Instructions for use of Technology Demo for Heat Run – Excel File

The purpose of this is not to limit to the attached, but to expand the understanding possible from the use of such a tool, and suggest justification for assuring means to collect the data necessary to allow such analyses. The attached file data was collected automatically from an actual heat run, but is used only to demonstrate the functional opportunity, not to insist on any format.

The test data represents part of the full test, which consisted of nine each thermocouples on the conductor and enclosure, plus six measuring ambient around the enclosure, collected approximately once per minute. The particular standards involved required a minimum of four ambient measurements, a maximum temp rise in Deg. C of 65 for the conductor, 40 for the enclosure, vs. ambient, and a max difference of 2 Deg. C for stability at each device thermocouple for a minimum of three readings spanning an hour.

This time spec should be understood to represent the concern which provides the primary justifications for this tool; manual transcription of discrete data readings is both tedious and error-prone, but additionally allows for the false-read errors of too-high or too-low from limited discrete readings. The analysis tool, developed exclusively by **Idea Man** for GE (referred to as "the model" hereafter) performs statistical analysis on the raw data, thereby highlighting deviant data to allow its exclusion (as is evident from observing cell Y201, shown in yellow, and its original raw data as shown in AC201). As explained in Y245, the raw data was replaced by the selected value because the raw data fell outside the Median plus Three Sigma, so was obviously not representative of normal data varience, and so could be so discarded.

Similarly, at certain points throughout the data block there are rows colored in turquoise. As can be observed, these have discrete readings which are significantly outside the normal observed, and are simply errant spikes, and so should also be eliminated were they within the selected time range.

The model, at the discretion of the operator, selected the median of the minimum ambient as the control for maximum rise, but it can readily be seen that this could be an average of the ambients, or whatever else is acceptable to the testing parties. It should generally be agreed, however, before the start of the test. Similarly, since all the functions used in the model are common to most spreadsheet software, the use of Excel should be viewed as merely one alternative, and the specific functions should be seen as also flexible, depending on the purpose sought by the tool.

A powerful capability uses the formatting function for Number to display a negative value as a red in parentheses. By subtracting a Max value from a Min value, then adding 2, the resultant is immediately observed as good if black, bad if red, since the limit of two for range is added back before display (as shown in row 254). Similarly, subtraction of max from calculated max allowable would display in red if the limit were exceeded (as in row 262). An example of the usefulness of this tool is observed in the area M247:M262 wherein the enclosure was actually being heated not by its own current capacity, but by the electrical test connections made to that area. Therefore, the model allowed the operator to immediately see that there was a problem, focus on the issue, quickly understand the root cause, and therefore determine to properly ignore that data as invalid, just as for the other yellow and turquoise colored cells.

One final comment regards the ability to look at the "trend" and "comparitive areas" instead of discrete points, since that would allow proper decision making even in the presence of significant electrical noise, as for example might be observed if spiking was widespread, since common sense says a local thermal mass would prevent rapid swings of 2 Deg C if they were observed from noise on the thermocouples.

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