



# EZ SIM BILLING ANALYSIS SOFTWARE

## Tale of Two Refrigerators -- Modeling Supermarkets

The simulation tool is capable of modeling supermarket refrigeration. But there are points to understand.

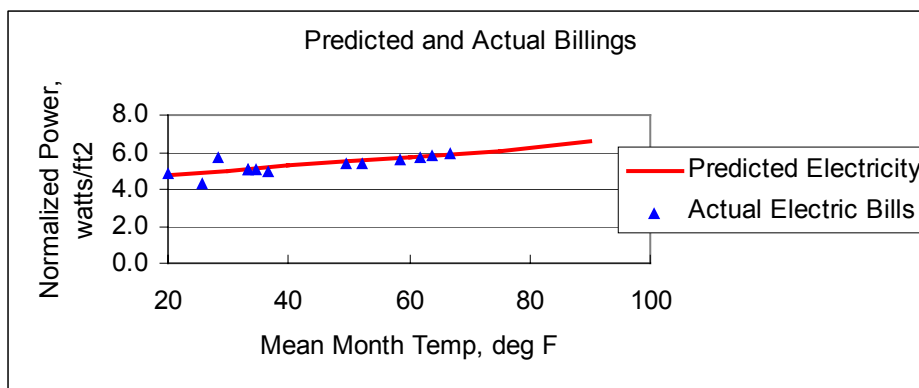
### *Inventory Refrigeration Loads*

The simulation tool operates because energy end-uses can be distinguished by their "shape" relative to temperature without costly submetering. But this option does not apply if the end-uses are difficult to distinguish. When that occurs, we must rely on other information to separate consumption.

One such example is supermarket refrigeration. Without submetering, it hard to know how much consumption was lighting or HVAC or refrigeration. So we rely more heavily on audits of the loads to tell us how much each end use is consuming. The connected load for lighting can be computed from a lighting survey. We can also survey the amount of coolers and freezer cases to estimate the refrigeration load. With this information to guide us, we have a way to separate these end uses.

### *Identify Type of System Control*

The next decision about refrigeration is clarifying the efficiency. The model distinguishes two types -- fixed head pressure and floating head pressure. These types can be distinguished using the utility bills because the fixed pressure consumes more energy at low temperatures. Floating head is more efficient, especially at low temperatures. Most new installations utilize floating head, an example is shown in Figure 1.

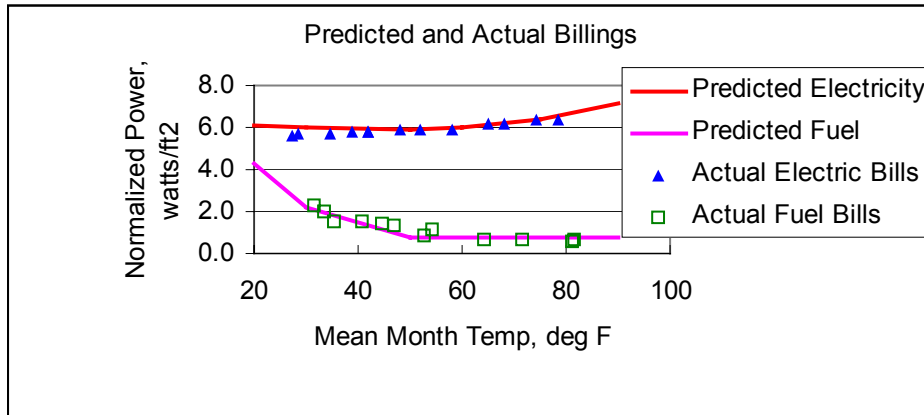


**Figure 1. Floating Head Refrigeration**

### *Waste Heat Recovery*

The next question to consider is whether waste heat from the refrigeration is recovered for use in space heating. Heat recovery of this sort is becoming common in larger supermarkets. Heat recovery can be deduced from the utility bills as shown in Figure 2.

Notice that the change in the use of gas at low temperatures. That is an indication of heat recovery.

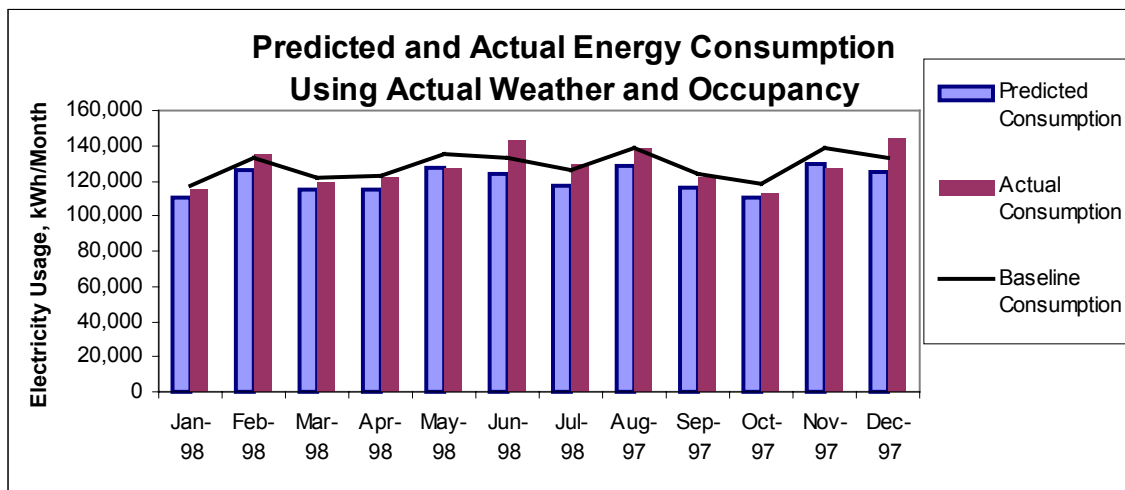


**Figure 2. Heat Recovery from Refrigeration**

Heat recovery is generally applied to a system with fixed pressure controls. That is because the floating head system does not provide enough waste heat to make heat recovery useful. The electricity plot helps to distinguish between these two types -- the fixed pressure system has a more flat operating profile with respect to temperature. Compare Figures 1 and 2 to see the difference.

