# UniSim® Feedwater Heat Exchanger Modeler

## (referred to as UniSim® FWH)

### 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.

For further information please contact

Honeywell
300-250 York Street
London, Ontario
N6A 6K2
Telephone: (519) 679-6570
Facsimile: (519) 679-3977



Prepared in Canada.

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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 installation 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 Exchangers programs. The Getting Started and Reference Guide are specific to each UniSim® Heat Exchangers 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 it 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** | unisim.support@honeywell.com |
| **North America** | unisim.support@honeywell.com |
| **Latin America** | unisim.support.lar@honeywell.com |
| **Europe, Middle East, Africa** | unisim.support.emea@honeywell.com |
| **Asia Pacific** | unisim.support.ap@honeywell.com |

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® Feedwater Heat Modeler** (*referred to as **UniSim® FWH***) software are a number of example input files that can acquaint you with the program. The cases are fully defined and ready to run. You can simply open the cases and run UniSim® FWH to see the type of output that can be calculated. This **Getting Started** will step you through one of these example cases, as a brief introduction to the UniSim® FWH 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 3 - QA Examples**.

A set of tutorials showing you how to set up input files for (different) specific problems is included in **Chapter 5 - Examples**, of the Reference Guide.

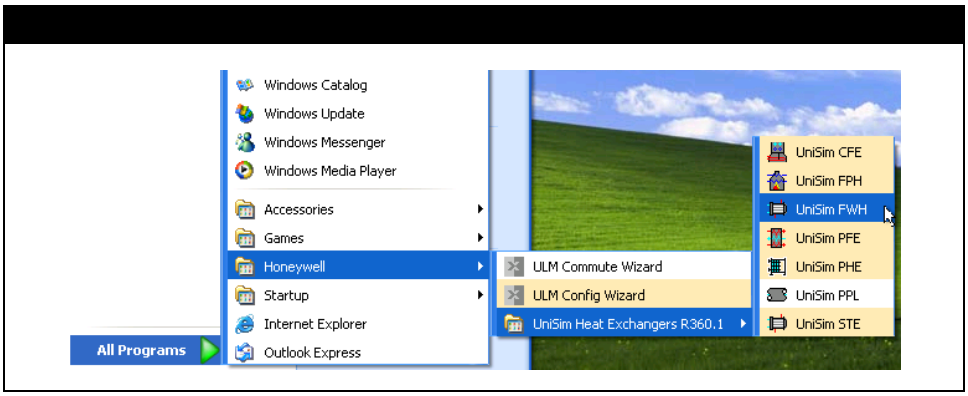
Before examining and running the example input files, it is important to define the main types of calculations that UniSim® FWH can perform. These allow you to calculate the performance of feedwater heaters. The examples in the Reference Guide will elaborate on this, but for now we will just describe the calculations:

| UniSim® FWH Calculation Modes | |
|---|---|
| **Simulation** | This mode is appropriate when you wish to calculate the heat duty achieved in a fully specified heater design. You should specify the extraction steam inlet state, the feedwater inlet conditions and mass flowrate as well as the heat geometry. The program then calculates the extraction steam flowrate and the heat transfer rate. |
| **Checking** | This mode is intended for use at the design stage when you wish to calculate the surface area required to achieve a specified heat duty. You should specify the heater geometry, the inlet and outlet state of the extraction stream, the feedwater flowrate, and the feedwater inlet and outlet temperatures. UniSim® FWH then calculates the required surface area. |

# 2.1 Example 1

In this first example we will take a brief look at how an existing data set can be reviewed, run and the outputs viewed.

1. Start UniSim® FWH. This can be done several ways and will depend on exactly how you set up your desktop. However, the two main ways are:
   - clicking the UniSim FWH shortcut on the **Start** menu then **Programs**, **Honeywell**, **UniSim Heat Exchangers Rxxx** and **UniSim FWH** menu or
   - select FWH from within **Windows Explorer**.




