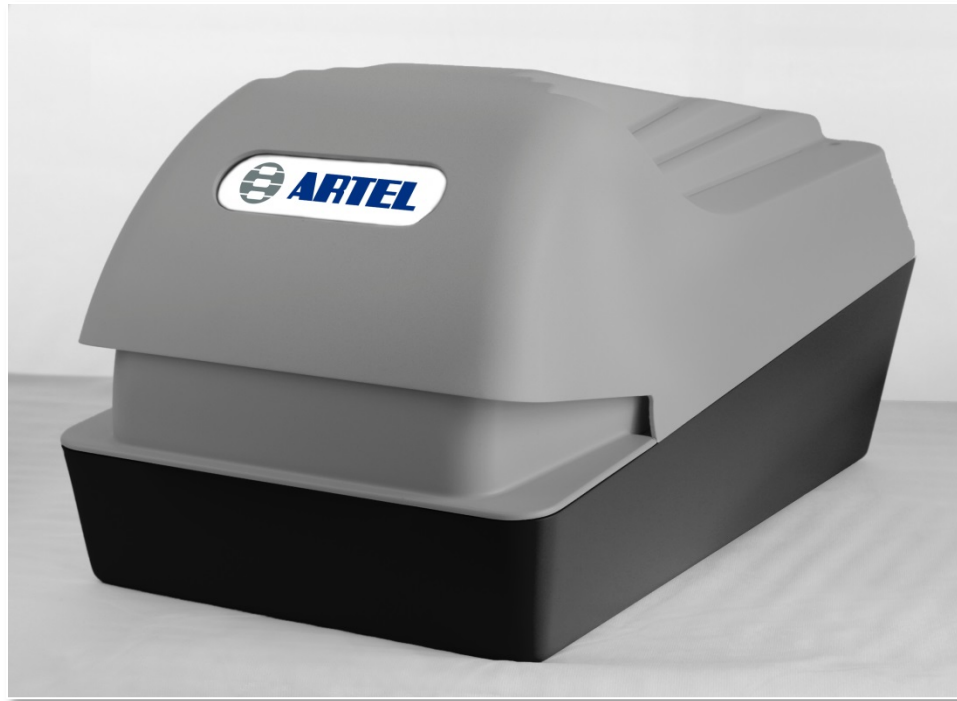


Artel Presents Newest System that Measures Volume Within Wells by Pressure Technology

Dana Campbell – Field Applications & Support Specialist



Concerns that may arise? Anyone experience these?

- Empty wells
- Low volumes in wells
- Clogged tips or channels
- Bad tip or plate lots
- Liquid loss from plate seal
- Liquid loss from tip carryover
- Poor liquid class definitions
- Mechanical failures over time
- Database discrepancies
- Unknown well volumes



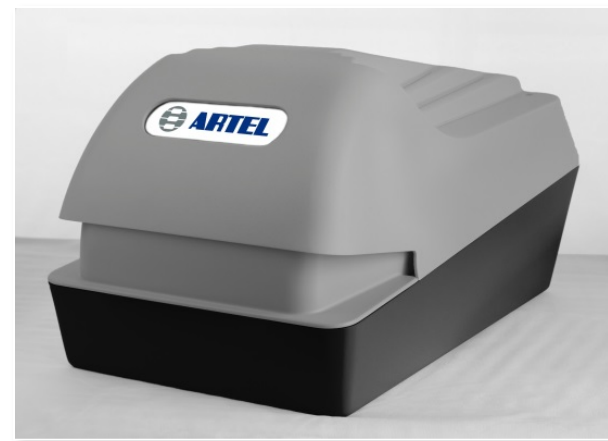
Some of these issues can be resolved with real-time volume detection.

