0 Floates 0 Case 1 Case 1 <		Project description		PROJECT=	4	Flowsheet Data
Petrolnum Dota Component Dota Thermodynamic bata Reaction Dota Departmental Dota PVT Analysis Default Duta Reprivate Dota Reprivate Dota		Problem description		PROBLEM-	5	End Data
Component Data Thermodynamic Data Relaction Data Dispermental Data PVT Analysis Def ault Data Retwork Data		Case identifier		CASE=	6	
Component Data Thermodynamic Data Relaction Data Dispermental Data PVT Analysis Def ault Data Retwork Data	_	-1				
Cupic Data	ĸ				×	Component Data Thermodynamic bata Reaction Data Experimental Data PV1 Analysis Default Data Recyclin Data Network Data VLE Analysis

Figure 4.2 Simulation data window with new categories pop-up menu

The '*Category*' context menu is shown in detail on the next Figure. Only input categories not already included in the tree view will appear.

Petroleum Data
Component Data Thermodynamic Data
Reaction Data
Experimental Data PVT Analysis
Default Data
Recycle Data Network Data
VLE Analysis
Output Data

Any input category can be selected, with the only exception of '*Recycle Data*' and '*Network Data*' which are mutually exclusive.

4.2 Inserting statements

To insert a new input statement as a parameter of another statement, the user must **right click** with the mouse on the 'parent' statement.

A context menu appears showing the available input statements. Input categories already inserted by the user are not presented in the selection menu.

For example, by right-clicking on a **FLASH** statement, the context menu shows the available parameter statements that can be added to this unit operations. See the next figure.

File Edit View Data Run Result			V < A 1) ") → ←) [
	t il str	EAM - 51 - Stream				_ 8 >
	No	Keyword	(UoM/spec)	Value	Description	
DIMENSION	1	STREAM=		S1	Stream id/name	
System Data	2	TEMP=		0	Temperature	
E I THERMSET - M1	3	PRES=		20	Pressure	
Flowsheet Data	4	RATE=	U .	1000	Flowrate	
COMP	5	NORM			Normalize composition	
Pressure specification	6	XBASIS=		н	Composition basis	
Inp Temperature specificatio	7	REFSTR=			Reference stream	
General specification Vapor/liquid entrainment	8	PHASE=		-	Phase	
Duty specification	9	VF=			Vapor fraction	
	10	VAR=		-	Vary temperature or pressure	
	- 1					

Figure 4.3 Sub statement selection pop-up menu

Pressure specification	
Temperature specificatio	
General specification	
Vapor/liquid entrainment	
Duty specification	

Parameter statements already defined, that can appear only once, are not shown on the menu.

By **right clicking** on the same **FLASH** item but after toggling the '**Ctrl**' key a different menu is brought up.

The 'CTRL' key switches the menu from the 'upper level' to the 'lower level' and vice-versa.

🔀 XPSIM v.1.0 - [prova01 - Simulation data]
File Edit View Data Run Results Window Help
□ ☞ 🖬 😂 🗛 🙏 🛍 🛍 🔍 🔍 🖽 🖽 🖅 🗛 🕼 🎬 🐡 ← 🕨 🖾 🖾 🦉 🧏
General Data
ERUN Description / service
Desciptor service
System Data
te = freemeet bas Id From Uop Id Phase Phase
G STREAM - S1 S1 S2 V
S3 L
E real table = 1
Inpu Equi type definition
Stream
Stream names definition Stream data set/creation
Controller
Multi Var Control New Delete
Stream list
Id From Uop To Uop Add to feeds
52
Add to products
For Help, press F1

Figure 4.4 Upper statement selection pop-up menu

Set thermo methods Equi type definition Stream Stream names definition Stream data set/creation Controller Multi Var Control

Unit operation are not presented by the menu because they can be added only through the pfd window

The third menu, that can be displayed by '**right-clicking'** with the '**shift**' key pressed, is shown on the next figure.



A final menu line, selected from:

- Disable statement
- Enable statement

is added at the bottom of the previous menu.

With this menu it is possible to cut or copy a single statement or to paste a previously copied statement at a desired position in an input tree. So, a user can copy the **SPEC** parameter statement of a **COLUMN** unit (e.g., C-1) and paste the statement under another COLUMN unit (e.g., C-3).

4.3 Statement Data windows

Statement data are displayed in the 'Statement Data windows'; according to the statement type.

Three possible format types are used:

- standard format
- table format
- unit operation format

The standard format is the most frequently used. Input data for most input statements are entered using this format. It presents the available entries using the format shown on the next figure.

XPSIM v.1.0 - [Crude-oil-01 - Simulation	Datal				
<u> </u>					
🗋 🖆 🖬 🎒 📐 👗 🛍 💼 🔍 e	L 🔶	← ▶ 🗒 🗐	१ №		
	👯 🖪 ST	REAM - S1			_ B ×
JOB DESC	No	Keyword	(UoM/spec)	Value	Description
DIMENSION	1	STREAM=		S1	Stream id/name
⊡… 🗐 System Data ⊡… 🗐 Flowsheet Data	2	TEMP=		450	Temperature
	3	PRES=		14	Pressure
E → STREAM - S1	4	RATE=	v •	5000	Flowrate
	5	NORM			Normalize composition
COMP	6	XBASIS=		м	Composition basis
COLUMN - SS01	7	REFSTR=			Reference stream
	8	PHASE=		•	Phase
	9	VF=			Vapor fraction
	10	VAR=			Vary temperature/pressure
		1			
Input Data End					
	•				F
For Help, press F1					

Fig. 4.5 A standard statement window

Each format is described in detail in the following chapters.

4.4 Standard Format

The window presents all the possible entries ordered in lines with related data in columns; the columns have titles shown in the first line.

The following columns are displayed:

No	contains the sequence number of each entry.
Keyword	contains the entry keyword that will identify the input item in the XPSIM input file.
UoM/Spec	contains either the Unit of Measure of the following value or a <i>'type'</i> specification (e.g. the molar, weight or volume basis of a flow rate.)
Value	contains the value of the item.
Description	contains a brief description of the input field.

The '*UoM/Spec*' column is not shown when none of the entries has this attribute. See for example the '**RUN** statement' shown in Fig. 7.1.

The user can enter parameters data as usually done in the Windows environment. To move from one field to another the user can either click with the mouse on the desired field or use the 'Tab' button on the keyboard.

Using the '**Tab**' command the user can move sequentially from one field to the next, when a field is not visible it is automatically scrolled into the visible area.

To scroll the view with the mouse, the user must click on the arrows of the scroll-bars.

Three types of data fields are available for entering data.

Edit fields	this fields represent the values of a statement keywords where a user's value is expected (e.g. temperatures, pressures, flowrates, etc.)
Selection lists	this fields map calculation options where one value is to be selected within a predefined set of multiple values (e.g. the flash model can be selected from the following options: ISO , ADIA , DEW , BUB , ISOVF
Check boxes.	This field is used to specify a statement option represented by a self-defining keyword: i.e. a keyword that, when entered by the user, indicates that a specified option is to be used. Possible examples are the NORM (normalize) option in the STREAM statement or the CON (condenser) option of the PARA statement for distillation columns.

Edit operations

Edit fields	the user can enter text or number (integers or real) depending on the field type. Values entered are checked with respect to their validity and allowed length. For example, the insertion of an alphabetic symbol where a number is expected is immediately detected and signaled.
Check boxes	the user can check or uncheck this field by clicking with the mouse or using the 'space' key of the keyboard.
Selection list	the user can select one of the entries contained in the list. A value, previously selected, can be cleared using the ' <i>Canc</i> ' button of the keyboard.

Mandatory fields

The keyword related to mandatory fields is shown in **RED**. The user should enter the required value. If the keyword is not defined, the description is shown in red.

Mutually exclusive fields

When two or more fields are mutually exclusive (i.e. only data in one field is allowed), the data already present in one field automatically forbids input of data in the related exclusive fields. To allow data insertion in one of the other fields, the user must clear the data inserted in the previous field.

<u>Selection list</u>

Some input fields allow only values to be selected from a predefined list. In this case the field is presented as a 'Windows combo-box'. The user can select the desired value by opening the list and click on the relevant line.

For new generated statements the value selected may appear empty or filled with a default value when defined.

ISO	4
ISO	
ADIA	-
DEW	
BUB	Π
ISOVF	H

Each selection is provided with a brief description, which is shown as a 'tool-tip' when the mouse is on the field, as shown on the next figure.

ISO	4
[fixed temp and	l pres

When the number of possible choices is large to allow an easy selection from a '*combo-box*', the user may bring-up a '*selection dialog*'.

This can be done by double-clicking on the relevant line either on the left or on the right of the 'combo-box'.

The following selection dialog appears.

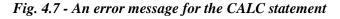
Select value	from table	
Valu	e Description	
ISO ADIA DEW BUB ISOV	fixed temp and pres adiabatic/isenthalpic flash dew-point calculation bubble-point calculation	
<	ок 1	Cancel

Fig. 4.6 - Selection list dialog

The user can select a value and press the OK button. The value selected by the user is inserted in the field.

Statement Verification

Before a statement is closed (for displaying of another statement) it is verified. If one or more errors are found, messages are issued in a dialog box (see the figure below).



8 S tateme	nt CALC errors			×
	TEMP and DT are m	utually exclusive		
	Correct	Next	Ignore	

The user can select one of the following actions:

Correct	to correct the detected error remaining on this statement.
Next	to display the next error message, if any, related to the current statement.
Ignore	to ignore the error message and let XPSIM to display the next statement.

4.5 Table Format

This format is used only by relatively few input statements.

Some input statements contain a number of repeatable fields, so they are displayed in a table-like format, consisting of a fixed number of columns and a variable number of lines.

An example is shown on the next Figure.

📽 🖬 🥔 🗛 🕺 🖪 🖻 🤆	a a	$\rightarrow \leftarrow \mid \rightarrow \mid$	🗒 E 💡 😽		
	DAT.			_	
	No	Mid vol per	Property value		
Flowsheet Data	NO	cent	Troperty value		
NAME		3	97	-	
🖻 🔿 STREAM - S1	1			_	
E PETROCUT - CUTO1	2	5	149		
	3		208		
	4	20	330		
	5	30	459		
	6	40	590		
	7	50	690		
COLUMN - SSO1	8	60	770		
COLUMN - SSO2	9	70	865		
SIDECOL - SS03	10	80	980		
■ → STREAM - S2	11	100	1600		
STREAM - S3 S3		1.00	1000		
Input Data End					
input Data Enu					

Fig. 4.8 - An example of a statement shown as table.

To move from one field to another, the user can click with the mouse on the desired field or use the 'Tab' button on the keyboard.

Using the 'Tab' command the user can move sequentially from one field to the next; when a field is not visible, it is automatically scrolled into the visible area.

To scroll the view with the mouse, the user must click on the arrows of the scroll-bars.

The first line of the table contains the description of the statement field associated to each column.

The first column presents the number of lines available for input or already filled by the user.

By clicking with the right button of the mouse, the 'line command' menu is presented with the following available commands:

Add row
Insert row Delete row Repeat row
Copy row Paste row

These commands perform the following operations.

Add row	a new empty line is added after the <i>last</i> line
Insert row	a new empty line is inserted before the current selected line
Delete row	the current selected line is deleted.
Repeat row	the current selected line is repeated.
Copy row	the current selected line is copied. Its content is available for a subsequent ' <i>paste</i> ' operation.
Paste row	the current selected line is replaced with the data of the previously copied line.

The statement must contain at least one data line.

Units of measure on the top line

When a statement, displayed using the 'table format', contains units of measure that are defined for the first entry only, it would be useful to have all units of measure fields collected and shown at the top of the table.

This feature may be activated using the command '*UoM on second line*' from the **Data** menu.

🔲 POI	NT - Profile p	pint/segment					
No	DIST	ELEV	DIAM	ROUGH	CORR	TEMP	TEXT
Uol	IMT	MT	MT	MICR			CENT
1	17000	-26	0.621	50			25
2	18000	-25					
3	19000	-27					
4	20000	-25					
5	21000	-26					
6	22000	-25					
7	23000	-27					
8	24000	-25					
9	25000	-25					
10	26000	-26	0.621	50			
11	26250	-26	0.621	50			
12	26260	0	0.621	50			
13	26265	17					

Fig. 4.9 - Units of measure shown on the top line

In this case, the Units of Measure defined are applied to the first repeatable line of the statement and implicitly to all the subsequent lines.

If the unit of measure is redefined on one of the following lines, the standard table format should be used.

Statements with Fixed Columns

Some statements may contain a not-modifiable column, in addition to the column number. This column is usually present for statements that contains the list of the chemical components previously defined in the **CHEMCOMP** statement.

XPSIM v.1.0 - [Ttex01 - Simulation File Edit View Data Run Resul		Jolo			
	<u>. କ</u> ଲାଇଙ୍ <u>୮</u> ପ୍ର୍ୱାର୍ଥି) 🖪 🗐 💡	₩?	
				·7:	
E System Data COMPLIST ⊡-E THERMSET - SET1		nponent id	composition/flowrate 151.17		
E - E Flowsheet Data	• • • • •	THANE	44.33 8545.25		
	5 PR	HANE OPANE TANE	868.88 483.96 58.33		
FLASH - V-2 B	8 PEN	ITANE NTANE	114.92 18.92 38.83		
⊕ + HEATEXCH - CONDENSR	10 HE	NTANE XANE PTANE	24.63 4.38		
Recycle Data Output Data Input Data Input Data End					
For Help, press F1					

Fig. 4.10 - Fixed column in COMP statement

Copy and Paste Column Values

The user can copy column values in the window clipboard or either paste column values generated by other applications e.g. MS Excel

By right-clicking on a column title the following context menu is displayed.

	-
Copy column values	
Paste column values	

The user can select proper command to execute the desired function. When the column is empty the Copy command is not shown. Similarly, the Paste command is not available if the windows clipboard is empty.

These functions are especially useful for exchanging data (e.g., stream compositions) between XPSIM and other engineering applications.

4.5.1 Unit Operation format

This format is used to display and modify the header statement of the unit operations. The header statement presents the following data:

- name
- description
- *list of the feed streams*
- list of the product streams

Ptd & Simulation Data × Simulation trace & status General Data Gystem Data Flowshee Data COMPRESS-KL CALC	Image: COMPRESS - KL - Compressor Name Decorption / service [61] [COLD RECYCLE COMPRESSOR]	
General Data System Data Flowsheet Data COMPRESS - K1 COMPRESS - K1	Name Description / service [1:1 [COLD RECYCLE COMPRESSOR]	
a	Name Description / service [1:1 [COLD RECYCLE COMPRESSOR]	
e ▲ System Data ■ COMPRESS - K1 ■ CALC	Name Description / service [1:1 [COLD RECYCLE COMPRESSOR]	(D)
Kowsheet Data COMPRESS - K1 CALC	KT COLD RECYCLE COMPRESSOR	
COMPRESS - KL	KT COLD RECYCLE COMPRESSOR	
E CALC		
End Data	Feeds Products	
	Phate Phate	
	Id From Uop Id Phase Product	-
		f - 1 - 1 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2
		(((
		8
Help, press F1	Steady State Simulation No Simulation Performed Xpsim of	eneric view

Fig. 4.11 - An example of 'Unit operation format' statement.

Using this form the user can view feed and product streams of the various unit operations.

4.6 Help function

In the **'Help'** menu a function is provided to obtain a full explanation and description of statements and related keywords with examples and guidelines.

When a statement is displayed on the right part of the 'Simulation Data' frame, the user can invoke the '*Help on statement*' function.

By selecting this command the help window is opened on the information pertinent to the statement.

