

# **UniSim® Plate Heat Exchanger Modeler**

**(referred to as UniSim® PHE)**

**Getting Started Guide**

**Honeywell**



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The information in this help file is subject to change over time. Honeywell may make changes to the requirements described. Future revisions will incorporate changes, including corrections of typographical errors and technical inaccuracies.

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# 1 Introduction

This Getting Started Guide forms part of the documentation supplied with each UniSim® Heat Exchanger program:

- UniSim® Heat Exchangers User Guide
- Getting Started
- Program Reference Guide.

The UniSim® Heat Exchangers User Guide is supplied as a pdf document with the UniSim® Heat Exchanger media. The Documentation media contains the UniSim® Heat Exchangers User Guide and all the other documents. The UniSim® Heat Exchangers User Guide is generic to all UniSim® Heat Exchanger programs. The Getting Started and Reference Guide are specific to each UniSim® Heat Exchanger program.

The Getting Started Guide assumes you have access to an installed copy of the UniSim® Heat Exchanger program, and takes you through some example cases provided with the program, so you can get a feel for its capabilities. It also describes how you can run a set of QA sample cases, and compare the output files with sample results, to confirm that the operation of the program is as it should be.

More detailed examples, showing how you can use the program to solve typical problems, are provided in Appendices to the program Reference Guide.

# Technical Support

Technical support is available by phone (1-403-509-1379 or 1-866-392-8748 toll free in North America), fax (1-403-216-2801).

E-mail support for customers with a current support contract for their product is available.

Honeywell	Email Address
Global	<a href="mailto:unisim.support@honeywell.com">unisim.support@honeywell.com</a>
North America	<a href="mailto:unisim.support@honeywell.com">unisim.support@honeywell.com</a>
Latin America	<a href="mailto:unisim.support.lar@honeywell.com">unisim.support.lar@honeywell.com</a>
Europe, Middle East, Africa	<a href="mailto:unisim.support.emea@honeywell.com">unisim.support.emea@honeywell.com</a>
Asia Pacific	<a href="mailto:unisim.support.ap@honeywell.com">unisim.support.ap@honeywell.com</a>

On-line support can be accessed via <http://www.honeywell.com/ps>.

When contacting us via email or phone, please include in your message:

Your full name, company, phone and fax numbers.

The software version you are using (shown in the Help menu, About UniSim...).

A detailed description of the problem (attach a simulation case if possible).

## 2 Getting Started

Included with your **UniSim® Plate Heat Exchanger Modeler** (referred to as **UniSim® PHE**) software are a number of example input files that can acquaint you with the program. These cases are fully defined and ready to run. You can simply open the cases and run UniSim® PHE to see the type of output that can be generated. This **Getting Started** will step you through one of these example cases, as a brief introduction to the UniSim® PHE architecture, input options and available output information.

A complete set of results for the sample input files is provided in a separate location for Quality Assurance purposes. See [Chapter 4 - Output](#) for details.

[Chapter 7 - Examples](#) of the UniSim® PHE Reference Guide section consists of a set of tutorials that you can follow to build different types of UniSim® PHE examples. By working through these examples you will familiarise yourself with the software data entry methods and the various input and output views.

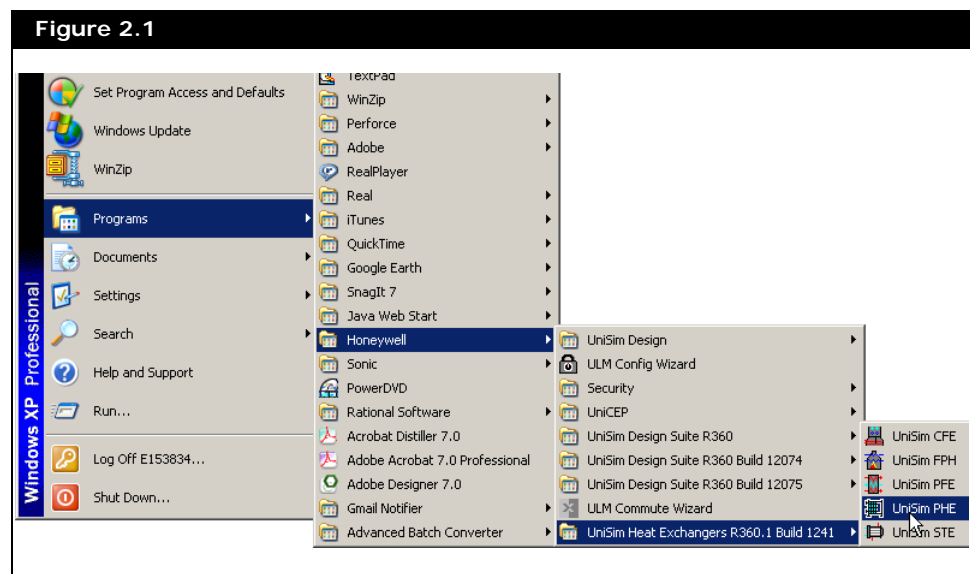
Before looking at and running the sample input files, it is important for you to know that essentially UniSim® PHE can perform four main types of calculations. When you begin modelling your own exchangers you will have to make the choice as to which calculation type you require. The examples in the UniSim® PHE Reference Guide section provide greater detail on the calculation mode options, but for the purposes of this **Getting Started**, they are briefly described below:

Calculation Types	
<b>Design</b>	For designing a heat exchanger to meet a heat load duty and pressure drop limits, which you specify.
<b>Simulation</b>	Determines the heat load, pressure changes and stream outlet conditions that will occur with a specified exchanger, with given stream inlet conditions.
<b>Checking</b>	Checks whether a heat exchanger of specified geometry will achieve a specified duty, or specified stream outlet conditions.
<b>Extend</b>	The program designs an exchanger using a plate type which you specified, by adjusting the number of plates and the pass arrangement.

