Degree Days, What are they & how do you use them?

https://safety.networkrail.co.uk/home-2/environment-and-sustainable-development/energy-and-carbon-management/energy-management-tools/degree-days/

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The external temperature of a building has a significant effect on energy use, particularly in buildings or for heating energy use. It is important to consider these factors when assessing energy use or looking for areas of excess consumption.

Degree days help us to understand how hot or cold it’s been. They aren’t technically “days” at all. They’re a unit of measurement that’s been adopted as the industry standard for weather models.

The base temperature used to calculate degree days in the UK is 15.5ºC, because at this temperature most UK buildings do not need supplementary heating. Degree days is a measure of the difference between the baseline and the actual outdoor temperature multiplied by the number of days. “

Traditionally degree days can be “gathered” in the field by taking both the Minimum and Maximum outside temperature readings each day and applying a set of rules to calculate the Heating Degree Day (HDD) for that day. Eg. HDD = 15.5 - (Max + Min) /2

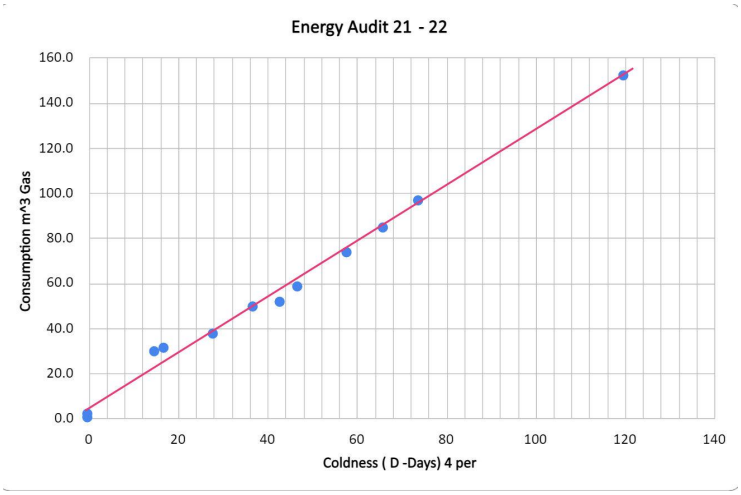
Today one can find all the data you will need on the Web

- https://vesma.com/ddd/welcome.htm
- https://www.gov.uk/government/statistics/weather-digest-of-united-kingdom-energy-statistics-dukes
- https://www.degreedays.net/

Now you have your HDD how do you use them

The theory says that the amount of energy used to heat a building over a given time will be proportional to the number of HDD in the same period. Ratio = kWh / HDD .

So far this year (2021) both Nov & Dec for my home have a ratio of 1.28 m^3 / HDD.



Monthly is too coarse a measure. Here is a graph that shows weekly performance. This shows HDD v m^3 of gas from mid October to mid December 2021 and shows high consumption at the 16 HDD mark and good adherence to the rule thereafter.

The “best fit” line is drawn through two calculated points.

The mathematical formulae for a straight line is :- y = mx + c or in our terms :-

Gas consumption = Slope * HDD + Intercept

Where the Slope is related to the angle of the line and the Intercept is the point where the line crosses the Y axis. Both these terms may be calculated within a MS Excel spreadsheet.

In the graph above Slope = 1.25 and the Intercept is 1.5 From this one can calculate where to draw the best fit line, at 120 HDD the consumption will be 1.25 * 120 + 1.5 = 151.5

The value of 120 is a bit high, a week with 100 HDD is very cold, for the Isle of Wight.

Having obtained these figures from your practical measurements one can now see how the system behaves as time goes on. The simple method would be to manually plot this graph each week on paper. Your notes should have the following; Date, Gas Meter Reading, Used this week, HDD and comments. The comments feature is important with such things as; Sunny, Windy, Away at weekend etc.

Degree days are also useful when comparing one year with another. Many folk simply use the amount they pay the gas man each month via their direct debit ! A true comparison can only be made using gas consumed (either m^3 or kWh) and how cold it was. Never the money.

There are a lot of things wrong here, the main one being one can not compare house against house or different lifestyles but it is far more sensible to use this method rather than the value of the direct debit.

What to do next

1. Find a few old gas bills that have accurate meter readings.
2. Visit https://www.degreedays.net/
3. Put in a town / airport near you and the time period mentioned on the bill
4. Download the HDD data
5. Do the maths Total gas used / Total HDD
6. Note the result
7. Repeat for a few more years for which you have data and compare.

Now start to build your weekly graph.

Each week read the gas meter and plot how much gas was used, in cubic metres, against the total HDD for that week.

Date	Gas Meter	Dif	DD
27-Mar-2022	1455	61	58
3-Apr-2022	1516	37	38
10-Apr-2022	1553	19	21
17-Apr-2022	1572	17	11

Three features to look out for :-

1. A high value of the intercept indicates that gas is used for other things like cooking and HW
2. If the line curves upwards as it gets colder ; you have added to the time the gas is used
3. If the line curves downwards as it gets colder ; your system is at its limit.