
SuperSystems
incorporated

# FURNACE UTILIZATION AND REPORTING SYSTEM

## TRACKING AND REPORTING SOFTWARE

# OPERATIONS MANUAL

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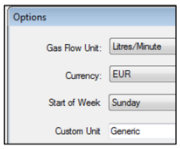
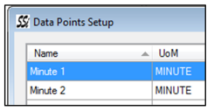
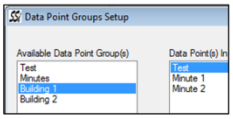
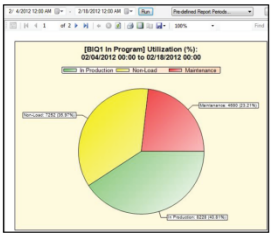
## Introduction

Part of the SSi SuperDATA suite of programs, the **Furnace Utilization Reporting System (FURS)** provides powerful tools for analyzing and generating reports on utilization of furnace equipment. FURS works seamlessly with SuperDATA, generating reports and visual graphs based on log file data created by SuperDATA. The cost of fuel to run a furnace (or group of furnaces) can be estimated based on log data and rates provided by the user. FURS allows for customized scripting based on VBScript.

The setup diagram below shows the suggested procedure for installing, configuring, and using FURS.

## Setup and Use Diagram

| Step | Result | See Page... |
|---|---|---|
| Verify Prerequisites |  FURS prerequisites are installed. These include .NET Framework 3.5 or higher and, if using load data, SQL Server 2008 R2 Express Edition or higher. | 6 |
| Install Furnace Utilization Reporting System |  FURS is installed and ready to be opened. | 6 |
| Configure Options |   Options are configured for gas flow unit; currency type; start of the week; any custom unit needed for reporting purposes; and rates for electricity, gas, and the custom unit (if set up). | 17 |
| Create Data Points |   Data Points are created for measurable properties of a furnace. | 17 |
| Create Data Point Groups; Assign Data Points to Groups |   Data Point Groups are created. Each group represents a particular area, location, or other logical grouping of Data Points.<br><br>Data Points are categorized into appropriate Data Point Groups, allowing for accurate classification when reporting. | 19 |
| Run Reports |  Reports are generated by FURS and used for cost/productivity analysis and planning. | 22 |

## Prerequisites

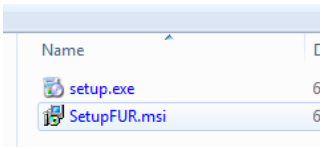
FURS has some prerequisites in order to run properly. Windows XP or higher operating system is required. Windows 7 or higher is recommended.

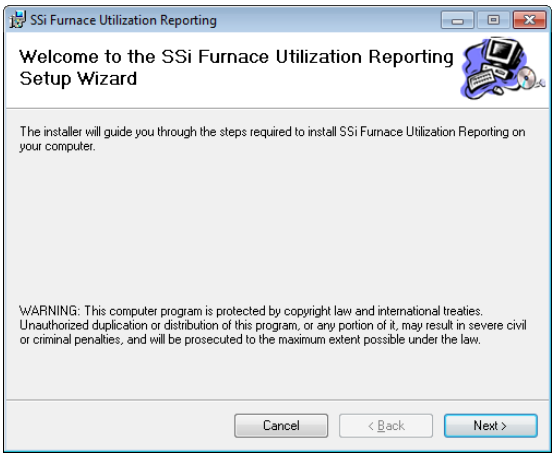
Microsoft .NET Framework 3.5 or higher is required to run FURS. The URL for .NET is as follows: http://www.microsoft.com/net/downloads.

*Required for accessing load data (optional) from an SQL Server*: SQL Server 2008 R2 Express Edition or higher. The URL for downloading SQL Server 2008 R2 Express Edition is as follows: http://www.microsoft.com/en-us/download/details.aspx?id=30438. [Note: If load data is being accessed, the <UseSQLEXPRUtilDB> option will be "true" in the AppOptions.xml file. See the Appendix 1: Configuration File Settings (AppOptions.xml) section for more information.]

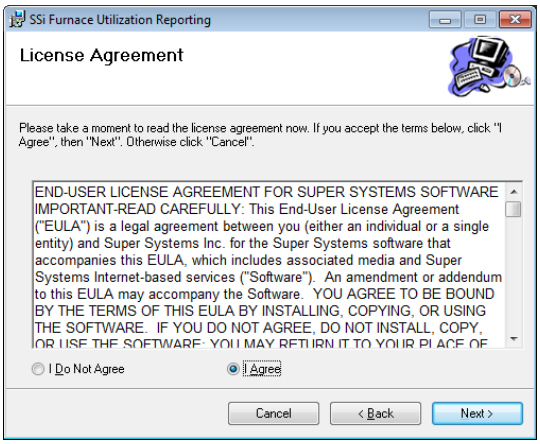
## Installation

To install, open the "SetupFUR.msi" file. The **Setup Wizard** window will appear. Click "Next" continue.



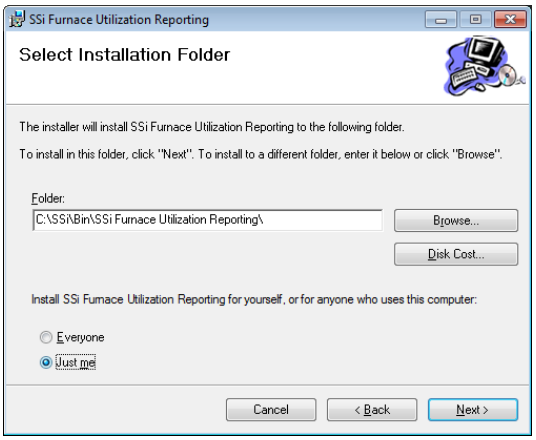



The **License Agreement** window will appear. Read the terms of the license and, if in agreement, select "I Agree" and then click "Next".

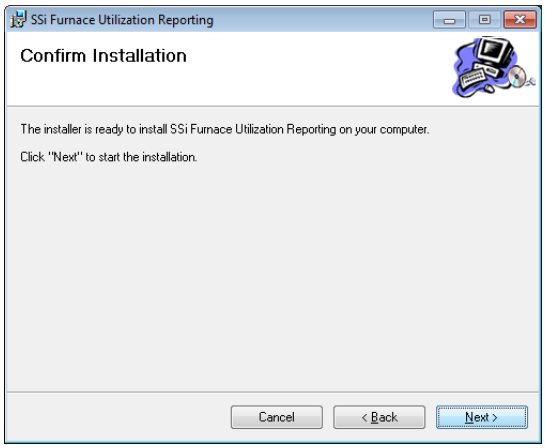



The next window will give you the options to change the installation folder for FURS, to install FURS for the current user or for all users of the computer, and to estimate the amount of disk space that will be used when the program is installed. Click "Next" to continue.

**SUGGESTED:** Record the folder name where FURS is installed so that you can refer to it in the future.

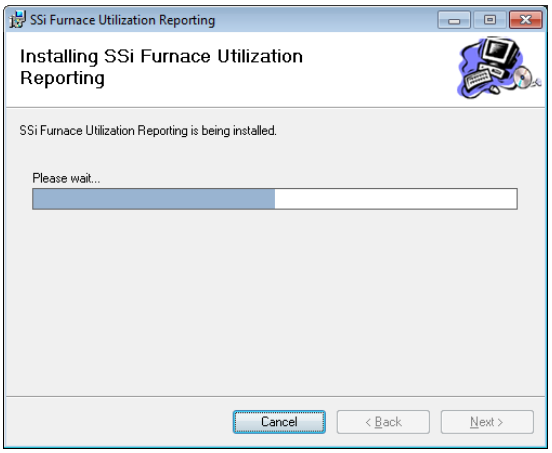



A **Confirm Installation** window will appear. Click "Next" to continue.