		2 17 🚽 🗛 🚯		
Xpsim1 - Simulation date				
General Data	METHODS - Methods I	ist		- 7 🛛
DESC	No Reyword	Value	Description	
IMENSION IMENSION	1 K=	•	R-values	
	2 SYST=	-	Thermo properties system	
	3 AL=	•	Liquid activity coeff	
A Flowsheet Data	4 FV=	•	Vapour fugacity	
🔺 Input Data End	5 FL=	•	Liquid fugacity	
	6 HS=	•	Vap/liq enthalpy and entropy	
	7 H=	-	Vapour/liquid enthalpy	
	8 HV=	•	Vapour enthalpy	
	9 HL=	-	Liquid enthalpy	
	10 S=	~	Vanour/limuid_entrony	×
Help on User Manual File View Go Help Image: Section of the section of th				
			L COMPONENTS AND NAMIC METHODS	
-	ents and keywords ded for the specification of compo	nents and thermody	mamic methods are listed hereunder with the related keyw	vords.

Fig. 4.12 - Help window for Thermodynamic Methods.

The help window may be kept open and it will be displayed on the top of the screen each time the command is invoked.

History of the opened Help documents is stored so the user can navigate backwards and forwards.

This command can also be invoked by pressing the icon on the application toolbar.

4.7 Component selection

Some statements have input lines that require the specification of one or more chemical components selected from the list defined by the **CHEMCOMP** statement.

To make this task easier a special user interface is provided.

To fill these fields, see for example **SPEC** statements for **COLUMN** or **CONTROL**, it is possible to recall a dialog through which the user can specify one or more chemical components as required.

The dialog is brought-up using the '*Edit component selection*' menu that appears by rightclicking with the mouse on the statement line.

Select components from total Compone	
No Component Key 001 H20 002 C2 003 C3 004 IC4 005 NC4 006 IC5 007 NC5	Add> No Component Key 1 H20
<u><u> </u></u>	Component interval (I) <u>Cancel</u>

Fig. 4.13 - Component selection dialog

Using the 'Add' and 'Remove' buttons the user can define the list of the 'selected components' that apply to the current entry.

When two components are selected, the user can activate the 'components interval' checkbox to specify that the two components defines a component interval, i.e. the specification applies to all the components within the two specified components.

4.8 Selection of elements from lists

Some input data define a list of elements and one or more of elements can be selected in other input statements.

For example, a **MATERIAL** statement defines a material identifier which can be subsequently used to define wall layers. XPSIM builds automatically these lists and allow the user to select elements without having to remember their identifiers.

When an entry can be selected from a list, by right-clicking on its field the context menu will appear.

To make this task easier a special user interface is provided.

The dialog is brought-up using the '*Edit component selection*' menu that appears by rightclicking with the mouse on the statement line.

Fig. 4.13 - Element selection dialog

Using the 'Add' and 'Remove' buttons the user can build the set of the 'selected elements' that will be inserted in the current entry.

4.9 Inserting Stream or Unit Operation names

Some statement entries require the name of a stream or unit operation. For example, the SPEC statements of a controller may be applied either to a selected stream or unit operation. When the 'Simulation Data' view works in 'linked mode' with the Pfd view it is possible to ask the insertion of the name of the stream or unit operation that is currently 'high-lighted ' on the 'Pfd view.

The dialog is brought-up using the 'Selected Stream Id' or 'Selected Uop Id' menu commands that appear by *right-clicking* with the mouse on the statement line.

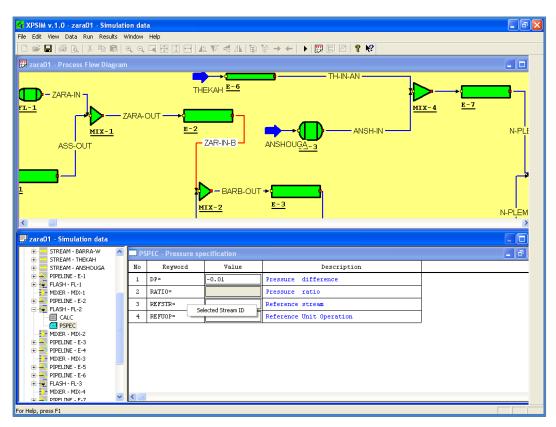


Fig. 4.14 - Inserting stream or unit names

In this example the stream 'ZAR-IN-B' is selected on the pfd. In the **PSPEC** statement window of the **FLASH** operation the '*Selected Stream ID*' command can be executed, and the result is to place the stream name in the **REFSTR**= field value.

4.10 Moving statements

Statements may be repositioned in the **'tree view'** using **'drag and drop'** operations. By clicking on a selected item (for example a STREAM) the user can drag its icon before the FLASH statement. After releasing the mouse left button, the statement is positioned before the destination unit.

XPSIM verifies that the defined destination position is allowed. For example, a **STREAM** statement may not be dragged on the **'System Data'** category.

KPSIM v.1.0 - prova01 - Simulation		_ 8 ×
File Edit View Data Run Results V	indow Help R, Q, Π, 19, Π, Γ, Γ, Γ, Π, Ν, Ν, Λ, Ν, Ν, Ν, Λ, Γ,	
prova01 - Process Flow Diagram		-10
S1		
💂 prova01 - Simulation data		_ [
General Data RUN CHENCION System Data CHENCOMP CHEN	Statement Window click on a statement icon to view its data	
For Help, press F1		

Fig. 4.15 - Moving statements

4.11 Copy and paste statements

Selected statements may be copied from one item and pasted over another item.

For example, a **SPEC** statement of a **COLUMN** (e.g., **C1**) can be copied and then pasted within the parameter statements of another column (e.g., **C2**).

XPSIM takes care that a statement is pasted on 'correct positions' of the tree data. So, a column **SPEC** statement may not be pasted on a **FLASH** which allows **SPEC** statements having a different syntax.

4.12 Selecting objects

The 'Edit' menu provides some commands for selecting and interacting with objects.

- Find stream/unit in pfd
- Find stream/unit ...
- Find in statements ...

Find stream/unit in pfd

By selecting on the tree-view a line representing either a stream or a unit operation this command becomes available. By its execution the selected stream/unit operation is **highlighted** on the pfd window.

Find stream/unit

This command allows the user to select a stream or unit operation from the tree view.

It brings up the following dialog.

Find/loo	cate a	pfd object			×
Unit ope	eration	Stream			
	No	Id	Туре	~	
	1 2 3 4 5 6 7 8 9 10	E-1 FL-1 MIX-1 E-2 FL-2 MIX-2 E-3 E-4 MIX-3 E-5	PIPELINE FLASH MIXER PIPELINE FLASH MIXER PIPELINE PIPELINE MIXER PIPELINE		
		ОК	Annulla	Applica ?	

The user can select an item and press the OK button. The object selected by the user (e.g **E-4** in the above figure) is located in the pfd and its parameter statement displayed. The user can order the list of unit operations either by name or by type by clicking on the 'Id' or 'Type' column titles.

With respect to the analogous command available on the pfd window, the list of the available stream is limited to those for which input data have been defined by the user; i.e., feed streams or recycle streams.

Find in statements

This command allows the user to select the identifier of a stream, unit operation, control operation, etc. and to locate it in every statement when it is referenced.

This command brings up the following dialog

Find object reference in st	atements	×
Stream or Unit Operation Id	<u></u>	
		Find next

The user can enter the name of desired object and press the **"Find next"** button. The input statement tree is searched and when the name is found in a statement, the input element is scrolled, selected and the related statement is displayed.

4.13 Navigating statements

Some simple commands are provided for seeing statement data in sequence an for expanding or collapsing the input tree.

- **expand input tree**. Using this command the input tree is expanded one level at a time.
- **collapse input tree**. Using this command the input tree is collapsed one level at a time.

The input tree may be collapsed until only the category heading statements are visible.

- Next statement. Using this command the user may display the data of the following statement.
- Previous statement Using this command the user displays the data of the previous statement.

4.14 Statements with input errors

As previously described, when a statement is closed, it is verified. If errors are found, messages are issued. The user can ignore the warning message and leave the statement with errors. The program allows the user to highlight at any point the input statements with errors using the :

Highlight statements with errors command provided in the 'Data' menu.

By selecting the related menu line, the command is toggled, i.e. it is activated or deactivated. When active, a check mark appears on the left of the menu line.

Statements with errors are shown with a red icon allowing an easy identification by the user even with very large simulations.

K XPSIM v.1.0 - [OMEGA-EXE-02						
💭 Eile Edit View Data Run Result						_ 8 ×
D 📽 🖬 (4) 🗛 X 🖻 🖻	ବ୍ ବ		r 🕼 🚽 🛛			
General Data	🗖 C/	LC - Iso T/P or AD	IA flash/BP/			- 7 🗙
E RUN	No	Reyword	(UoM/spec)	Value	Description	
DIMENSION - INPUT	1			•	Calculation type	
CHEMCOMP	2	TEMP=	-		Temperature	
THERMSET Flowsheet Data	3	DT=	-		Temperature difference	
😑 🔜 STREAM - S1	4	PRES=	-	260	Pressure	
COMP	5	DP=	-		Pressure difference	-
	6	TEST=			Temperature estimate	
	7	PEST=			Pressure estimate	
ELASH - V2	8	VF=			Vapor fraction	
i i i i i i i i i i i i i i i i i i i	<					,
For Help, press F1						

Fig. 4.16 - Data statements with errors are highlighted

4.15 Disabling statements

It is possible to disable one or more input statements appearing in the tree view by using the relevant command in the **Edit** menu.

To disable a statement the user must select one statement on the data tree and select the *'Disable statement'* command in the **Edit** menu.

When a statement is disabled, all the related sub-statements are also disabled.

By clicking on a disabled statement, an '*Enable statement*' command becomes available under the **Edit** menu.

When a previously disabled statement is enabled, all the related sub-statements are also enabled.

This feature is designed to help the user in defining possible alternatives in the simulation and to keep only one active at a time.

For example, in simulating a distillation column that allows a maximum of 2 parameter specifications, the user may define 3 or more SPEC statements while keeping only two active and disabling the others.

Similarly, if a process flow-sheet includes parallel branches, the user can disable all the statements related to those unit operations which he wishes not to simulate.

4.16 Notes & Remarks Window

In the 'Simulation Trace & Status' window, a '*Notes & Remarks*' window is also created. In this window, the user can enter all the notes and remarks he wishes about the current simulation problem.

With this function, the process engineer can describe basic data, design options and any other important information which could be useful in future to easily understand the simulation pfd and input data.

The user can at any time add or update the text already present.

When the simulation problem is saved, the content of the '*Notes & Remarks*' window is saved together with simulation data and pfd drawing in the **.xpi** file.

5. Simulation Creation

This section provides some general information and guidelines about the basic functions that can be used for creating a process simulation, providing the appropriate parameters and data, running the simulation and analyzing the results.

When a new problem is created, XPSIM generates:

- an 'empty' pfd
- a 'simulation data window'

The simulation data window presents the following default categories and statements:

General Data

RUN statement DESC statement DIMENSION statement System Data CHEMCOMP statement THERMSET statement METHODS statement

Flowsheet Data

Input Data End

Within the **'Flowsheet Data'** category no default statements are created. The user will define unit operations and streams using the Pfd interface and will add statements to these objects.

Before starting the creation of the simulation Pfd the user should supply the basic information defined in the statements listed above.

5.1 RUN statement

Using this statement, the user supplies few data designed to identify the calculation.

The entries provided are:

ID=	calculation identification
CUST=	customer id
USER=	user id
PROJ=	project identification
or PROB=	problem identification

5.2 DESC statement

In this statement the user can supply one or more lines of description of the problem to be simulated.

5.3 **DIMENSION** statement

In this statement, the user defines the units of measure of the main thermodynamic and physical properties (flow rates, temperatures, pressures, heat, etc.).

One default **DIMENSION** statement is automatically generated; user can add two other statements for the definition of different output units and of an additional set of output units.

5.4 System Data category

In this category, the user must define

- the list of the chemical components that will be used during the simulation
- at least one set of thermodynamic methods for the calculation of the physical and transport properties.

5.5 Chemical Components list

Using the **CHEMCOMP** statement the user must supply the list of the chemical components that will be used during the simulation.

For the definition of this list, the user can insert the component keywords in the relevant statement window (see next figure) or use a special dialog.

XPSIM v.1.0 - [Simulation Data]			
	leter et proventier et proven		
· · · · · · · · · · · · · · · · · · ·			_ @ ×
System Data	No component compo	nent name Reference	
	id	componer	
Flowsheet Data	2 METHANE		
Input Data End	3 ETHANE		
	4 PROPANE		
	5 IBUTANE		
	6 BUTANE		
	7		
	8		
	9		
	10		
J For Help, press F1			

Fig. 5.1 - Component list definition window

The window is initially created with 10 lines. This number may be increased using the standard commands available for the table format.

However, for helping the user in selecting the chemical components within the component library, a special dialog is also available and may be invoked using the 'Select components ...' command contained in the **Data** menu.

5.6 Chemical Components from Library

The user is advised to define the chemical components that will be used in the simulation as early as possible.

It is usual to enter components following an order which is 'classical' in the HPI (Hydrocarbon Processing Industry): light gases and components are entered first followed by the hydrocarbons in ascending order of molecular weight.

Water is usually defined as the first or the last component.

ompon		Saturated Hydrocarb	ons	•	
		1			
2-MET	HYLPROPAN	IE	C4H10		Sort
SOBU	TANE HYLBUTANE		C4H10 C5H12		C Alphabetical
2,2-DIN	METHYLPRO		C5H12		Chemical Formula
	ANE ENTANE		C5H12 C5H12		 Chemical Formula
ISOPE	NTANE		C5H12		
ISOHE	XANE		C6H14	•	
		Add	<u>R</u> emove		
electe	d Component	s		10	
No	Key	Name		*	Change
1	C1	METHANE			keyword
2 3	C2 C3	ETHANE PROPANE		_≡ Up	
	IC4	ISOBUTANE			
4	104			Down	
	NC4 IC5	BUTANE ISOPENTANE			

Fig. 5.2Component selection dialog

Using this dialog, the user can display the components belonging to a given class (such as saturated hydrocarbons, unsaturated hydrocarbons, etc.), order them either alphabetically or by the chemical formula (*Hill order*), and add the desired component (with the *Add* button) to the selected component list.

Navigating the selected component list, the user can delete one or more specified components (**Remove** button) or change the component keyword that will be used throughout the simulation to uniquely identify the component.

By clicking the 'Change keyword...' button another dialog is invoked.

Fig. 5.3 - Keyword selection dialog

PENTANE	
NC5	
PNTN PENTANE	

When components can be identified by more than one keyword (up to a maximum of four) the user can select the keyword he wishes.

5.7 Thermodynamic and transport properties

To perform a process simulation the user must specify at least one set of methods to be used for the calculation of thermodynamic (VLE K-values, enthalpy, entropy, etc.) and transport properties (viscosity and thermal conductivity).

These methods are defined through the **METHODS** sub-statement of the **THERMSET** statement.

In the **THERMSET** statement, the user should only give an identifying name that will be used to uniquely identify the set of thermodynamic methods.

In the **METHODS** statement, the user will select the proper methods for the definition of the various properties.

An example of selection of thermodynamic methods is given in the next figure.

	5 Q				
eneral Data /stem Data	<u> </u>	ETHODS - Methods	i list		
CHEMCOMP	No	Keyword	Value	Description	
THERMSET	1	K=	SRK	K-values	
owsheet Data	2	SYST=	V	Thermo properties system	
nd Data	3	AL=	•	Liquid activity coeff	
	4	FV=	•	Vapour fugacity	
	5	FL=	•	Liquid fugacity	
	6	HS=	LK 💌	Vap/liq enthalpy and entropy	
	7	H=	v	Vapour/liquid enthalpy	
	8	HV=	•	Vapour enthalpy	
	9	HL=	_	Liquid enthalpy	
	10	S=	_	Vapour/liquid entropy	
	11	SV=	_	Vapour entropy	
	12	SL=	•	Liquid entropy	
	13	CP=	LK 💌	Vapour/liquid heat capacity	
	14	CPV=	v	Vapour heat capacity	
	15	CPL=	V	Liquid head capacity	
	16	D=	LK 💌	Vapour/liquid density	
	17	DV=	v	Vapour density	
	18	DL=	v	Liquid density	
	19	IV=	•	Vapour isentropic exponent	
	20	T RAN=	IDEAL 💌	Transport property system	
	21	VIS=	v	Vapour/Liquid viscosity	
	22	VISV=	•	Vapour viscosity	
	23	VISL=	•	Liquid viscosity	
	24	THC=	T	Vapour/Liquid thermal conductivity	
	25	THCV=	_	Vapour thermal conductivity	
	26	THCL=	•	Liquid thermal conductivity	
	27	SURT=	IDEAL 💌	Liquid surface tension	

Fig.5.4 - Thermodynamic methods selection window

5.8 Drawing a Flowsheet

To draw the flow-sheet the user can select the unit operations from the relevant palette using the standard 'drag-and-drop' operation and position the selected one on the PFD window.