## 2.1 Example 1

In this first example you will take a brief look at how an existing dataset can be reviewed, run and the outputs accessed.

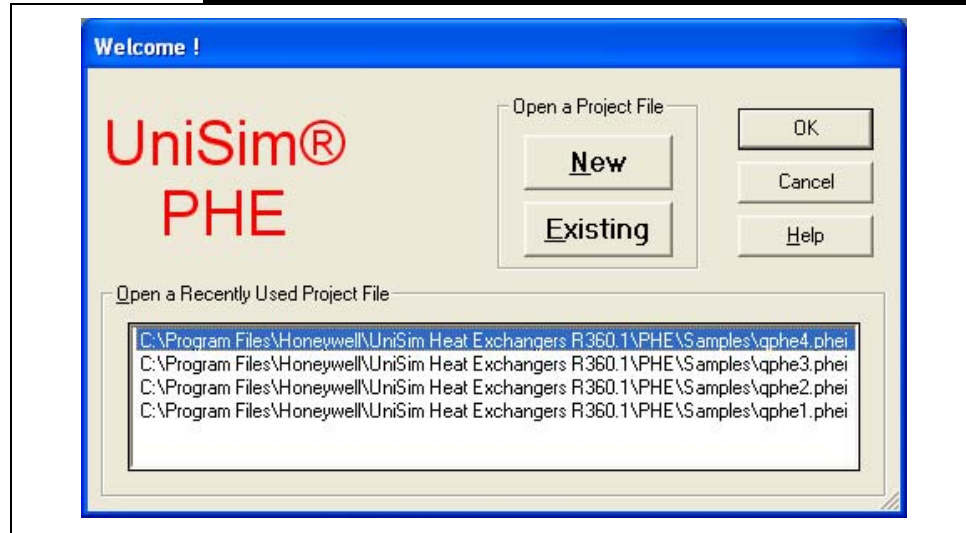
1. Start UniSim® PHE. This can be done several ways and will depend on how you set up your desktop. However, the two main ways are:
  - Clicking the PHE shortcut on the **Start** menu, **Programs**, **Honeywell**, **UniSIM Heat Exchangers Rxxx** and **UniSim PHE** menu;



- Selecting UniSim® PHE from within **Windows Explorer**.

Once the splash screen has cleared you will see the main UniSim® PHE window and over the top of this is the **Welcome!** dialog as shown in [Figure 2.2](#). From this view you can select to create a **New** file or an **Existing** file. If you have used UniSim® PHE previously, the project file you have worked with will appear in the **Recently Used Project File** list, making it easy to get back to files you were recently working on.

