

Cost-effective thermal validations: How a move to wireless data loggers can really pay off

- > Still using thermocouple validation systems?
- > Looking for a way to reduce validation costs?
- > Want to know why switching to data logger systems can make good economic sense?



Long a mainstay in the pharmaceutical world, thermocouple systems are increasingly falling out of favor with validation engineers. The primary motivator is simple: **cost**. Thermocouple systems are inefficient to use and maintain. In their place, self-contained thermistor-based data logger systems are a cost-effective alternative that can offer companies a surprisingly fast payback.

Here's why:

1. Better accuracy - less rework
2. Better sensor stability - less setup, calibration, and maintenance time
3. No cables or wire - less disruption to the work space
4. Built-in humidity capability - more complete information on environmental conditions

>>>> **more**

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Better accuracy – less rework

Accuracy is vitally important in validation applications for a very basic reason: confidence. If measurement discrepancies are encountered, such as between probes in a chamber, or in the calibration results before and after a test, a lack of confidence can trigger a costly train of investigations and rework. In such cases, operators must determine if the fault lies with the process, the equipment, or the measurement instrumentation.

A challenge with using thermocouples is that they have several inherent characteristics that make them less accurate and less dependable than thermistor-based data loggers. The two main sources of thermocouple measurement error relate to cold junction temperature compensation and the quality and condition of the thermocouple wire used. These errors are difficult for operators to deal with because they cannot be calibrated out.

In contrast, thermistor-based data logger systems do not rely on cold junction reference measurements - nor are they affected by wiring quality issues. Consequently, they provide a highly accurate absolute temperature reference that can be counted on to produce dependable results.

Bottom line: The accuracy of thermistor-based data logging systems can help you avoid the expense of needless troubleshooting - and having to repeat validation runs.

Better sensor stability – less setup and calibration time

A challenge with any measurement system is how to be certain of the accuracy in between calibration intervals. Thermocouple systems are particularly challenging because of the number of variables that affect accuracy and stability. To compensate, frequent calibration is considered mandatory.

The main issue with thermocouple stability is the changes in homogeneity that take place in the thermocouple wire with normal use. Commonly called “cold working”, repeated stressing of a thermocouple wire actually alters the characteristics of the wire, introducing what amounts to be unintended junctions in the wire. When these junctions are located in a temperature gradient, a voltage is generated that results in a temperature error.

Controlling homogeneity involves careful handling of thermocouple probes as well as the use of high-grade thermocouple wire. All wiring, however, can get damaged through normal usage, potentially creating measurement errors. It is for this reason that many companies routinely discard their thermocouple probes after only a few temperature studies.

In contrast, thermistor-based data loggers do not have “cold working” errors and can maintain accuracy for years without adjustments.

Bottom line: The stability of thermistor-based data logging systems can help you minimize setup, calibration, and maintenance expenses associated with each validation run.

No cables or wires – less disruption to the work space

Thermocouple systems typically consist of a laser-printer sized data acquisition unit and a bundle of thermocouple probes. Mapping a space with such a system requires centrally placing the unit and then stringing the probes from it - taking care to avoid kinks and potential damage from on-going work operations. This is often an onerous process.

To minimize the downtime caused by stringing wires, such as in a warehouse, thermocouple system operators must frequently perform their work in piecemeal. In doing so, the mapping work can be made less disruptive - however - such an approach can stretch out a mapping project significantly.

In contrast, thermistor-based data loggers operate without wires or cables and can be easily placed in areas without affecting normal work flow.

Bottom line: Because data loggers are “wireless”, they minimize the setup time associated with stringing cables. They also help avoid the expense of business operation downtime.

Built-in humidity capability – more complete information on equipment performance

In many pharmaceutical processes, temperature mapping alone does not provide the complete picture necessary to properly validate a space. In such cases it is also necessary to include relative humidity to meet the requirements of humidity dependent materials or processes. While it is possible to measure relative humidity with a thermocouple system, it is not always an easy task to perform, or to calibrate for.

Mapping a chamber or space for both temperature and relative humidity can increase the flexibility of the space for the end-user. For example, it can potentially be used for both temperature and humidity-dependent processes. With relative humidity information readily available, companies can be assured that the necessary requirements will be met.

In contrast to thermocouple systems, data loggers are available with built-in humidity sensors - allowing operators to accurately map a space for both temperature and relative humidity - without adding additional wires or components.

Bottom line: Thermistor-based data loggers are available with built-in humidity sensors, eliminating the expense of using costly humidity transducers and wiring. With more complete information, equipment and processing areas can be used more flexibly, resulting in a more profitable use of space and equipment.



Conclusion

For many organizations, switching to thermistor-based data loggers is an investment that can pay quick dividends. By avoiding needless rework, minimizing setup, calibration, and maintenance time, avoiding business downtime, and providing a greater level of information, operators and organizations can reap the benefits quickly and without compromising data quality.

For more information on Veriteq's VL-series Validatable data logging system, or for a quote for your facility, please contact Veriteq.

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