

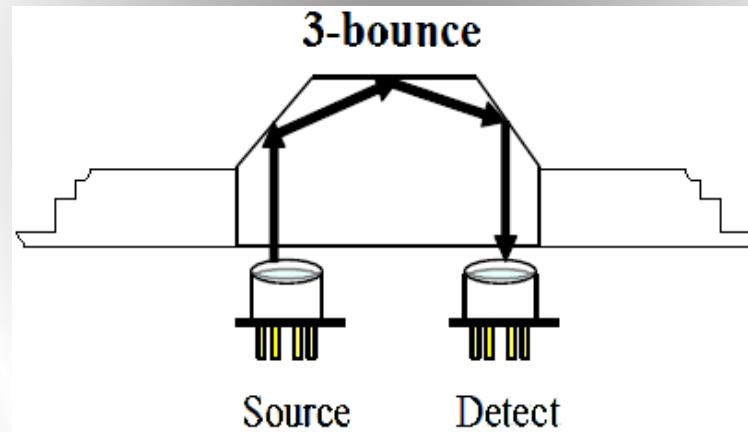


Real-time infrared instrument for process control

Measure Dissolved Organic Acids, Alcohol and Sugars inline

VS-3000 is a Mid-Infrared Spectrometer using Attenuated Total Reflective Index and Beer-Lambert's Law

- Infrared Source emits infrared energy from the sapphire crystal to into solution (vinegar)
- IR energy bounces 3 times off the crystal and returns to the IR detectors



- IR detector determines how much energy was absorbed in the beer based on the speed of the CH stretch molecule vibration (via Beer-Lambert's Law)
- Each concentration of interest is measured independently and has its own filter machined to a particular micron depth to read only the concentration level of interest

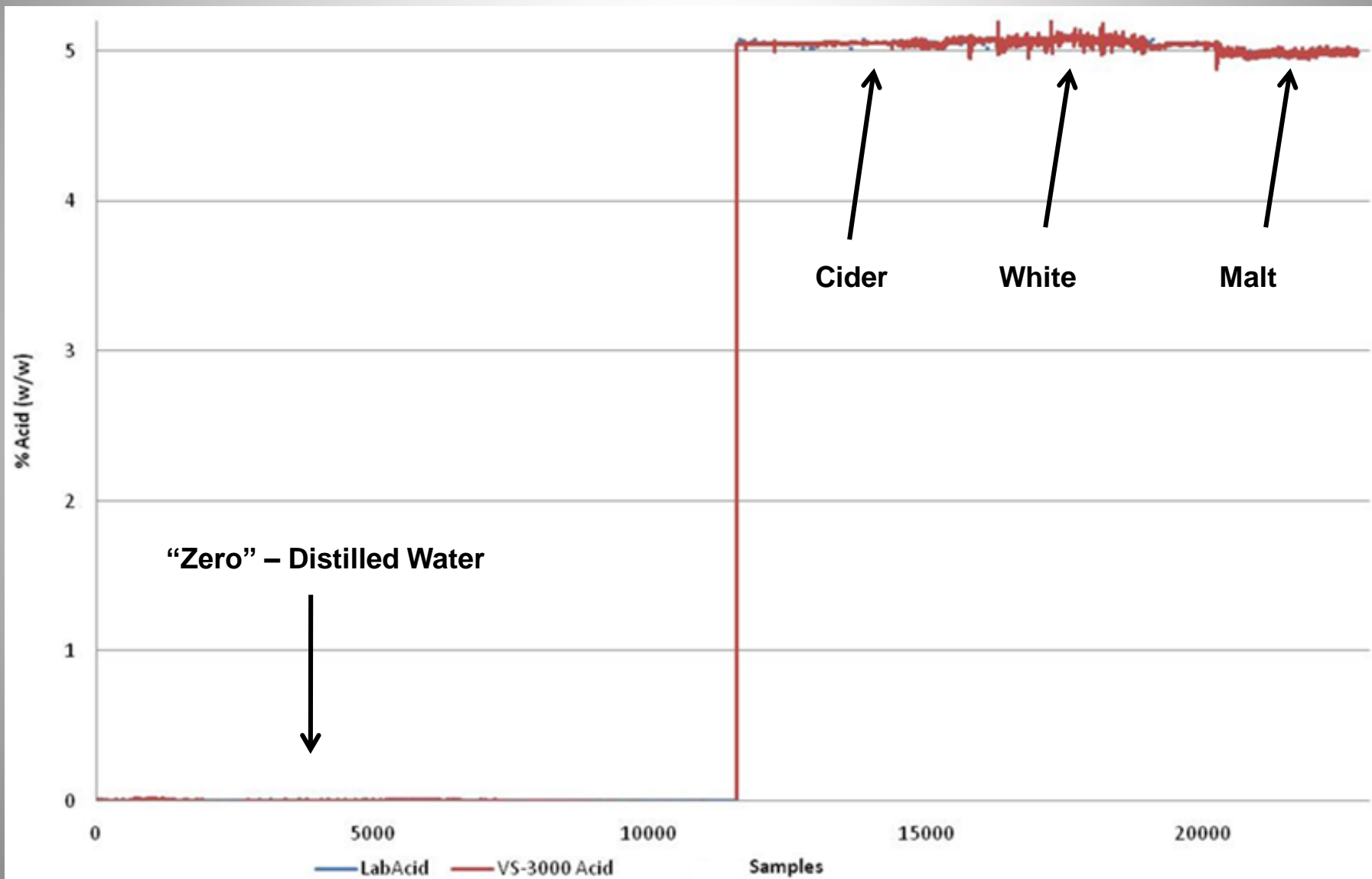
What this means to a process

VS-3000 Concentration readings are not affected by or dependent on temperature, pressure, density, color, turbidity or flow.