Quick History

- “What’s the volume dispensed?”
- Global leader in liquid volume measurement
- MVS – uses dual dye photometric technology
- Answers the question of liquid volume measurement
- But what if... ???s A major pharm company asks.
- Stratec responds with the “Tholos”.
- Artel enters into a partnership with Stratec
- Tholos becomes the Artel VMS (Volume Measurement System)

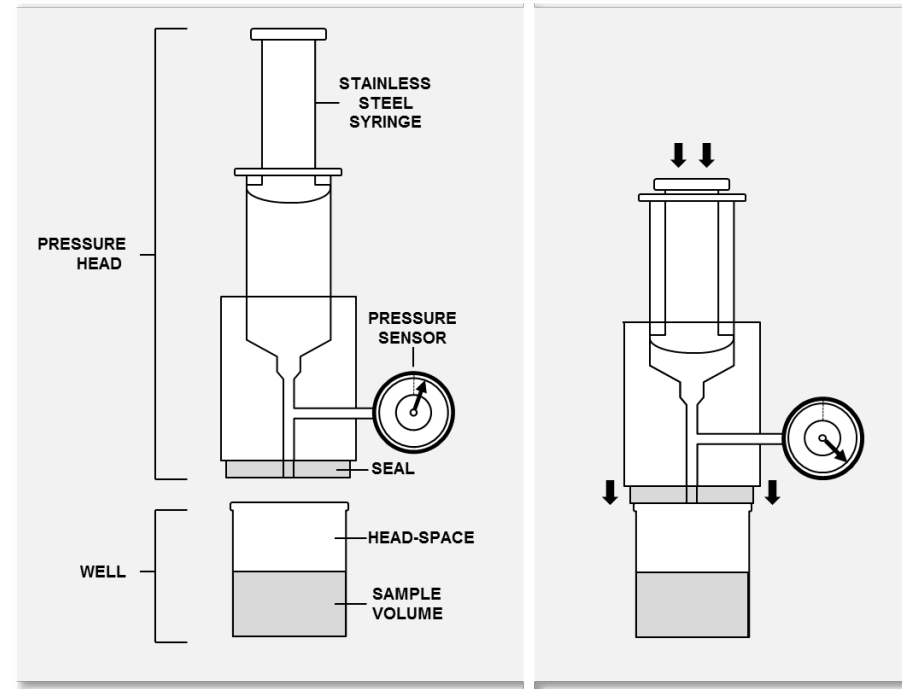
Overview – the Artel VMS™

- Measures volumes in 96- and 384-well plates
- Measures liquids, solids, and suspensions
- Uses pressure based technology
- Technology developed with Compound Management and Screening in mind
- Measurement is independent of shape of well, type of plastic, and color of material
- Can measure volumes up to 500 μL
- CV < 2% (plate dependent)
- Accuracy < 5 μL (plate dependent)
- Automation friendly



Measuring Volume with Pressure

- Ideal gas law: $PV=nRT$
- Knowing P & T; able to solve for V
- A known volume of air is added to each well.
- **A strain gauge pressure sensor provides feedback which can be compared to a calibrated value and converted to a volume.**
- Reference wells are used to normalize T and barometric changes.
- Not subject to issues normally seen by optical or acoustic methods of measurement (bubbles, meniscus issues, etc).