Once the splash screen has cleared you will see the main UniSim® FWH 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® FWH 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.

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

   C:\PROGRAM FILES\HONEYWELL\UniSim Heat Exchangers Rxxx\UniSim FWH\Samples directory.

   (This is the default directory, the exact location may be different if you changed the UniSim® FWH destination directory during installation.) See **Figure 2.3** for the **Open File** view.
4. For this example, select the file **QFWH1.FWHI**, which is for a 3-zone heater in **Checking** mode. The **Process Diagram** will appear within the UniSim® FWH window. See **Figure 2.4**.

Once UniSim® FWH has started you can open other files by selecting

**Figure 2.2**

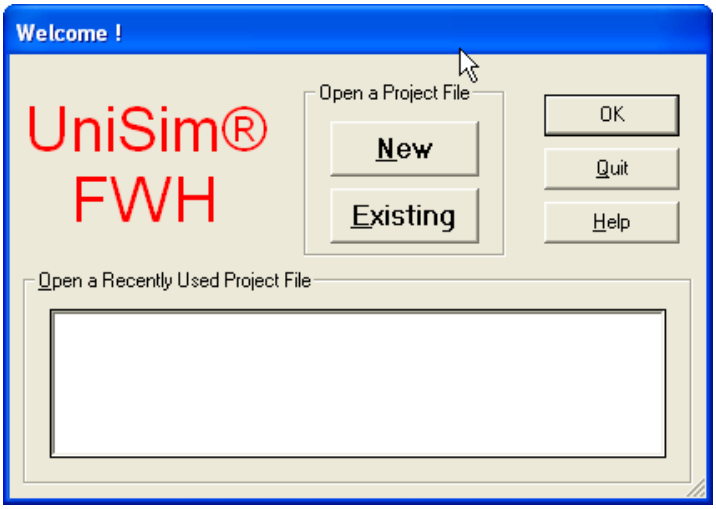
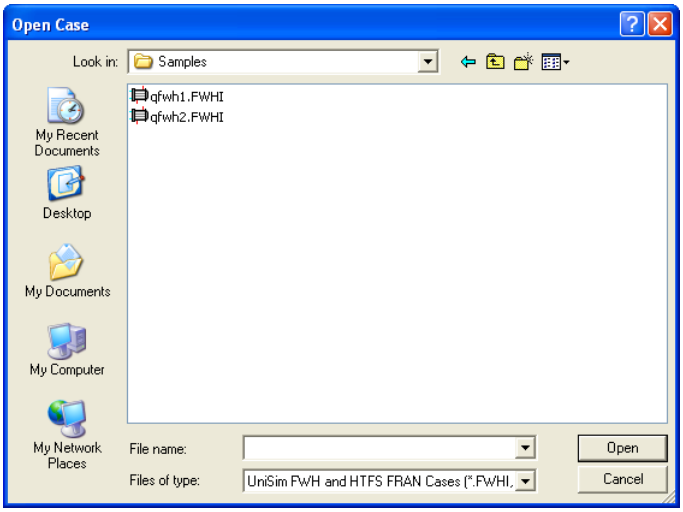