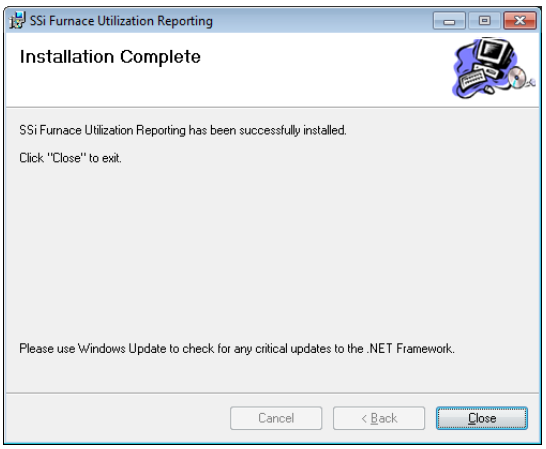


An installation status window will appear.

If a window appears on screen asking if you want to authorize changes being made to your computer, simply choose "Yes".




Once the installation process has finished, the **Installation Complete** window will appear. Click "Close" to close the window.




## FURS Concepts

Before using FURS, it is helpful to have an understanding of the concepts used in the software.

Data Point

The main building block of a FURS report is a Data Point. A **Data Point** represents a measurable property associated with a furnace. Examples might include fuel consumption, non-production time, load time, or percentage of utilization during certain periods of the day. Data is gathered from SDIO (the SuperDATA communications engine) and, for calculations that involve loads, from an SQL database. Using scripting within the program, the user can then instruct FURS on how to use that data to generate meaningful calculations on a furnace property. These calculations are used to generate Data Points, which are then used to generate graphs, tables, and reports within FURS.

### *Additional Technical Details*

A data point represents a one-minute resolution data item which is calculated by using any number of available "raw data points" as inputs. The VBScript language can be used on the inputs to create the desired output.

Currently, data points with the following units of measurements are available in the program:

- *scfm* (Standard Cubic Feet per Minute)
- $m^3m$ (Cubic Meter per Minute)
- *litres/minute*
- *kwh* (Kilowatt Hour)
- *minute*
- *USD* (US Dollar)
- *EUR* (Euro)
- *GBP* (British Pound Sterling)

A data point will have a script (in VBScript syntax) that tells the program how to generate usable data from raw data. A simple script to determine a data point value follows:

```
result.value = (c1s1.value + c2s2.value + c3s3.value) / 3
```

In the above script, the data point value is simply the average value of the three raw data points: `c1s1.value`, `c2s2.value`, and `c3s3.value`. The names of raw data points are predefined as cxsy.value. Descriptions for the raw data points are available in the program.

Depending on the unit of measurement of the data point, available reports for the data point will be determined automatically by the program. For example, a data point with a unit of measurement of *scfm* will have a "Gas Usage" report available.

Data Point Group

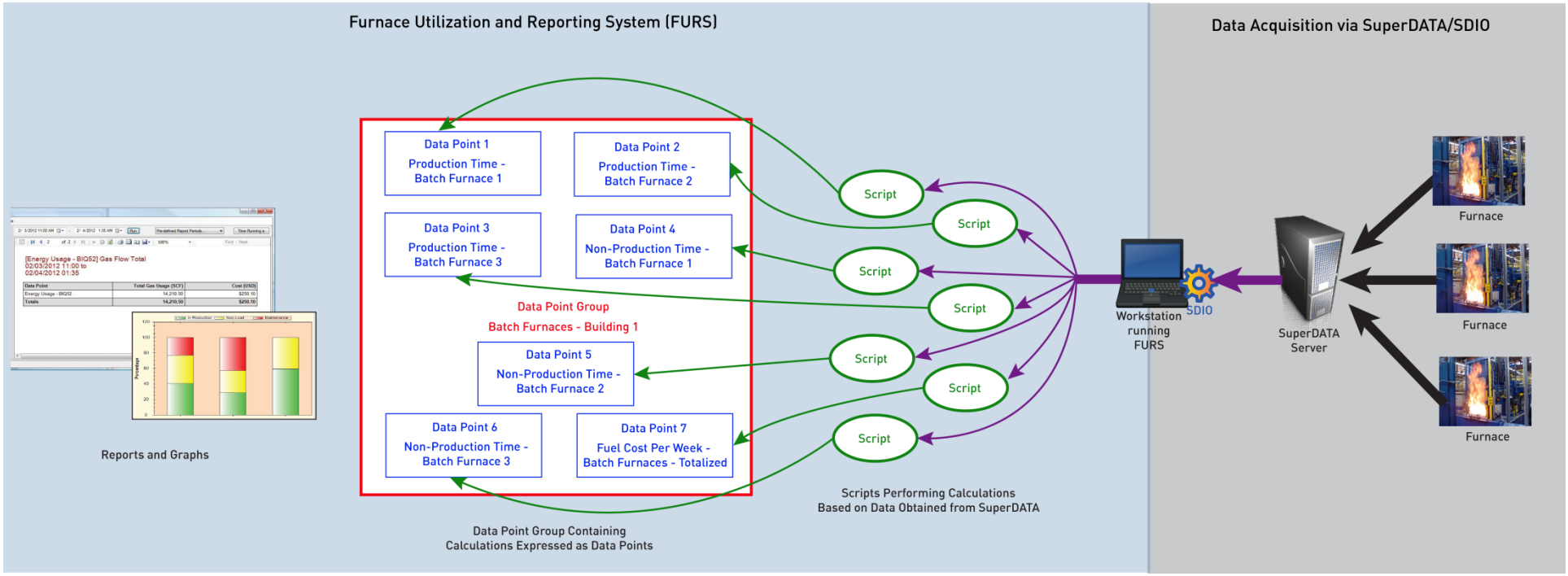
Once Data Points have been defined, they can be added to Data Point Groups. A **Data Point Group** is a collection of data points typically organized by shared location, building, department, type of furnace, or some other common trait. For example, a Data Point Group may be created for "Batch Furnaces – Building 1" and may include Data Points such as:

- Production Time – Batch Furnace 1
- Production Time – Batch Furnace 2
- Production Time – Batch Furnace 3
- Non-Production Time – Batch Furnace 1
- Non-Production Time – Batch Furnace 2
- Non-Production Time – Batch Furnace 3
- Fuel Cost per Week – Batch Furnaces – Totalized

With FURS's scripting abilities, the possibilities become very diverse as the availability of raw data increases.

Data Points, Data Point Groups, and Report Generation

The diagram below illustrates how FURS operates. First, the SuperDATA server acquires data on furnace operation from furnace instrumentation. That data is shared with a computer running FURS using SDIO, the SuperDATA communications engine. Using the acquired data, FURS executes one or more scripts. The results of the script calculations are then applied to Data Points within Data Point Groups. Using the organized data, FURS can generate reports and graphs.



Scripting (VBScript)
The purpose of a script is to allow the generation of reportable data from raw data. A script will have an output and one or more raw data input(s). Programming logic would be used on raw data points to generate the reportable output.

Below are the naming conventions for use in scripting:

- Script output shall always be referenced as: `result.value`
- Script input(s) shall be referenced as: cxsy.value (where x is the channel number and y is the slot number).

*Examples of valid raw data points:* `c1s1.value`, `c2s2.value`, `c10s2.value`.

*Possible Example:*
A customer is interested in knowing how much time his furnace is in production based on the following condition:

- Furnace temperature (identified by `c1s1.value`) is greater than 1400 degrees F.
- A recipe is running (when `c2s2.value` = 1)

The below script will be appropriate for this case:

```
if (c1s1.value > 1400 and c2s2.value = 1) then
      result.value = 1
else
      result.value = 0
end if
```

Report Templates
The program will allow saving all of its configuration parameters in a template to allow that template to be reused later. Report templates will be saved in separated XML files to allow greater portability. Report templates can be modified and saved. Multiple report templates can be created but only one can be used at a time. The Save and Load template feature is accessible under the File menu of the program.