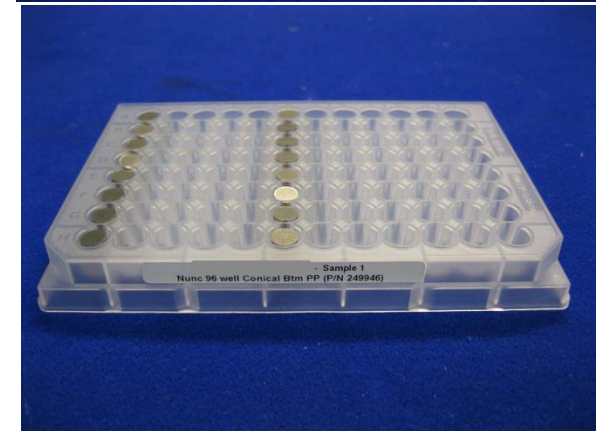
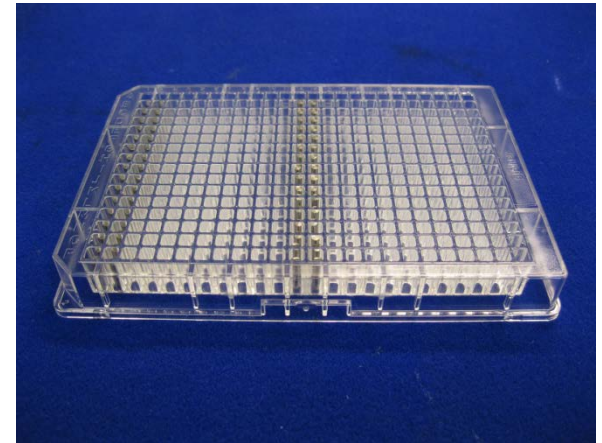
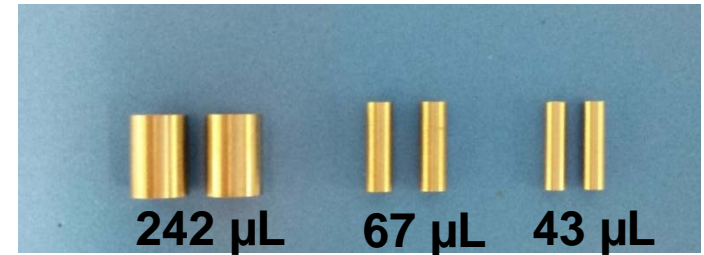