Similarly process streams, that carry material flows between the unit operations, may be created by selecting them on the process palette and drawn on the PFD window.

The following unit operations are provided.

Unit Operation	Description	
MIXER	Stream mixer	
SPLITTER	Stream splitter	
FLASH	Vapor liquid equilibrium operations	
COMPSEP	General component separator	
VALVE	Control valve	
COMPRESS	Compressor	
EXPANDER	Expander	
PUMP	Centrifugal pump	
HEATCOOL	Simple heater/cooler or heat balance	
HEATEXCH	Shell&tube or LNG heat exchanger	
AIRHX	Air-Cooler	
COLUMN	Distillation column	
REACTOR	General chemical reactor	
PIPELINE	Single or multiphase pipeline	
PIPE	Simple pipe calculation	
NODE	Connection node networks	
PSD	Pressure safety device (PSV or rupture disk)	
DEPRESS	Vessel depressurization	
UCALC	User calculator	

From the Pfd window the user can move to the data window by right clicking on a unit operation. The following menu will appear

View data View results
Detach Detach feeds Detach products Change object
Rename Uop

By selecting the 'View data' command the related unit operation statement will immediately opened and displayed

Similarly by right-clicking on a stream connection a similar menu will be displayed :

By selecting the 'View data' command the stream data, if defined, will opened and made available to the user.

5.9 Some remarks about distillation columns

When the user selects a distillation column from the unit operation palette a dialog is prompted for the specification of column structure.

- The user should define:
- Number of trays
- Condenser existence
- Reboiler
- Number of feed streams and the related feed tray
- Number of product streams, their phase (vapor or liquid), and the related draw-off tray.

On the basis of this information the column symbol is drawn on the pfd window with the relevant handles required to attach feed and product streams.

These data are used only for the definition of the column symbol not for the definition of the simulation data: the number of trays of the column must be given also in the **PARA** statement of the **COLUMN** unit and this number may be different from that defined for the column in the flow-sheet.

For example, the user may draw a column symbol with 10 trays but may specify 12 trays in the column **PARA** statement.

Similarly the user may change the feed location on the **FEED** statement without the need of updating the column symbol.

This allows the user to perform repeated calculations and to update, if he likes, the column symbol only at the end of the problem solution.

The following features will be provided by next XPSIM release:

- Automatic update of column pfd symbols from input data.
- Drawing of pump-arounds and bypasses.

5.10 Some remarks about recycle problems

The user may approach the simulation of recycle problems using two possible ways:

- *defining the calculation sequence*
- *letting the simulation engine to find the calculation sequence*

Calculation sequence defined by user

The first case is the default option, and XPSIM will assume that the calculation sequence is defined by the user in the input data stream. In this case unit operations will be solved in the sequence defined by the 'simulation data tree'. To change this order the user can simply change the position of a unit in the tree view.

Calculation sequence defined by program

The second option may be defined by setting the **SEQ**= option to **AUTO** in the **SOLUTION** statement in the **RECYCLE DATA** category.

5.11 Saving the current problem

At some point of the input preparation the user should decide to save the data already defined. The user must select the '*Save*' or '*Save as...*' command from the **File** menu. When these commands are selected, the standard MS Windows file definition dialog is

prompted to the user.

The user must give a name to the problem; e.g. *Test-case-01* as shown on the next figure and press the '**save'** button.

The current Xpsim problem will be saved with the extension ".xpi" (xpsim input).

The extension may be given or omitted by the user; if already defined by the user the file extension will not be duplicated.

File Edit Wew Settings Zoom Symbol Results Tools Window Help
X psin1 - Process Flow Diagram
S1 Salva con nome Salva in: E st Courneril Documenti Desktop
Salva come: Xosim input Files (*.xoi) 👻 Annulla
For Help, press F1

Fig. 5.5 - Selecting a file name for the current problem

6. Units of Measure – Definition and Conversion

XPSIM provides some support for the conversion of units of measure of input values.

This section provides some general information about conversion functions together with guidelines and hints.

For each simulation problem, the set of unit of measures (**UoM**), is defined by the user through the **DIMENSION** statement. This statement is always required and is created by the Windows interface.

Its format is shown on the next figure.

DIMENSION - Unit of measure specification				
No	Reyword	Value	Description	
1		INPUT 🔽	Input/Output/2nd output dimensions	
2		SI 🔽	Unit of measure system	
3	MASS=	•	Mass/weight uom	
4	TEMP=	·	Temperature uom	
5	PRES=	BAR	Pressure uom	
6	TIME=	-	Time uom	
7	DUTY=	-	Duty/heat/energy_uom	
8	WORR=	-	Work uom	
9	LVOL=	-	Liquid volume uom	
10	WVOL=	•	Vapour volume uom	
11	VISC=	I	Viscosity uom	
12	COND=	•	Thermal conductivity uom	
13	SURT=	•	Surfacial tension	
14	STDVAP=		Standard vapor volume	
15	VREF=	•	Standard wapor reference cond	
16	RTEMP=		Ref temp desc	
17	RPRES=		Ref pres desc	

As a basic point, this statement requires the user to define the units of measure (UoM) system.

Possible systems are:

Keyword	Description
SI	Standard International unit of measure
ENG	English unit of measure
MET	Metric unit of measure

In addition of the basic set, the user can define specific unit of measure for a number of physical properties such as temperature, pressure, energy, etc.

The support supplied by XPSIM windows interface is essentially based on the choices made by the user in defining the **DIMENSION** statement.

So the user should decide the systems of units to be used at the very beginning of a simulation problem and enter immediately this data into the **DIMENSION** statement.

Utility functions provided to support the conversion of units of measure are slightly different for the **'standard'** and **'table'** formats. These functions are described by the following paragraphs.

6.1 Standard format

For each input value, that has a related unit of measure, the current selection is reflected as a 'tooltip' or 'hint' when the cursor remains on the related input field.

For example:

🗖 СА	CALC - Iso T/P or ADIA flash/BP/DP spec			
No	Reyword	(UoM/spec)	Value	Description
1			ISO 💌	Calculation type
2	TEMP=	•	100	Temperature
3	DT=	•		Temperature difference
4	PRES=	 Image: A set of the set of the	27	Pressure
5	DP=	F		Pressure difference
6	TEST=			Temperature estimate
7	PEST=			Pressure estimate
8	VF=			Vapor fraction

Fig. 6.2 - Input Field with a tooltip

The UoM for temperature is shown to be $^{\circ}C$ (degrees centigrade) since this has been defined on the **DIMENSION** statement and no different unit has been selected in this **CALC** statement of the **FLASH** unit operation.

When a unit of measure is available on the UoM column and a value has been selected by the user, the hint is not displayed.

See the next screen image.

Fig. 6.3 - Input Field with	h a specified UoM
-----------------------------	-------------------

CA	CALC - Iso T/P or ADIA flash/BP/DP spec				
No	Reyword	(UoM/spec)	Value	Description	
1			ISO	Calculation type	
2	TEMP=	•	100	Temperature	
3	DT=	•		Temperature difference	
4	PRES=	ATM 🔽	27	Pressure	
5	DP=	•		Pressure difference	
6	TEST=			Temperature estimate	
7	PEST=			Pressure estimate	
8	VF=			Vapor fraction	

In this example, a unit of measure (**ATM**, for atmosphere) is selected for a pressure value of 27.

To convert a property value the user can '*right click*' on the relevant input field, to bring up a context menu.

	CALC - Iso T/P or ADIA flash/BP/DP spec				
No	Reyword	(UoM/spec)	Value	Description	
1			ISO 💌	Calculation type	
2	TEMP=	•	100	Temperature	
3	DT=	•		Temperature difference	
4	PRES=	ATM 💌		Pressure	
5	DP=	•	Convert value	ssure difference	
6	TEST=			Temperature estimate	
7	PEST=			Pressure estimate	
8	VF=			Vapor fraction	

Fig. 6.4 - Convert value menu

When the context menu is selected the following dialog is provided.

Fig. 6.5 - UoM conversion dialog

Convert property value to a new unit of measures	
Current UOM and Value	
Convert to	
New UOM and Value	
27.4 BAR	
OK	

By selecting the 'new' unit of measure the input value is converted.

By pressing the **OK** button the converted value is accepted and replaces original input field.

6.2 Table format

For input statements displayed using the 'table format', tooltips/hints are displayed when the mouse stays on a column heading, as shown on the next figure.

Fig. 6.6 - UoM tooltip on a Table Format

PROFILE - Liquid or Vapor/Temp/Pres profile					
No	TRAY	LIQ	VAP	TEMP	PRES
1	0	2500		130	116
2	1				121
3	33			300	136

The hint/tooltip reflects the unit of measure defined on the DIMENSION statement for INPUT data.

By right-clicking on the column heading, the user can start a 'column conversion' command.

The following dialog is issued.

current UoM and Values		
lbm 💌	first value	2500
	last value	
Convert to		
new UoM and Values		
	first value	
	first value last value	

Fig. 6.7 - UoM conversion dialog for column data

The dialog displays the first and last input values found in the column. The user can select the new UoM, and have all the values converted. In this case input values cannot be changed within this dialog. The user can also ask to convert cell values. This menu is issued by right-clicking on a cell value, as shown on the next Figure.

Fig. 6.8 -	Cell	value	convert	menu
------------	------	-------	---------	------

PROFILE - Liquid or Vapor/Temp/Pres profile							
No	TRAY	LIQ	VAP	TEMP	PRES		
1	0	2500		130	116 Convert	" cell value	
2	1				121 Convert	ceil value	
3	33			300	136		

In this example, a value of the pressure column of a **PROFILE** statement, is be converted. A conversion dialog, similar to that used by standard format statements, is then issued, as shown in the next screen image.

Fig. 6.9 - Cell value convert dialog

Convert property value to a new unit of measures	
Current UOM and Value	
Convert to	
New UOM and Value	
7.998 bar 💌	
OK	

6.3 Guidelines for UoM Conversion

When a user wants to convert input data of a problem defined in one system of measure (e.g. **ENG** system) to a different system (e.g. **SI** system), the following sequence of actions is recommended.

- a) DO NOT change at first the system specification in the DIMENSION statement. This change should be performed only as final operation.
- b) Start converting all input values. Conversion dialogs will present current values as belonging to the initial ENG system.
- c) Finally, change the required entries in the DIMENSION statement, as needed.

7. Keyword Input Files

A user can also prepare a simulation input using a simple text editor and set-up a keyword input file. In this case the user should remember statement syntax and their keywords since there is no way to have them displayed.

When an input file has been opened by the user, the menu bar is updated to present all the commands available for operating on an input file. The following menu becomes active :

File

- New, Open, Close, Save, Save As...
- Print, Print Preview, Page Setup...,Print Setup...
- Recent File
- Exit

<u>Edit</u>

- Undo, Cut, Copy, Paste, Delete
- Find..., Find Next..., Replace
- Select All

View

- Toolbar, Status Bar
- Set Tab Stops, Set Font, Set Printer Font, Mirror Display Font

Exec

- Run Simulation
- Generate Multi Output Files, Generate a single ouput file

<u>Results</u>

- Global out file, Input list, Trace list, Stream results, Unit operation results
- View graph results

7.1 File Menu

The file menu contains commands for opening other input files, closing and/or saving the current input file.

Print	starts printing the input file on the selected device
Print Preview	opens the preview window for the active input file
Page setup	invoking this command the user may customize page header and footer.

7.2 Edit menu

This menu name contains in its drop-down some commands needed to edit the input file.

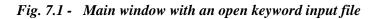
Undo	nullifies the last edit action on the input file.
Cut	deletes the selected text and copies it into the clipboard.
Сору	copies the selected text into the clipboard.
Paste	insert, if any, the text contained in the clipboard at the position of the caret.
Delete	deletes the selected text.
Find	calls the 'Find' dialog. The user may enter a string to be searched within the input file.
Find next	tries to locate the next occurrence of the string defined in the 'Find' dialog.
Replace	invokes the 'Replace' dialog in which the user can specify a string that must replace another string.
Select All	selects all the text contained in the input file.

7.3 View menu

This menu option contains some commands to set tab stops for editing and to define character fonts for both editing and printing.

Set Tab Stops	invokes a dialog through which the user may define one or more tab stops.
Set Font	using this command the standard 'Select Font' dialog is invoked. The user may change the active font. The selected font is used immediately and the document window is updated to reflect the user's choice.
Set Printer Font	using this command the standard 'Select Font' dialog is invoked. The user may change the active font for printing.

Mirror display font This option may be selected or deselected. When selected the font specified for display is applied to printing also.



4 XPSIM v. 1.0 - [TTEX01]	
Elle Edit View Run Results Window Help	- 8 ×
<pre></pre>	~
Ŕ	
* MODULE TTEX01	
DESC TEST CALCULATION - TURBOEXPANDER PLANT	
DESC PROPANE RECOVERY	
* DIMENSION ENG	=
*	
* COMPONENTS/METHODS DEFINITIOON	
* · · · ·	
SYSTEM DATA	
* CHENCOMP N2/ CO2/ METHANE/ ETHANE / PROPANE / BUTANE / IBUTANE /+	
CHERCONP NZ/ COZ/ HEIRANE/ EIRANE / FROPANE / BOIANE / IBUIANE /+ PENTANE/ IPENTANE / HEZANE / HEZANE / HEZANE	
*	
THERMSET UID=M1	
METHODS K=SRK HV=LK HL=LK SL=LK SV=LK CPV=LK CPL=LK +	
DL=LK DV=LK IV=LK VISV=IDEAL VISL=IDEAL + THCV=IDEAL THCL=IDEAL SURT=IDEAL +	
*	
*	
FLOWSHEET DATA	
*	
* plant feed stream *	
STREAM-FEED PRES-800. T=115.	
COMP 151.17/44.33/8545.25/868.88/483.96/+	
58.33/114.92/18.92/38.83/24.63/4.38	
STREAM=S108 TEMP=-25. PRES=750. RATE(M)=10353.58 REFSTR=FEED	
NAME S148 'PROPANE PRODUCT'/+	
S119 'ETHANE RICH PRODUCT'	
*	
* PLANT DESCRIPTION	
FLASH IN FEED OUT S102(V) S101(L) NAME=V−1	
*	
FLASH IN S108 OUT S109(V) S110(L) NAME=V-2 +	
DESC='MEDIUM PRESSURE FLASH'	~
S.	>
For Help, press F1	

7.4 Window menu

The Window menu allows to organize window documents in the main application window.

Cascade	arrange the open windows in an overlapping pattern so that the title bar of each window is visible
Tile	arrange the open windows side by side so that all windows are visible
Arrange icons	arrange into rows window-item icons

8. Executing a Simulation Run

8.1 General Information

After the simulation input has been prepared, the user should launch the simulation engine that will perform all the required calculations and generate unit operations and stream results.

The interaction of the user with XPSIM is different if the user starts the simulation for a problem defined using keyword input files only or the windows interface (pfd+statement windows).

These functions are provided by the **Exec** menu.