**Figure 2.3**



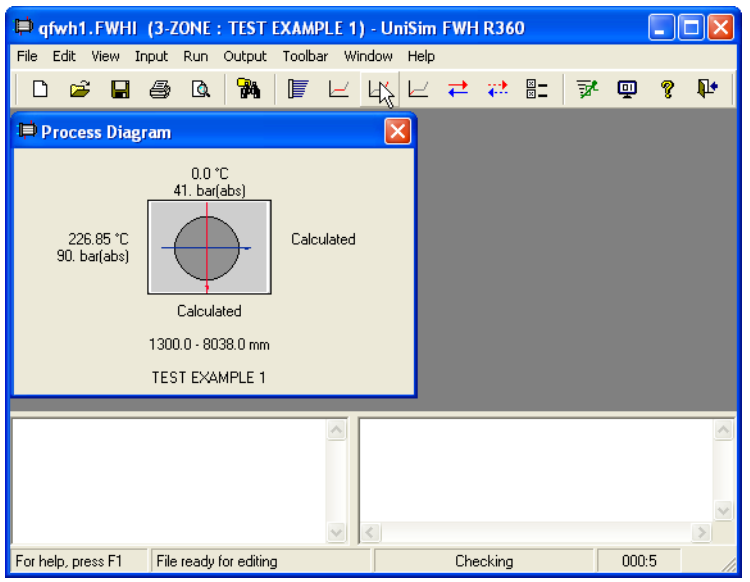

**Open** from the **File** menu. To use the **Welcome!** screen again, select **Start Project** from the **View** menu. However, in either case you can only have one project active at any one time. For most common activities there are short-cuts. So to open a file you can either click on the ***Open***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

Open Button

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

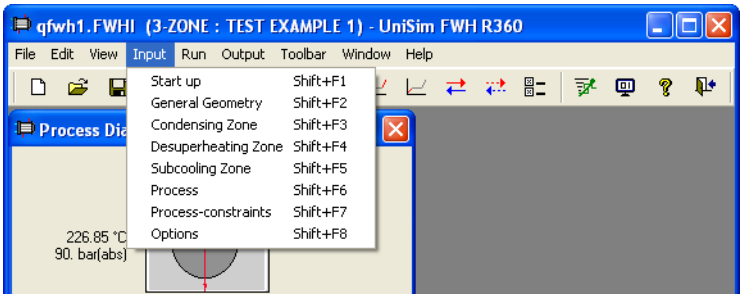
1. Click on **Input** in the menu bar.

**Figure 2.5** shows the **Input** menu, which gives access to all of the input data. The menu itself is divided into 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 and process conditions.

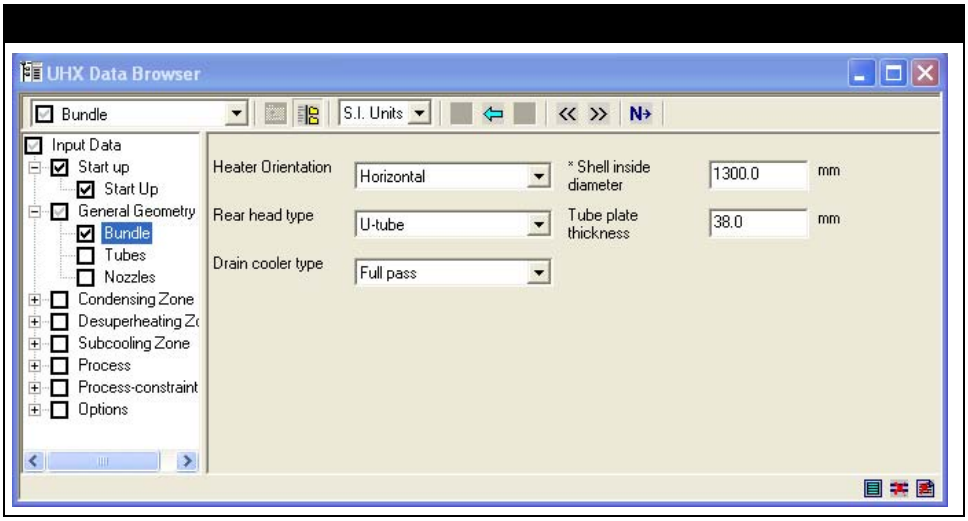
**Figure 2.5**




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

2. Select the **General Geometry** input form (see **Figure 2.6**) and you should see inputs which give the basic exchanger geometry. This screen is typical of most screens in that data are entered either in a text box or via a drop-down menu. The drop-down menu shows a list of possible inputs where you simply select the appropriate item.

> **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.**




Process Data Button

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

**Figure 2.7** shows the process data input screen.

4. Run UniSim® FWH by doing one of the following:
   - Click on the ***Run*** button in the Toolbar.
   - Select the Run menu and then **Calculate All**.
   - Press **<F4>**.

