Energy AnalytiX
Setting up Degree Day Normalization

APPLICATION NOTE

October 2015

Description: Guide to setting up a simple degree day normalization using Energy AnalytiX.
General Requirement: Working knowledge of Energy AnalytiX and a good understanding of the nomenclatures used in Energy analysis and calculations.

Introduction

Energy consumption data needs to be normalized for useful analysis. Coupling this data along with degree days would add more value to the data being logged and charted. This can be easily accomplished using Energy AnalytiX in a few steps.

This guide would assist the user in setting up a simple degree day analysis and perform normalization of their consumption data along with their degree day analysis.
We would also briefly touch base on plotting the normalized degree day data using the new Energy AnalytiX Viewers.

In order to setup the normalization of degree day data, the following prerequisites are required;

- Configure at least one **meter** in EA to log data

What are Degree Days?

Degree days comprise of **Heating degree days** and **Cooling Degree days**. Heating degree days are the days when heating would be required and it is a measure of the severity and duration of the outside cold temperature. Cooling degree days on the other hand are the days when heating would be required and is a measure of the severity and duration of the outside hot temperature.

A day is considered to be a Heating or a Cooling Degree day if the outside air temperature is higher or lower than a **Base temperature**. The base temperature is defined within Energy AnalytiX. If the OAT is higher than the base temperature, it would be considered a Cooling Degree day. If the OAT is lower than the base temperature, it would be a Heating Degree day.

In short, a degree day is the summation of heating or cooling over time.

Define a Temperature Source

In order to begin computing the degree days, we need to define a temperature source to provide us with OAT and a base temperature. It is based on this base temperature that EA would automatically decide if a degree day is heating or cooling.

1. Open Workbench-SL
2. Click on the AssetWorX provider and drill-down to Product Configuration -> System properties -> Temperature Sources

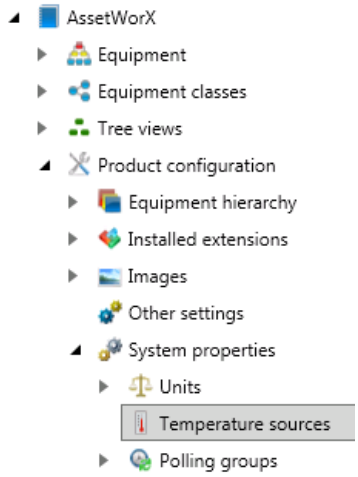

Figure 1 - AssetWorX Tree Showing Temperature Sources

3. Select *Temperature Sources* to load the corresponding window.
4. Define a new temperature source by clicking on the **Click here to add new item** row. This enables the row so you can configure a source.

   Note: Multiple temperature sources can be defined depending upon the scale of the project and your implementation.

5. Enter a **Name** and **Description** for the source. The name should identify the location and the data being collected; for example, "Foxborough OAT".
6. Select the source type as either of the following:
   a. **Dynamic Tag** means that the source is an OPC tag or Web service. If you select this option, you must specify the OPC tag or Web service in the Source Tag column.
   b. **Dynamic Manual** means that the outside temperature will be populated in the table manually or by some other means.
7. In the **Source Tag** field, enter the OPC tag that is providing the temperature source data; this could be either from the BAS or from a web service.
8. Enter the **Base Temperature.** Specify the threshold for calculating the Heating and Cooling degree days.
9. Specify the **Scan Rate**; it is the rate at which the temperature data is collected.

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10. Lastly Specify the **Unit** of measure for the temperature gradient.

Create an Energy Asset with Temperature Source

Now that we have our temperature source defined, we would need to create an Energy Asset that would be linked to this Temperature Source.

1. Add a new equipment into the asset tree and add the Energy AnalytiX extension to the asset.
2. Set Asset Type to Energy Asset.
3. Under Configure Energy Asset section, set Temperature Source to Foxborough OAT

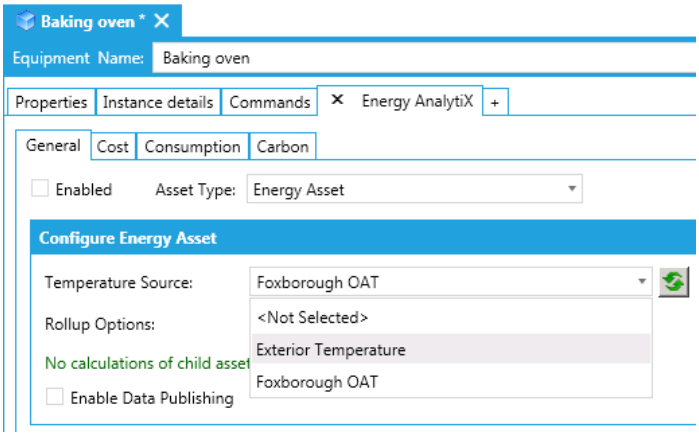

Figure 2 - Configure Temperature Source for Asset

4. Add a *Standard Calculation* to this energy asset. In our example, we have created a Consumption calculation for the meter that was already created.