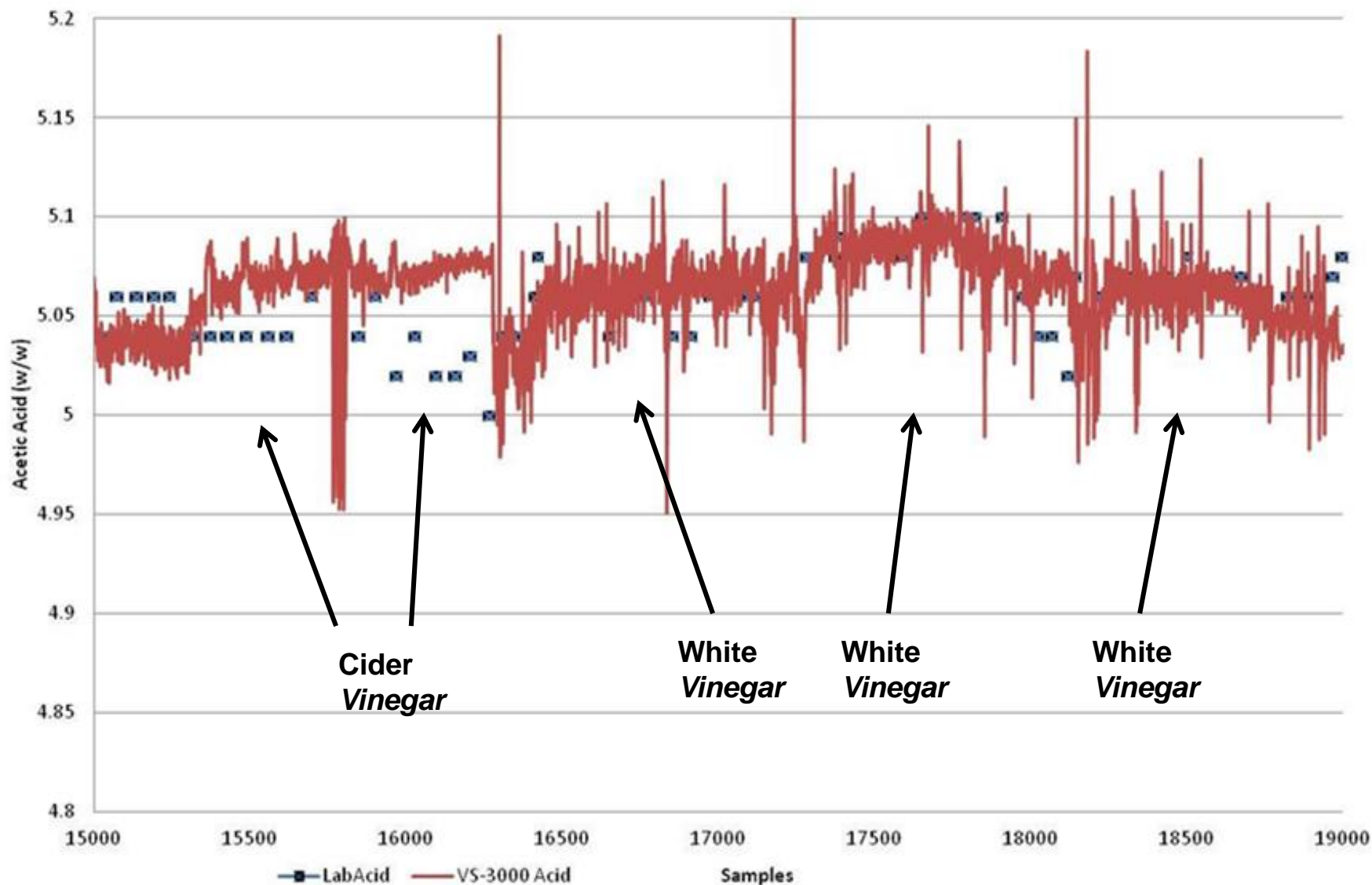
- Total Acid is measured 24 times per second based on spectral analysis of the organic acid molecules. VS-3000 extrapolate Total Acid based on mass flow, density or offline lab sampling.
- Alcohol is measured 24 times per second based on spectral analysis. VS-3000 does not infer or approximate based on density which is an inference based on constants and approximations of other substances in the beer.
- Brix is measured 17 times per second based on spectral analysis of Sugar molecules and ONLY the sugar molecules. VS-3000 does not infer or approximate based on sound velocity or mass flow which is an indirect inference.

Capabilities of VS-3000 in a Vinegar plant

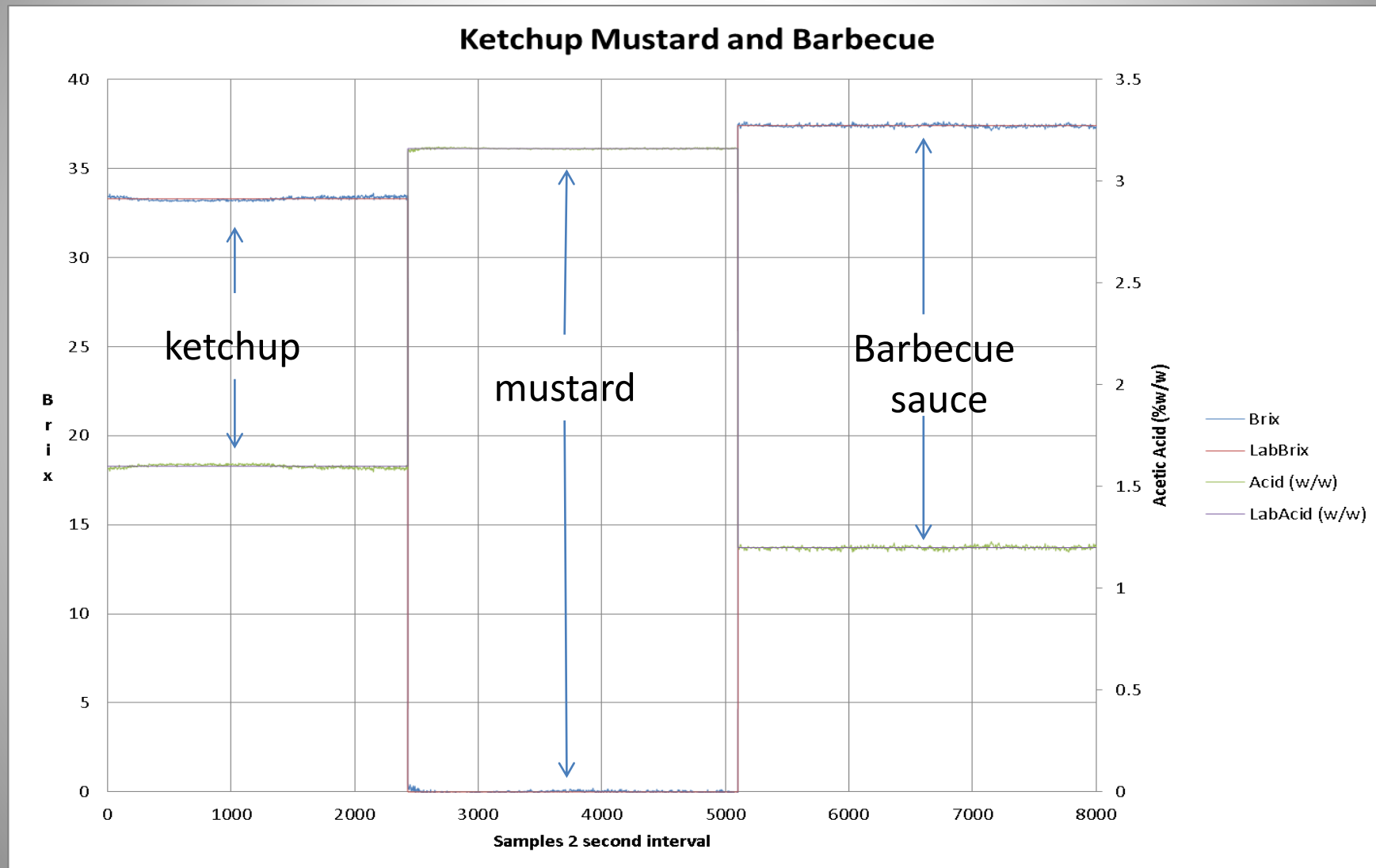
- VS-3000 measures total organic acid in solution 24 times per second
 - works on *White, Cider, Malt* and *Wine* Vinegar
- Control cutting / mixing in real-time
- Real-time monitoring at a filler
- Limit “out of spec” product with instantaneous readouts
- Reduce man hours + titration error in the QA lab, VS-3000 is a hands-off measurement
- Measure up to 30% total acid with an accuracy of $\pm .005$ w/w
- Monitor fermentation by measuring Alcohol, Sugar and Acid/CO2 **with 1 sensor head**
 - determine when fermentation is completed in real time
 - do not need to rely on density approximation for alcohol reading
 - measure sugar real-time
- Sensor contains no moving parts and requires no routine maintenance or cleaning. Readings are not affected by density, color, temperature or pressure

