Verification of Air Canister Sampling Flow Rate Using a Data Logging Device

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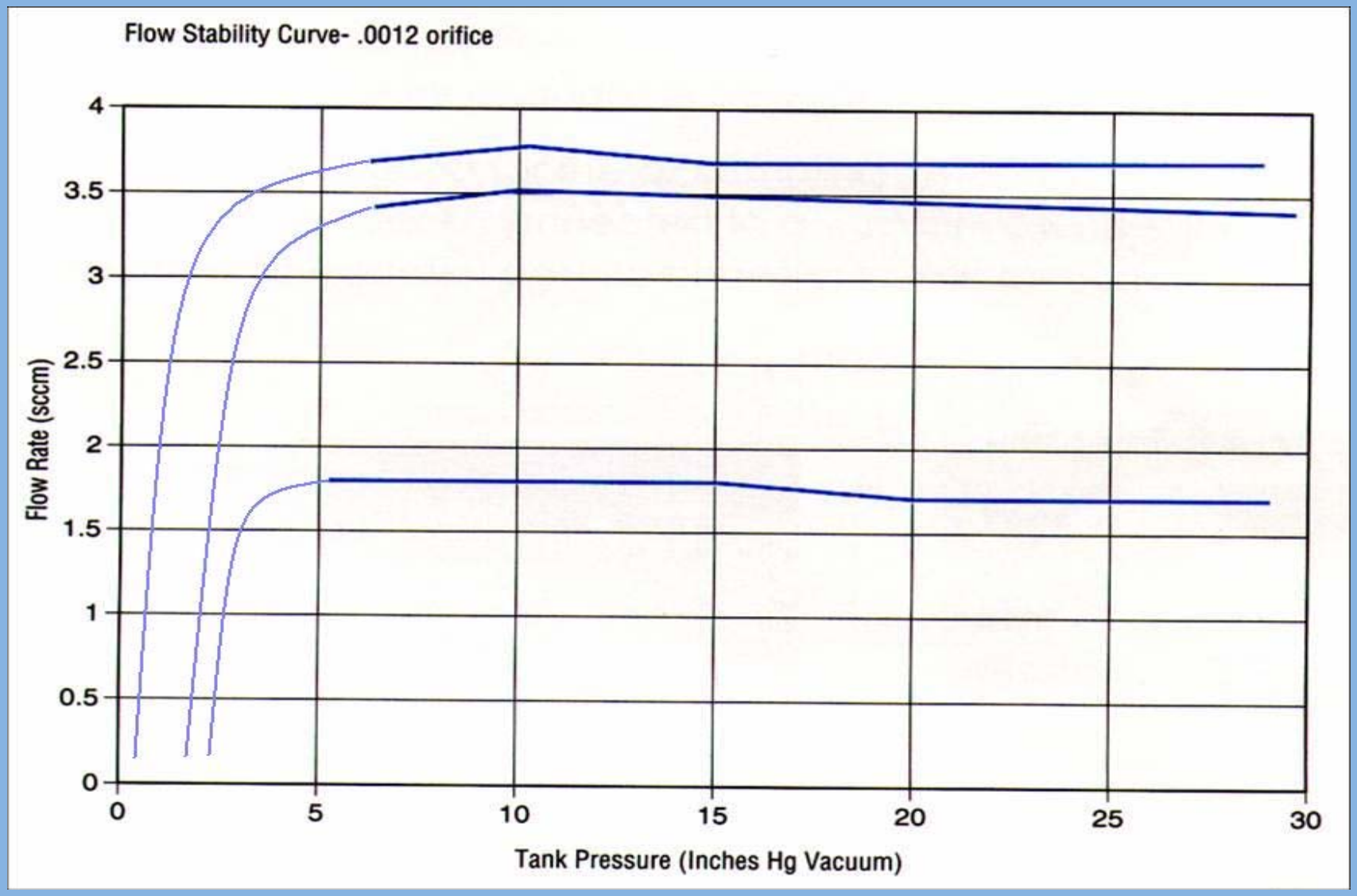
What is Integrated Passive Sampling?

- Uses vacuum in canister to draw in sample
- Uses vacuum flow controller to maintain constant flow during sampling period
- Flow rate is selected to fill canister over a pre-determined time interval

Passive Sampling

Vacuum Affect on Flow Controller



Critical Orifice/Flow ranges

Critical orifice diameter versus flow rate.