VMS Operation

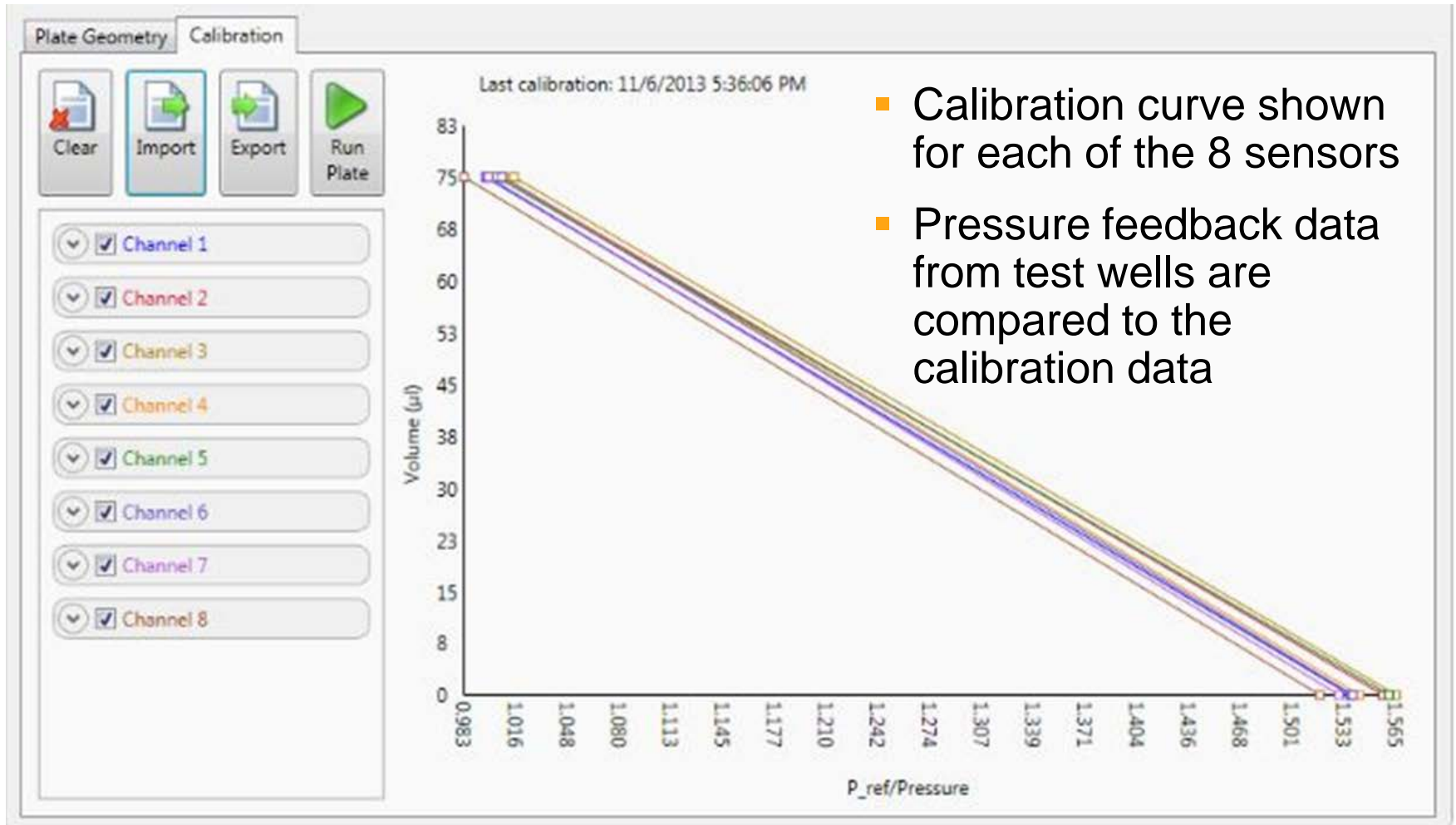
Calibration and Measuring Test Plates

Volume Simulators – For Calibrating the VMS to Each Plate Type

- High precision volume simulators are used during the calibration procedure
- Appropriate volume simulators are added to the plate
- Most 96- and 384-well SBS plates (<20mm height) can be calibrated on the VMS
- A pressure-to-volume curve can be generated by measuring full wells and empty wells



Calibration Curve for the Respective Plate Type



Measured Volume of Well Contents in Test Plate are Then Displayed

The screenshot displays the Strattec Volume Measurement Instrument software interface. The main window shows a 96-well plate measurement results for 'Plate 'Test plate 1' 7/24/2013 12:35:15 PM'. The plate is visualized as a grid of wells, with a corresponding data table showing the measured volume and pass/fail status for each well. The data table is as follows:

Row	Column	Volume	Pass/Fail
A	1	54.2 μ l	Pass
B	1	53.4 μ l	Pass
C	1	51.5 μ l	Pass
D	1	51.8 μ l	Pass
E	1	52.7 μ l	Pass
F	1	53.0 μ l	Pass
G	1	53.5 μ l	Pass
H	1	53.4 μ l	Pass
A	2	55.7 μ l	Pass
B	2	53.3 μ l	Pass
C	2	49.8 μ l	Pass

Standard deviation: 2.20 μ l CV: 4.09 %

The interface also includes a 'Test Method' section with options for recording errors and highlighting colors, and a 'Wells to measure' section with a grid of wells and selection options. The bottom right corner of the software window features the 'strattec biomedical' logo.

- *CSV file export*
- *Time of measurement*
 - *96-w test plate ~ 30 s*
 - *384-w test plate ~ 120 s*

Applications

- Real time sensing of volume discrepancies
- Understanding transfer accuracy for custom, PCR, non-aqueous, suspensions, “bio” liquids, etc.
- Enables pre/post measurement of critical aspirate/dispense steps
- Early detection of liquid handler malfunctions
- Early detection of clogged tips
- Liquid class & pipetting method optimizations
- Detection of database errors
- Real time process verification
- Process optimization
- QC of incoming collections of materials (outsourced plates)



Where does volume accuracy matter in your lab work?

Questions?