VS-3000 Acid vs. ***QA Lab Acid***

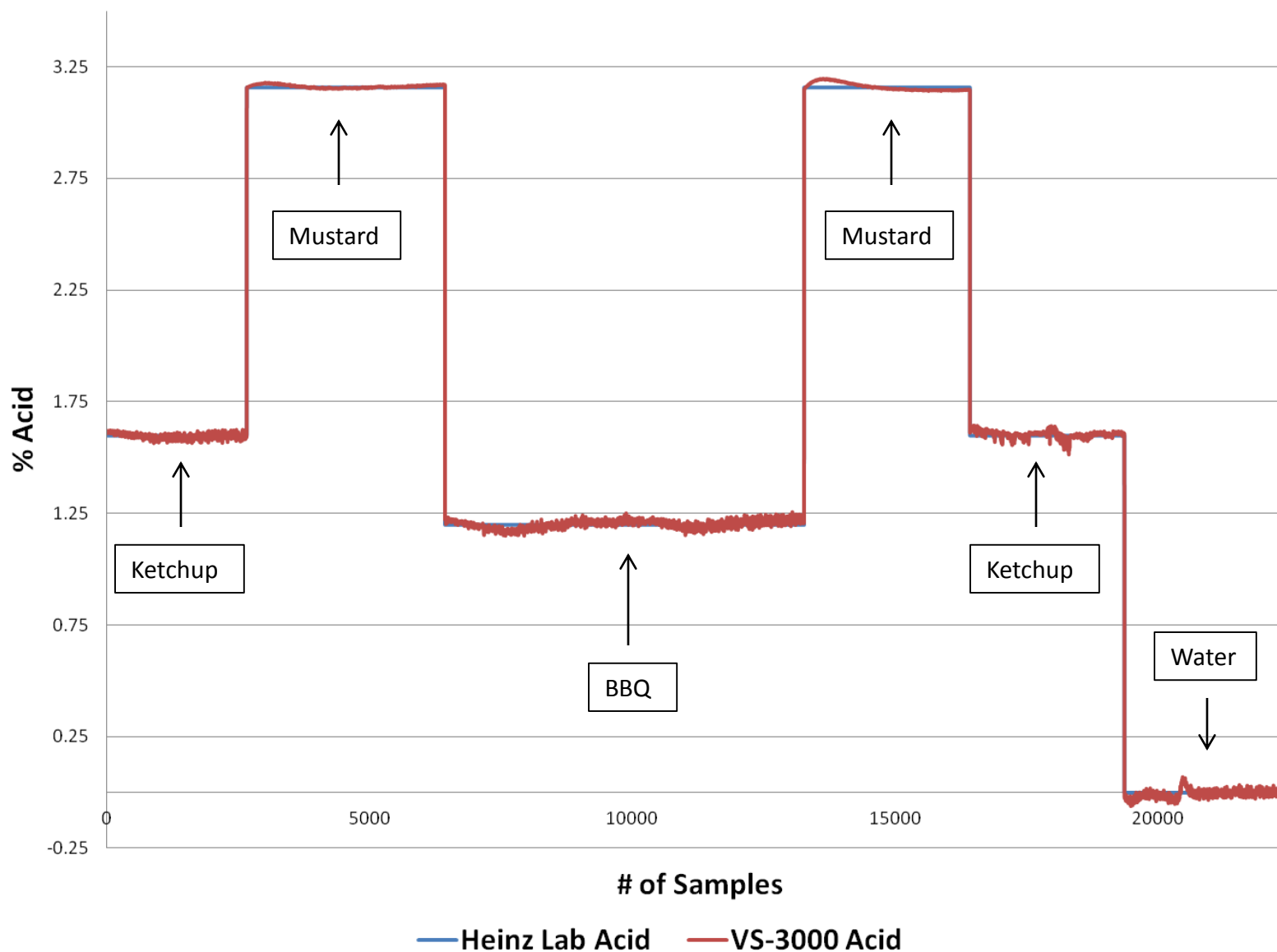
VS-3000 Acid vs. QA Lab Acid (Expanded)