Configuration Screens
All configuration information will be stored in the database of the program. The order of configuring in this section is important and should be followed before reports can be generated.

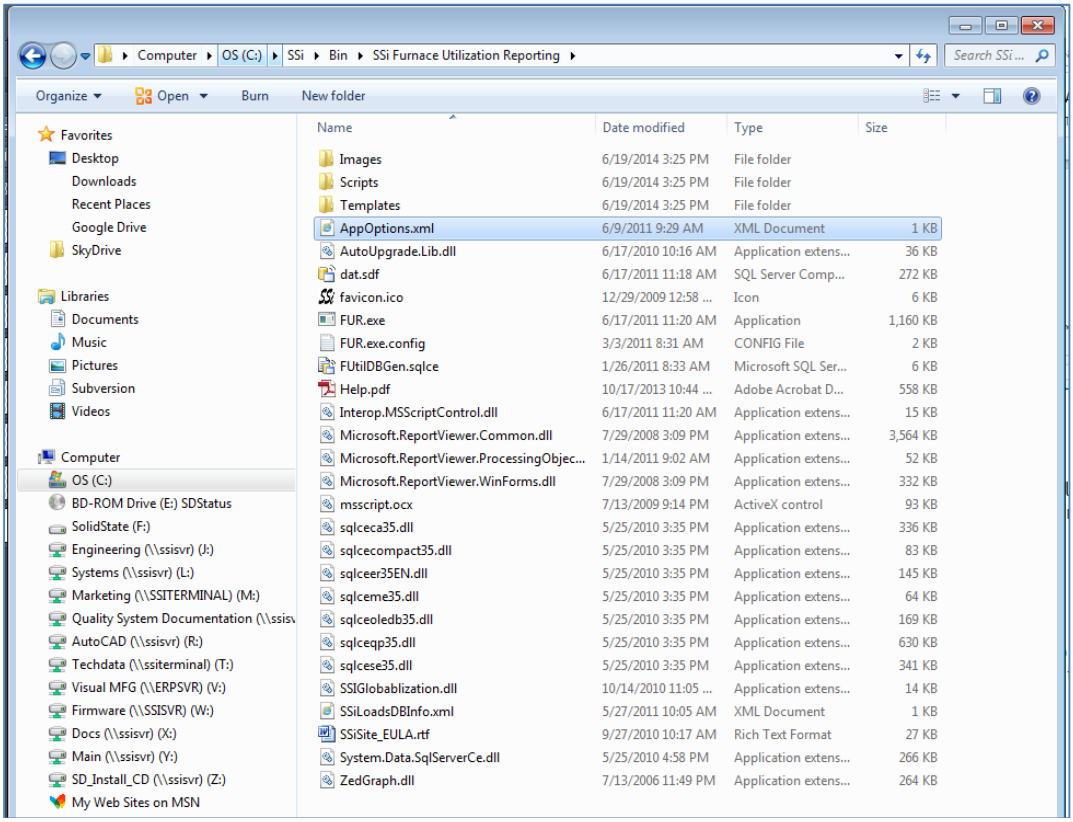
The screens are captured on a new installation of the program so that a user can easily follow after installing his program.

## If Using Load Data and Running FURS for the First Time

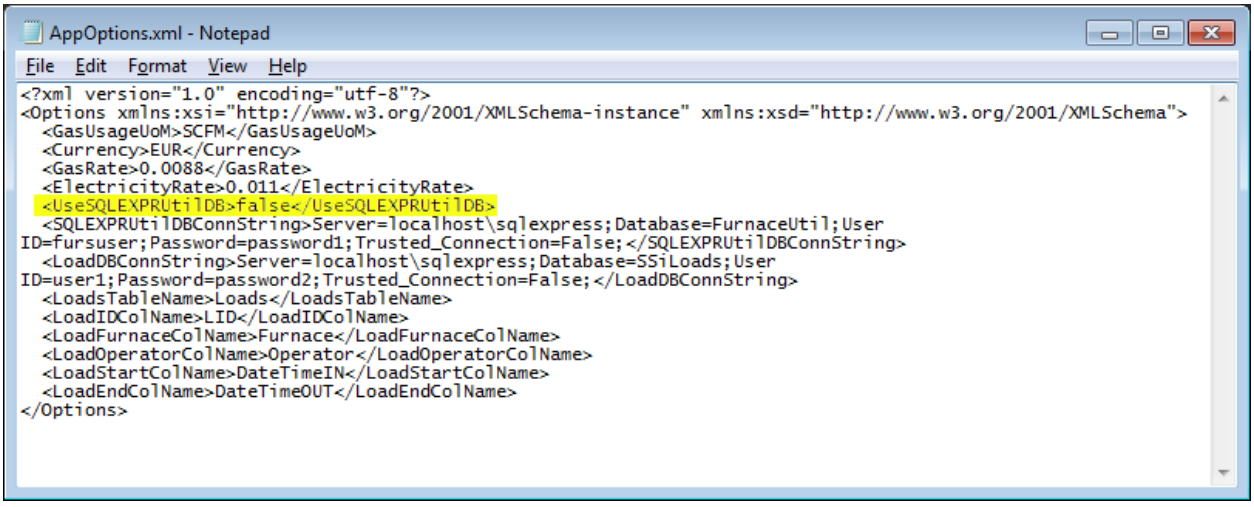
Before running FURS for the first time on the computer where it is installed, follow these steps. Doing so will help ensure that FURS starts and runs smoothly and that the program is able to recognize where to obtain load data from.

1. Determine whether the load database will be:
    a. Stored on the local machine or
    b. Accessed from a server.

2. In Windows Explorer, open the folder where FURS is installed. A common folder location for FURS is "C:\SSi\Bin\SSi Furnace Utilization Reporting" (but this is not always the case).




3. Open the file **AppOptions.xml** in a text editor (such as Notepad).
4. Find the tag for option **UseSQLEXPRUtilDB**. The open tag is `<UseSQLEXPRUtilDB>` and the close tag is `</UseSQLEXPRUtilDB>`. The value for the option will be *true* or *false*.



5. The next actions you take will be based on whether the load database is stored locally or accessed from a server.
   a. If the load database will be stored on the local machine, make sure that UseSQLEXPRUtilDB is *true*. Then save the AppOptions.xml file and close it. Proceed to the Using the Software section.

   b. If the load database will be accessed from a server, make sure that UseSQLEXPRUtilDB is *false.* Then enter the following parameters for the SQLEXPRUtilDBConnString:

      - Server (the location of the SQL Express server)
      - Database (the name of the database)
      - UserID (the login/user ID of a user with permissions needed to access the database)
      - Password (the password for the user)
      - Trusted_Connection (True or False—whether the SQL connection is trusted or not)

      Save the AppOptions.xml file and close it. Proceed to the Using the Software section.