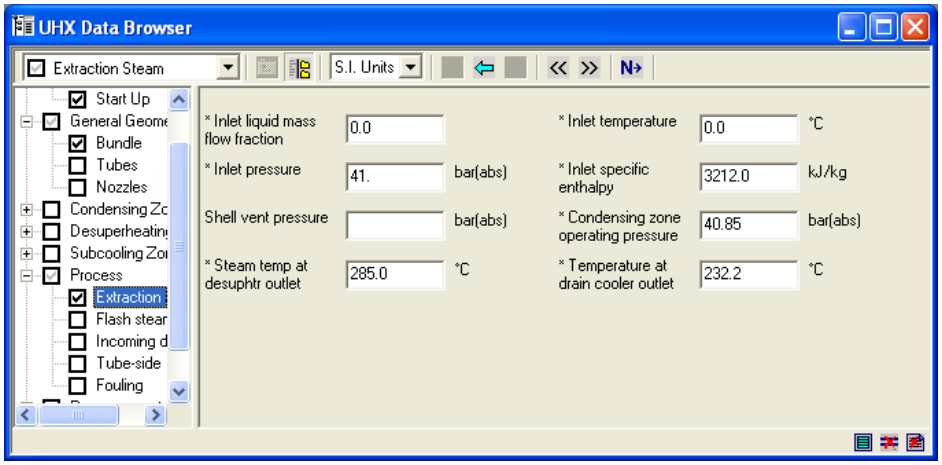
Run Button

UniSim® FWH 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 warnings associated with the run.

**Figure 2.7**




- Failure 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**.

# 2.2 Example 2

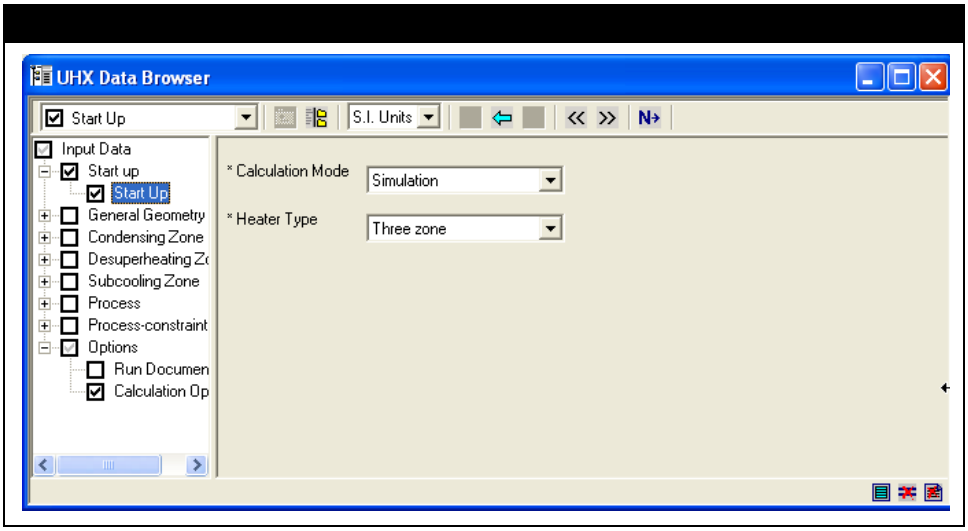
This example demonstrates how UniSim® FWH operates in **Simulation** mode. The heater in the previous example is used. You will have to change the calculation mode to **Simulation** in the **Start up** screen but keep the **Heat Type** set to **Three Zone**.

1. Use **Close All** from the **Window** menu to close all the current windows.
2. Show the **Start up** screen by selecting **Start up** from the **Input** menu. The **Start up** screen is also shown whenever you create a new file. It is here where you must make the decision about what type of calculation will be performed.