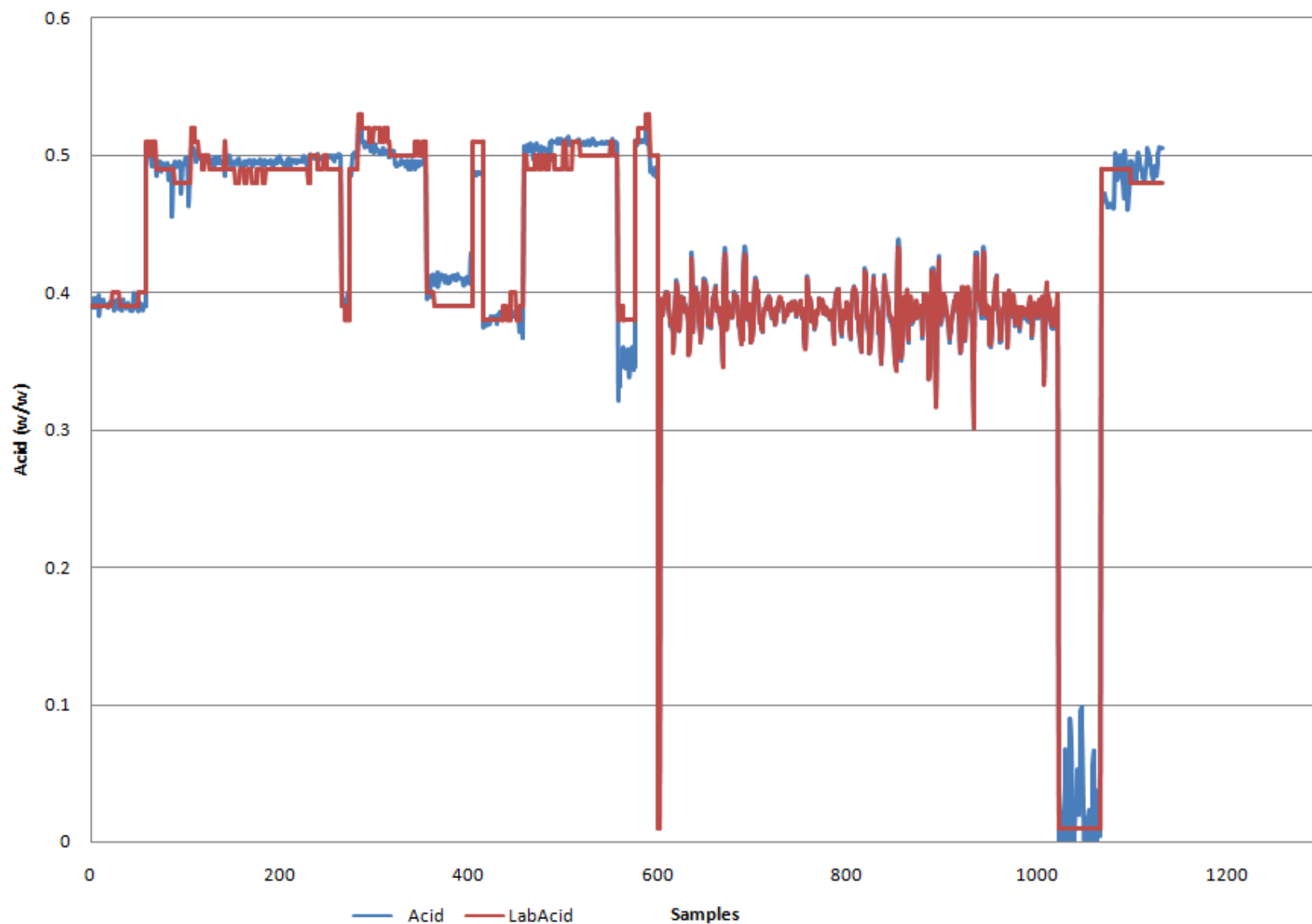


VS-3000E Brix and Acetic Acid Ketchup, Mustard and Barbecue Sauce

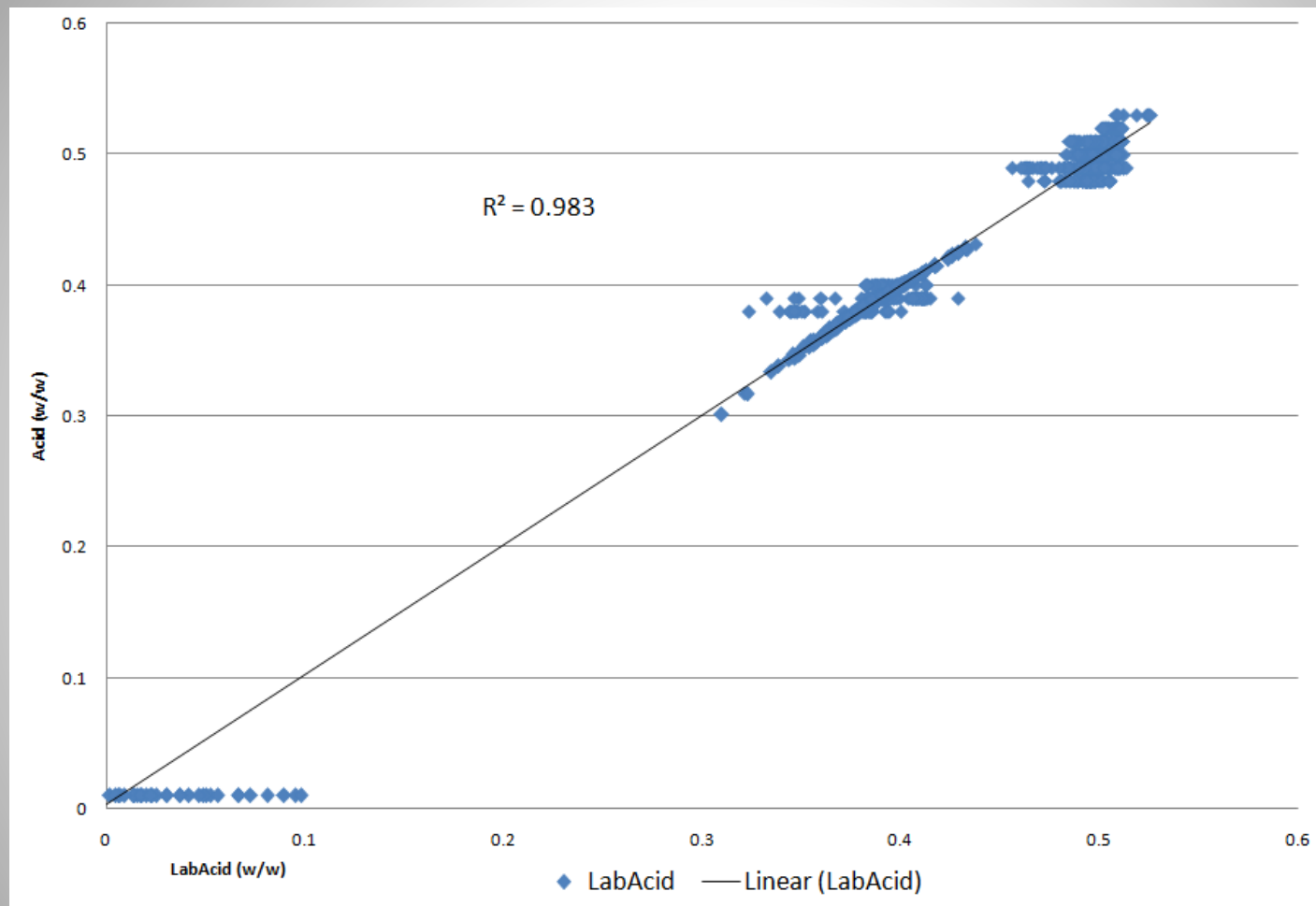