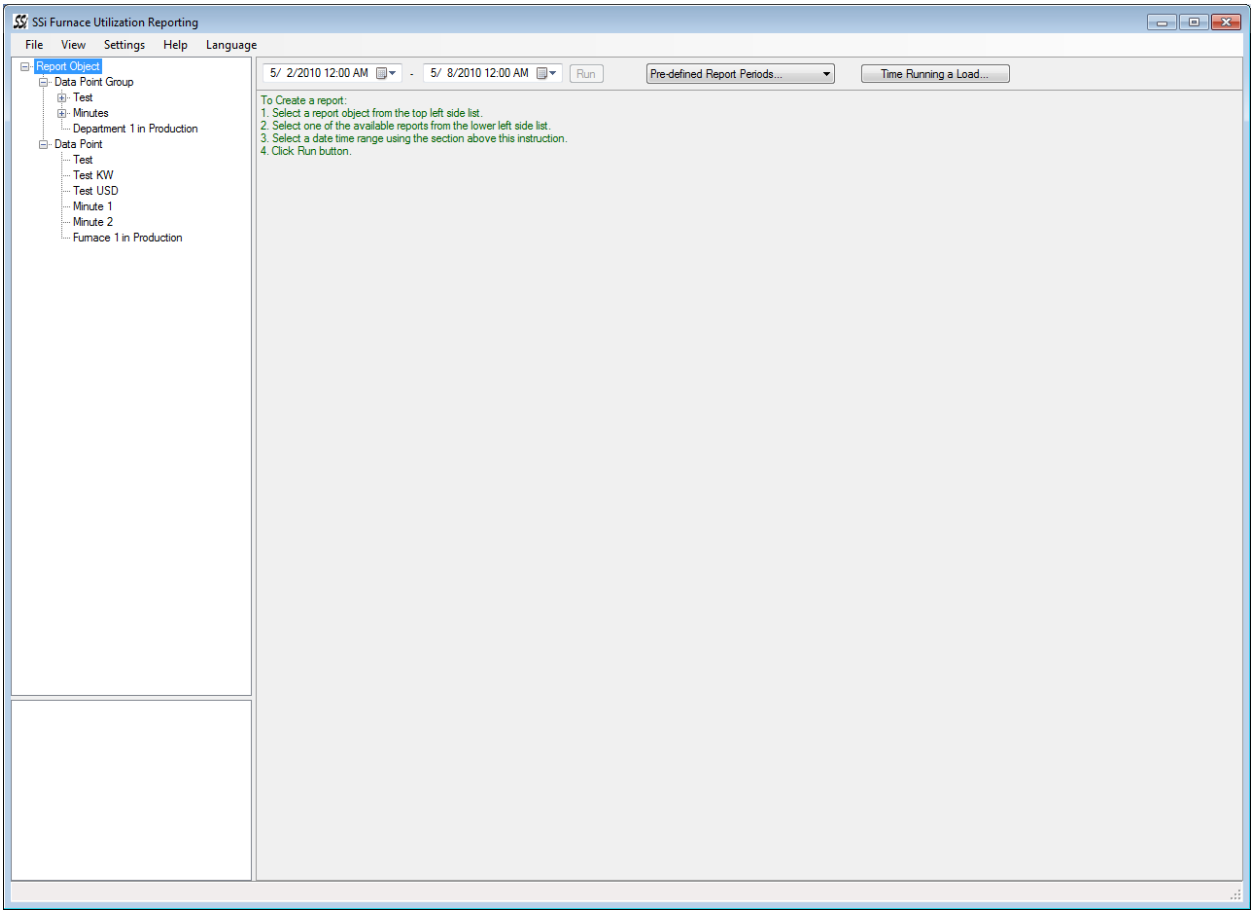
## Using the Software

**IMPORTANT!**

If you are running FURS for the first time on the computer where it is installed and intend to use FURS to analyze load information, please refer to the section
If Using Load Data and Running FURS for the First Time before using this section.

Main Window

This is the entry point and the main window of the program.




The menu section at the top of the window allows access to features of the program such as save template, load template, data point setup, data point group setup, non-production time setup, options, etc.

The left hand side panels allow users to select what object to report on and what report to display on the right hand section of the window.

*File Menu*

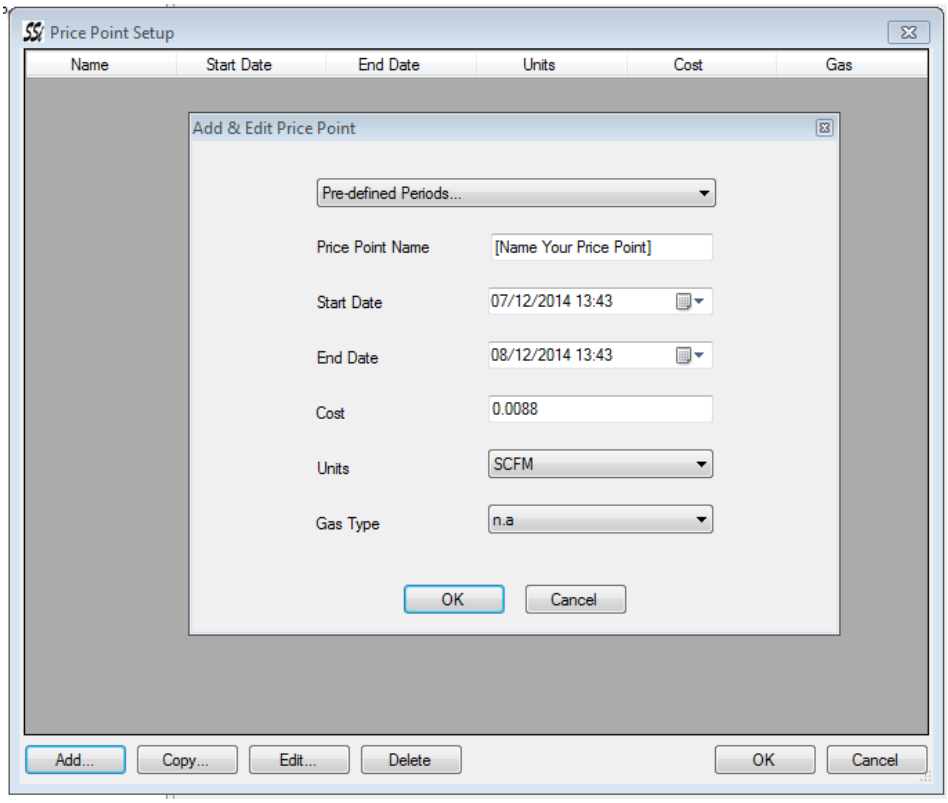
| Option | Description |
|---|---|
| Save Template | This option allows you to save a template file with the .tfl extension. The template file contains the Data Point and Data Point Group data and can be loaded into FURS in future instances. |
| Load Template | This option allows you to select a template file for FURS to load. Once the template file is loaded, saved Data Point and Data Point Group information will be loaded into the program. |
| Exit | This option closes FURS. |

*View Menu*

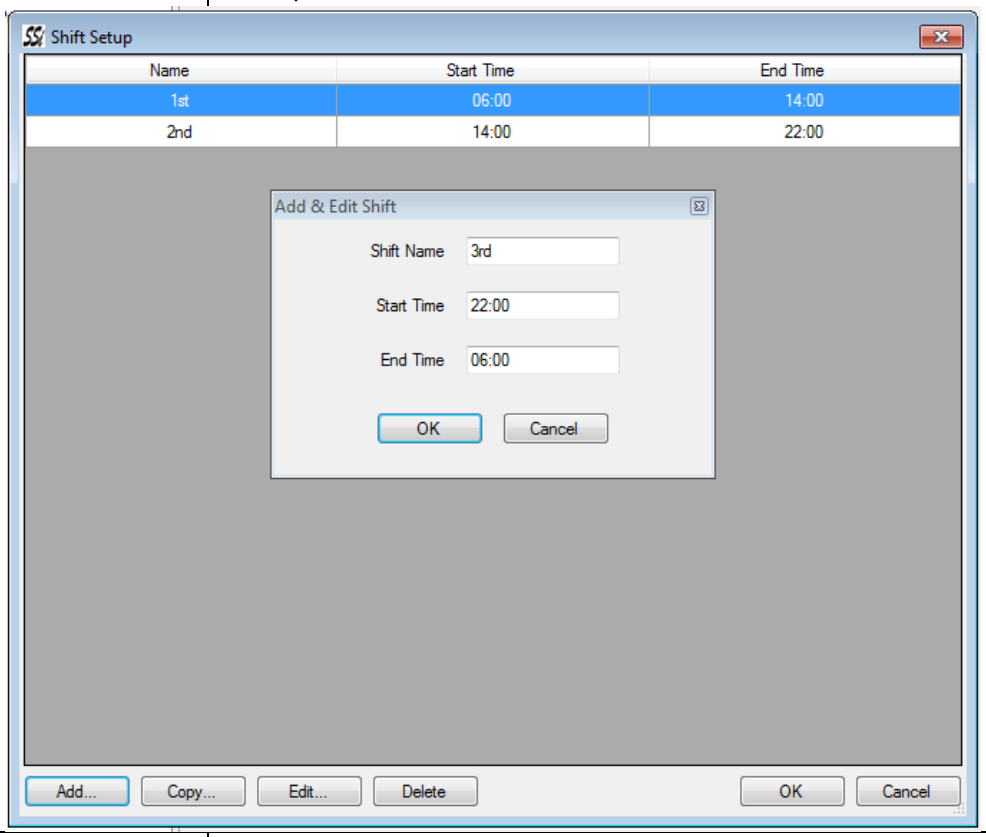
| Option | Description |
|---|---|
| Show Left Panel | When this option is checked, the left menu is displayed. The left menu shows Data Points, Data Point Groups, and report types that are available within FURS. |