Degree Day Normalization

Now that we have our Energy Asset configured, the next step would be to setup Degree Day Normalization.

1. Degree days are exposed as Meta Data which gives us the ability to them normalize out consumptions based on Degree Days.
2. In WB SL, in the Energy AnalytiX provider, under **General Options → Analytics Properties**, there is a new folder called **Internal**.
3. This consists of 4 new meta data's
   a. **BaseloadDD** – This is the minimum Energy Consumption incurred without any heating or cooling
   b. **Gradient** – It is the rate at which the heating or cooling days influence the consumption
   c. **Heating Degree Days** – These are the days when the OAT is lower than the base temperature.
   d. **Cooling Degree Days** – These are the days when the OAT is higher than the base temperature.

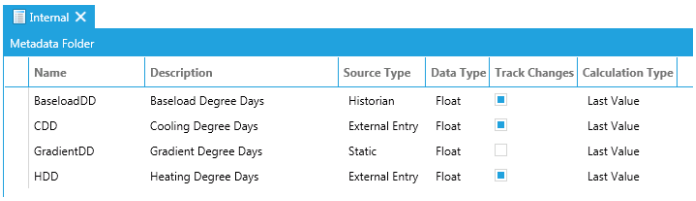

Figure 2 - Internal Metadata

4. We can then normalize our consumption data based on the Degree Days by defining a new **Calculation**
   a. Under the Energy AnalytiX provider -> **Calculations**
   b. By default there are 3 predefined calculations. Click on + to add a new calculation

Figure 3 - Adding New Calculation

   c. It automatically defines the new calculation as *Dervied4*
   d. In our example, we have defined the **Display Name** as *Degree Day Normalization* and filled in the **Description** as *Normalization consumption by Total Degree Days*
   e. The next field is ***Expression***. This is where we specify the normalization calculation. Click on the ellipse button to load the *Expression Editor*.

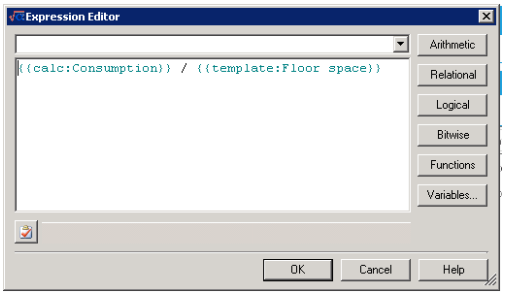

Figure 4 - Define Normalization Calculation

   f. We then create the calculation template we would like our Consumption to be normalized by. In our example, we will be normalizing our Energy Consumption by the

Total Degree Day (HDD+CDD). Click on the *Variables...* button to load the **Calculation Variables Browser.**

g. Click on **Internal** and select the Meta data you would like to add to your calculation template.
h. Once you have created your expression, click on OK.
i. The last field is ***Category***. Select the category you would like to group the template by, in our example we have categorized this calculation as Consumption.

NOTE: You can define your own category by clicking on the *Define Calculation Categories* button.

5. Now that we have our calculation defined, we would need to bind the Meta data to the asset and define the Derived Calculation.
6. Load the Energy Asset that was previously created and click on the Energy AnalytiX extension.
7. Under the General tab add the HDD and CDD metadata by clicking on the + sign.

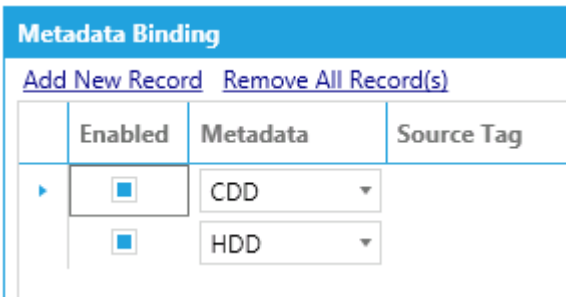

Figure 5 - **Add Metadata for Energy Asset**

8. The Source Tag field is disabled as EA will automatically determine the HDD and the CDD based on the temperature source and base temperature.
9. Click on the Consumption Tab and click on ***Add Derived calculation***. You should now see the calculation template *Degree Day Normalization* that we previously created.
10. Select the calculation template and click on OK.
11. Specify the units to measure the defined derived calculation

NOTE: The derived calculation is always based on the Standard Calculation defined for the asset.

12. Click on Apply. We have now defined a Degree Day Normalization for our Energy Consumption.

Create Degree Day Analysis Study

We can also create and save several Analysis Studies based on the degree days. The analysis can be done through the charts and the changes we make can be saved into these Analysis Studies.