VS-3000E Acetic Acid Ketchup, Mustard BBQ Sauce

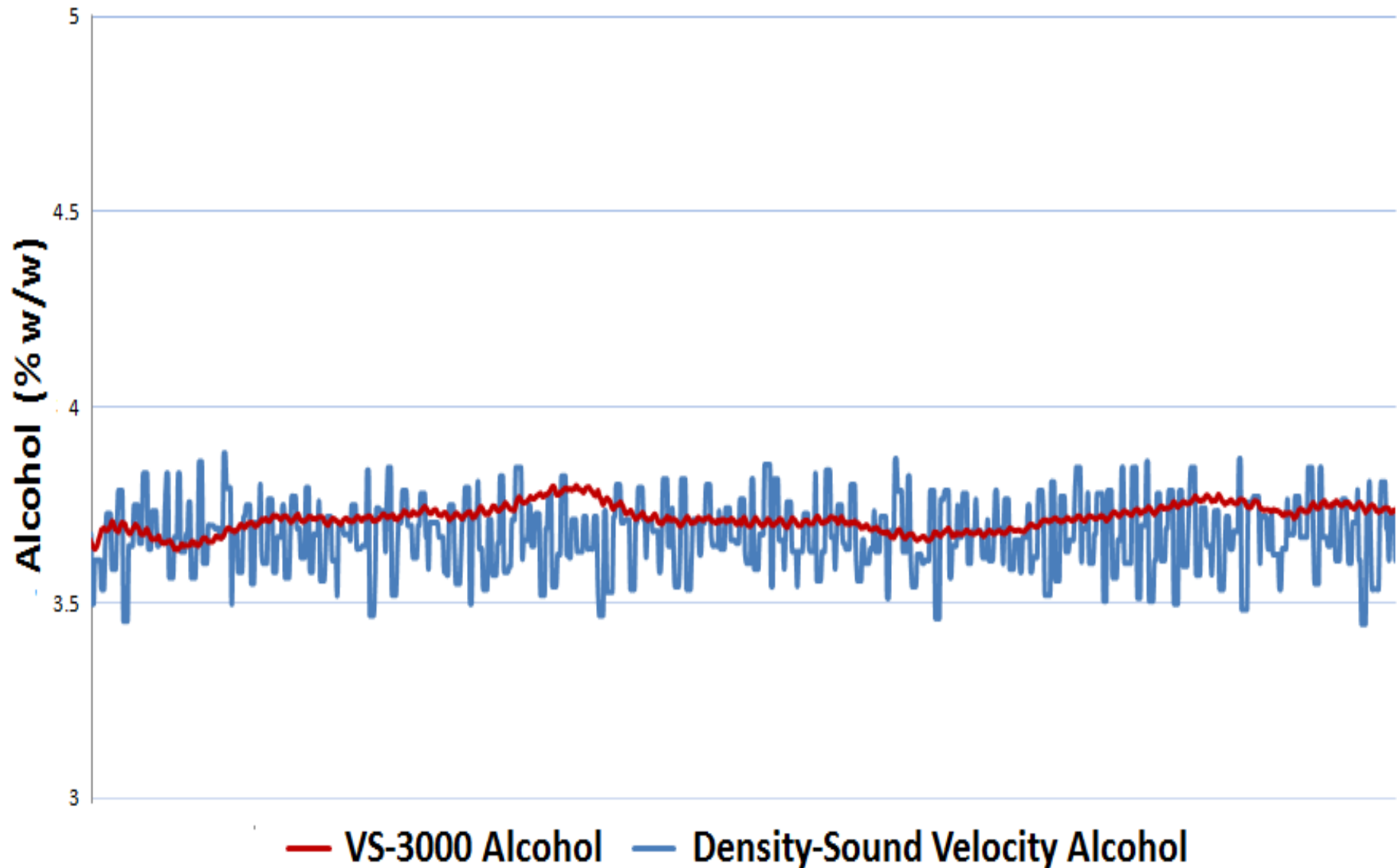


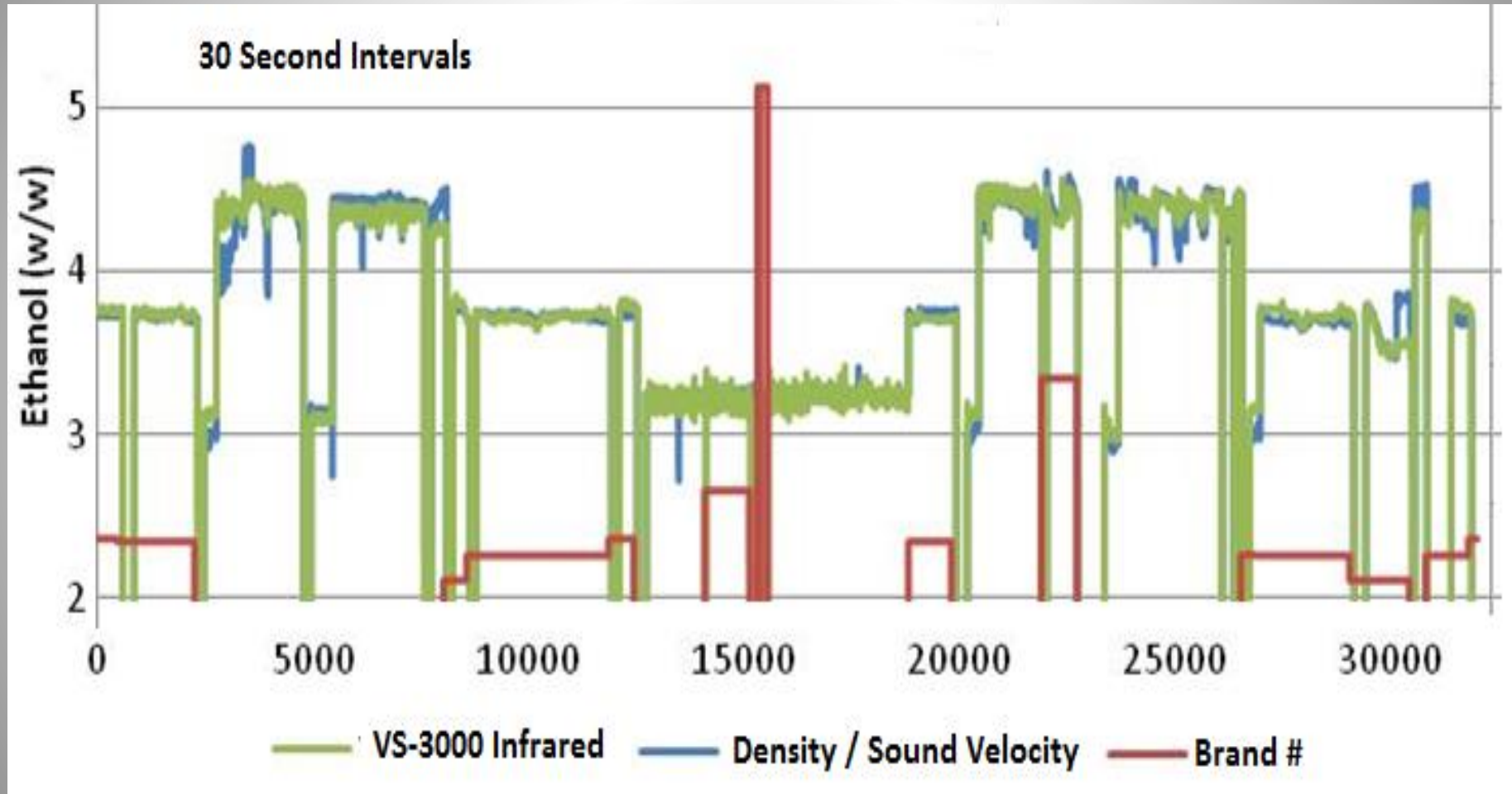