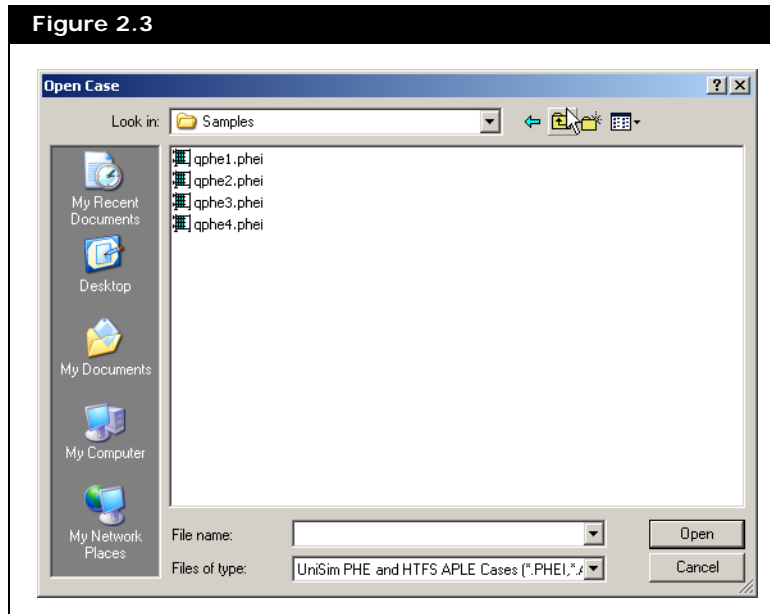
Figure 2.2



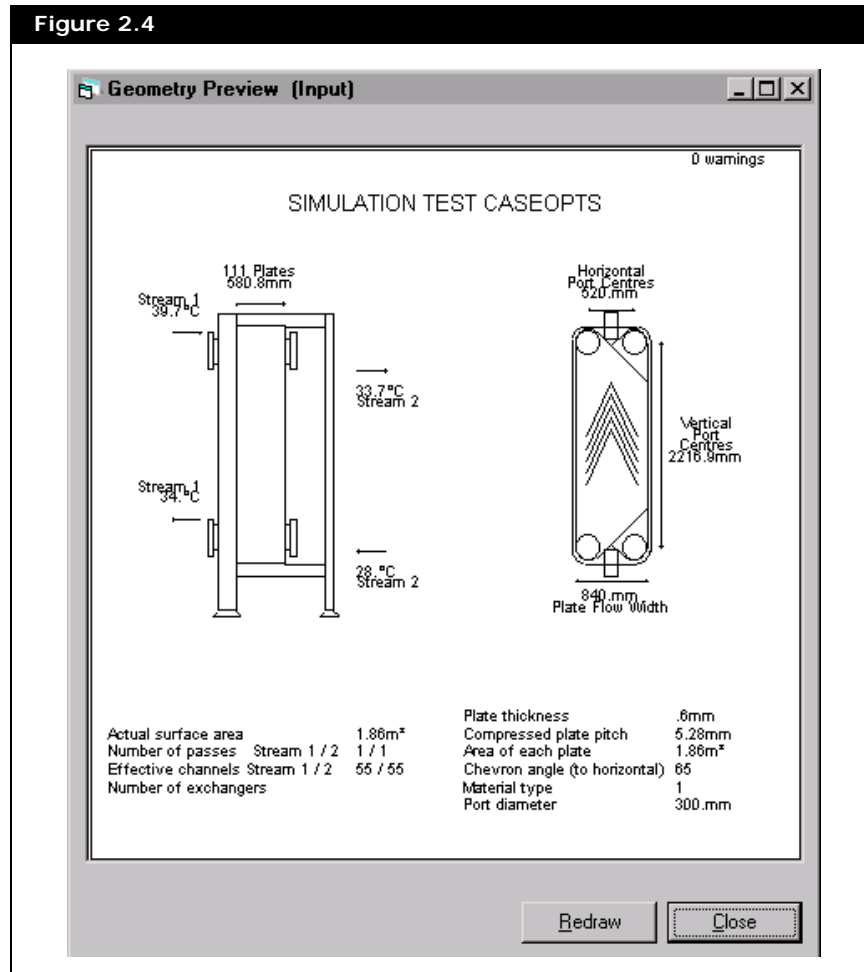
2. Select an **Existing** file; press the **Existing** button.
3. You are presented with an **Open File** screen. To open the file for this Getting Started, go to the

C:\Program Files\Honeywell\UniSim Heat Exchangers Rxxx\UniSim PHE\Samples directory.

(This is the default directory, the exact location may be different if you changed the UniSim® PHE destination directory during installation.) See [Figure 2.3](#) for the **Open File** view.



4. For this example, select the file **OPHE2.PHEI**. You will know when the file has been loaded because the **Exchanger Diagram** will appear within the UniSim® PHE window as shown in **Figure 2.4**.



**Tip –**

If you cannot remember where a file is located, there is a Find File utility to help you. Select Find File from the File Menu or use the keyboard shortcut by pressing <CTRL> + <F>.



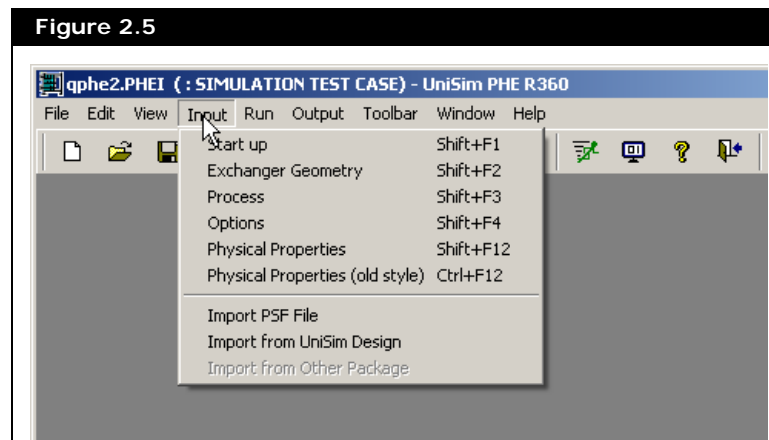
Open Button

Once UniSim® PHE has started you can open other files by selecting **Open** from the **File** menu. To use the **Welcome** screen again, select **Start Project** from the **View** menu. However, in either case you can only have one project active at any one time. For most common activities there are short-cuts. So to open a file you can either click on the **Open** button or use the keyboard shortcut by pressing <CTRL> + <O>.

Now look a bit closer at the project file you have opened:

1. Click on **Input** in the menu bar.

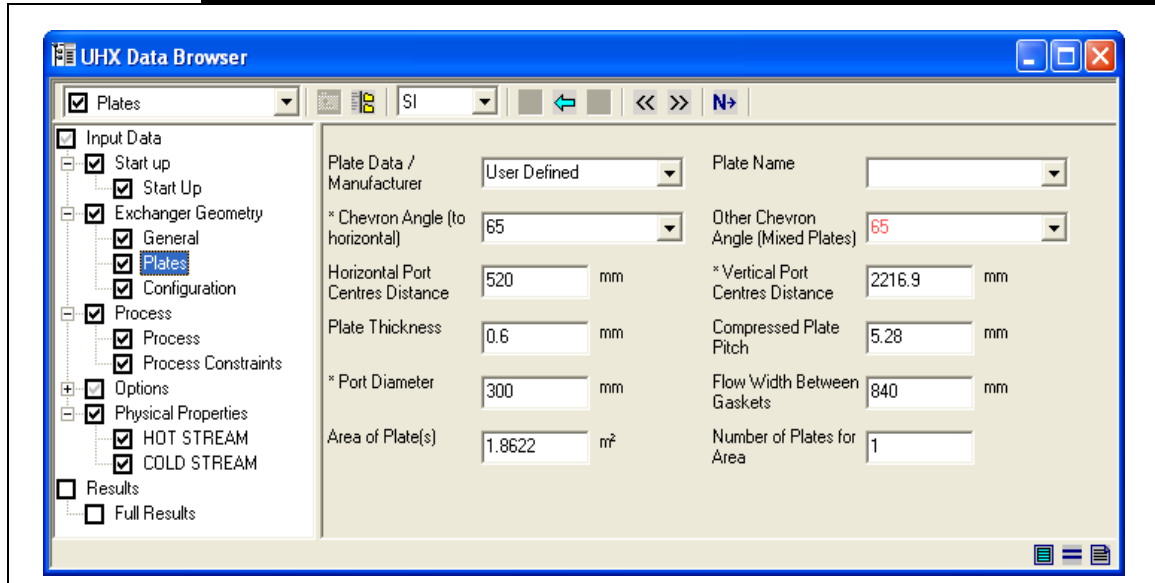
**Figure 2.5.** shows the **Input** menu, which gives access to all of the input data. The menu itself is divided into the different types of data you need to describe the heat exchanger and the conditions under which it will operate. These include different aspects of geometry, process conditions and physical properties.



**Note – You may see minor differences in the screens in your version of UniSim® PHE, compared with the figures in this manual.**

2. Select the **Exchanger Geometry** input form (see **Figure 2.6**) and you should see inputs which give the plate geometry information as **Horizontal** and **Vertical Port Centres Distance**, **Chevron Angle**, **Area** and so on. This screen is typical of most screens in that the data are entered in text boxes. On other screens you will also see drop-down menus. The drop-down menu shows a list of possible inputs where you simply select the appropriate item.

Figure 2.6

**Tip –**

**If at any point you are not sure what input you want or something is not clear, you can press <F1> and get context sensitive help.**

- Now look at process data by selecting **Process** from the **Input** menu or by clicking on the **Process Data** button.

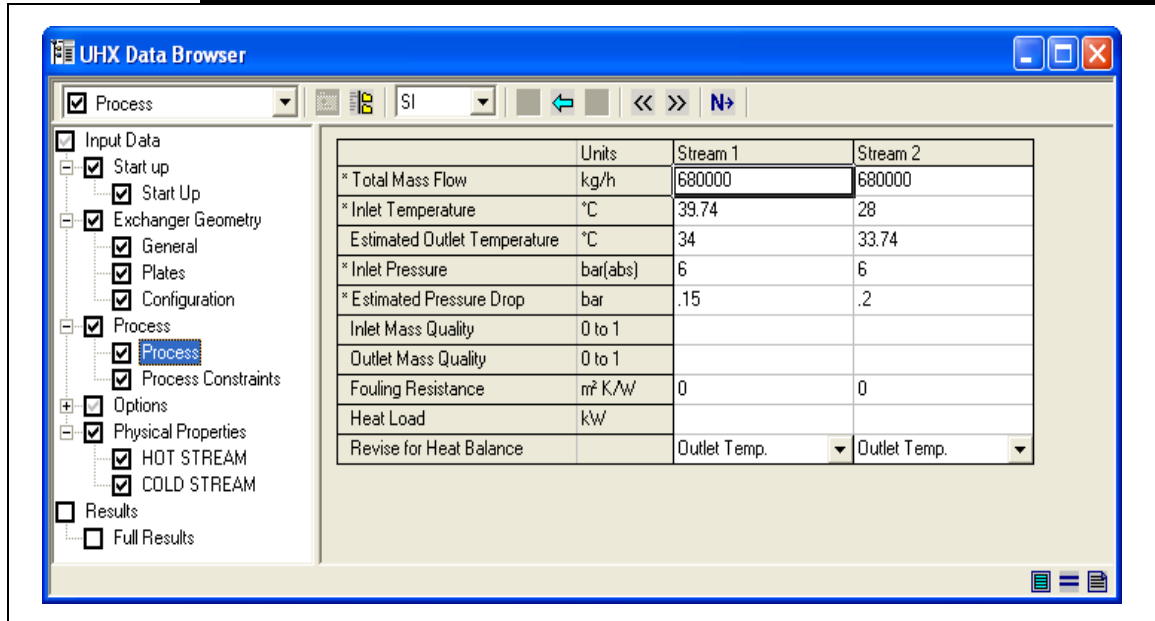


Process Data Button

**Figure 2.7** shows another form of input screen where the input items are arranged in a spreadsheet format. If the data do not fit on the screen, a scrollbar allows you to access the other input items. The spreadsheet view is used when data are required several times, in this case for the two streams in the exchanger. Note the left hand column is

for the hot stream and the right hand column is for the cold stream.

Figure 2.7



4. Finally, you will look briefly at the physical properties input by selecting **Physical Properties** under the **Input** menu or by clicking on the **Physical Properties** button.