8.2 EXEC menu

The **EXEC** menu provides in the related drop-down menu commands and options to control the execution of the steady state simulation with XPSIM

The user may request the program to generate a single output file or multiple output files containing the calculation results.

When multiple output files are selected the calculation results are parsed in the following files :

- Input image and input description
- Calculation trace list
- Unit Operations results
- Stream list results
- **•**...Run calculation this command starts the steady state simulation using one of the opened input files. When the pfd+data-tree mode is used, an input file is

immediately created and the simulation is started. When keyword input files are used, a dialog containing the list of the opened input files is presented. The user must select the input file to be used in the simulation.

Stop calculation this command stops the simulation. This command can be used to halt unwanted calculations inadvertently started before all input data have been completed or updated.

8.3 Keyword Input file

When one or more keyword input files are open the user can launch a simulation calculation for one of them.

The program prompts the user a dialog for asking to select which file is to be used for the simulation.

XPSIM v.1.0 - TCONTR15	- 8 X
e Edit View Run Results Window Help	
······································	
<xpsim>generated by XpsimWin v.1.01</xpsim>	
CVBSINC CVBSINC generated by XpsinWin v.1.01 RUN ID-KHARG CUSTOMER-PPC PF RUN ID-KHARG CUSTOMER-PPC PF System Data THERN THERN CHENC System Data THERN THERN CHENCOMP C1 / C2 / C3 / IC4 / NC10 YOUTH THERNSET UID=TH1 HET HOUSS K-PR HS=LK CP=LK D=L V THERNSET UID=TH1 NETH Flowsheet Data COMP * <t< td=""><td></td></t<>	
r neip, press na	

Fig. 8.1 - Run selection dialog

This selection dialog is available only when key-word input files are used. In this case the user can have more than one input file open at the same time. The user is asked to select the file he wants to simulate.

8.4 Running the simulation

Running the current simulation problem, is always possible.

If one or more errors (usually data missing) have been already identified by the windows interface, the following warning message appears:

XPSIM-1.	00	×
⚠	Defined statements contain one or more er Do you want to stop simulation ?	rrors
	<u>Si</u> <u>N</u> o	

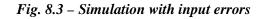
	e & status			
e View Run Window Help				
🖆 🔛 🎒 🔃 👗 🛍 💼 🔍 100%	- Q Q 🕀 🛛 🖃 🛦 🛛 🚽 🗛			
Pfd & Simulation Data Simulation trace & s				-
STREAM 'S2 '	P. 91	 1 Sim		_
STREAM 'TF-P680 '	P. 93	Simu	ulation Status	
STREAM 'S1 '	P. 95			
STREAM 'S3 '	P. 97			
STREAM 'SS '	P. 99			
STREAM 'S6 '	P. 101			
STREAM 'S8 '	P. 103			
STREAM 'S10 '	P. 105			
STREAM 'S11 '	P. 106			
STREAM 'S12 '	P. 107			
STREAM 'S13 ' STREAM 'TF-HR1 '	P. 108 P. 110			
STREAM 'IF-HR1 ' STREAM 'S9 '	P. 110 P. 112			
STREAMS INDEX/PRINTOUT SEQUENCE	P. 112 P. 114		Simulation completed	
- Generated Graphic Data File Closed				
contraction of applied base fille crosed			Solution Obtained	
Calculation time 2.00 sec				
Simulation no. 8 - Ended at 22.1	2.03 on SEP 30, 2013 -	E		
	in window	•		10
r can insert Notes and Comments in th	is window	• •		*
r can insert Notes and Comments in thi	is window	 		*
r can insert Notes and Comments in thi	is window	* *		
r can insert Notes and Comments in thi	is window	 * *		
r can insert Notes and Comments in th	is window	, *		
r can insert Notes and Comments in th	is window	¥		-
r can insert Notes and Comments in th	is window	,		
r can insert Notes and Comments in th	is window	,		*
r can insert Notes and Comments in th	is window	, , , , , , , , , , , , , , , , , , ,		*
r can insert Notes and Comments in th	is window	,		*
r can insert Notes and Comments in th	is window	, , , , , , , , , , , , , , , , , , ,		*
r can insert Notes and Comments in th	is window	,		*
r can insert Notes and Comments in thi	is window	,		
r can insert Notes and Comments in th	is window	,,		
r can insert Notes and Comments in th	is window	,		*
r can insert Notes and Comments in th	is window	,		* *

Fig. 8.2 – Simulation activity window with completion status

The window showing the calculation trace is presented on the left part of the screen. The status of the simulation is presented on the top-right part of the 'Simulation Trace and Status' window.

8.5 Fixing Input Errors

Though the preparation of input data is made easier by the windows interface, a number of input errors can be detected only by the simulation engine when the simulation is started.



🔣 Line and chocke - pr L680 - 05 - Simulation trace & status		
E File View Run Window Help		
- □ ☞ 🖬 🖨 魚 ☆ № 絶 ④ 100% 📑 ④ ↓ 🗄 🗄 🖽 ▲ 🌾 🥑 🗛 № 🖗 ↔ → 🖩 閉 目 溜 ▶ 🔳 ※ 🖻 🐂	🐂 l 🛷 😵	
Pfd & Simulation Data Simulation trace & status 🗙		
*** XPSIM, v. 2.00 *** *** Process Simulation Program ***	Simulation Status	Ξ
Process Simulation Program		
**		
- Input, Calculation and Output Summary Report -		
- Simulation started at 22.22.14 on SEP 30, 2013 -		
* RUN N. 9 - STARTED AT 22.22.14 ON SEPTEMBER 30, 2013 *		
INPUT LISTING P. 1	One or more input errors found	
*** INPUT ERRORS LISTING *** P. 4	Check input data	
- Calculation time 0.00 sec		
	Double click on this windows to open error trace	
- Simulation no. 9 - Ended at 22.22.14 on SEP 30, 2013 -		
		2
4	,	7
User can insert Notes and Comments in this window		
		=
		1/
4		
For Help, press F1 Steady State Simulation Last Simulation (2) - NOT solved Calculation	ation Window	

By double-clicking over the 'Simulation status' pane the 'Input Error Trace' window is open as shown on the next figure.

Line and chocke - pr L680 - 05 - Pfd & Simul	ulation Data	-					
File Edit View Search Data Tree Pfd !	d Settings Zoom	Symbo	I Run Results	Tools PI pa	ges Window He	lp	
🗋 📾 🔚 🚑 🖪 👗 ங 🛍 🍳 1009	0% 🔹 🍳 🛙	🖪 🕀 (I 🗗 🕼 🕸 <		i 🔶 🔶 i 🎇 📴 i	🗊 I 🔐 I 🕨 📰 🔛 📽 😵	
Pfd & Simulation Data × Simulation tr	trace & status						*
Input Error Trace -							•
File View Run Wir	lindow Help						
ETAN00 - 10800 PO 10900 PO 11000 PO 11000 PO 11100 PO	OINT DIST=1814 OINT DIST=1897 OINT DIST=2016 OINT DIST=2190 RINT STEP PROF	ELEV= ELEV= ELEV=	1437 1543 1711			×	
W1 - Vright W1 - V	End of Simula 2.00 * E&P " "ETAN	•••	nput File * e - * ION ERRORS ***	Xtended -	Process SIMula INPUT -	tion* * Page 0004 * * Job "ETAN * * * Date SEP 30, 2013 *	
* ERROR AT/BEFORE	E STMT 890	00* Inv	alid relief pre	ssure valu	e *		-
ERROR AT/BEFORE			alid relief pre		e *	•	, , , ,
MIXER - MX2 B-SS SETSTR - SS7						Description	
ERROR AT/BEFORE AT/BEFORE A		PAR No	tA - Main parameter	5		Description Calculation mode	
CPEGR. AT/BETGRE C CPEGR. AT/BETGRE C C CPEGR. AT/BETGRE C CPEGR. AT/BETGRE C CPEGR. AT/BETGRE C CPEGR. AT/BETGRE C		No 1	tA - Main parameter Keyword	5		Calculation mode	
ESGOS AT/BETORE ESGOS AT/BETORE ESGOS AT/BETORE SETSTR - SST DPPLINE - P690 DT VALVE - CHECK4 D+C FLASH - F1 D+S ESTSTR - SS1		No 1 2	A - Main parameter Keyword CALC=	5	Value	Calculation mode	
		NO 1 2 3	IA - Main parameter Keyword CALC= METHOD=	(UoM/spec)	Value	Calculation mode Calculation method	
PBDOK AT/SETORE MDER - MO2 STSTR-SS7 PPELINE - 660 PG FLASH-F1 STSTR-SS1 PPELINE - 660 PUELINE - 660 STSTR-SS1 SS		PAR No 1 2 3 4	A - Main parameter Reyword CALC= METHOD= PSET=	(UoM/spec)	Value	Calculation mode Calculation method Set pressure	, , , , , , , , , , , , , , , , , , ,
		No 1 2 3 4 5	A - Main parameter Keyword CALC= METHOD= PSET= OVERP=	5 (UoM/spec)	Value	Calculation mode Calculation method Set pressure Over-pressure per cent Pelief pressure	
		No 1 2 3 4 5 6	A - Main parameter Reyword CALC= METHOD= PSET= OVERP= PREL=	(UoM/spec)	Value 1	Calculation mode Calculation method Set pressure Over-pressure per cent Relief pressure Belief temperature	
MOLER - MA2 MOLER -		No 1 2 3 4 5 6	A - Main parameter Keyword CALC= METHOD= PSET= OVERP= PREL= TREL= TREL=	(UoM/spec)	Value 1 Value 1 Value	Calculation mode Calculation method Set pressure Over-pressure per cent Pelief pressure	
		No 1 2 3 4 5 6	A - Main parameter Keyword CALC= METHOD= PSET= OVERP= PREL= TREL= TREL=	(UoM/spec)	Value 1 Value 1 Value	Calculation mode Calculation method Set pressure Over-pressure per cent Relief pressure Belief temperature	
		No 1 2 3 4 5 6	A - Main parameter Keyword CALC= METHOD= PSET= OVERP= PREL= TREL= TREL=	(UoM/spec)	Value 1 Value 1 Value	Calculation mode Calculation method Set pressure Over-pressure per cent Relief pressure Belief temperature	

Fig. 8.4 – Input Error Trace Window

This window presents the echo of the input statements and the error messages.

In this case the error message:

* ERROR IN/BEFORE STMT 8900* Invalid relief pressure value *

was generated.

By *double clicking* on the message line, the related statement window is opened and presented to the user.

This operation may be repeated for all the error messages generated.

Some error messages may not be related to a specific statement.

For example, a feed stream defined on the pfd may have been only partially defined, e.g. temperature, pressure or flowrate can be missing, so input data are not sufficient to start the simulation.

In this case the user should locate the stream and complete its data.

8.6 Set system options

The 'Run' menu allows to set some simulation options. This is provided through a dialog shown in the next two figures.

Set/change run options	×
System options Run & DB Options	
Calculation date	
YYYY MM DD	
OK Annulla Applica ?	

Fig. 8.6 - System Options

The first page allows the user to define the calculation date. Using this option the user can change the date shown on the page header of the simulation output.

Fig. 8.7 - Run Options

Set/change run options	×
System options Run & DB Options	
Interactive No Warning	
Max no of lines per page	
Data Base Identifier	
OK Annulla Applica ?	1

The second page allows to set some options related to run and the output.

Data base identifier	the user can define a data base identifier. This option is not enabled in the current version.
Interactive	this check box activates an interactive simulation run. The user will be able to check after each loop the changes in the recycle stream properties and eventually terminate the calculation.
Interactive	this option may be used to suppress a warning message shown on the calculation output when the simulation convergence is not achieved.
Max lines	this option allows the user to change the default no of lines per page. The default value is 60, a lower value is not permitted. Similarly, values higher that 90 are not accepted.

9. Viewing and Analysing Results

After a simulation has been performed the user can browse or view the results in a number of ways:

- 1) browsing basic stream results through the Pfd window
- 2) browsing stream and/or unit operation results through the Pfd window
- 3) opening and previewing the output file generated by the simulation
- 4) viewing stream results in a 'Heat&Material Balance' type window

These functions and options are described in the next paragraphs.

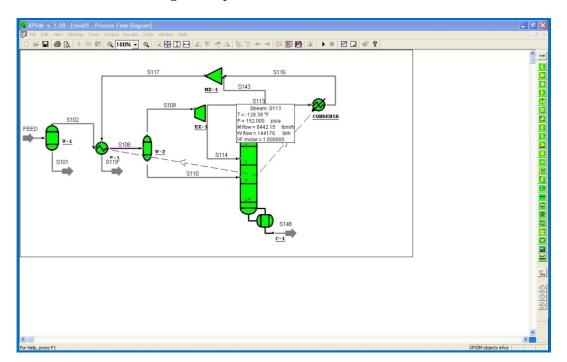
9.1 Basic Stream Data

Stream data can be easily browsed on the Pfd window in a straightforward way. By placing the mouse on a stream connection and leaving it for about 1 second, basic stream data such as

- temperature
- pressure
- molar and weight flow-rates
- vapor fraction

are displayed in a tool-tip window.

An example is shown on the next Figure.





9.2 Browsing Streams and Unit Operations

The user may locate on the Pfd the object (stream or unit operation) whose results he wishes to browse.

Then he may either double-click or right click on the object.

Double-clicking

In this case the relevant results are immediately displayed in a separated window.

Right-clicking

By right-clicking on a stream or unit operation a context menu is displayed.

For unit operation:

View data View results
Detach Detach feeds Detach products Change object
Rename Uop

For streams:

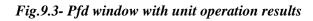
View data View results
Detach Detach start point
Detach end point Rename

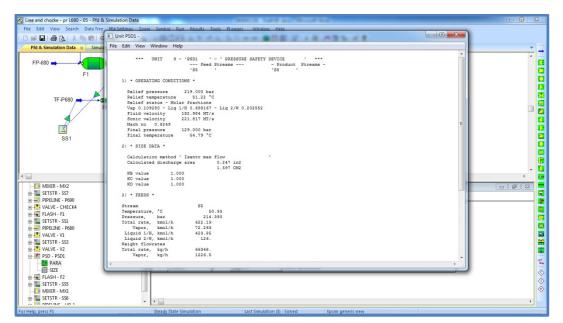
Select the 'View results' command to have the calculated values displayed.

A single window is used to display both stream or unit operation results. The user may move and size the window as he wishes. Position and size of the window are remembered and will be used when the window is reopened.

🖆 🖬 🖨 🖪 i 🐰 🐚 💼 i e	Stream U2B -	- #CH +				122.02			•]
Pfd & Simulation Data × Simula	File Edit View W	/indow Help							
	* STREAM 'IJ2							-	
	- SIKEAN 'IJ2	B							i i
	- Temperature	57.03 °C	- Pressure	96.2697 bar					
ETAN00 =									
	Phase		TOTAL	VAPOR	LIQUID H	LIQUID W			
PHE1	Molar Flow Rate Weight Flow Rate		1945.132	95.401 1593.497	155.180 30756.694	1694.551 30535.809		E	
	Molar Fraction	kg/n	62886.000	0.049046	0.079779	0.871175			
	Weight Fraction			0.025339	0.489087	0.485574			
	Molecular Weight		32.3299	16.7031	198.1998	18.0200			
	Std Vap Vol Rate		56.0655	2255.7420	200.2000	10.0100			
	Std Lig Vol Rate		68,1021		37,5977	30,5044			
t 1	Act Volume Rate		92.9858	24.6832	37.2540	31.0486			
W690P	Enthalpy	MJ/h	-74947.2	-28.8651	-2084.71	-72833.1			
10.14	Spec. Enthalpy	kJ/kg	-1192.011	-18.118	-67.793	-2385.604			
W1 🔿		kJ/kmol	-38537.634	-302.621	-13436.551	-42988.596			
10	Spec. Heat Cap.		3.268814	2.826656	2.095862	4.473325			
		kJ/kmol °C	105.680574	47.214057	415.399466	80.609334			
0 MX2	Spec. Entropy	kJ/kg °C	3.2511	9.1003	2.1155	4.0896			
		kJ/kmol °C	105.1076	152.0032	419.2987	73.6950			
	Compressibility			0.907163					
	Density	kg/m3	676.2968	64.5579	825.5945	983.4845			
	Gravity at 60/60				0.818026	1.001004			
	Isentr. Exponent Viscosity	CP		1.317604	2.794	0.4841			
	Thermal Conduct.			0.047801	0.130209	0.4041			
PIPELINE - P690	Surface Tension			0.04/801	18.3124	66.7676			
VALVE - CHECK4	Gor (std L dens)		336,855		10.3124	00.7070			
	GOT (BCG D Gens)	Nm3/m3	59,997						
FLASH - F1	Gor (act L dens)		339,963						
SETSTR - SS1		Nm3/m3	60.550						
PIPELINE - P680	Water/oil ratio		0.811						
VALVE - VI	Api density				41.4774				
	Gas gravity			0.5769					
	Reference Gas St	atus - Tempera	ure 15°C	- Pressure 1	atm				
PSD - PSD1			TOTA	L PHJ	ISE		VAPOR F	HASE	
PARA									
SIZE	1.0								
FLASH - F2									
E SETSTR - SSS									
MIXER - MX1									
E SETSTR - SS6									

Fig. 9.2 - Pfd window with stream results





9.3 Heat and Material Balance view

The complete set of values of calculated streams can be viewed in a single window by issuing the '*View Heat&Material balance*' command.