> **Tip -**
>
> **All the main input screens have keyboard shortcuts. For instance the Start up screen is <SHIFT>+<F1>.**

> **Note that in the Process Data the following items are only required in Checking mode and are not displayed in Simulation mode.**

- Feedwater outlet temperature (Process/Tube-side)
- Condensing section operating pressure (Process/Extraction steam)

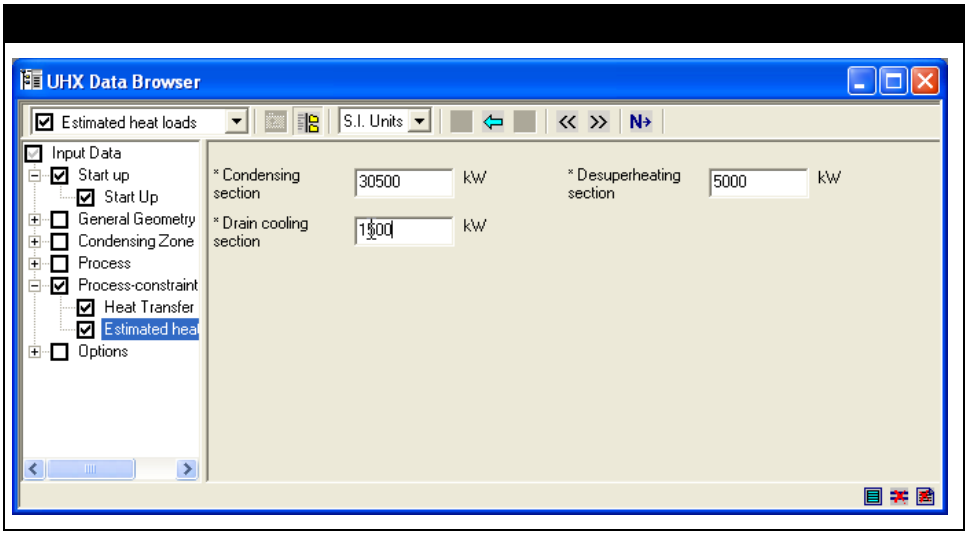



- Steam temperature at desuperheater outlet (Process/Extraction steam)
- Drains temperature at drain cooler outlet. (Process/Extraction steam)

3. In **Simulation** mode you should also estimate heat loads for each of the parts of the heater. These values are used by the program to set up initial conditions for the simulation. You should enter these

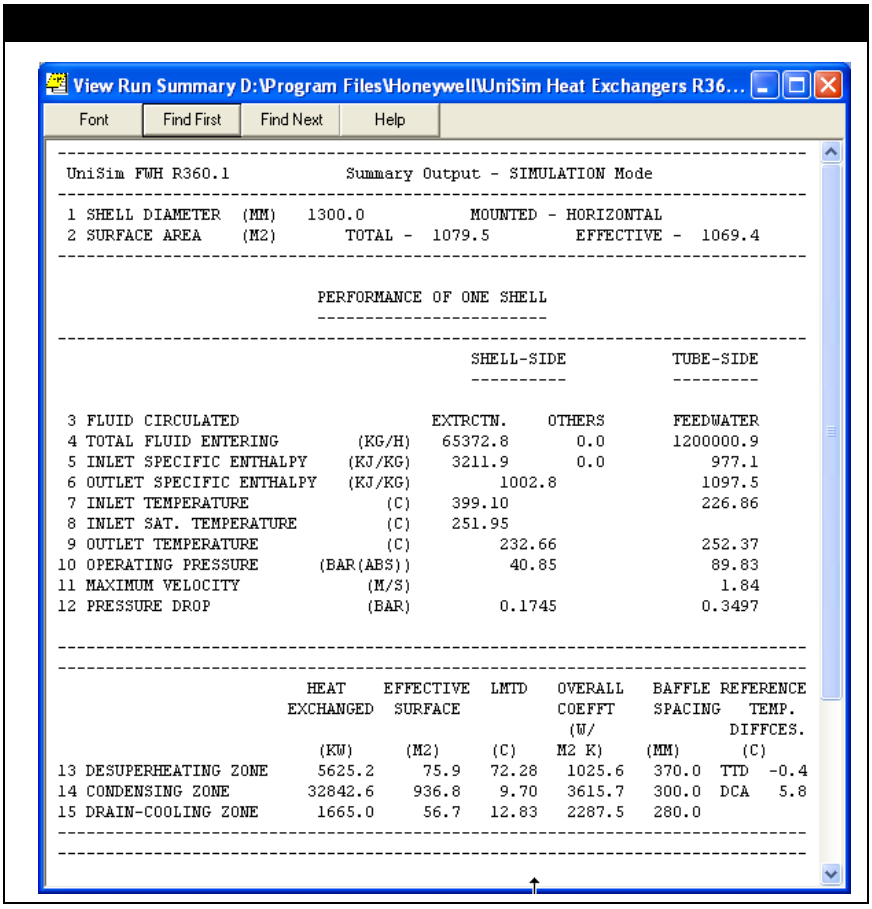
| | Value |
|---|---|
| **Estimated Heat Load - Desuperheater** | 5000 kW |
| **Estimated Heat Load - Condensing Section** | 30500 kW |
| **Estimated Heat Load - Drain Cooler** | 1500 kW |