Acid Regression: VS-3000 vs. QA Lab



98.3% Confidence level



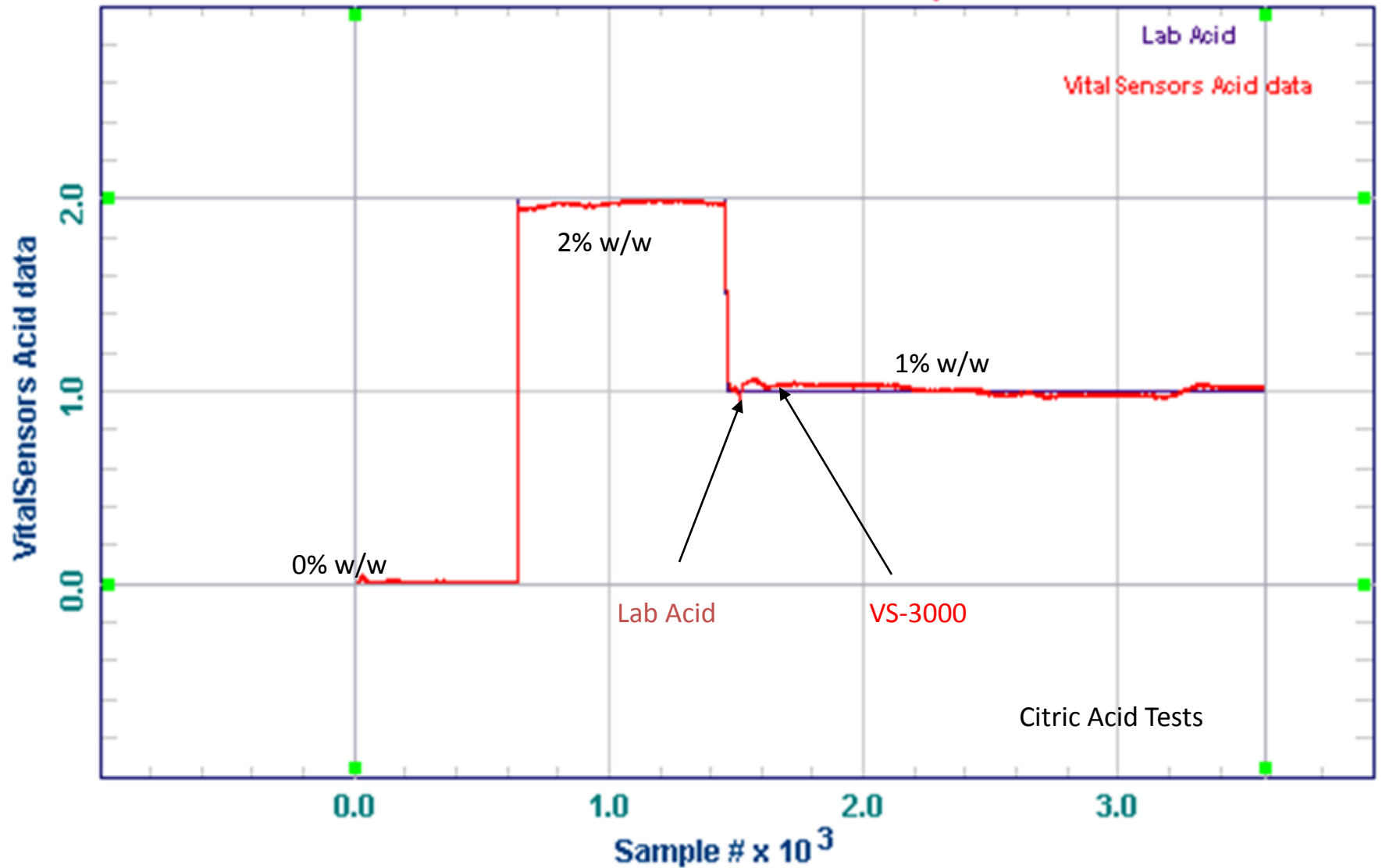


VS-3000 used no offsets for this chart (37 brands)