When this command is used stream data are displayed as shown on the next screen image.

T case of miller of mi	eat & Materi	ial Balance					
	UoM	1	2	3	4		
Stream id		RUSSIA	RUSSIA1	RUSSIA2	TURKISH		
Description							
Temperature	*C	45.9	45.9	45.9	3.1393		
Pressure	bar	166.5	166.5	166.5	80.524		
Phase		VAPOR	VAPOR	VAPOR	VAPOR		
Total stream							
Molar flow rate	kmol	69907	34954	34954	34954		
Weight flow rate	kg	1.1532e+006	5.7658e+005	5.7658e+005	5.7658e+005		
Volume flow rate	m3	9622.3	4811.2	4811.2	8144.6		
Vapor molar fraction		1	1	1	1		
Vapor weight fraction		1	1	1	1		
Component molar flowr	at kmol						
01) WATER		2.0272	1.0136	1.0136	1.0136		
02) NITROGEN		650.33	325.16	325.16	325.16		
03) CARBON DIOXIDE		286.61	143.31	143.31	143.31		
04) METHANE		68177	34088	34088	34088		
05) ETHANE		614.95	307.48	307.48	307.48		
06) PROPANE		97.657	48.829	48.829	48.829		
07) ISOBUTANE		10.416	5.2079	5.2079	5.2079		
08) BUTANE		17.336	8.6682	8.6682	8.6682		
09) ISOPENTANE		12.583	6.2915	6.2915	6.2915		
10) PENTANE		14.191	7.0954	7.0954	7.0954		
11) HEXANE		15.519	7.7595	7.7595	7.7595		
12) C7+		8.808	4.404	4.404	4.404		
Molecular weight		16.496	16.496	16.496	16.496		
Molar enthalpy	kJ/kmol	-1472.4	-1472.4	-1472.4	-2383.4		
	kJ/kg °C	3.2491	3.2491	3.2491	3.0406		
Weight heat capacity Weight density	kg/m3	119.84	119.84	119.84	70.793		

Fig.9.4- Heat & Material balance window

The user can browse main stream properties, such as:

- Temperature
- Pressure
- Flowrate
- Composition

in a single window.

9.4 Opening results files

The **RESULTS** menu includes commands for viewing and printing result files generated by the simulation.

The available commands are the following.

Global Output	this command opens the output file produced by the simulation and displays it in a new window.
Input	select this command to view the file that contains the input listing.
Trace	select this command to view the trace list file
Activity Index	select this command to open and view the 'Activity Index'. Through this window the user will be able to interact with the other output window.
View graphs	this command is available when the simulation has generated one or more graphs. When selected this command presents the user the list of graphs generated by the calculation. After a graph has been selected, a new graph document is created and displayed in its window. The commands available for a 'Graph document' are described in the next chapter.
View property tables	this command is available when the simulation has generated property tables. Generation of Property Tables can be requested by using the PTABLE input statement within the " <i>VLE Analysis</i> " input category. Details about the functions available for browsing and saving generated results are given in a following chapter.

9.5 Global Output Window

When the user has selected a file a new window is created and the related output file is shown. See next Fig. 5.

The main result file is shown on the right part of the window frame. The activity index is presented on the left part of the screen. This last window presents results index with the page no.

ine and chocke - pr L680 - 05 - Output & Index			
le Edit View Options Results Window Help			
📾 🖬 i 🚭 🔃 🕺 🛍 🛍 i 🔍 100% 🔷 🤇		《 < ▲ 勤 ♥ ← → ■ 閉 目 墨 ▶ ■ 존 目 ┺ � \$	
Pfd & Simulation Data Simulation trace & status	Output & Index ×		
	^ _	* Page 1 * XPSIM, Vers. 2.00 * * eXtended Process SIMulation*	* Page
INPUT LISTING * NO DIAGNOSTICS GENERATED *	P. 1	Cust/user " " - INPUT - INPUT - Proj/Problem " -	* Date SEP 30,
USER'S SUPPLIED THERMODYNAMIC DATA ACTIVE COMPONENTS CHEM/PHYS CALCULATION METHODS	P. 6 P. 7 P. 10	Simulation Input File	
STREAM 'W1 ' DATA STREAM 'ETANGO ' DATA	P. 14 P. 14	*XPSIM>generated by XpsimWin v.2.01 *EXE-OPT> PAGELEN=80 *	
STREAM 'WF-650 ' DATA STREAM 'FF-650 ' DATA STREAM 'FWR 1 ' DATA	P. 14 P. 15 P. 16	100 RUN ID=ETAN CUSTOMER='ENI E&P' PROJECT='ETAN '	
STREAM 'WHR_1 ' DATA UNIT OFERATION 1 - 'FHE1 '	P. 16 P. 16 P. 17 E	200 DESC RESERVOIR ETAN 1X 300 DESC LEVEL 720-730	
UNIT OPERATION 2 - 'MK2 ' STREAM SET OPER 1 UNIT OPERATION 2 - 'P690 '	P. 17 P. 17 P. 18	400 DIMENSION INPUT SI PRES=BAR	
UNIT OPERATION 4 - 'CHECK4 ' UNIT OPERATION 5 - 'F1 '	P. 20 P. 20	500 Petroleum Data	E
STREAM SET OPER 2 UNIT OPERATION 6 - 'P680 ' UNIT OPERATION 7 - 'V1 '	P. 20 P. 21 P. 23	600 HYPO ID=C30+ NAME=C30+ SPGR=0,9608 MW=430	
STREAM SET OPER 3 UNIT OPERATION 5 - 'V2 '	P. 23 P. 23	700 Thermodynamic Data	
UNIT OPERATION 9 - 'PSD1 ' UNIT OPERATION 10 - 'F2 ' STREAM SET OPER 4	P. 23 P. 29 P. 23	200 Intermodynamic Data *	
UNIT OPERATION 11 - 'MX1 ' STREAM SET OPER 5	P. 24 P. 24	800 METHOD METHOD=PR 900 COMP=C30+ PARA=1704.29.159.342.1.11905	
UNIT OFERATION 12 - 'HR_1 ' STREAM DICTIONARY/CROSS REFERENCES SIMULATION STATS/LOOPS DEFINITION	P. 25 P. 27 P. 29	= 1000 METHOD METHOD=SRK-P 1100 COMP=C30+ PARA=1650.45,156.976,0.231172	
* CALCULATION SUBMARY PRINTOUT *		1200 METHOD METHOD=P-CST 1300 COMP=C30+ PARA=615.812.11.8780.651.275	
ED/RECYCLE STREAMS PROCESSED OUTPUT/RESTART FILE 'ETAN ' INITIALIZED		1400 System Data	
Unit op 1 - 'PHE1 ' calculated Unit op 2 - 'MK2 ' calculated SET STREAM OP 1 337 RESOLVED			
Unit op 3 - 'P690 ' calculated Unit op 4 - 'CHECK4 ' calculated Unit op 5 - 'F1 ' calculated SET STREAM OF 2 351 RESOLVED		1500 - CHENCOMP H3O / N2 / CO2 / C1 / C2 / C3 / XC4 / NC4 / Z5 / NC5 / NC6 + / NC7 / NC6 / NC9 / NC10 / NC11 / NC12 / NC33 / NC14 / HX55 / NC16 / + / NC17 / NC16 / NC19 / NC20 / NC21 / NC22 / NC23 / NC24 / NC25 / NC26 + / NC27 / NC26 / NC29	
Unit op 6 - 'P680 ' calculated Unit op 7 - 'V1 ' calculated SET STREAM OP 3 353 RESOLVED Unit op 8 - 'V2 ' calculated		° 1600 THERMSET UID=M1 1700 METHODS K=PR HS=PR CP=PR D≈SRK-P IV=SRK VISV=P-CST VISL=P-CST + TK=IDEAL SRT=IDEAL	
Unit op 9 - 'P3D1 ' calculated Unit op 10 - 'F2 ' calculated		1800 WOPT THERM=2	
SET STREAM OF 4 555 RESOLVED Unit op 11 - 'MK1 ' calculated	-	1900 Default Data	-
III		m	•

Fig. 9.5 – Output and Index window

By *double-clicking* on a line that contains a *page number*, the 'Global Output' window will receive a command to display the '*selected page*'.

The user can set the character font for the view window and for the preview and print command.

This is performed by selecting the 'Set Font' and 'Set Printer Font' command. The standard 'Font selection dialog' is prompted to the user.

Carattere			? ×
Ippo: Courier New To courier New	Stile: Normale Normale Corsivo Grassetto	Dimensione:	OK Annulla
약 Eni3 Fixedsys 약 Garamond 약 Georgia 약 Gill Sans MT	Grassetto Corsiv	12 14 16 18 20 💌	
	Esempio AaBbYyZz	:	
	Scjittura: Occidentale	•	

Fig. 9.6 - Font Selection Dialog

To view the output files as formatted text files, with data correctly aligned in columns, the user should not select a proportional font but a fixed font such as 'Courier New'.

9.6 Output Windows

When an output file document is shown in its window the following menu commands become available.

File

- Close, Save As...
- Print, Print Preview, Print Setup...
- Exit

View

- Toolbar, Status Bar
- Set Font...., Set Printer Font...

Results

- Global out file, Input list, Trace list, Stream results, Unit operation results
- View Heat&Material balance.
- View graph results ...
- View Property Tables

Window

• Cascade, Tile, Arrange Icons

Some of these commands have been already described in the previous chapters, so only the most important are reviewed.

9.7 Save output file

Using the 'Save as' command the user may save each output file generated by the calculation in a private folder.

When this command is selected the standard 'File save dialog' is presented.

9.8 Print and Print Preview

The output file may be previewed and printed using the Print preview command. An example is shown on next Fig. 6

Fig. 9.7 -	Output	File	Print	Preview
------------	--------	------	-------	---------

Pent Peer Page Prescharz Joon Page Zoom Jul Doce	XPSIM v.1.0 - OUTPUT	LST	
* Cost (Towner, ************************************	Print	rey Page Iwo Page Zoom In Zoom Out Close	
	<u>Pint</u> <u>N</u> ext Page	<pre>X2030, Wers 3.437 ************************************</pre>	
Page 1 NUM	Prov 1		

Prod & Simulation Data Simulation Data Simulation Data Output & International States - CALCULATION SIMULATION - Simulation Data - SimulationData - Simulation Data - Simul	ALL DECK CALLES CONTROL FOR CONTROL CONTRUCT CONTROL CONTROL CONTROL CONTROL CONTROL CONTROL C
PG & Simulation Data Simulation tack & status Output & Ins - CLACTATION STRAAMY PRINTON - FURT CONTRACTANGE STRAAMY PRINTON - Data 90 - 1998 - 1	# & Brdex ************************************
SUMCTIATION FORMAT PLATTOF * TOTALTER OPTION ADDRESS FRANTOF * TOTALTER DELS of 1 - PRE1 * initiate OPTION ADDRESS FRANTOF * TOTALTER DELS of 1 - PRE1 * initiate OUTLOT PLATOTOT * 'OUTLOT PLATOTOT * 'DELS OF 1 - PRE1 * INITIATE OUTLOT PLATOTOT * 'DELS OF 1 - PRE1 * INITIATE OUTLOT PLATOTOT * 'DELS OF 1 - PRE1 * INITIATE OUTLOT PLATOTOT * 'DELS OF 1 - PRE1 * INITIATE OUTLOT PLATOTOT * 'DELS OF 1 - PRE1 * INITIATE OUTLOT PLATOTOT * 'DELS OF 1 - PRE1 * INITIATE OUTLOT PLATOTOT * 'DELS OF 1 - PRE1 * INITIATE OUTLOT PLATOTOT * 'DELS OF 1 - PRE1 * PRE1 * INITIATE OUTLOT PLATOTOT * 'DELS OF 1 - PRE1 * PRE1 * INITIATE OUTLOT PLATOTOT * 'DELS OF 1 - PRE1 * PRE1 * PRE1 * INITIATE OUTLOT PLATOTOT * 'DELS OF 1 - PRE1 * PRE1 * INITIATE OUTLOT PLATOTOT * 'DELS OF 1 - PRE1 * PRE1 * PRE1 * INITIATE OUTLOT PLATOTOT * 'DELS OF 1 - PRE1 * PRE1 * PRE1 * INITIATE OUTLOT PLATOTOT * 'DELS OF 1 - PRE1 * PRE1 * PRE1 * PRE1 * INITIATE OUTLOT PLATOTOT * 'DELS OF 1 - PRE1 *	<pre>* ** UST Vers. 200 ** * extended Process SIMulation* * FA * Cust/user *K. 24# * * • · · · · · · · · · · · · · · · · ·</pre>
THED.RECVEL FIRSHM FROGENED 	* XFEIM, Verg. 2.00 * * extended Process ENVLAtion* * Do * PA * Froj/Frojlew TEAN * * - VAIT 9 - PDJ - * Date SEP 30 *** UNIT 9 - 'PDJ ' - ' PRESSURE SAFETY DEVICE ' *** - SF dout, Streams - 'SF 1) * OPERATING CONDITIONS * Relief pressure 219.000 Bar Relief pressure 219.000 Bar Relief pressure 219.000 Bar Streams - '19 Sonit velocity 221.213 MF/3 Medic no 0.2249 139.000 Bar Final temperature 3: 1,9°C 2) * SILE DATA * Calculated discharge area 0.247 nc Calculated discharge area 0.247 nc KK value 1.000 1.597 CM2 KK value 1.000
	Calculated discharge area 0.247 no . Kk value 1.000 . KV value 1.000 . KD value 1.000
UNIT OFERATION 1 - 'HEI1 ' P. 81 Oragahi East 'lis (Speed UNIT OFERATION 2 - 'MAG2 ' P. 84 UNIT OFERATION 2 - 'MAG2 ' P. 94 UNIT OFERATION 2 - 'MAG2 ' P. 94 UNIT OFERATION 5 - 'TIL ' P. 42 UNIT OFERATION 5 - 'TIL ' P. 42 UNIT OFERATION 5 - 'TIL ' P. 43 UNIT OFERATION 7 - 'TIL ' P. 44 UNIT OFERATION 7 - 'TIL ' P. 44 UNIT OFERATION 5 - 'TIL ' P. 44 UNIT OFERATION 5 - 'TIL ' P. 44 UNIT OFERATION 5 - 'TIL ' P. 45 UNIT OFERATION 1 - 'TIL ' P. 46 UNIT OFERATION 1 - 'TIL ' P. 47 UNIT OFERATION 1 - 'TIL ' P. 48 UNIT OFERATION 1 - 'TIL ' P. 49	
UNIT OPERATION 11 - 'MX1 ' P. 49	9 Stream 55 9.1 Temperature, 'C 50,93 7.24.1933 Temperature, 'C 214,933 7.35 Temperature, 'C 214,933 7.37 Temperature, 'C 214,933 7.37 Temperature, 'C 214,933 8.37 Temperature, 'C 214,933 8.43 Liquid 1, 'N, kmol/h 42,854 9.43 Weight Thomas 56,335 9.44 Weight Thomas 22,855 9.45 Liquid 1, 'N, kg/'n 423,655 9.45 Liquid 1, 'N, kg/'n 423,655 9.45 Weight Thomas 62,855 9.45 Liquid 1, 'N, kg/'n 423,655
THEAMS/CONSIDERTIES DATA CALCULATION AND STORING ACTIVITY SIMMARY P. 75 STREAM STATUS SIMONARY P. 76 ETREAM 'NI P. 76	5. 45 3) = PRODUCTS = 50 Cream Cream Stature, 'C 58 54.79 Pressure, bar 129.000
	p. 76 Weight flowrates Total rate, kg/h 66348.
r III or Helo, press F1 Steady St	Weight flowrates

Fig. 9.9 - Global output scrolled to a selected page

10. Graph documents

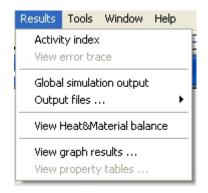
During a simulation some unit operations and other functions such as:

- Phase envelopes
- Pipelines
- Distillation columns
- Heat-exchangers
- Depressurizer
- PVT analysis
- VLE analysis
- Binary VLE analysis
- Instrument and control trends in dynamic simulation

generate graphical information which is of great help in the analysis and assessment of the results.