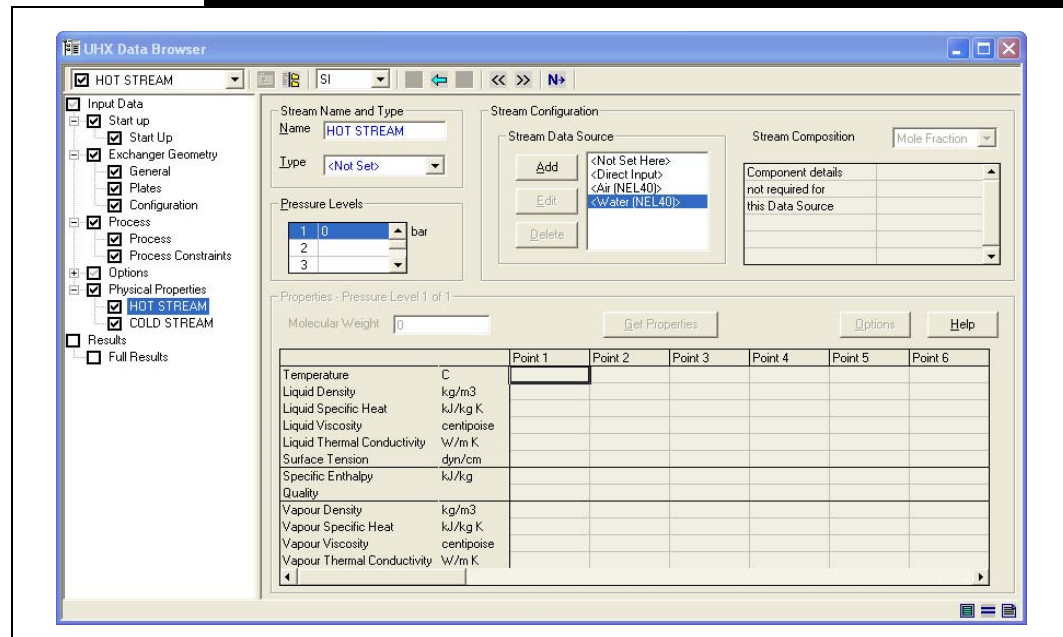
Physical Properties Button

The initial **Properties** screen, [Figure 2.8](#), shows the top level information about each stream.

Depending on the type of physical property data you are working with, you can either enter the property data for the stream directly or enter data for components and allow UniSim® PHE to perform vapour liquid equilibrium and mixture calculations. All of the physical property data,

are managed through these screens.

Figure 2.8



Since this is an existing case all the necessary data have already been entered.



Run Button

5. Run UniSim® PHE by doing **one** of the following:

- Click on the **Run** button in the Toolbar;
- Select the **Run** menu and then **Calculate All**;
- Press **<F4>**.

UniSim® PHE now displays a status window that reports progress of the run.

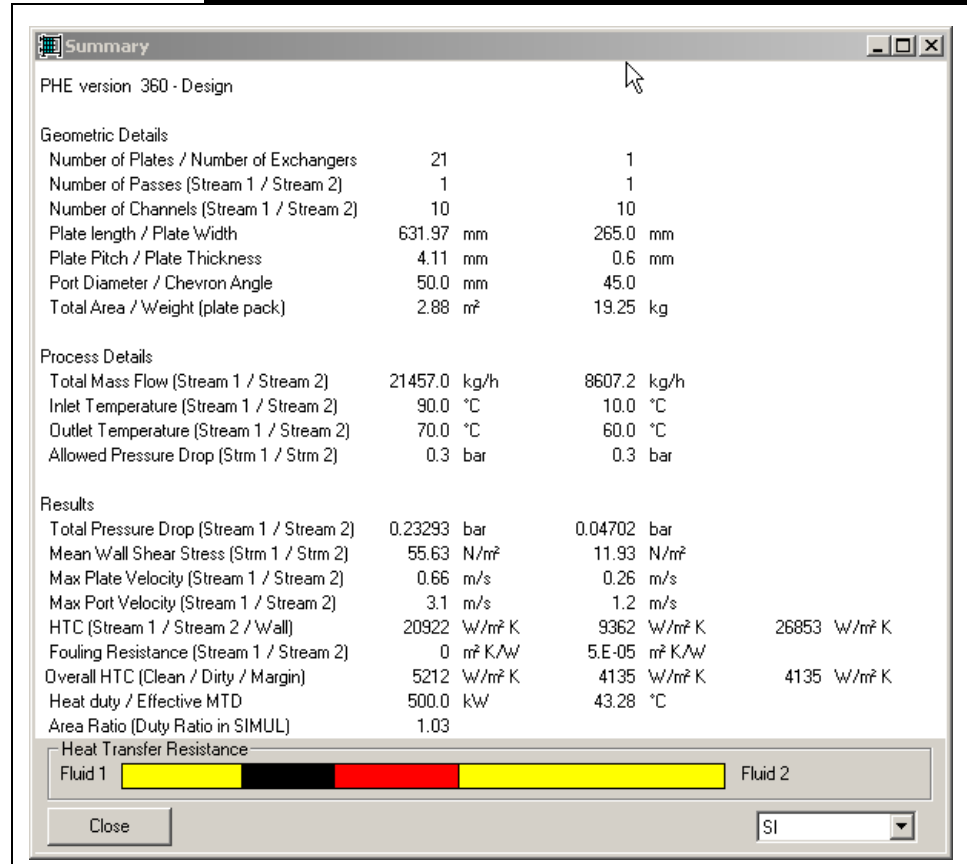
When the run completes there are three possible outcomes and corresponding outputs will be displayed.

