



Cost benefit between thermocouple systems and loggers

Over the past 10 years data logging systems have slowly been replacing thermocouple based systems for validation applications in the food and pharmaceutical industries. The one major drawback of using loggers is they cannot give you real-time data during the study. The majority of validation studies do not require real-time data making data loggers an idea solution.

Benefits of data loggers over thermocouple systems

Accuracy

Most high quality data loggers use PT1000 temperature elements for measuring temperature. These RTD elements are far more stable then thermocouples. Typically they will not drift more then 0.1C over a years use. Thermocouples are much less stable and can drift several degrees over a short amount of time or even more depending on how much the wires are bent and flexed. Therefore most SOP's require the thermocouples have a 3 point calibration before each validation. Using RTD's we recommend just a 1 point verification, a 3 point calibration is not necessary.

Setup Time Savings

Organizing and positioning 16 thirty foot wires through a port and then sliding them throughout an autoclave load requires a lot of time and patience. Data loggers can be started and positioned into the load before it is placed in the autoclave. Furthermore, thermocouple wires are a hazard to be tripped over or can get hung up on surrounding equipment. Data loggers are just cleaner to use and do not interfere as much with surrounding workflow. Below gives an illustration of the time that can be saved using loggers.

Step	Description	Time in minutes
Thermocouple System		
Initial Setup	Gather instrumentation, setup thermocouples	30
Calibration	3 point, Dry block, 16 channels, 15 minute stability period between cal points 40C, 120C, 135C.	120
Calibration	Report & confirmation	30
Study setup	Prepare equipment and autoclave	30
Thermocouple Setup	Wire thermocouples through port and position at each monitoring point	120
Run Validation	One hour autoclave run	60
Clean up	Remove thermocouples & store	60
Data Analysis	Export to Excel, run statistic & Fo calc.	60

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Data logging System

Initial Setup	Gather instrumentation	10
Calibration	1 point verification at 121C, set bath	30
Start loggers	Start loggers & insert into bath	10
Stability	20 minute stability	20
	retrieve, download loggers, print limit	
Read loggers	report	10
Study setup	Prepare equipment and autoclave	30
Start loggers	Start and place loggers in autoclave	15
Run Validation	One hour autoclave run	60
Read loggers	retrieve, download loggers	10
Reports	Output validation report, statistics, F0	5
	Using Valsuite	

200

These times are conservative and should be adjusted per specific applications. In general data loggers can save at least 50% in setup time in comparison to thermocouples.

Vessel Integrity

Wiring thermocouples requires they run through a port or slid through the door gasket. If not properly sealed leaking can occur around and through the wires. This is a non issue with data loggers.

Safety

An important issue many avoid addressing is calibration error. With thermocouples you must calibrate & if you calibrate them incorrectly you can have a faulty study and not realize it. You must depend on the reference probe you are using. Each data logger is an independent unit. So if one is out it has no bearing on all the other units. Again, this is why we recommend 1 point verifications over calibration.

Many Food and Medical Device manufacturers have dropped performing a 1 point or 3 point calibration on their loggers because it is not required. They rely on the yearly NIST calibration certificate which is acceptable for their industries and because of the historical stability of loggers over thermocouples.