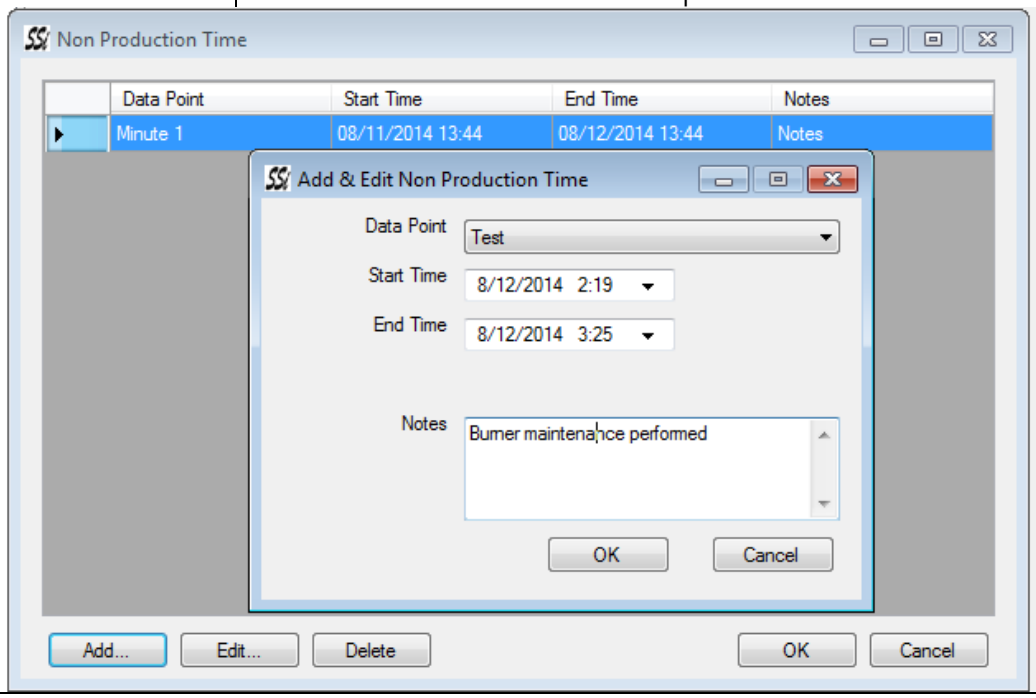
*Settings Menu*

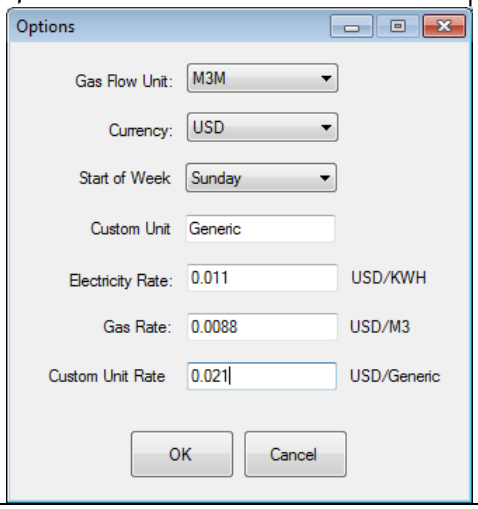
| Option | Description |
|---|---|
| Data Points Setup… | This option brings up the Data Points Setup window. See the Data Point Setup Window section on page 17 for more details. |
| Data Point Group Setup… | This option brings up the Data Point Group Setup window. See the Data Point Group Setup section on page 19 for more details. |
| Price Point Setup… | This option allows you to add price points for different gases used in heat treating processes. The gas is determined by the Gas Type field, with the unit of measurement determined by the Units field. The Cost per Unit is entered in the Cost field. Start and end dates for the price point can be manually entered or selected from pre-defined periods accessible from a drop-down list. |



| Option | Description |
|---|---|
| Shift Setup… | This option gives you the ability to set up shifts in FURS. Times are entered in a 24-hour format (for example, 4:00 p.m. is entered as 16:00). |
| Non Production Time | Using this option, you can enter specific periods of non-production and enter notes on what the non-production time was used for. |



| Option | Description |
|---|---|
| Options | Options allow you to configure units and rates used within FURS. Gas flow units can be standard cubic feet per minute (SCFM), cubic meters per minute (M3M), or litres per minute. Currency can be US Dollars (USD), Euro (EUR), or British pound sterling (GBP). The start of the week can be set up as any of the seven days of the week. A custom unit can be set up, along with rates for electricity, gas, and whatever custom unit is set up.   |

*Help Menu*

| Option | Description |
|---|---|
| Check for Updates | This option will check for updates to the FURS program. If updates are available, FURS will give you the option to have them downloaded and installed. An Internet connection is needed for this option to work. |
| Open Help File | This option will bring up the manual for FURS. |
| About | This option will bring up a window showing version details for FURS. It also provides the link to download the installation file for Realtime Utilization features. |

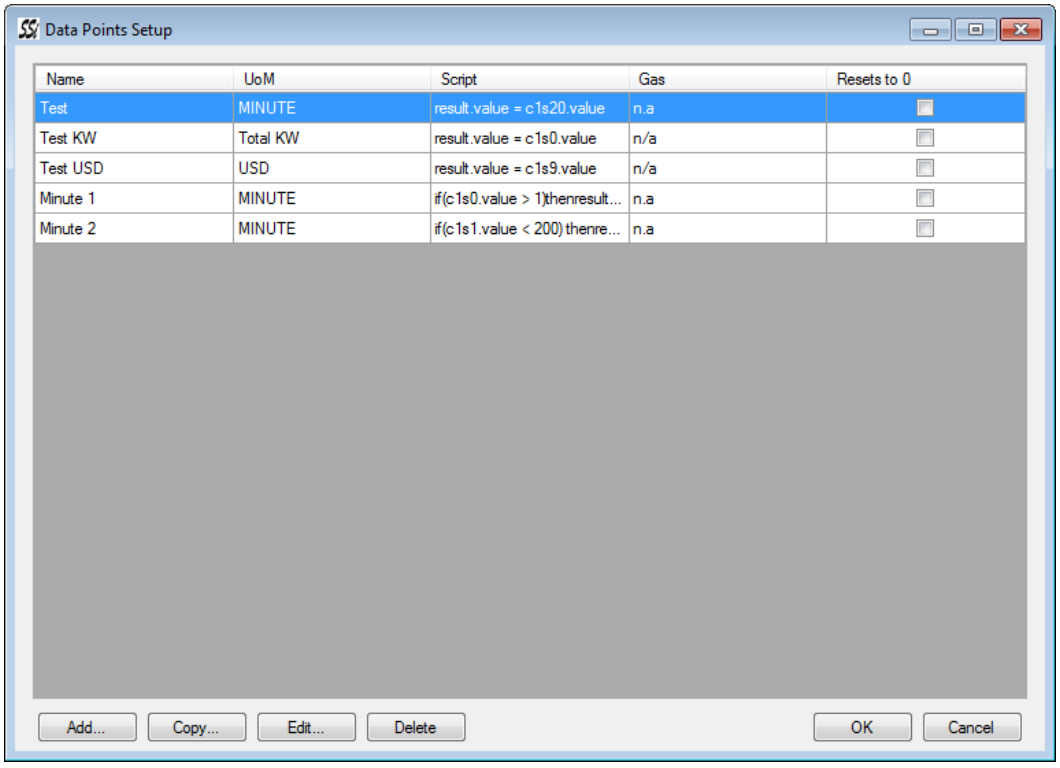
*Language Menu*

The Language menu displays the available languages for the FURS interface. Two letters denoting each available language are shown. For instance, *en* represents English.