- Successful run with no fatal errors and no warnings - a screen showing the **Results Summary** is displayed.
- Successful run with no fatal errors but with one or more warnings - the **Results Summary** is displayed together with a list of the warnings associated with the run.
- Failed run due to fatal errors - the **Error Log** is shown with a description of the errors that have occurred.

In this case you should see the **Results Summary** which shows the

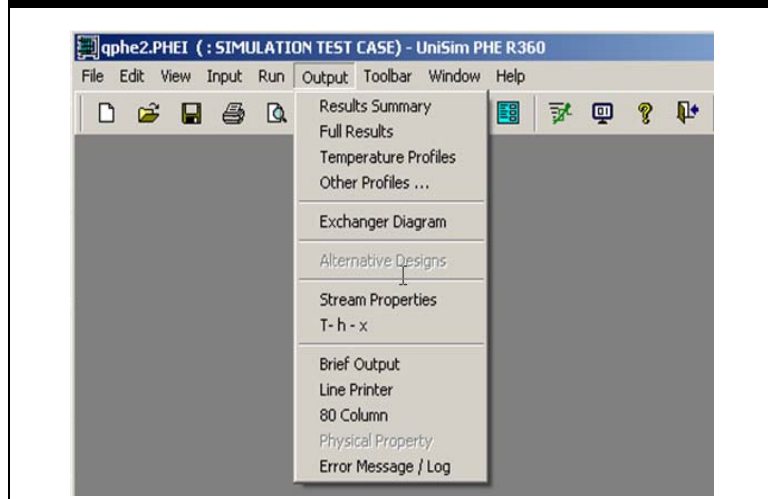
given **Geometric** and **Process Details**. See [Figure 2.9](#).

**Figure 2.9**



There are many different outputs that can be viewed from the **Output** menu, as shown in [Figure 2.10](#).

**Figure 2.10**



The outputs are collected together in various groups. The majority are Windows outputs, however, the final group of outputs are files generated directly by the calculation engine. They are all text files and contain different aspects of results generated. Of these, the one that you are most likely to use is the **Lineprinter Output**, which contains all of the important information, should you want to retain output. See [Figure 2.11](#).

Figure 2.11

```

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SEE REFERENCE MANUAL FOR COPYRIGHT AND DISCLAIMER NOTICES

22-JUN-2006 13:16 INPUT FILE: C:\Program Files\Honeywell\UNISIM\Examples\qphe2.PHEI

THE FOLLOWING INPUT DATA CARDS WERE SUPPLIED

START PHE26 FIX B SIMULL 11
001 OPTS B
002 SIMULATION TEST CASE
010 1 1
011 1 1 1 *
020 * 1 0
101 GEOM 3 User Defined
102 520 2216.9 0.6 5.28 300 840
103 1.8622 165 *
111 1 55 1 1 4
112 1 * * * * *
113 2 55 1 2 2
114 2 * * * * *
201 PROC 3
202 1 680000 * * 1
204 39.74 34 6 .15 0 *
205 * 3
207 * * * * 1
201 PROC 3
202 2 680000 * * 1
204 28 23.74 6 .2 0 *
205 * 3
207 * * * * 1
301 STRE 3 HOT STREAM
302 1 1 0 3 1 11.00
301 STRE 3 COLD STREAM
302 2 1 0 3 1 11.00
EXEC

THIS PROGRAM CONTAINS THE FOLLOWING UNK PACKAGES:

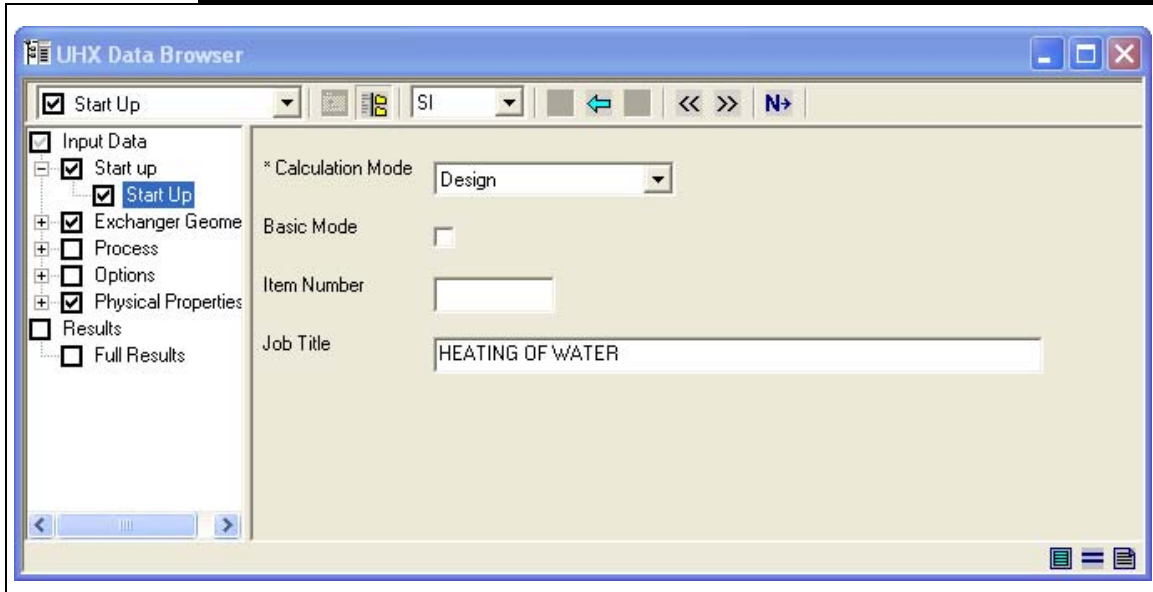
```