Orifice Diameter (in.)	Flow Range (sccm)	Canister Volume / Sampling Time				
		400cc	1L	3L	6L	15L
0.0008	0.5-2	8 hr	24 hr	48 hr	125 hr	--
0.0012	2-4	2 hr	4 hr	12 hr	24 hr	60 hr
0.0016	4-8	1 hr	2 hr	6 hr	12 hr	30 hr
0.0020	8-20	--	1 hr	4 hr	8 hr	20 hr
0.0030	20-40	--	--	2 hr	3 hr	8 hr
0.0060	40-80	--	--	--	1 hr	3 hr

Process of Integrated Passive Sampling

1. Evacuate canister to 29” Hg in the laboratory
2. Set flow controller to required flow rate
3. Ship canister and flow controller to sampling location
4. Open valve and begin sampling
5. Close valve at end of sampling period
6. Ship canister back to the laboratory for analysis

Factors Effecting Sampling Validity

- Leaks during transport to & from the sampling site
- Incorrect flow rate setting
- Leaks during sampling
- Flow restrictions due to particulate clogging

Method Specification on Sampling Validity

- From Method TO-14:

  "For a sub-atmospheric sampling system, if the canister is at atmospheric pressure when the field final pressure check is performed, the sampling period may be suspect."

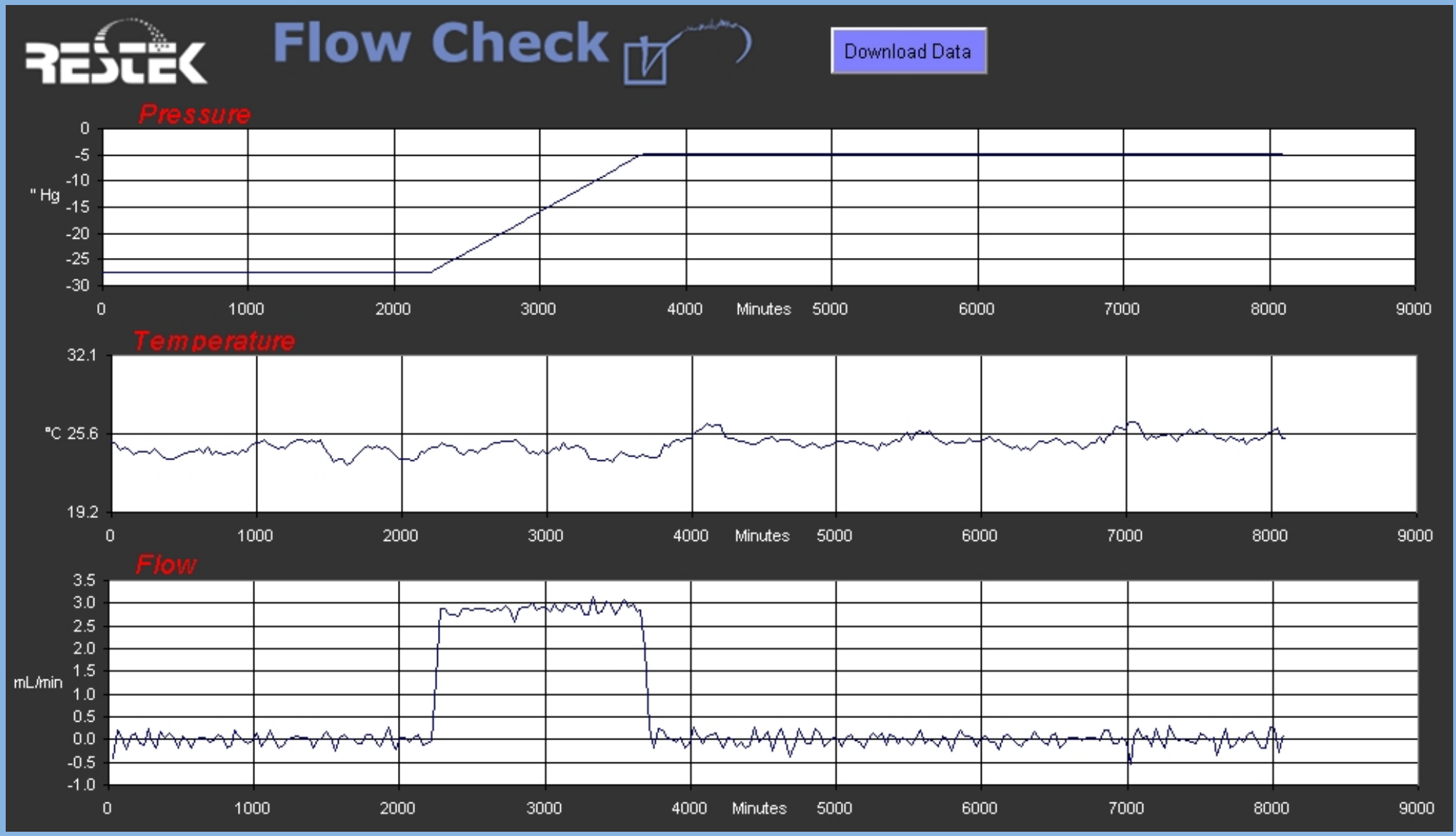
Passive Integrated Sampling Validation

- Electronic flow logging device
  - **Monitors pressure and temperature**
  - **Calculates flow rates based on pressure differential**
  - **Stores data during transport and sampling event**
  - **Data downloads to Excel spreadsheet**
  - **Graphs of pressure, temperature, and calculated flow rate versus time can be plotted**

Flow Logger
(mounted on canister valve)

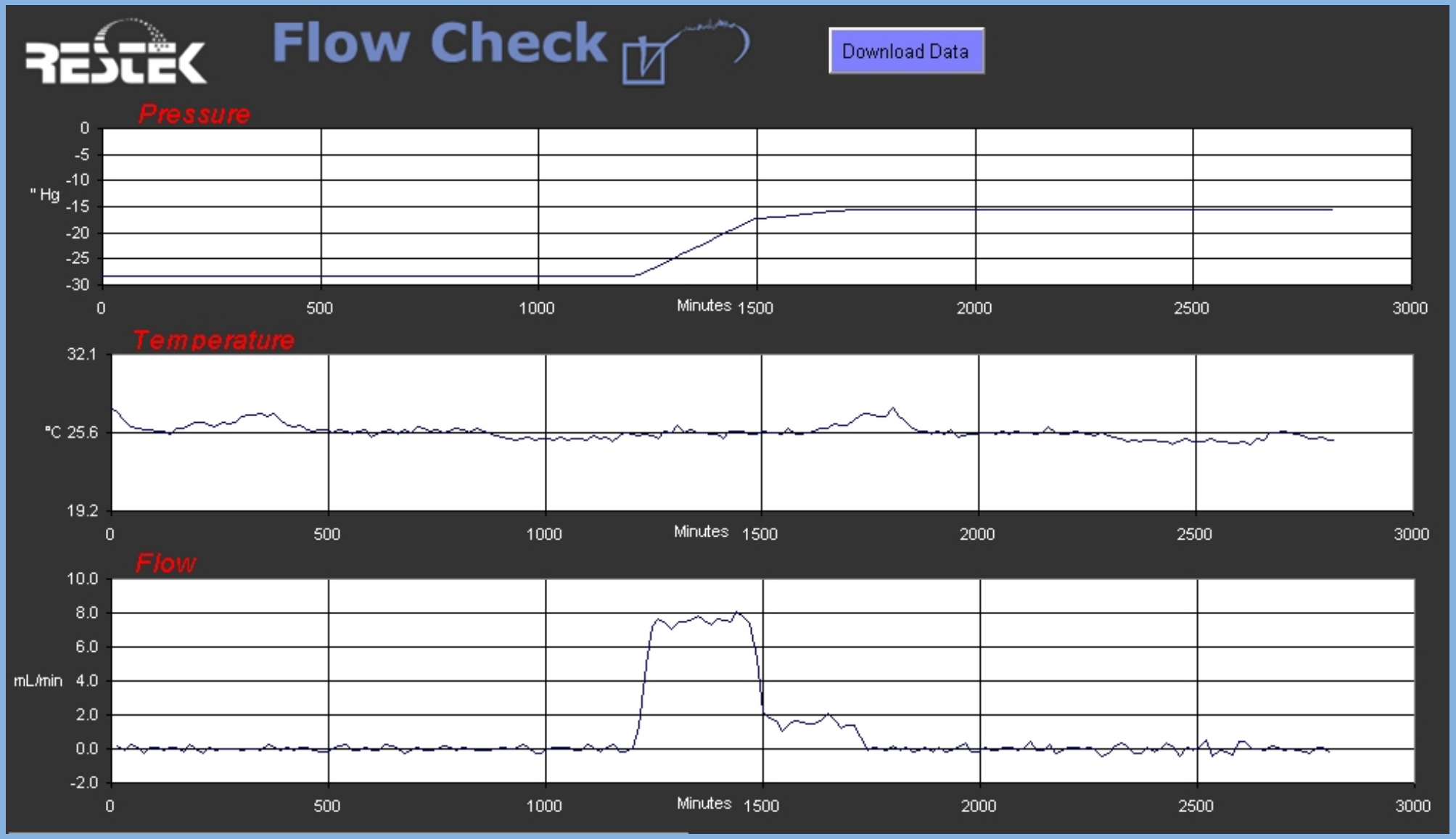
Flow Logger
(with cover removed)