10.1 General information

Generation and availability of graphical information is reflected in the **"Results"** menu, as shown by the next screen image.



The user may then select the "*View graph results*" command (or click the 22 icon in the application tool-bar) to access the list of the available graphs and select the desired one. By selecting this command, a new window is opened as shown by the next figure. It is divided in two parts:

- list of the available graphs
- graph preview

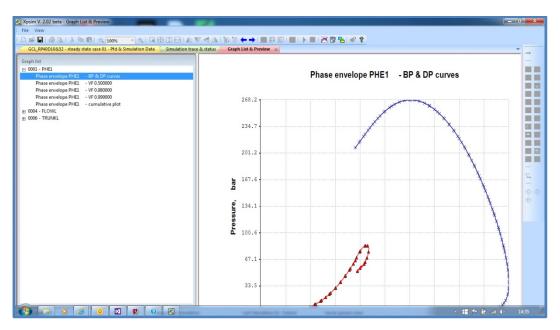


Fig. 10.1 – Graph selection and preview

The left tree view shows unit operations and functions, which have generated one or more graphs.

By selecting one line, the graph is displayed on the right part of the window.

To save, print, edit and customize the graph the user can double-click on the selected line: the relevant graph is then opened and displayed in a new window.

The menu bar is updated to reflect all the available commands to operate on the graph. In this window, the menu command: *'save graph collection'* is available and the user can save the entire graph collection.

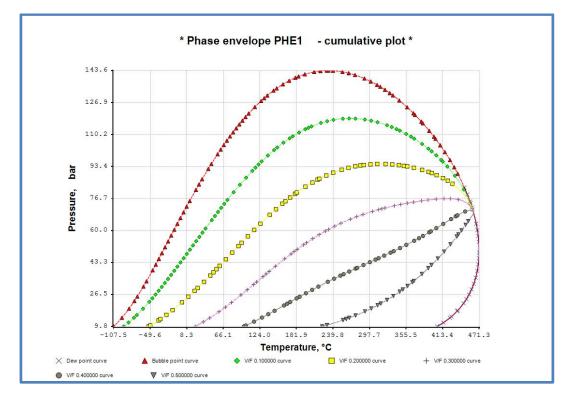


Fig. 10.2 - Graph document window

When a graph document is opened the user can view it, change the size of the window, previewing it and printing it.

The menu items available when a graph window is active makes available the following commands:

The following commands are available.

File

- Save As ...,
- Save As Metafile...,
- Save As image...,
- Print, Print Preview, Print Setup...,
- Close

Options

- Scale range mode
- Mesh
- No color pens
- Draw curve symbols
- Diagonal
- Customize
- Reflect axis
- Dynamic Elapsed Time

Tools

- Merge another graph into this one
- Export curve data to Excel

Window

• Cascade, Tile, Arrange Icons

10.2 Available Operations

This chapter describes the functions available for managing the graph object.

<u>File menu</u>

Save as	using this command, the user can save graph data on a file for subsequent use. When this command is invoked the 'Save as ' standard MS-Windows dialog is invoked allowing the user to select the folder and the filename. The file is save with the '.gph' extension.
Save as metafile	using this command, the user can save the graph image into a file for subsequent use. The image is saved in a <i>'windows enhanced</i> <i>metafile format'</i> and can be subsequently imported in Word and Excel documents. When this command is invoked the standard 'Save as ' dialog is displayed allowing the user to select the folder and the filename.
Save as image	using this command the user can save the graph image into a file for subsequent use. The image can be saved in various formats such as bmp , jpeg , gif . When this command is invoked the standard 'Save as ' dialog is displayed allowing the user to select the folder and the filename.
Print setup	using this command, the user can select the printer and the printing layout.
Print	using this command the user can print the graph to a selected printer.
Print preview	using this command the user can preview the graph image before printing.

Options menu

This menu item provides a number of commands for modifying and customizing the graph drawing.

Customize	this command invokes a dialog that makes available a large number of options. It is described in detail in the next chapter.
Scale range mode	the user can change the mode used to define and display graph scales. <i>Three predefined modes are available</i> . Additional modes to change the graph aspect are available using the 'Customize' command
Mesh	selecting this option a mesh is drawn over the graph. <i>Square</i> , <i>horizontal</i> or <i>vertical</i> meshes can be selected. Deselecting this option the mesh is eliminated.

No color pens	selecting this option all graphs are drawn using black pens. Deselecting this option color pens are used.
Draw curve symbols	this command selects or deselects the 'curve symbols option'. When the option is on the symbols are drawn on each curve of the graph.
No lines	exclude interpolating lines from the graph. In this case only symbols are shown.
No single points	exclude the drawing of single points from the current graph.
Diagonal	this option, when activated, draws a diagonal connecting the bottom-left with the top-right vertices of the graph. This option is useful when vapor-liquid equilibrium compositions (Y-X graphs) are presented.
Reflect axis	this command allows to reflect the direction of \mathbf{X} or \mathbf{Y} axes. E.g. if pressure values are displayed on the \mathbf{X} axis in <i>increasing</i> order, using this command pressure values will be presented in <i>decreasing</i> order.
$X \leftrightarrow Y$ exchange	this command allows to exchange X and Y axes. This command is enabled only when the graph has one X and one Y axes.
$Y1 \leftrightarrow Y2 \text{ exchange}$	this command allows to switch the Y axes when the graph has two Y axes.
Dynamic elapsed time	this command is available only for graphs generated by XDSIM (Dynamic Option) when X axis represents elapsed time. In this case, default unit of measure is second. The user can change the time unit by selecting: Seconds, Minutes, Hours and Days.

10.3 Customization Options

Under the Options menu, the Customize command invokes a dialog that can be used to change a number of graph features.

Title and axes description

The user can change the graph title and axis descriptions.

Fig. 10.3 - Title and Description

Set / Change Graph	h Options	×
Title & description	Scale - digits & divisions Scale - Ranges & limits Curves aspect Fonts	
Title	Instruments TI-111 PI-111	
1st X axis	Elapsed time,	
2nd X axis		
1st Y axis	TEMPERATURE , CENT	
2nd Yaxis	PRESSURE . BAR	
3rd Y axis		
4th Yaxis		
/		
:		
	OK Annulla Applica	?

Scale digits and divisions

By means of this dialog, the user can modify:

- the number of divisions/ticks for each axis
- the number of digits of tick labels for each axis
- the number of the decimals of tick labels

	Axis	No	Segments	Digits	Decimals		
	- X - - Y -	1 1	10 8	6 6	1 0		
	<				>		
Up	date divisior	ns, digit:	s, decimals			1	
				No of digits	No of Decimals	Update	
A	kis		No of divisions	NO OF DIGICS	NO OF Decimals	opadeo	

Fig. 10.4 - Scales custimization

By clicking on one row in the *Axis* column, related values are copied in the editable fields. After desired fields have been updated, the user should press the *Update* button to save the modifications applied.

Axis Limits

Next image presents the dialog for modifying axis limits and scale factors.

Axis	No	Lower value	Upper value	Lower limit	Upper limit	Scale fact
- X - - Y -	1 1	0 -2140.72	389.88 214	0 -2140.72	400 214	0 0
<						
Chano	je or upd	ate axes limits				
					Scale factor	Update
Axis		Lower limit	Uppe	er limit	Scale ractor	opuace

Fig. 10.5 - Axes Range customization

For each axis, the user can set:

- the lower and upper limits
- the scale factor

in order to set a desired axis range.

By clicking on one row in the *Axis* column, related values are copied in the editable fields. After desired fields are updated, the user should press the *Update* button to save the modifications applied.

Lower and upper limits are normally set to values that encompass the lower and upper values for each axis.

By setting lower and/or upper limits within the lower and upper values, only a subset of graph will be displayed

Curve aspect

Using the next dialog the user can modify the curve aspect for each curve included in the graph.

The user can modify:

- Line style
- Line width
- Line color
- Points marker and its size
- Curve legend

Fig. 10.6 - Curve aspect customization

Set/change graph options			×
Title _description Scale - digits _divisions	Scale - Ranges limits	Curves aspect	
Curve classes Curve type 1 Curve type 2			
Properties Style	Width	Color	
	2 .		
Marker	Size		
X •	2 .		
Legend		Update	
Pressure			
		OK Annulla Applica ?	

The set of curves shown in a graph are listed in the 'Curve classes' window. By clicking on one row of this list, the related values are copied in the editable fields. After desired fields are updated, the user should press the *Update* button to save the modifications applied.

<u>Fonts</u>

For each type of descriptive line:

- Title
- Axis description
- Values
- Curve legends

the user can change the font, its size and effects.

	Scale - digits & divisions	Scale - Ranges & lim	its Curves aspect	Fonts	
Туре	TypeFace	Size	Bold	Italic	
Title	Arial	6	YES	NO	
Axis Desc	Arial	5	YES	NO	
Values	Courier New	4	NO	NO	
Legends	Arial	3	NO	NO	
•		III		•	
		Update	T Italic		

Fig. 10.7 - Font customization

The user can select one font, change its properties and press the Update button to save the changes.

10.4 Tools for graphs management

In the Tool menu, the user can found two advanced functions for graph management.

- Merge another graph into this one
- Export curve data to Excel

Graph merging

The user can merge the curves of two graphs for preparing comparison charts. This can be done by starting the command '*Merge another graph into this one*' available in the **Tools** menu.

This command is available when 2 graphs are currently open, allowing to merge one graph into another.

For example, the user can proceed as follows:

- a) Run a pipeline calculation, display and save the calculated pressure/temperature profile as. Save this graph as "*TP-graph01.gph*" and close it.
- b) Run another simulation of the same pipeline with different inlet condition.
- c) Open the new pressure/temperature profile graph (assume this is graph A).
- d) Re-open the saved file "*TP-graph01.gph*" (let us call this graph **B**)
- e) Activate graph A and start the 'Merge another graph into this one' command.

As a result, graph B is included into graph A.

This operation is allowed only when the two graphs have the same kind of X/Y axes with congruent units of measure.

Export curve data

All curve data contained in a graph can be exported to MS-Excel, by starting the command: *'Export curve data to Excel'*.

Excel application is started, a new work-book is opened and all curve data are loaded in a single work-sheet.

11. Property Tables for OLGA and LedaFlow

With XPSIM a user can generate property tables to be used with the "OLGA Multiphase Flow Simulator or LedaFlow".

Generated property tables can be saved on a file and subsequently used in dynamic pipelines simulations with OLGA or LedaFlow

When, starting from the **Results** menu, the **'View Property Table'** command is issued data are opened in a new window which may look as follows:

🔏 autodiv 02 - Property Tables	
File Edit View Property Window Help	
E 🖬 🖨 🔈 i k 🖻 🖻 🔍 100% 📑 🍳 🗔 🕀 🗊 🗠 🕸 🖪 A. 🕼 🦉	←→ ■閉目 出 ▶■ ※目そ?
Property Tables ×	▼ ""
- PROPERTY TABLE 1 'GL1 ' - FILE	
'ENTROPY NONEQ '	Fluid Property
0.10000E+06 0.41146E+06 0.72292E+06 0.10344E+07 0.13458E+07	GL1 GAS DENSITY
0.16573E+07 0.19687E+07 0.22802E+07 0.25917E+07 0.29031E+07 0.32146E+07 0.35260E+07 0.38375E+07 0.41490E+07 0.44604E+07	LIQUID DENSITY DROGOP
0.47719E+07 0.50833E+07 0.53948E+07 0.57062E+07 0.60177E+07	DROLDP
0.63292E+07 0.66406E+07 0.69521E+07 0.72635E+07 0.75750E+07 0.78865E+07 0.81979E+07 0.85094E+07 0.88208E+07 0.91323E+07	DROLDT E
0.94438E+07 0.97552E+07 0.10067E+08 0.10378E+08 0.10690E+08	GAS MASS FRACTION GAS VISCOSITY +
0.11001E+08 0.11312E+08 0.11624E+08 0.11935E+08 0.12247E+08 0.12558E+08 0.12870E+08 0.13181E+08 0.13804E+08 0.14427E+08	Linits
0.15050E+08 0.15673E+08 0.16296E+08 0.17542E+08 0.18788E+08	NT
0.20033E+08 0.21279E+08 0.22525E+08 0.25017E+08 0.27508E+08 0.30000E+08	Cacuation
-50.000 -47.917 -45.833 -43.750 -41.667	Timit, C Temperature, C
-39.583 -37.500 -35.417 -33.333 -31.250 -29.167 -27.083 -25.000 -22.917 -20.833	T max, °C
-18.750 -16.667 -14.583 -12.500 -10.417	NP Pressure, bar
-8.333 -6.2500 -4.1666 -2.0833 0.4444E-04 2.0834 4.1667 6.2500 8.3334 10.417	
12.500 14.583 16.667 18.750 20.833	
22.917 25.000 27.083 29.167 31.250 33.333 35.417 37.500 39.583 41.667	
43.750 45.833 50.000 54.167 58.333	
66.667 75.000 83.333 91.667 100.00 116.67 133.33 150.00	
0.10000E+26 0.10000E+26 0.10000E+26 0.10000E+26 0.10000E+26	
0.10000E+26 0.1000E+26 0.1000E+26 0.1000E+26 0.1000E+2	
0.10000E+26 0.10000E+26 0.10000E+26 0.10000E+26 0.10000E+26	
0.10000E+26 0.1000	
0.10000E+26 0.10000E+26 0.10000E+26 0.10000E+26 0.10000E+26	
0.10000E+26 0.10000E+26 0.10000E+26 0.10000E+26 0.10000E+26 0.10000E+26 0.10000E+26 0.10000E+26 0.10000E+26 0.10000E+26	
0.10000E+26 0.10000E+26 0.10000E+26 0.10000E+26 0.10000E+26	
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0.0000 0.0000 0.0000 0.0000 0.0000	
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	
¢	
For Help, press F1 Steady State Simulation	Last Simulation (1) - Solved Properties Table

Fig. 11.1 – Property Table window

This window is divided in 3 parts:

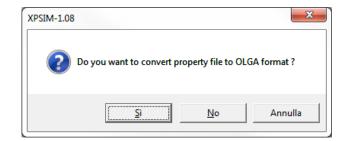
- the left column shows the image of property table file.
- the right-top part shows a selection form (calculation window).
- the right bottom part shows a line graph (result window)

Property tables can be generated for more than one fluid using various options, as explained in the XPSIM Reference Manual.