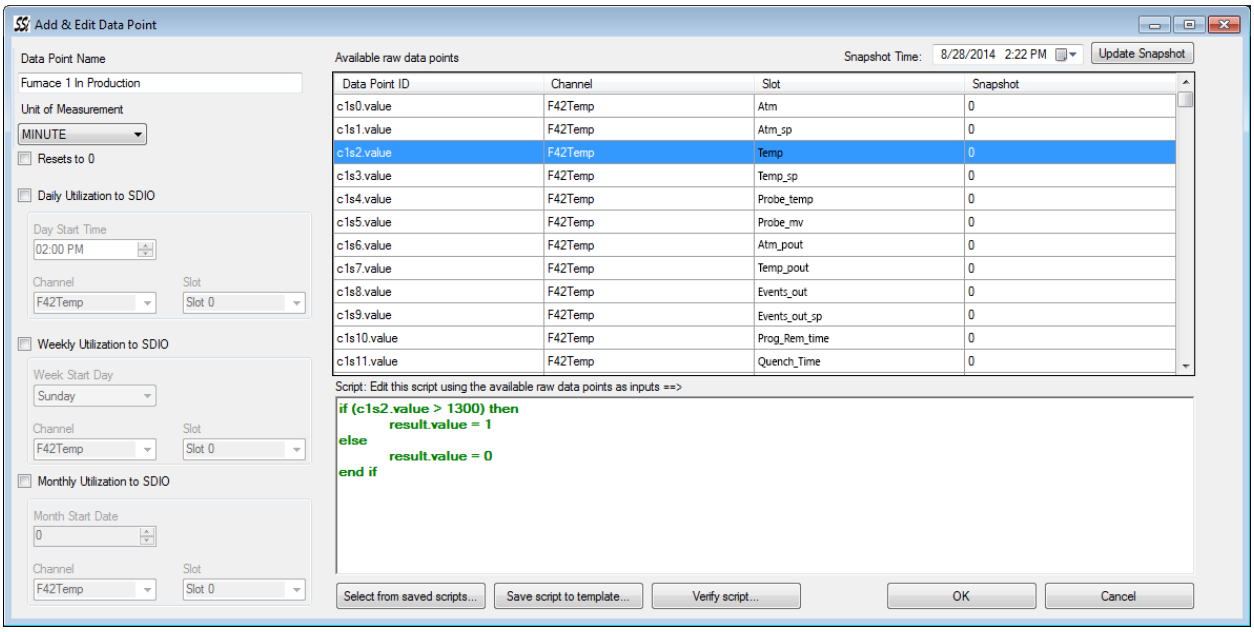
*Data Point Setup Window*

To access this window, select Settings -> Data Points Setup... from the main window.

This window allows setting up data points for use in the program. The following figure shows this window.




Clicking **Add...** (Or **Edit** when applicable) in the above screen will bring up the screen below. Note that the available raw data points are listed on the right side of the window.




Creating a data point using the above window is straightforward. A data point name, a unit of measurement, and a script are the required information. A sample script is automatically inserted as a hint. Once a data point is customized as needed, clicking OK will save it to the

database. The newly created data point is now ready for reporting or for inclusion in data point group(s).

In the above screen, a data point named "Furnace 1 In Production" will be created. The script of this data point will yield a result of 1 (minute) for any minute that the value of c1s2.value is greater than 1300°F. The right side grid of the window indicates that c1s2.value contains temperature information.

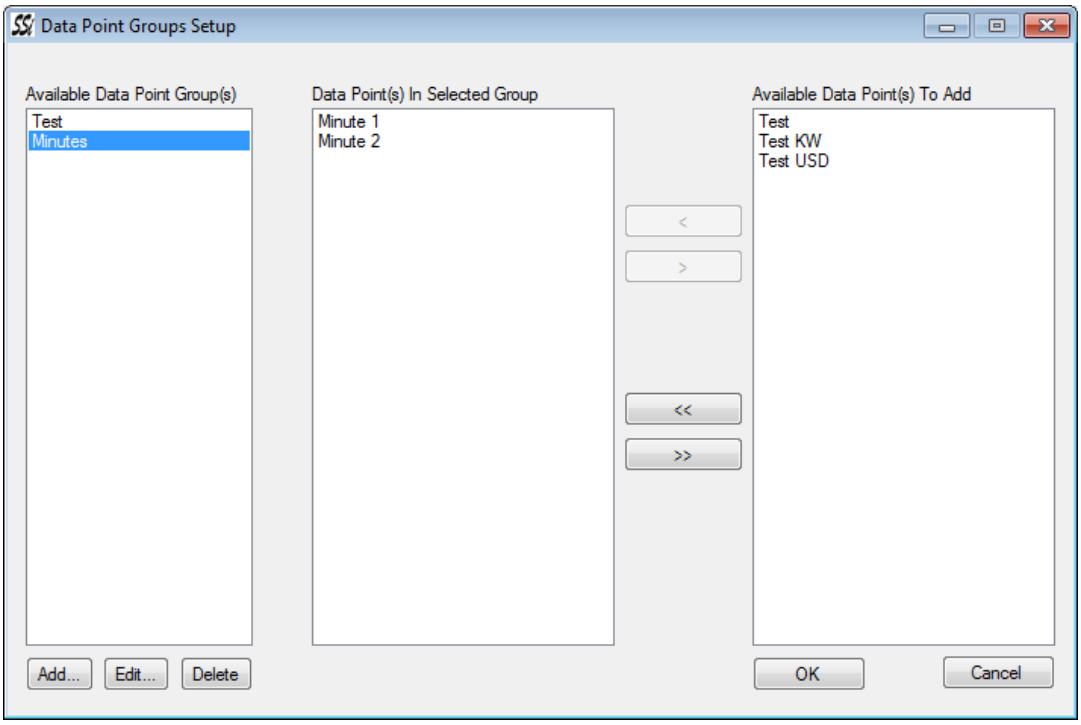
Other features in this window:

- Select from saved scripts…: allows users to select from any saved script to use with current data point.
- Save script to template: allows users to save current script to a text file to use later.
- Verify script…: allows users to check the current script for any errors so that adjustments can be made. This feature also allows users to provide input(s) and verify that the script generates the correct output.
- Update Snapshot: allows users to pick a time and see values of raw data points at that time to get a perspective of the data.

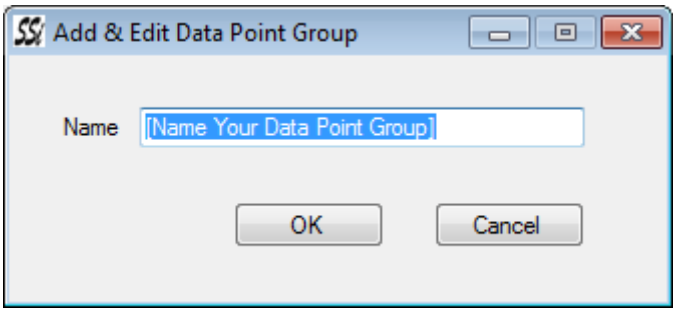
### *Data Point Group Setup*

To access this window, select Settings -> Data Point Group Setup… from the main window.