data in the **Process-constraints** form.



Run Button

4. From the **Run** menu, select **Calculate All**, or click on the ***Run*** button on the Toolbar. In response to the **Warning** regarding changed data in the input file, click on the ***No*** button, or click on ***Yes*** and save the data to a different file name. You should now see a **Results Summary** screen. (See **Figure 2.10**)




UniSim FWH R360.1 Summary Output - SIMULATION Mode

1 SHELL DIAMETER (MM) 1300.0 MOUNTED - HORIZONTAL
2 SURFACE AREA (M2) TOTAL - 1079.5 EFFECTIVE - 1069.4

PERFORMANCE OF ONE SHELL

| | | | SHELL-SIDE | | TUBE-SIDE |
|---|---|---|---|---|---|
| 3 | FLUID CIRCULATED | | EXTRCTN. | OTHERS | FEEDWATER |
| 4 | TOTAL FLUID ENTERING | (KG/H) | 65372.8 | 0.0 | 1200000.9 |
| 5 | INLET SPECIFIC ENTHALPY | (KJ/KG) | 3211.9 | 0.0 | 977.1 |
| 6 | OUTLET SPECIFIC ENTHALPY | (KJ/KG) | 1002.8 | | 1097.5 |
| 7 | INLET TEMPERATURE | (C) | 399.10 | | 226.86 |
| 8 | INLET SAT. TEMPERATURE | (C) | 251.95 | | |
| 9 | OUTLET TEMPERATURE | (C) | 232.66 | | 252.37 |
| 10 | OPERATING PRESSURE | (BAR(ABS)) | 40.85 | | 89.83 |
| 11 | MAXIMUM VELOCITY | (M/S) | | | 1.84 |
| 12 | PRESSURE DROP | (BAR) | 0.1745 | | 0.3497 |

| | | HEAT EXCHANGED (KW) | EFFECTIVE SURFACE (M2) | LMTD (C) | OVERALL COEFFT (W/ M2 K) | BAFFLE SPACING (MM) | REFERENCE TEMP. DIFFCES. (C) |
|---|---|---|---|---|---|---|---|
| 13 | DESUPERHEATING ZONE | 5625.2 | 75.9 | 72.28 | 1025.6 | 370.0 | TTD -0.4 |
| 14 | CONDENSING ZONE | 32842.6 | 936.8 | 9.70 | 3615.7 | 300.0 | DCA 5.8 |
| 15 | DRAIN-COOLING ZONE | 1665.0 | 56.7 | 12.83 | 2287.5 | 280.0 | |

This concludes the UniSim® FWH Getting Started chapter. When you have completed your UniSim® FWH session, simply select the ***Exit*** button or **Exit** from the **File** menu.