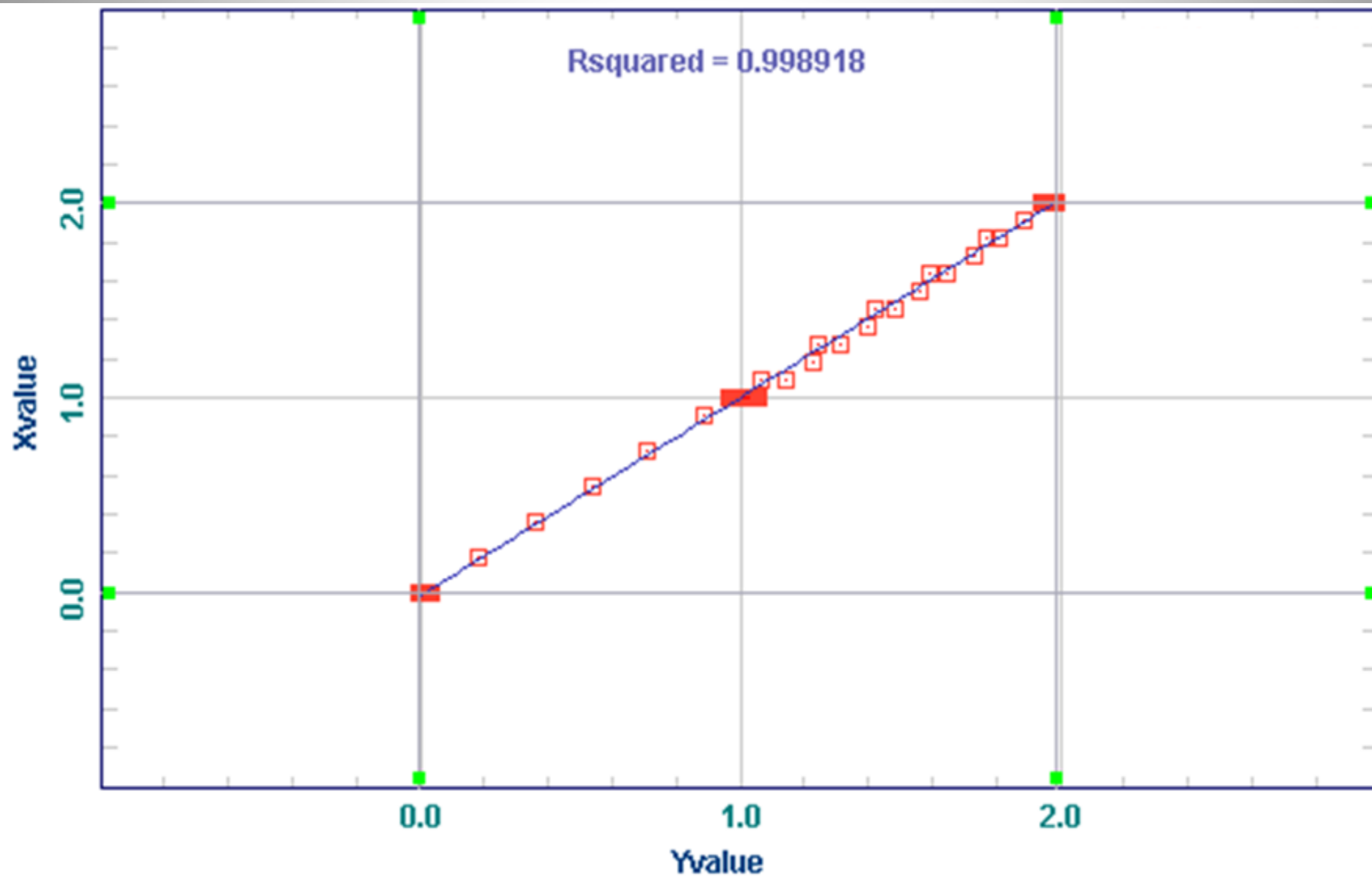
The next 3 charts prove

- Accuracy – using weight / weight solutions of acetic acid over 30 degree temperature ramps. This test was performed in a controlled laboratory.
 - R2 value of .9982 (perfect correlation)
- Independence of concentration reading from temperature fluctuations
 - R2 value of .00047 (no correlation)

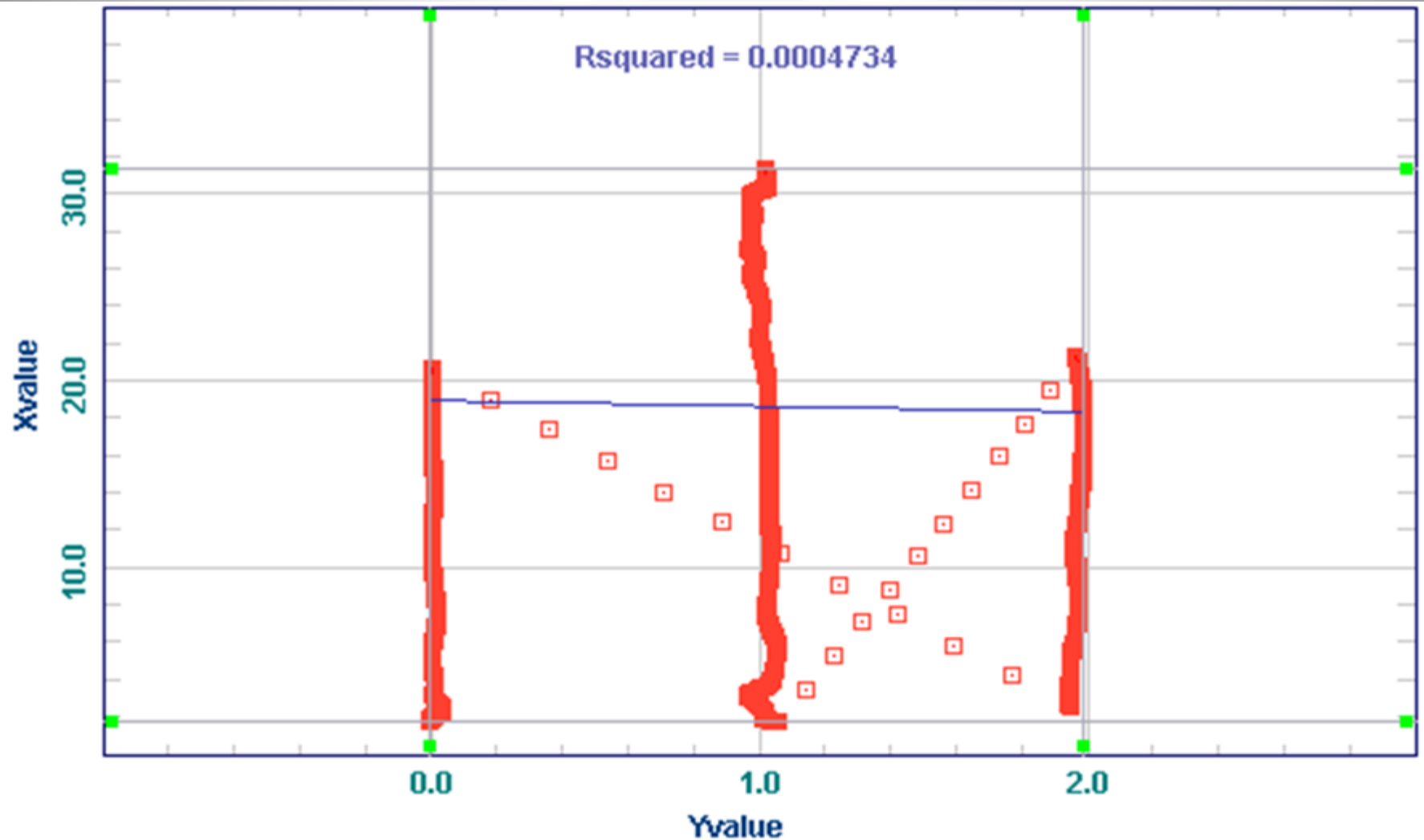
VS-3000 Acid vs. **Lab Acid** concentration test using percentage w/w acid. 2.0 percent by weight then 1.0 percent by weight, distilled water was used for 0



R2 of .9989 over 2.0 % weight/weight.