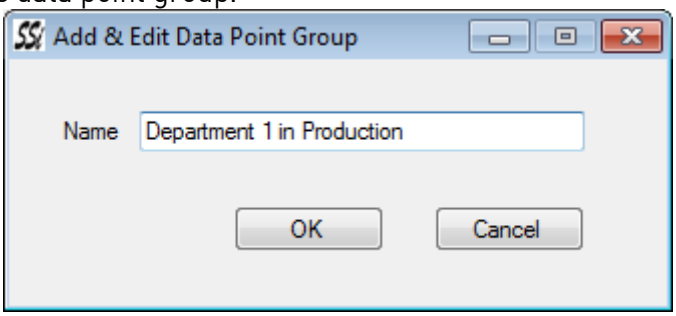
This window allows adding/editing data point groups. Information needed to set up a data point group includes a name and needed data points.



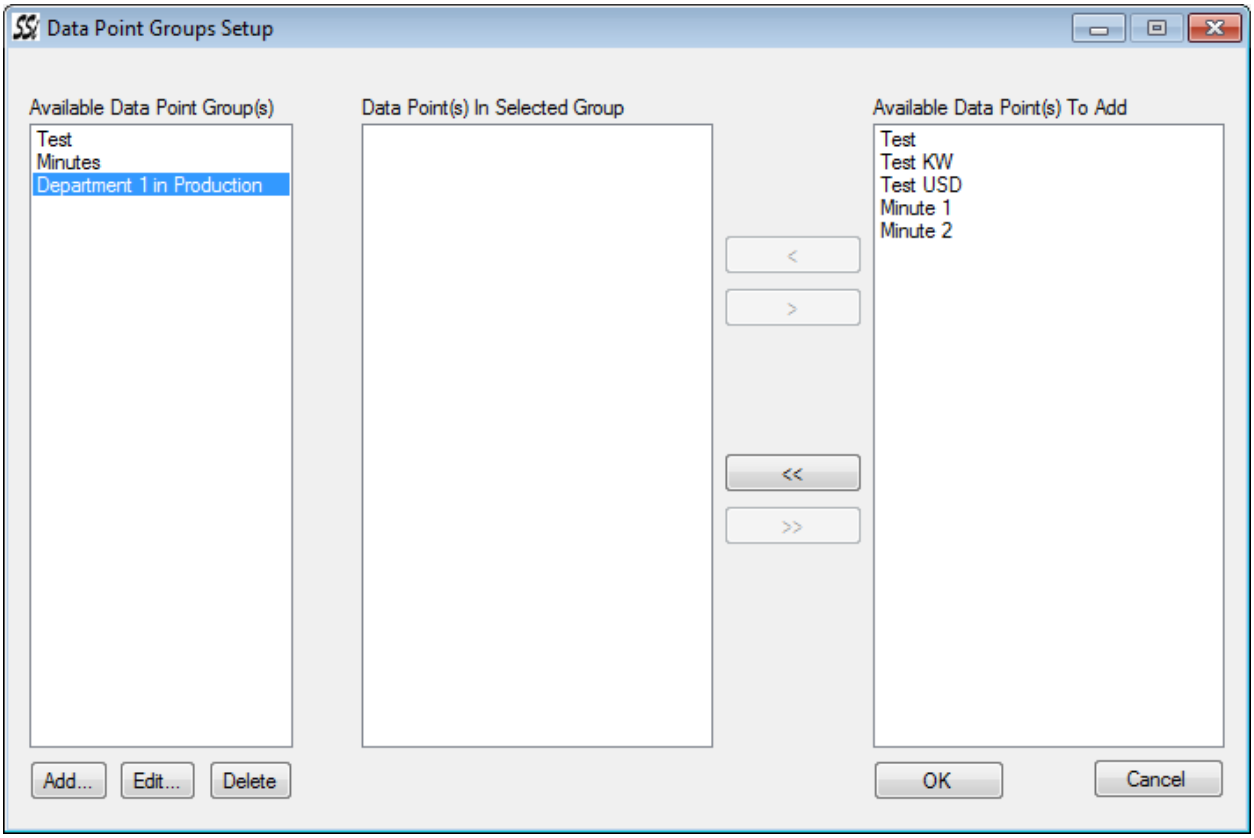

Clicking Add… in the above screen will bring up the screen below.



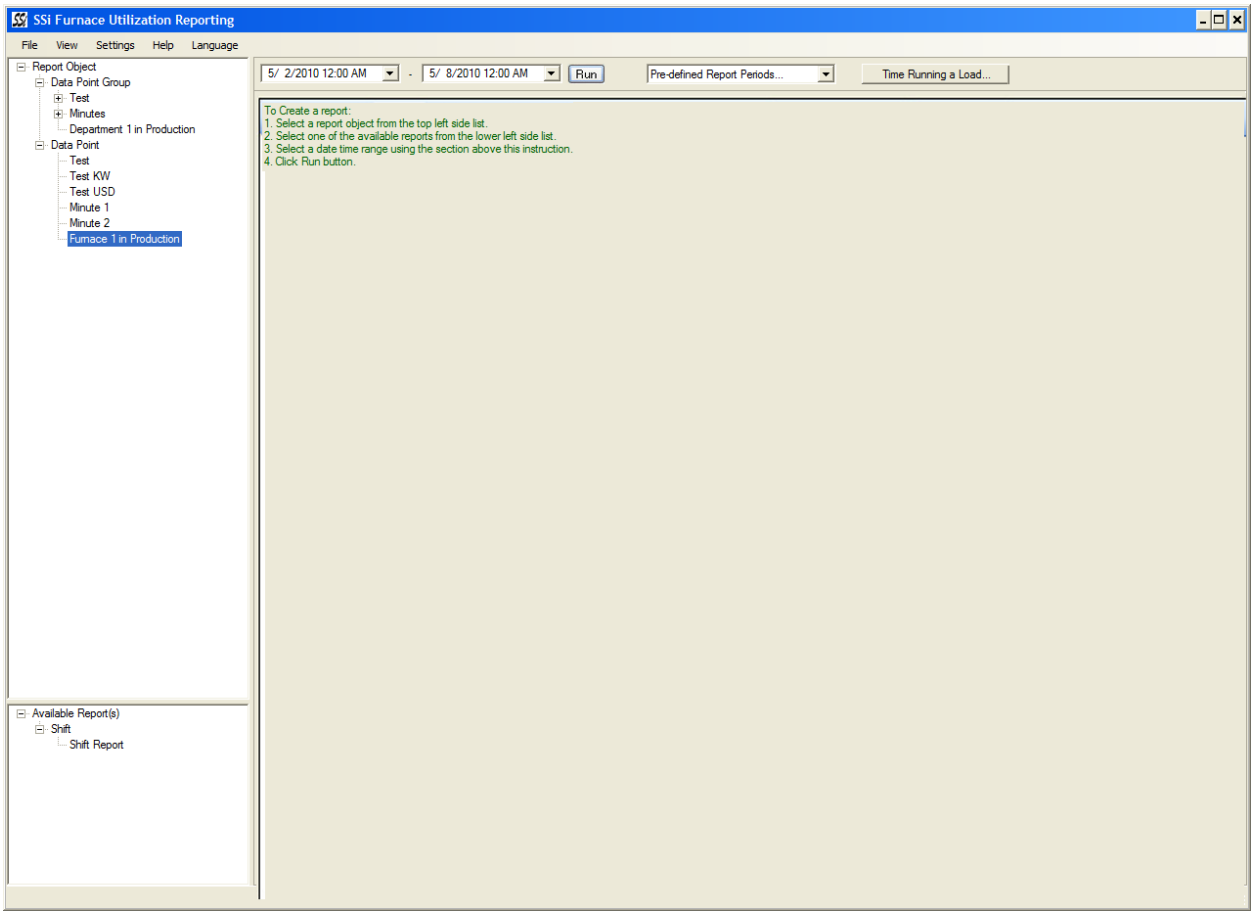

Provide a name for the data point group.