Output from Flow Logger

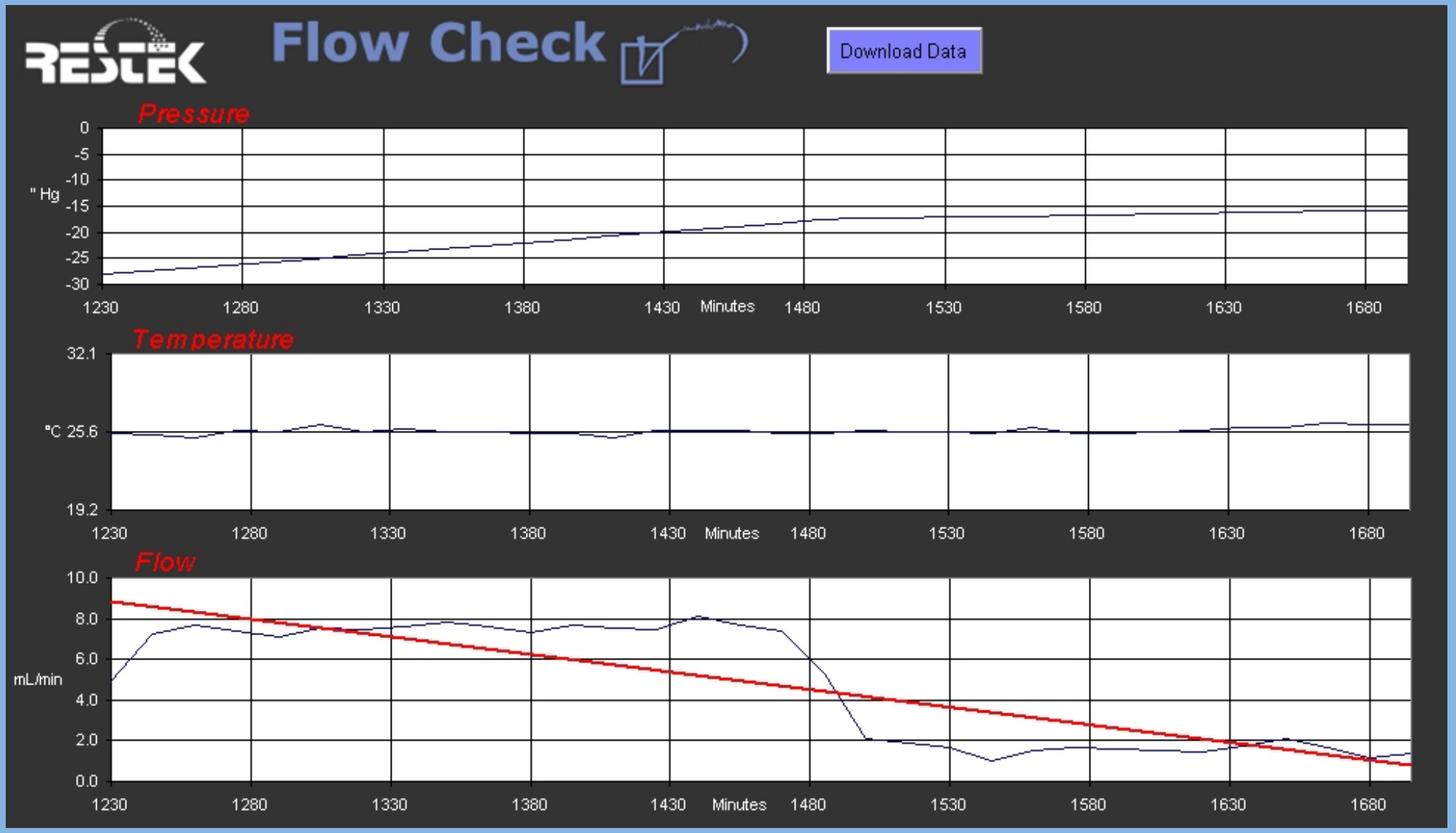


Expanded View of Sampling Period

Invalid Sample (clogged orifice)



Expanded View of Sampling Period



Conclusions

- Integrated passive air sampling techniques are commonly used to measure air pollutants.
- Validation for integrated passive is useful in determining the accuracy of air sampling.
- A battery operated device has been developed to validate integrated passive air sampling.