The user can select a fluid and a property, as result the file is scrolled up or down to the relevant property and through the calculation window either point values or temperature/pressure traverse can be obtained.

How to save a property table

Using the "File – Save as" command the user is asked whether the file is to be converted to the OLGA/LedaFlow format.



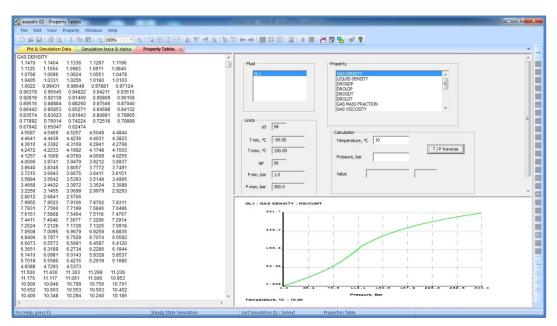
Calculating property values

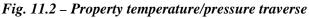
The user can select a fluid and a property from the available selection list.

The file is scrolled to the relevant part where values of the selected property are contained. In addition the user can ask to calculate:

- a selected point by giving one temperature and one pressure values.
- pressure traverse by giving one temperature value
- temperature traverse when one pressure value is selected

as shown on the next figure.



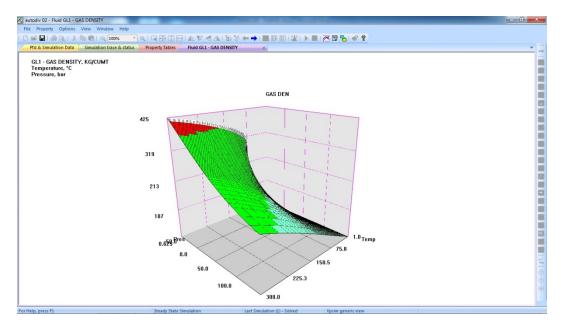


11.1 3D Property Surfaces

When the property tables file has been opened, the user can view the property surface which depends on temperature and pressure mesh defined.

An example of property surface generated by XPSIM is shown on the next figure.

Fig. 11.3 – A Fluid Property Surface



A property may not be defined on certain intervals of temperature and pressure where either the vapor or liquid phase does not exist.

In this case, the surface where the property does not exist is presented transparent and with no colorization.

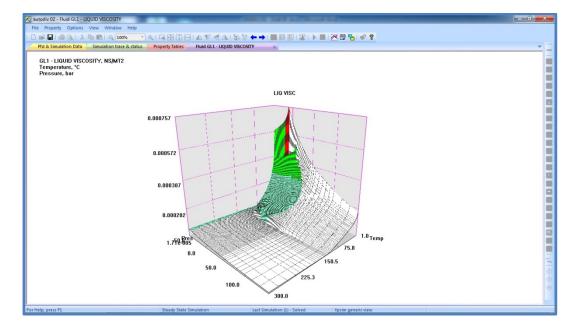


Fig. 11.4 – Fluid Property Surface with extrapolated values

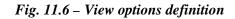
Customize colors and intervals

It is possible to modify the colors associated to the minimum, middle and maximum values and the number of subdivisions used for mapping intermediate values. This option can be set using the next dialog:

Fig. 11.5 – Interval and colors customization

fine colors for min/max values	8 23
Mininum value	
Middle value	
Maximum value	•
No of ranges 4	
ОК	Cancel

The appearance of property surface can be modified by scrolling the X,Y and Z axis. Besides the user can also modify the screen distance which operates like a zooming function.



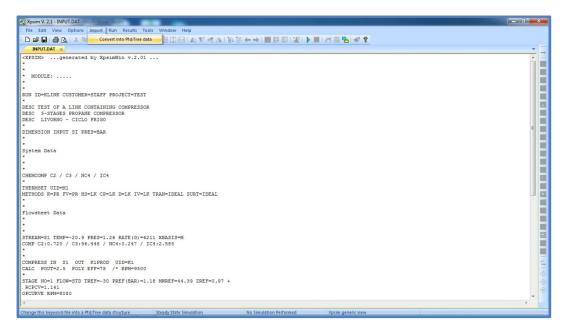
Axes rotations,	degrees	
X 20	ү ⁻⁴⁵ z [0
	ion, range (-10,+10)	
x 0.00	Y 5.00	
1		
	a sa cul	
	Reset Defaults	

12. Importing Keyword Files

The user can import key-word file in order to generate automatically the "Simulation data" interface and a related "Process Flow Diagram".

This function is available when a keyword input file is open as shown by the next figure.

Fig. 12.1 – Starting import activity



In the 'Import' menu the user can select the 'Convert into Pfd / Tree data' function.

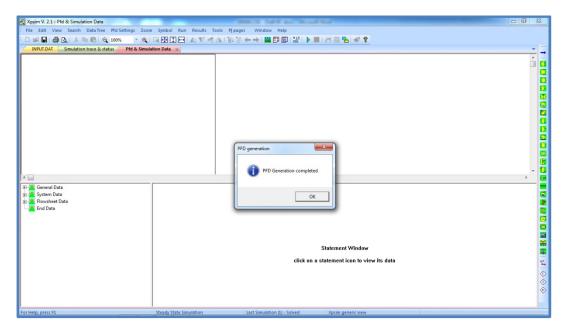


Fig. 12.2 - Import keyword file - activity trace

The keyword input file is processed to check the validity of the input statements.

When this first analysis is successfully completed, the input file is imported and the "Statement data tree" is generated.

13. How to prepare and run a simple simulation

In this chapter, the user will be guided *step by step* through the operations required to setup and run a simple flash calculation.

<u>Step 1 – Start XPSIM and select input mode</u>

Launch XPSIM and select the 'New' option from either the File menu or the relevant icon on the toolbar.

In the dialog *"Select new XPSIM file type"*, click on the *"simulation data linked to PFD data"* radio button.

In the dialog "*Define PFD size*" click the "**Standard**" button and then select the "A4 Horz" standard size.

At this stage the main application window is opened showing the main two windows.

🔣 Xpsim V. 2.1 - Pfd & Simulation Data	Constant Age of the second		
File Edit View Search Data Tree Pfd Settings Zoom	Symbol Run Results Tools P[pages Window Help		
D 🚅 🖬 🖓 D, 1 X lb 📾 1 Q 100% 👘 Q 1	R 🖽 🖬 El 🛦 🔍 🖪 A. I B. V. 🖛 🗰 🐯 🗐 🔐	I ■ I ※ 回 % I ≪ ?	
Pfd & Simulation Data 🗴 Simulation trace & status			*
×=			
er 📷 General Data 8 — System Data Howsheet Data Cind Data			
		Statement Window	
	cli	k on a statement icon to view its data	
			1
🔞 💷 🖉 🦉 🖉 🖉	A manufacture and the second second	And proting	🗐 " - Pr 🗑 🛋 👀 - 1040 💆

Fig. 13.1 - Main empty application windows

<u>Step 2 – Define basic problem data</u>

On the left tree view of the "Simulation Data" window click on the 'General Data' line in order to expand it and showing the icons related to RUN, DESC and DIMENSION statements.

Click on the **RUN** statement icon to display the relevant statement window, and fill the **ID**, **USER** and **PROBLEM** fields with some descriptive values, for example:

ID	CALC01
USER	PROCESS DEPT
PROBLEM	SIMPLE TEST

Click on the **DESC** icon to close the **RUN** statement and to open the **DESC** statement. This statement will show 5 empty lines. You should fill at least one line with some description, e.g.:

DESC "Simple flash calculation"

Click on the **DIMENSION** tree icon in order to close the **DESC** statement and to open the **DIMENSION** statement

In the **DIMENSION** statement select **"SI"** for "*Unit of measure system*" and **BAR** on the '*pressure uom*" line.

Step 3 – Define chemical components and thermodynamic methods

The user can now define the chemical components to be used in the simulation. This can be done by expanding the **"System Data"** category and filling the **CHEMCOMP** statement.

Instead of directly typing the component keywords under the "**Component Id**" column the user can choose to open the "*Define components*" dialog by using the related command under the "**Data**" menu.

	ent Family:	Saturated Hydrocarbo	ons	-	
ISOBU 2-MET 2,2-DII PENT/ NEOP	HYLBUTAN METHYLPR(ANE ENTANE NTANE	Electron	C4H10 C5H12 C5H12 C5H12 C5H12 C5H12 C5H12 C5H12 C5H12 C5H14	â c	ort — Alphabetical Chemical Formul
Selecte	d Componer	Add	Remove	10	
No	Key	Name	2	*	Change
	C1	METHANE			keyword
1		ETHANE		115	
	C2	ETHANE		E Up	
1	C2 C3	PROPANE			
1 2					
1 2 3 4 5	C3	PROPANE		Down	
1 2 3 4	C3 IC4	PROPANE ISOBUTANE			

Fig. 13.2 - Library component selection dialog

Select the 'Saturated hydrocarbon' family and then add 7 components from *methane* to *pentane*.

The user can then open the **THERMSET** statement and insert an identifier for the set of thermodynamic methods to be selected (e.g. **M1**)

In the **METHODS** statement select **SRK** (Soave-Redlich-Kwong) method for **'K values'**, and **LK** (Lee-Kesler) method for **'Vapor/liquid enthalpy'**.

<u>Step 4 – Save the partially defined problem</u>

At this point it would be better to save the data already defined.

The user can select the **"Save as"** command from the **"File"** menu. The command issues the standard Windows **"Save as"** dialog. The user can navigates within the folder he has already on the PC or create a new folder.

Then he can enter the file name:

"Simple Flash";

the file will be saved with the extension **.xpi**.

Step 5 – Create a Flash unit and its feed/product streams

At this point the user must define one unit operation at least, to do so :

- Click on the **'Process Flow Diagram'** window in order to activate the **"Unit operation** palette".
- Click on the "Flash" icon and afterward on the point where the flash should be placed.
- The 'Select Flash type' dialog is opened and, in this dialog, select the second option "Vapor and liquid product".

The flash symbol will be drawn on the selected point, by clicking on the symbol it is selected and the *resizing handles* will appear. The user can enlarge the symbol up the desired size.

At the same time, a **FLASH** statement, with a related **CALC** sub-statement, is created in the **'Flowsheet Data''** tree-view.

The user must now insert the feed and product streams. Let us start from the feed stream.

Click on the '**Stream'** icon and then at the feed stream initial point on the left of the 'Flash' symbol. By dragging the mouse up to the yellow handle and right-clicking on it, the stream drawing process is completed and the stream is connected to the Flash symbol.

Similarly, starting on the red handles the user can draw the vapor and liquid product streams.

During these operations the feed and product streams identifiers will be automatically inserted in the **FLASH** statement.

The result is shown on the next window.

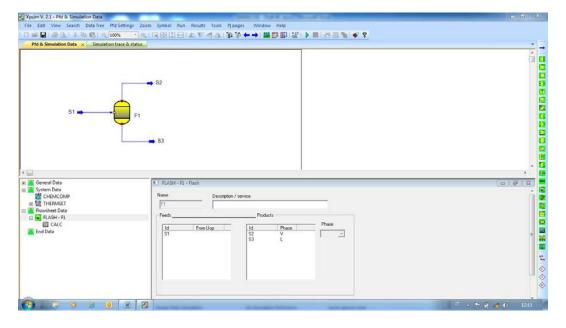


Fig. 13.3 - After FLASH definition

At this point the user must define the feed stream flow-rate, temperature, pressure and composition. The user must 'right click' on the **Flowsheet Data** category and select the 'Stream' command from the 'menu' that will appear.

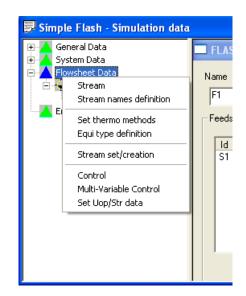


Fig. 13.4 - Insert object menu for Flowsheet Data

<u>Step 6 – Define feed stream composition and status</u>

The command will issue the '*Select stream*' dialog and in this the user must select the feed stream **S1**.

The 'STREAM – S1' statement is generated (with a related COMP sub-statement) and automatically opened. The user can insert the temperature (50°C), pressure (20 bar) and flowrate (1000 kg/h).

To insert the stream composition the user must open the COMP sub-statement which will be shown empty with a predefined component list equal to the list previously defined.

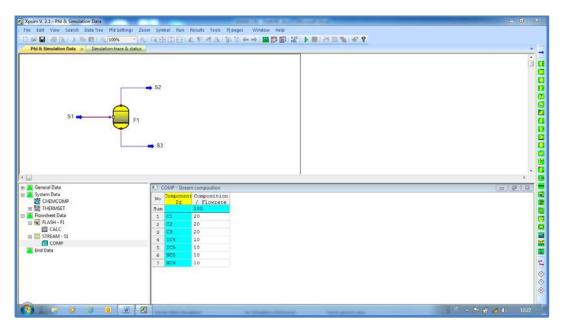


Fig. 13.5 - Stream composition window

The user can enter the molar composition as either fractions (the sum should be 1) or percent (the sum should be 100) for the 7 chemical components from C1 to NC5. Let us enter **20** for *C1*, *C2*, *C3* and **10** for *NC4*,*IC4*,*iC5*,*NC5*.

<u> Step 7 – Define Flash conditions</u>

Now the user must define flash conditions. Let us suppose that he wants to flash the feed at $4^{\circ}C$ and 14 bar.

By clicking on the **CALC** sub-statement, the user can open it; then he must select the **ISO** option for the **'flash type'** entry and insert the desired temperature and pressure values.

Input data are now complete.

<u> Step 8 – Run the simulation</u>

The user can then execute the simulation by starting the **'Run calculation'** command from the **'Run'** menu or by clicking on the **'Run'** icon on the toolbar.

The calculation starts.

The **'Simulation Trace and Status'** window is activated and the report the simulation calculation is reported. This window will remain on the top until it is closed by the user.

Step 9 – Browse simulation results

When the calculation is completed, the user can reactivate the "*Pfd and Simulation Data*" frame to have all the output functions available.

The user can:

- View the stream and unit operation results by double-clicking on the relevant symbols.
- View the global simulation results by selecting the related command from the '**Results**' menu.

14. Advanced options and functions

Some advanced options and functions are available under the **Tools** menu. Available functions are:

- Export object
- Import object
- Create stream data from results
- Export stream data to Excel
- Merge input file

Some of these functions are available only from the 'Pfd window'.

14.1 Export object

It is possible to export a stream or a unit operation from the current problem. This is usually done with the aim to import those data in another problem.

To perform this function the user must select either a stream or a unit operation and invoke the **'Export object'** command from the **'Tools'** menu.

The user will be prompted with the standard Windows file selection dialog for the definition of the name of the file onto which stream or unit operations data will be exported. As a standard the default extension '*.xpobj*' is used to identify an XPSIM object file.

Streams that do not have input data **may not** be exported.

14.2 Import object

It is possible to import either a stream or a unit operation into the current problem. The object to be imported must have been previously exported from another simulation problem.

To perform this function the user must invoke the **'Import object'** command from the **'Tools'** menu.

The user will be prompted with the standard Windows file selection dialog for the selection of the file to be used for importing stream or unit operations data.

The default file extension used for the identification of XPSIM object files is '.xpobj'.

Streams and unit operations imported will be placed at the right end of the process flowsheet.

14.3 Create stream data from results

The user can generate stream input data: i.e. *flow-rate, pressure, temperature and composition* from simulation results.

When this function is invoked the following dialog is prompted to the user.

Fig. 14.1 - Stream data creation - Options

Select Molar/Weight Stream Basis	×
Specify Partial Flowrates	
Total Flow Rate Basis	
Partial Flowrates / Composition Basis	
Molar C Weight	
OK	

The user may press 'Cancel' to terminate this function or 'OK' to continue. At the end, data of the selected stream are generated and included in the 'Flowsheet Data' category at the end of the relevant data tree.