After the data point group is added, data point(s) can be added to the group as shown in the following screens.

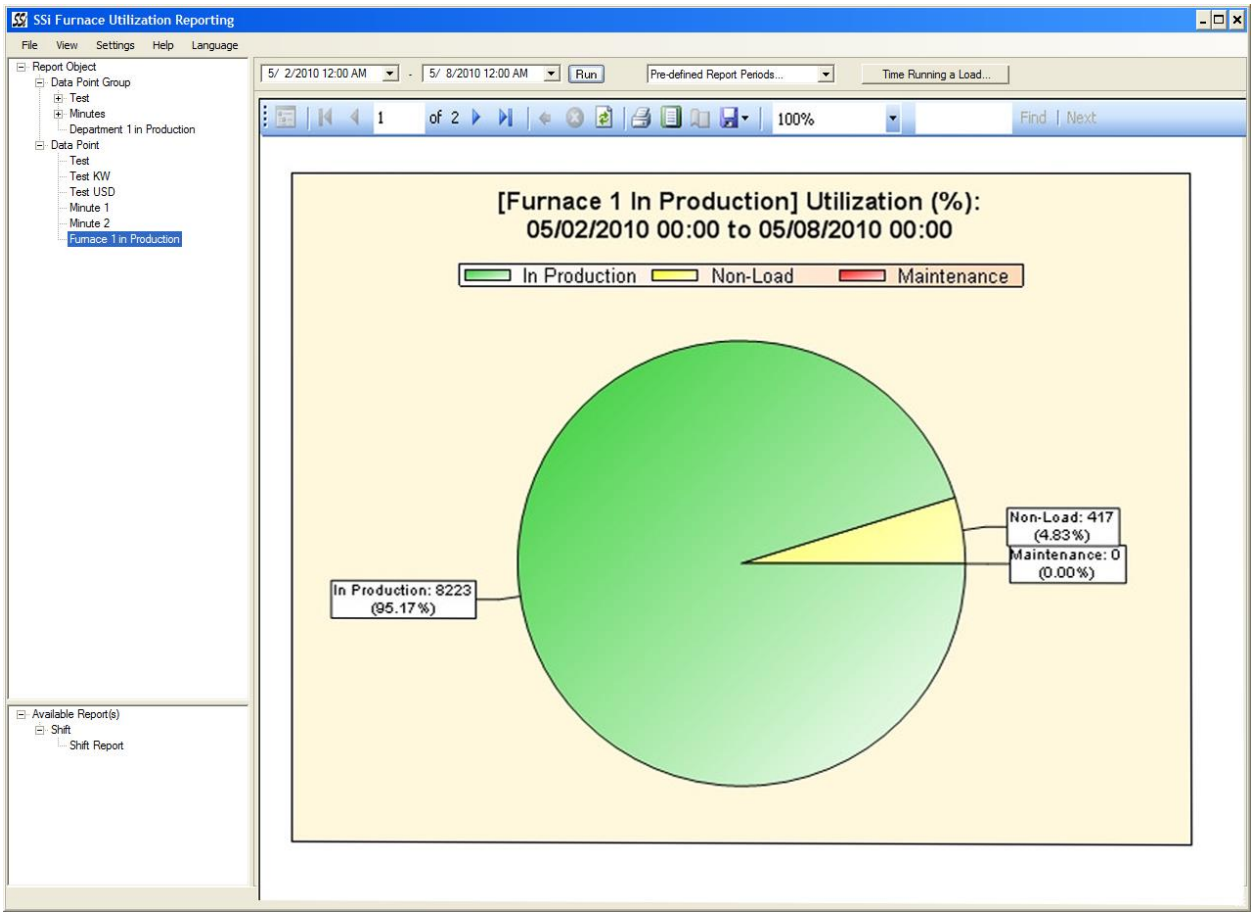



Resulting main window after the data point group is added follows.


SSi Furnace Utilization Reporting
File
View
Settings
Help
Language
Report Object
Data Point Group
Test
Minutes
Department 1 in Production
Data Point
Test
Test KW
Test USD
Minute 1
Minute 2
Furnace 1 in Production
Available Report(s)
Shift
Shift Report
5/ 2/2010 12:00 AM
5/ 8/2010 12:00 AM
Run
Pre-defined Report Periods...
Time Running a Load...
To Create a report:
1. Select a report object from the top left side list.
2. Select one of the available reports from the lower left side list.
3. Select a date time range using the section above this instruction.
4. Click Run button.

*Report Generation*

From here users can follow the instructions on screen (green text) to generate report(s). Following is a sample report for the data point that was created earlier.



## Revision History

| Rev. | Description | Date | MCO # |
|---|---|---|---|
| New | New manual | | |
| A | Changes to manual to reflect interface changes and functionality extensions | 9/10/2014 | 2150 |
| | | | |

## Appendix 1: Configuration File Settings (AppOptions.xml)

Each installation of the program comes with a configuration file named AppOptions.xml, which controls how the program works.

The location of the file is the installation folder of the program. The default location for this file is **C:\SSi\Bin\SSi Furnace Utilization Reporting**.

This section will provide explanations for each setting in the file.

Below are the contents of the default AppOptions.xml file:

```
<?xml version="1.0" encoding="utf-8"?>
<Options xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <GasUsageUoM>SCFM</GasUsageUoM>
  <Currency>USD</Currency>
  <GasRate>0.0088</GasRate>
  <ElectricityRate>0.11</ElectricityRate>
  <UseSQLEXPRUtilDB>false</UseSQLEXPRUtilDB>
  <SQLEXPRUtilDBConnString>Server=localhost\sqlexpress;Database=FurnaceUtil;User
ID=SSiUser;Password=ssississi;Trusted_Connection=False;</SQLEXPRUtilDBConnString>
  <LoadDBConnString>Server=localhost\sqlexpress;Database=SSiLoads;User
ID=SSiUser;Password=ssississi;Trusted_Connection=False;</LoadDBConnString>
  <LoadsTableName>Loads</LoadsTableName>
  <LoadIDColName>LID</LoadIDColName>
  <LoadFurnaceColName>Furnace</LoadFurnaceColName>
  <LoadOperatorColName>Operator</LoadOperatorColName>
  <LoadStartColName>DateTimeIN</LoadStartColName>
  <LoadEndColName>DateTimeOUT</LoadEndColName>
</Options>
```

Explanations of settings:

- <GasUsageUoM>: Unit of Measurement for gas usage such as SCFM (Standard Cubic Feet per Minute) or M3M, etc.
- <Currency>: Currency type for use with cost reports. Example values are USD, EUR, etc.
- <GasRate>: Gas price per one gas unit specified in the <GasUsageUoM> setting and in the currency specified in the <Currency> setting.
- <ElectricityRate>: Electric price per KWH in the currency specified in the <Currency> setting.
- <UseSQLEXPRUtilDB>: 1.) If set to true: To use a centralized Furnace Utilization SQL database server specified in the <SQLEXPRUtilDBConnString> setting. 2.) If set to false: To use the local SQL CE database on the local machine for all the configurations for the program.
- <SQLEXPRUtilDBConnString>: Connection settings for the centralized Furnace Utilization SQL database. This setting will only be used if <UseSQLEXPRUtilDB> is set to true.
- <LoadDBConnString>: Connection settings for the Load Entry SQL database.
- <LoadsTableName>: Name of the Loads table within the Load Entry SQL database.
- <LoadIDColName>: Name of the LoadID column of the Loads table within the Load Entry SQL database.
- <LoadFurnaceColName>: Name of the Furnace column of the Loads table within the Load Entry SQL database.

- <LoadOperatorColName>: Name of the Operator column of the Loads table within the Load Entry SQL database.
- <LoadStartColName>: Name of the TimeIn column of the Loads table within the Load Entry SQL database.
- <LoadEndColName>: Name of the TimeOut column of the Loads table within the Load Entry SQL database.