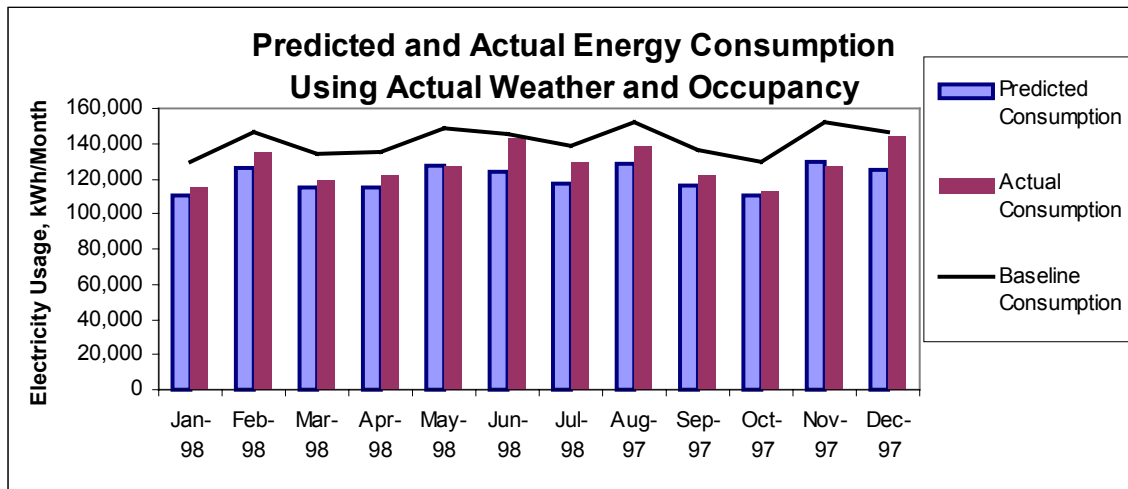
*Adjusting the Baseline*

The opportunity to implement conservation measures often occurs during a building remodel. The remodel is likely to include an upgrade of the refrigeration cases, adding new loads. In this case, one cannot simply compare the pre- versus post-retrofit bills to compute savings. One has to figure out what the old refrigeration system would have consumed if the new loads were added -- this means a revised baseline. Figure 3 shows an example. At first glance, there appears to be little savings even though the retrofit included efficient lighting and refrigeration cases. This is because a number of new cases were added.



**Figure 3. Commissioning Plot for Supermarket**

Figure 4 shows a better comparison. Here an equivalent amount of new cases was added to the baseline model, with the old refrigeration settings. Now we see definite savings for actual bills compared with the predicted baseline.



**Figure 4. Revised Baseline for Supermarket**

The following process sets up refrigeration parameters.

#### Modeling Parameters

##### Model Set-up

- Select Refrigeration. Be prepared to inventory amount of cooler cases.
- Set lighting loads, if known from site report.

##### Model Tuning

- Select floating head option or fixed, based on observations if not known from site.
- Select heat recovery, if appropriate.
- Select defrost type, default is hot gas but older cases may use resistance.
- Set refrigeration adjustment based on observation.

##### Conservation Measures

- Change conduction coefficient for efficient case insulation
- Change auxiliary energy for T8 lights and efficient fans.
- Check defrost method, change to hot gas
- Check compressor and controls options.

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## Energy Analysis at your fingertips

### EZ Sim billing analysis software

**EZ Sim** is the next step in energy accounting. Using actual utility bills, it reveals the patterns of use in commercial buildings.

**EZ Sim:**

- Diagnoses energy patterns and consumption
- Calibrates savings estimates to agree with actual energy usage
- Estimates energy end-uses within the facility
- Verifies vendor claims for energy products and services
- Generates performance targets and compares against actual energy bills

**EZ Sim** is a quick spreadsheet tool that is equivalent to

a sophisticated engineering analysis, but you don't have to be an engineer to use it. It's designed for resource conservation managers and facility operators.

**EZ Sim** uses actual energy bills and available information, so the **cost to operate EZ Sim is almost nothing.**

**EZ Sim** lets you use utility bills to calibrate a simulation of a commercial building in an interactive graphic window. **Once it matches the building's utility bills, the simulation model provides reliable and realistic estimates of potential conservation savings.**

With **EZ Sim**, the calibration process reveals how energy is used within the facility to help diagnose the reasons for excessive consumption or poorly functioning components.

Best of all, **EZ Sim** can be used to predict what future utility bills should be and can help you set performance targets to determine if installations are on track. **This is the simplest form of building commissioning - and at very little cost.**

## Stellar Processes, Inc.

*Stellar Processes is a company of consulting engineers specializing in energy economics, measurement and verification. Experts in monitoring and commissioning large facilities as well as diagnostic evaluation of small buildings.*

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