This function is especially designed to help the user in the simulation of recycle problems.

Using this function the user can generate recycle data for streams after some iterations have been performed and eventually adjust the last generated values. Stream data are generated even if another instance of the same stream exists.

14.4 Export data to Excel

The user can export stream results onto the Microsoft Excel application. From the **Tools** menu and the '*Export data to Excel*' item, the following two commands are available:

- Options...
- Streams ...

The first command allows the user to modify some export options. The user can:

- Exclude some properties for either the total phase or for the liquid or vapor phases.
- Change the description of one or more properties.
- Change the unit of measure.

Units of measure are initialized with the values defined in the current simulation.

	ew				
	Exclude	Property	Description	Unit of Meas	sure
-		Time	Time basis	h	-
1		Stream id	Stream id		
2		Description	Description		
3		Temperature	Temperature	°C	•
4		Pressure	Pressure	bar	-
5		Phase	Phase		
6		Total stream	Total stream		
7		Molar flow rate	Molar flow rate	kmol	•
8		Weight flow rate	Weight flow rate	kg	-
9		Volume flow rate	Volume flow rate	m3	-
10		Vapor molar fraction	Vapor molar fraction		
11		Vapor weight fraction	Vapor weight fraction		
12		Component molar flowrate	Component molar flowrate	kmol	-
13	V	Component molar fraction	Component molar fraction		_
14		Component weight flowrate	Component weight flowrate	kg	-
15	 M	Component weight fraction	Component weight fraction	0	
16		Molecular weight	Molecular weight		
17	v	Molar enthalpy	Molar enthalpy	kJ/kmol	•
18		Weight enthalpy	Weight enthalpy	kJ/kg	-
19	M	Molar entropy	Molar entropy	kJ/kmol °C	-
20		Weight entropy	Weight entropy	kJ/kg °C	-
21	 M	Molar heat capacity	Molar heat capacity	kJ/kmol °C	-
22	····	Weight heat capacity	Weight heat capacity	kJ/kg °C	-
23		Molar density	Molar density	kmol/m3	
23	⊻	Weight density	Weight density	knovins kg/m3	•
				кдута	-
25		Vapor Phase	Vapor Phase		
26		Molar flow rate	Molar flow rate	kmol	•
27		Weight flow rate	Weight flow rate	kg	•
28		Volume flow rate	Volume flow rate	m3	•
29		Vapor component molar flowrate	Vapor component molar flowrate	kmol	•
30	✓	Vapor component molar fraction	Vapor component molar fraction		
31		Vapor component weight flowrate	Vapor component weight flowrate	kg	•
32	Z	Vapor component weight fraction	Vapor component weight fraction		
33		Molecular weight	Molecular weight		

Fig. 14.2 - Stream export to Excel - Options

The '*Streams* ...' command performs the data export onto MS Excel which should be installed on the PC running XPSIM.

14.5 Extract keyword input

Simulation data defined by the user can be extracted from the current problem by using the command *Extract keyword input file*' in the **Tools** menu.

Using this command 'simulation data' are written in the keyword format.

The standard Windows file save dialog is then issued allowing the user to select the folder and the file name he wishes to use.

14.6 Merge Input File

Using this function the user can include in the current simulation all the unit operations and streams defined in another input file.

Before using this function the user should make sure that all the unit operations and streams to be imported have identifiers differing from the objects defined in the current simulation. If not, the import operation will not be completed.

Streams and unit operations imported will be placed at the right end of the flow-sheet.

15. Dynamic Simulation

Using the basic Windows interface, the user can prepare and modify both steady state and dynamic simulations.

The input for a dynamic simulation run is created as that for steady state simulation. The unit operation palette will reflect the selected dynamic simulation environment showing a lower number of unit operation. Similarly, the statement selection menu will show only the statements allowed by the dynamic simulation in that context.

However when a dynamic simulation is started and no input errors are detected a new window, i.e. the '*Plant View Interface*' is created and displayed to provide the user with the interactive commands required to control the simulation.

15.1 Dynamic Option

To run a dynamic simulation the user must activate the '*Dynamic Simulation*' option by toggling this command of the **Options** main menu.

Options	View	Help	
Dyn	amic si	mulation	
	_		_

When the dynamic option is activated, new input files are considered dynamic simulation input file and the *Dynamic Option Simulation Engine* will be invoked when a run is started. Dynamic simulation input files are saved with the extension *.xdy*, e.g. *xyz_file.xdy*. By opening an input file with extension *.xdy* the dynamic simulation environment is automatically activated.

15.2 Plant View Interface

A Dynamic Simulation can be viewed and controlled through the '*Plant View Interface*' which mimics some operator control system displays.

When a dynamic simulation is started and no input errors are found, the initial simulation status is displayed through an instrument *'bar view'* as shown on the next figure.

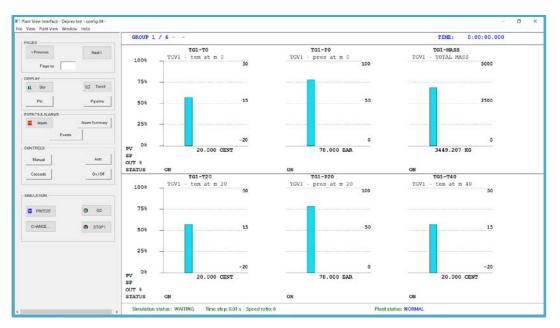


Fig 15.1 – Instrument bar view

This view is divided in two parts:

Left part	includes a number of command buttons
Right part	display instruments values, trends and alarms

Command buttons and their function are described in the next paragraph.

The right part of the 'plant view' shows instruments and controls defined in the dynamic simulation input according to the following criteria.

- Instruments and controllers, referenced by **GROUP** statements (defined in the SOLUTION DATA input category), will be grouped as defined and will occupy the corresponding initial pages.
- all remaining instruments and controllers are collected sequentially and groups of 6 elements are created.

Example: suppose the dynamic input defines two instruments groups as follows:

```
*
SOLUTION DATA
*
GROUP INST=TI-100,PI-100,FI-100 UID=GP-1 +
DESC='INLET CONDITIONS'
*
*
GROUP INST=C1,C2,PSV-1 UID=GP-2 +
DESC='CONTROLLER AND PSV'
*
```

The first two instrument pages groups will be GP-1 and GP-2

15.3 Command buttons

The left part presents a set of command buttons that can be used to control the dynamic simulation.

< Previous	Next>
Page no	
DISPLAY	
L Bar	M Trend
P&I	Unit Ops
ALARMS & EVENTS	
O Alarm	Alarm Summary
Eve	ents
CONTROLS	
Manual	Auto
Cascade	On / Off
SIMULATION	
FREEZE	GO
CHANGE	STOP!

Fig. 15.2 – Command Buttons

Buttons may be available or can be disabled depending on the status of simulation and the type of active display.

Buttons are divided in 4 groups as follows (from top to bottom):

Pages	select instrument pages display
Display	select display mode
Events and Alarms	manage alarms display
Controls	manage controllers
Simulation	control simulation execution

Pages

These buttons can be used to move from one instrument/control page to another. Available commands are:

< **Previous** to display the previous page

Next >	to display the next pages	
Page no	select the number of the page to view. This command is designed to jump to a given page when a large number of pages are defined in the simulation.	
<u>Display</u> The following buttons	are available:	
Bar	to view instruments/controller values as bars.	
Trend	to view instruments and controller values as trend graphs.	
Pfd	to view Pfd (process flow diagram) or P&I (process and instrument) pages if defined by the user.	
Unit Ops	to view the internal profile of some unit operations. This option applies to pipelines and distillation columns. The properties displayed by this view are those defined using the PLOT input statements in the OUTPUT DATA category. Default properties are elevation, pressure and holdup. When two or more unit operations are included in the current problem, the desired unit operation can be selected using the Previous or Next buttons.	

Events and Alarms

Buttons defined in this group can be used to display active alarms and alarm history summary. Alarm pages will be empty if no alarms have been added to the simulation input.

Alarm	to view alarm pages associated instruments/controller pages.
Alarm summary	to display alarm summary. Alarm summary presents the history of alarms as turned on or off by the dynamic simulation.
Events	to display the list of all events defined in the current simulation input. Events are listed according to the time sequence and are marked as: completed, active or waiting.

Controllers

Buttons included in this groups are designed to operate on PID controllers defined in the simulation input. These commands become active only when *a controller is selected* on the relevant bar display.

Manual	puts the controller in manual mode.
Auto	puts the controller in automatic mode.
Cascade	puts the controller in cascade mode.
On/Off	this button can be used to change the operation mode of the controller.
Simulation	

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These buttons can be used to control the dynamic simulation of the current problem. We should remember that interrupt time can be defined in the simulation input, so by default the simulation is carried on until a user's defined time interval has been reached. Using these buttons the user can override the values defined in the simulation input.

Available commands are:

Freeze	halts the simulation and puts execution in a 'waiting status'.	
Go	restarts the dynamic simulation.	
Change	in a 'waiting status', by pressing this button, the user interface is opened to allow the change of some simulation parameters.	
STOP	by pressing this button the current simulation is terminated.	

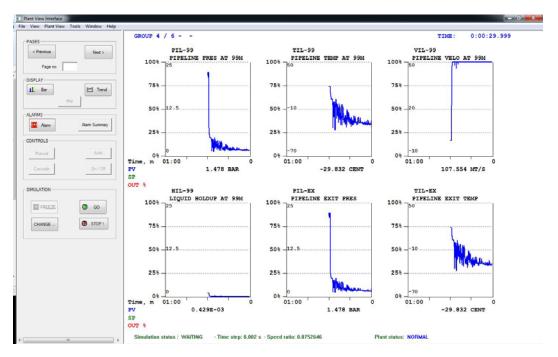


Fig 15.3 – Instrument trend view

15.4 Plant View Menu Commands

The Dynamic Plant Interface provides some other commands to control the dynamic simulation. These commands are presented in the next figure, which shows the menu pop-up window.

Fig.15.4 – Plant View Menu pop-up

Plan	Plant View Results Tools Window Help			
	Update Display Refresh Frequency			
	Instr / Controls graphs Unit Operations graphs			
	Close current plot file			

These commands allow the user to:

- Change the frequency of the display update.
- Request plots of instruments and control objects
- Request the plot of unit operation data

Each command is described in the following paragraphs.

15.5 Update Refresh Frequency

Bar and trend display are updated at a certain time frequency. The default refresh frequency is set at 1 seconds. I.e. the user interface polls the dynamic simulation engine to get new simulation results if they are available. If so, results are gathered and the current instrument page updated.

The default value can be changed using the menu command: "Update Display Refresh Frequency ..."

When invoked this command presents the following dialog:

Pla	ant Data Update Frequency	x	
	Update frequency, s	3	
1	ОК	Cancel	

The user can define a new value (greater of 1 second) for the Update Frequency.

15.6 Plotting trend and history graphs

In addition of the plotting requests defined by a user in the simulation input, it is possible to request at any time additional graphs.

Fig 15.4 – Instruments Selection Dialog

ements list Tag PI-1001 PI-1002 FI-1001 TI-1001 TI-1001 PI-2002 FI-2002 FI-2002 TI-2002 TI-2002 TI-2002 TI-2002 TI-111 PI-111	Type INSTR INSTR INSTR INSTR INSTR INSTR INSTR INSTR INSTR INSTR INSTR INSTR	Add->	Selected elements	9
<u>0</u> K			<u>C</u> ancel	

The left list presents all the instruments and controllers defined in the simulation. The user can select one or more elements and with the add button places them in the 'Selected' list. A maximum of 3 instruments can be selected.

When the dialog is closed by pressing the OK button the graphs of the relected instruments are requested to the simulation engine.

16. Managing P&I Pages

With XDSIM the user can define graphic pages of the process and instrument diagram (**P&I**) and to use them during the dynamic simulation for the display of plant values in a way similar to DCS pages.

In brief, the user can:

- prepare one or more drawings
- define for each drawing rectangular areas that will show instrument values
- Link each area to an instrument defined in the simulation input.

P&I	pages Tools Window	Help
	New collection	
	Open collection	
	Link for calculation	
	Remove link	

The user can:

- Create a new collection of P&I pages
- Open an already existing collection of P&I pages

When a collection of P&I pages has been prepared it can be:

- Linked for the new calculation
- *Released if previously linked.*

16.1 Open and view a collection

Information about a collection of pages is maintained in a file defined by the .pic extension. This file keeps information about the file that contains the graphic part and the instruments values to be displayed.

When a collection is opened, the first page is opened and displayed as shown on the next figure.

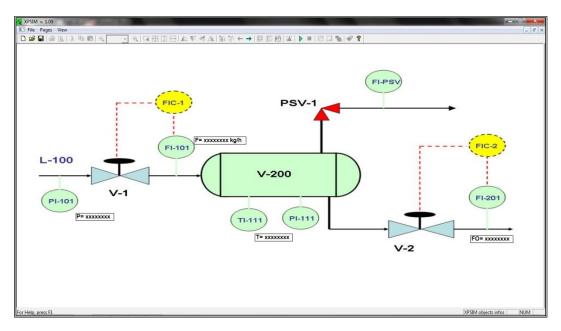


Fig. 16.1 – An example of Process & Instrument Diagram page

The windows show the first page and allows the user to move forward and backward to show each page.

The menu provides the following functions.

<u>File</u> Close

Save collection ...

Pages

Add page ... Delete page

View

Next page Previous page

16.2 Commands

The commands listed on the previous paragraph are described in more detail.

Close	close the display of the current page collection.
Save collection	save the current collection. A standard 'File Save' dialog is presented. The user can save the collection with its previous name or select a new file name.

Add page ... using this command a new page can be added to the current page collection. The graph of the new page must be an existing graphic file (jpeg format) with a .jpg extension. The user is prompted a standard 'File Open' dialog to select the graphic file of the new page.

Delete page	the current page is removed from the current collection. The related graphic file is NOT deleted.	
Next page	the next page, if existing, is displayed.	
Previous page	the previous page, if existing, is displayed.	

Notes & Remarks.

Graphic files *xxyyzz.jpg* selected for inclusion in the collection are not copied. The *.pic* file will only contain references to the *.jpg* files.

So while .pic files can be moved freely from one directory to another, *.jpg* file should be kept in their original directory in order to be linked through the *.pic* file.

However, in case *.jpg* files are moved from the original directory they can be 're-linked' by simply editing the *.pic* file with any text editor.

Links to the various .*jpg* files are described by the **PATH** keyword in the **<PAGE_LIST>** section, as in the following example.

```
<PAGE_LIST>
<PAGE>
<NO>1</NO>
<ID>PG-01</ID>
<DESC>hp separator</DESC>
<TITLE>Schema 03</TITLE>
<PATH>C:\YD\Pfd prova\Schema 03.jpg</PATH>
</PAGE>
```

16.3 Instruments and Control values

By right-clicking on the page window a context menu with the following commands is presented.

Insert run-time value Delete run-time value Modify run-time value

Each command can be available or disabled depending on the point on which the user rightclick with the mouse.

When the insertion of a new run-time value or the modification of an already defined value is requested a dialog is presented. This is discussed on the next paragraph.

16.4 Instrument Value Format

Information related to an instrument are defined by the following dialog.

Fig. 16.2 – Instrument value definition

Instrument / Control Description and Value	
Instrument / Control Tag	
Prefix	
No of characters 8	No of decimals 2
✓ Unit of measure	
Suffix	
ОК	Cancel

The user must define the Instrument (or Control) Tag that must match the name of an object defined in the simulation input.

In addition, the following parameters can be customized.

- an optional prefix string
- an optional suffix string

Default presentation of instrument values can be modified by defining:

- number of characters
- number of decimals
- unit of measure insertion

End of

XPSIM Windows Interface

User Manual