Exit Button

# 3 QA Examples

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

UniSim® FWH files have a file extension .FWHx (where x is an indicator of the type of file - input or one of the various outputs). A full listing is given in the **Help Text**.

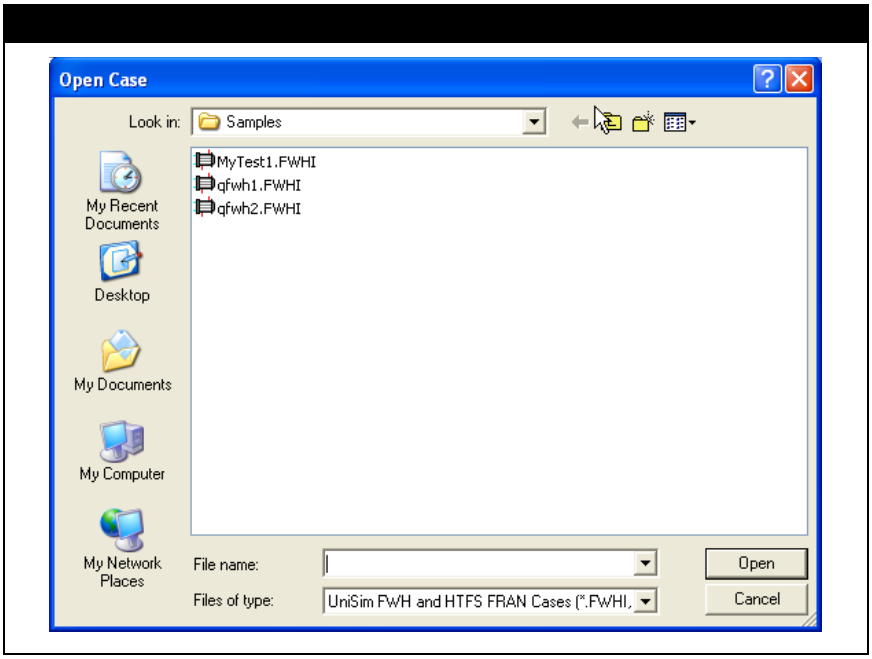
On installation, the QA files are stored in a subdirectory **QADATA** of the directory containing the main FWH folder. The two sample cases have file names **QFWH1** and **QFWH2**, and file extensions .QAx instead of .FWHx. The different extensions are used to ensure that you cannot accidentally overwrite the QA files when running UniSim® FWH.

Copies of the QA input files, with the standard input file extension .FWHI are put in the **\UniSim FWH\QADATA** directory by the installation procedure.

## 3.1 Creating Output for Comparison

Using the **QFWH1** example, a typical check on UniSim® FWH installation would be as follows:

1. Copy the **QFWH1.QAI** file from the **\UniSim Heat Exchangers Rxxx\UniSim FWH\QADATA** directory to some other directory, for example **\My Documents\My UniSim Heat Exchanger Cases**.
2. Rename the file, and give it the extension **.FWHI** for example **MYTEST1.FWHI**.
3. Start UniSim® FWH, you will see the **Welcome** screen, click on ***Existing*** and select **\My Documents\My UniSim Heat Exchanger Cases\MYTEST1.FWHI**.
4. Run UniSim® FWH with this case.
5. Compare the results files from your run with the results files supplied with UniSim® FWH.
6. Checks may be repeated with the other QA files supplied.




# 3.2 Comparing Outputs

Your calculated results are files named **MYTEST1.FWHx**, in directory **\My Documents\My UniSim Heat Exchanger Cases** and these need to be compared with the supplied results files **QFWH1.FWHx** in directory **\UniSim Heat Exchangers Rxxx\UniSim FWH\QADATA**.

Remember, the **QADATA** files supplied with UniSim® FWH have the extension .FWHx.

The most important comparisons are the **.FWHV** and **.FWHL** files but other files can be compared as well. The **.FWHV** file is the **Results Summary** 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 exactly identical, 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.