## 2.2 Example 2

In **Example 1** you will have seen that there is a lot of data that can be entered for UniSim® PHE. This demonstrates the full power of UniSim® PHE. For all calculation types you can reduce the amount of input you must consider by using **Basic Input Mode**.

1. Select **Open** from the **File** menu and select example **QPHE1.PHEI**. As this is a **Design** case you will initially be shown the **Process** input (as shown in [Figure 2.7](#) for the previous example).
2. Open the **Start up** screen by selecting **Start up** from the **Input** menu.

Figure 2.12



The **Start up** screen is also shown whenever you create a new file. It is here where you must specify the type of calculation that UniSim® PHE will perform. Notice that this is a **Design** case.

**Tip –**

**All the main input screens have keyboard short-cuts. For instance the Start up screen is <SHIFT>+<F1>; Physical Properties Data is <SHIFT>+<F12>.**

3. Check the **Basic Mode** check-box.

You will now see the **Process** form again as shown in [Figure 2.13](#). Notice that the amount of information displayed on the form has reduced and that the view now has only one tab instead of two. This

reduction of input fields is applied throughout the main input forms.

Figure 2.13

The screenshot shows a 'Process' dialog box with a table of input parameters. The table has columns for 'Units', 'Stream 1', and 'Stream 2'. The parameters are as follows:

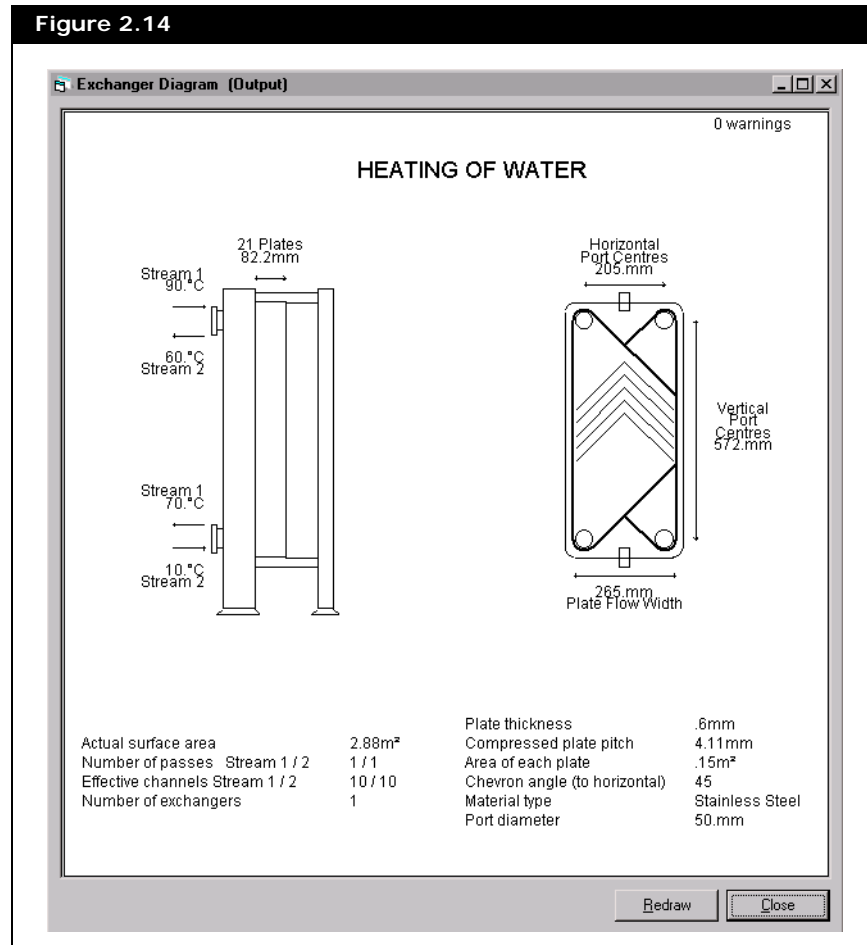
	Units	Stream 1	Stream 2
* Total Mass Flow	kg/h		
* Inlet Temperature	°C	90	10
* Required Outlet Temperature	°C	70	60
* Inlet Pressure	bar(abs)	2	2
* Allowable Pressure Drop	bar	0.3	0.3
Inlet Mass Quality	0 to 1		
Outlet Mass Quality	0 to 1		
Fouling Resistance	m <sup>2</sup> K/W		0.00005
Heat Load	kW	500	

At the bottom of the dialog box, there is a 'Units' dropdown set to 'SI', a checked 'Show units' checkbox, and buttons for 'Next', 'Apply', 'OK', 'Cancel', and 'Help'.

