

# An Example of Heating Degree Days in Action

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from <https://www.degreedays.net/introduction#story>

Let me introduce you to a man called Dan. Dan is the facilities manager of an office building, and he's under big pressure to reduce the building's energy consumption. The company CEO, Jock, has noticed the rising cost of energy, and he's decided that the business could, and should, save some money by becoming more energy efficient. Jock hasn't given much thought to *how* they're going to become more energy efficient, but he's certainly putting a lot of pressure on Dan to make it happen...

So, in January 2018, Dan spent a big chunk of his budget on improving the building's insulation. At the time, he was confident that this would *seriously* reduce the energy it took to heat the building, and that the savings in the energy bill would very quickly pay for the rather hefty capital cost.

Roll forward to January 2019, a year after Dan's big insulation spending spree, and Dan has a decidedly stressed look on his face... Jock, who's a "*numbers guy*", wants to see some "*solid evidence*" that Dan didn't "*squander the company's hard-earned cash lining the pockets of some fly-by-night jokers*". (No offence intended to the insulation industry - Jock just tends to be a little quick to point the finger...)

Anyway, Dan is sweating, and it's not because the building's temperature control is playing up (the well-insulated building is actually helping to keep things at a steady, comfortable temperature). Dan has just added up the heating energy consumption for 2018, and he's somewhat concerned by what he sees:

- Heating energy consumption in 2017: 452,976 kWh
- Heating energy consumption in 2018: 445,241 kWh

It's not that there hasn't been an improvement in the heating energy consumption (there has), it's just that Dan was rather hoping for more of an improvement... After spending a small fortune on insulation, he was actually rather hoping for *significantly* more of an improvement...

Now, it just so happens that, in Dan's neck of the woods, 2018 was quite a lot colder than 2017. Dan is aware of this, and, reluctant to admit that he might have overestimated the energy-saving potential of his insulation idea, he is pinning his hopes on being able to prove that 2018's cold weather was to blame for the disappointing energy savings. Dan tried explaining this theory of his to Jock, but he was met with a rather blunt "*Don't you try fobbing me off with any of your hand-waving nonsense!*"

Shame on you, Dan, for forgetting that Jock is a *numbers guy*...

Fortunately all is not lost, as a colleague has tipped Dan off to these things called *heating degree days*. They're basically a measure of how cold the temperature was, but they're specifically for heating - if you've got 10% more heating degree days in any given day/week/month/year you should expect 10% more heating energy consumption in that day/week/month/year, all else being equal. (And with the caveat that you have to get the heating degree days in a "base temperature" that makes sense for your building - I'll cover that shortly.)

So, Dan hunted the web until he found [Degree-Days.net](http://Degree-Days.net), a site that generates degree days for locations around the world. He found a good weather station near his office building and downloaded a few years' worth of heating degree days for that location, in a base temperature that made sense for his building (I'll cover this in a moment). He quickly assembled the following figures:

- Heating degree days in 2017: 3,320 (I'll explain what this number really *means* shortly)
- Heating degree days in 2018: 4,092

Applying some simple arithmetic:

- kWh per degree day in 2017 =  $452,976 / 3,320 = 136$
- kWh per degree day in 2018 =  $445,241 / 4,083 = 109$

Comparing these two figures, Dan concluded that *the heating energy efficiency in 2018 was around 20% better than that in 2017*. Well done Dan: your insulation plan was a good one, and the company should make good savings from it for many years to come. In fact, it was such a good idea, Jock has convinced himself that it was his idea all along... So, Dan, it's looking unlikely that your insulation success will help your bonus, but at least you can stop sweating - your job security is no longer in immediate danger.

**(Advanced note:** the kWh-per-degree-day calculations above are a very simple way to estimate energy savings. I don't want to overload you in an introductory article, but, just so you know, it's usually better to use a more sophisticated regression-based approach to calculating energy savings.

Of course it's not realistic to expect to be able to source infinite quantities of temperature data, so practically speaking the most accurate way is to apply the same Integration Method to detailed temperature readings taken throughout each day (e.g. every 30 or 60 minutes). Given the limitations of weather-station thermometers, 60-minute data is almost as good as infinite data anyway. (Degree-Days.net has a page on degree-day calculation that explains this in more detail, but I'd recommend you stick with this introductory article for the moment.)