1. In Workbench-SL, Under the Energy AnalytiX provider, select ***Degree Days Analysis***
2. Specify your
   a. **Study Name**, the name of your Analysis Study
   b. **Interval type**; it could be Daily, Monthly, Yearly
   c. **Day Aggregate**; if you would like the analysis to be for all the days, weekends, weekdays or a specific day,
   d. **Options;** if you would like to include All degree days or only HDD or CDD
   e. **Gradient;** we can specify a gradient here for estimation or predictive analysis
   f. **Base Load;** we can specify the base load for our chart, again, for future estimation or predictive analysis.

Viewing Degree Day Analysis Charts

In order to view your degree analysis charts, version 10.8 packs new Energy AnalytiX Viewers that would plot us a descriptive chart of our Base load, HDD, CDD and a Cumulative Summary Chart.

1. Open PortalWorX SL and add a new EA Viewer.
2. In the Configuration of the web part, right click on *Viewer*

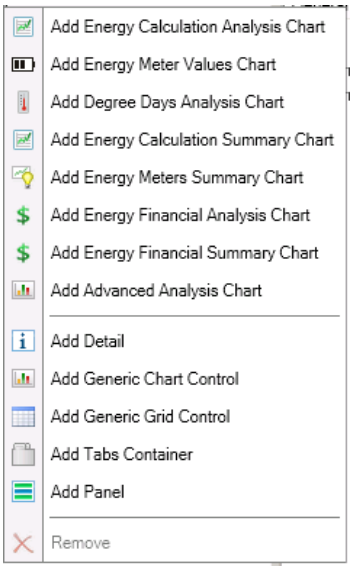

Figure 6 - Add Degree Days Analysis Chart Control

3. As you might notice, there are several new charts available in v10.8. Select ***Add Degree Days Analysis Chart Control***

4. Similar to the previous EA charts, specify your asset and a Time Range under the General tab.

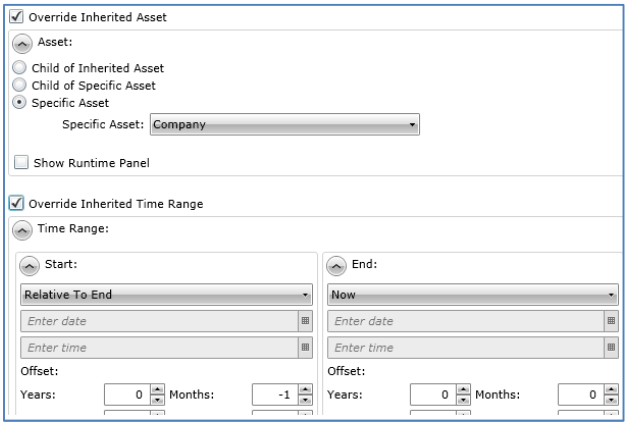

Figure 7 - General Properties for Energy AnalytiX Chart

5. Under the **Data** tab, select the Calculation Name, Meter Type etc. In our example, the **Calculation Name** is Degree Day Normalization.

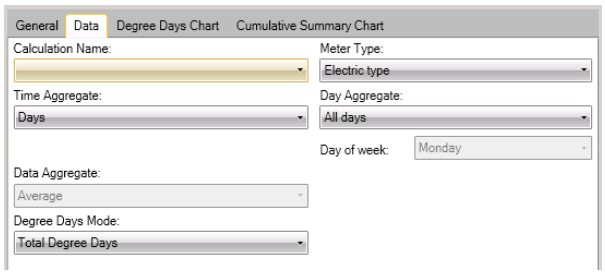

Figure 10 - Data tab for Degree Day Analysis Chart

6. Click on OK to load the Degree Days Analysis Chart.
7. You can exclude certain points from your regression and save your Degree Day Analysis Study.
8. There is also a Cumulative Summary Chart that gives us the option to create a Cumulative chart based on our Analysis Study.

   a. A rise in the plot shows the Actual consumption is greater than predicted.
   b. A drop in the plot shows the Actual is lower than the predicted consumption.

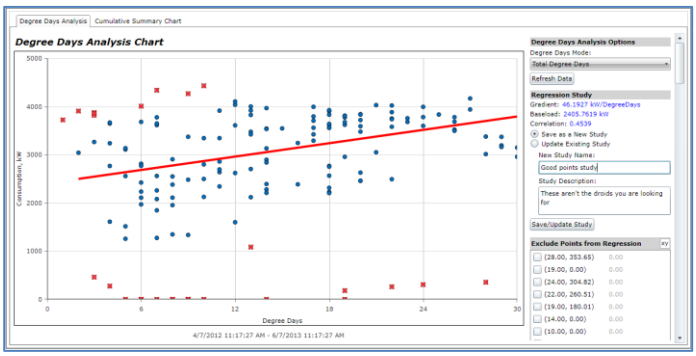

Figure 8 - Degree Day Analysis Chart