4. Look for **Exchanger Geometry** under the **Input** menu. You will find that it is greyed out. This is because in **Design** mode there is no need to specify any **Exchanger Geometry** input.

If you **Run** this case, then look at the **Output** menu, you will see that the **Exchanger Diagram** can be requested. See [Figure 2.14](#). This diagram is based on the results of the calculation, whereas the diagram shown when the previous example (UniSim® PHE Simulation) was

started, reflected the input data initially supplied.



This concludes the UniSim® PHE Getting Started chapter. Feel free to continue examining UniSim® PHE **Input** and **Output** options on your own, or to examine any of the other sample cases. Once you have completed your UniSim® PHE session, simply select the **Exit** button or **Exit** from the **File** menu to close UniSim® PHE.



Exit Button

# 3 QA Examples

A set of four sample UniSim® PHE cases, including both input and output files, are provided with UniSim® PHE for Quality Assurance (QA) purposes. As a check that you have installed UniSim® PHE correctly, you should run the input files and compare your results files with those provided.

UniSim® PHE files have the file extension **.PHEx** (where x is an indicator of the type of file - input or one of the various outputs). A full listing is given in the Reference Guide section, see [Section 6.3 - Project File Structure](#), and is covered in the [Help Text](#).

On installation, the QA files are stored in a subdirectory **QADATA** of the main PHE folder. The four sample cases have file names **qphe1.PHE1**, **qphe2.PHE2** etc. and files extensions **.QAx** instead of **.PHEx**. The different extensions are used to ensure that you cannot accidentally overwrite the QA files when running UniSim® PHE.

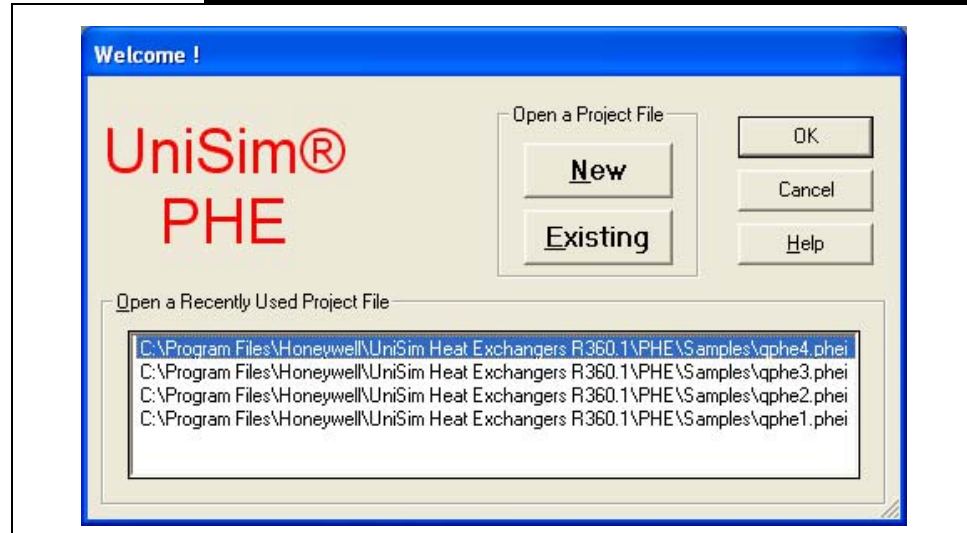
Copies of the QA input files, with the standard input file extension **.qax** are also saved in the **\UniSim Heat Exchangers Rxxx\UniSim PHE\QADATA** directory by the installation procedure.

## 3.1 Creating Output for Comparison

Using the **qphe1** example, a typical QA check on UniSim® PHE installation would be as follows:

1. Copy the **qphe1.qai** file from the **\UniSim Heat Exchangers Rxxx\UniSim PHE\QADATA** directory to some other directory, for example **\My Documents\My UniSim Heat Exchanger Cases**.
2. Rename the file, and give it the extension **.PHEx** for example **MYTEST1.PHE1**.
3. Start UniSim® PHE, you will see the following **Welcome** screen, click on **Existing** and select **\My Documents\My UniSim Heat Exchanger Cases\MYTEST1.PHE1**.

Figure 3.1



4. Run UniSim® PHE with this case.
5. Compare the results files from your run with the results files supplied with UniSim® PHE.

## 3.2 Comparing Outputs

Your calculated results are files named **MYTEST1.PHEX**, in directories **\My Documents\My UniSim Heat Exchanger Case** and these need to be compared with the supplied results files **QPHE1.QAx** in directory **\UniSim Heat Exchangers Rxxx\UniSim PHE\QADATA**.

Remember, the QADATA files supplied with UniSim® PHE have the extension **.QAx**.

The most important comparisons are the **.PHEV** and **.PHEL** files but other files can be compared as well. The **.PHEV** file is the **Brief Output** and is a relatively short file. You can do the comparison using a file difference utility, or by printing off the two files and looking for differences.

If the files are identical, (except for the run time and input file name recorded in the output), the QA check is successful. If the files differ slightly, but only in the fourth or fifth significant figure of one or two variables, the QA check on this example is also successful. If there are more significant differences, consult Honeywell.