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Part Two

Be More Specific

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Last month, in Part 1 of "Be More Specific," we thought about the ways in which people try to assess energy performance of cold stores and the reasons why those methods are unsatisfactory. It seems obvious that the true measure of efficiency should be the size of the electricity bill at the end of the year and how that relates to the extent to which the plant has achieved its goals of keeping temperature down (or up) to the desired level.

Factors that influence the amount of energy required to achieve temperature goals include what the weather is doing, how big the facility is, how busy the facility is, how well the building fabric has been maintained and how careful the operators are to minimize unnecessary heat gains. For most of these factors the way in which they drive the energy use is either already well understood (for example the weather) or can be relatively easily investigated (for example levels of business). Over 25 years ago the Energy Technology Support Unit of the UK Government's Department of Energy commissioned a survey of about 100 cold storage and distribution facilities in the UK. This showed a relationship between energy consumption and cold store volume that they called the "Specific Energy Consumption" or SEC for short. This was measured in units of kWh per cubic meter per annum (kWh/m^3/a)* and was easily calculated by dividing the annual energy use (in kWh) by the volume of the building (in m^3). The Department of Energy concluded that a benchmark for best practice could be set and store operators encouraged to monitor their performance against it. They declared, on the basis of their survey, that for stores of more than 100,000 m^3 (3,500,000 ft^3) the best practice metric was 30 kWh/m^3/a (about 1 kWh/ft^3/a).* For smaller stores the figure was higher—up to about 50 kWh/m^3/a for a store of 25,000 m^3 (875,000 ft^3).

Several studies since then have looked at the Specific Energy Consumption metric and found that the average performance of a large number of stores lies above the 1994 "Best Practice" figure but there are many examples of plants doing significantly better than it. This has led this year to the proposal of a new "BP," ranging from 25 kWh/m^3/a at 25,000 m^3 to 5 kWh/m^3/a at 400,000 m^3. For an existing installation the metric gives a good indication of how the whole system is performing, and more importantly whether there is room for improvement. This can be achieved by improving the refrigeration system or by sharpening up the operation of the business to hit targets more effectively.

Be more specific.

An obvious disadvantage would seem to be that you need a year's worth of data before the answer is known and when an improvement initiative has been implemented another year to see the full effect. However, based upon intensive analysis of about 15 sites, using daily kWh figures, it seems feasible to make predictions of the annual figure even from just a few days' readings. With just one day-value the prediction is probably no better than ±40%, but within a month this can be narrowed down to ±20% and after three months in most cases better than ±5%. If the energy performance can be tied to business throughput then these estimates could be further refined.

This metric could prove to be key to improving our building performance, but it needs a better name than "Specific Energy Consumption" because "specific" usually means per unit mass and the energy is not being "consumed," merely converted from one form to another. It would also benefit from a less clunky label: I favor "kpma" as the short form of kWh/m^3/a. Does anyone have a better idea? ■

*1 kWh/ft^3/a = 35.3 kWh/m^3/a.

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