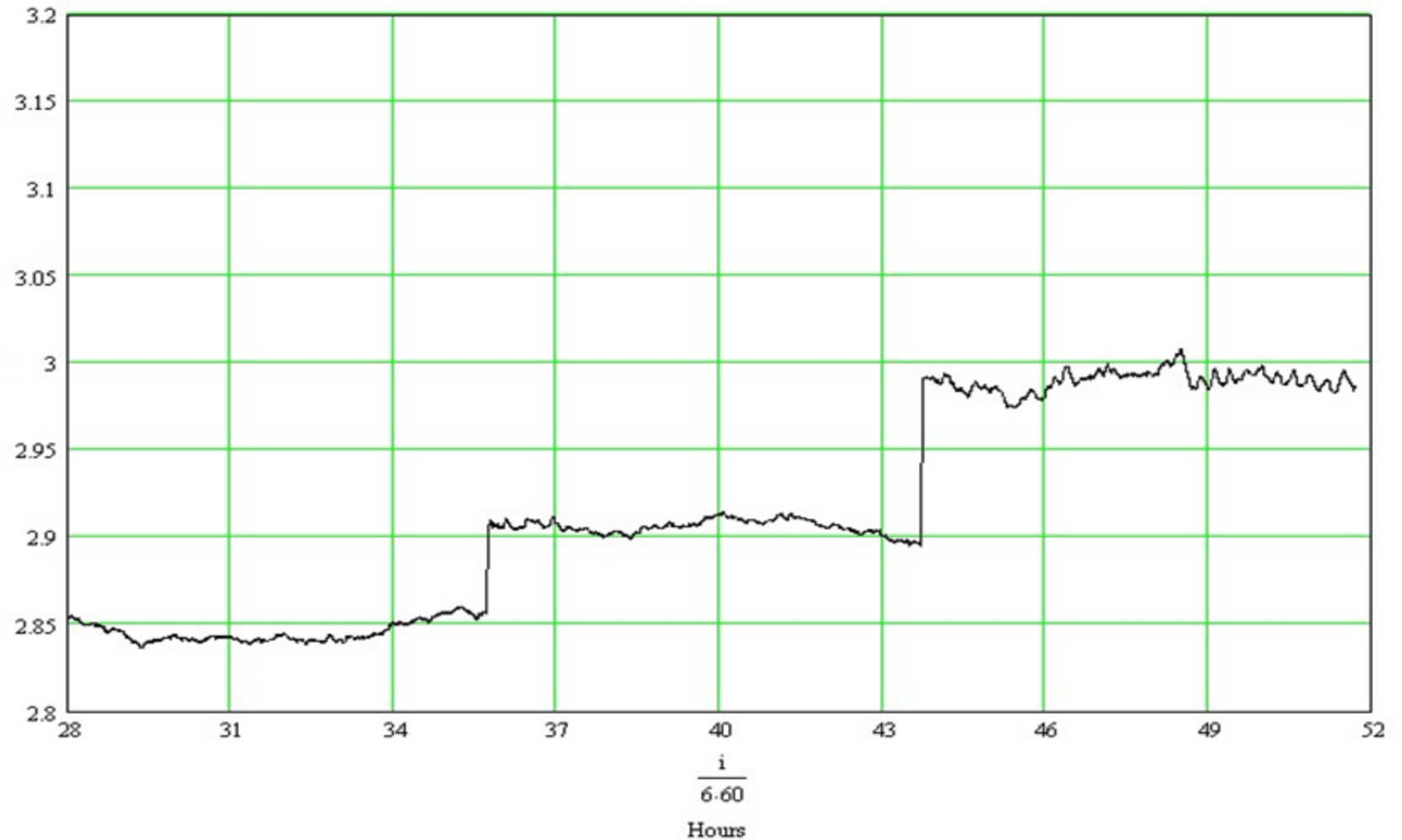


R2 of .0004734. There is exists no correlation between temperature and VS-3000 acid measurement



Sensor Resolution Test

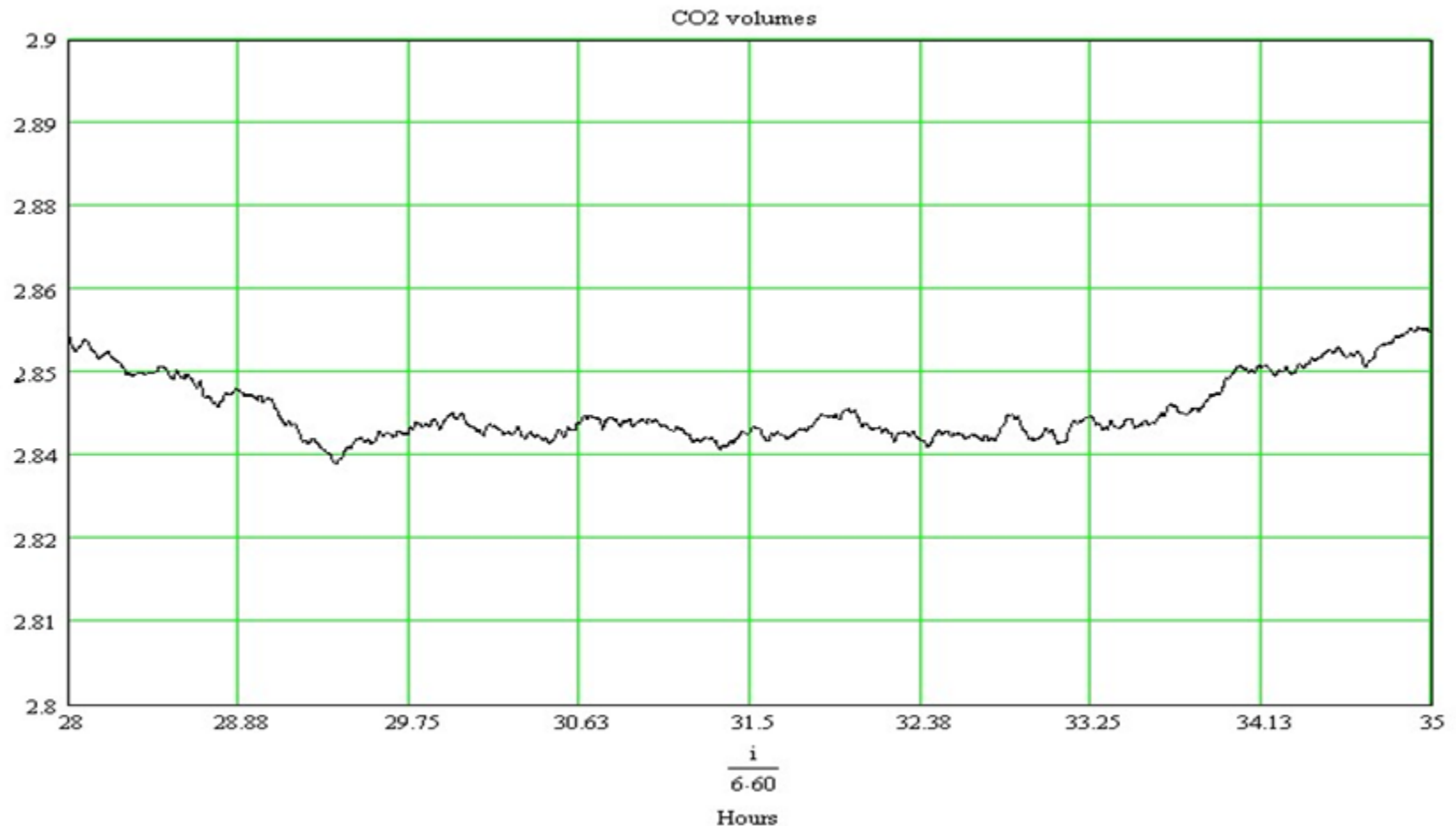
- Target Concentration Values for test: 2.84, 2.91, and 3.0
- Data in eight hour increments, data recorded every 10 seconds



VS-3000 Sensors are highly repeatable with no sensor drift.

- Target value = 2.84
- Data recorded every eight seconds

Data Repeatability = $\pm .008$ volumes
2500 + data points



BevSense Sample Customers

| Customer | Application, Measurement | Industry |
|-------------------------------|------------------------------|------------------------------|
| Anheuser-Busch | Alcohol, CO2, RE, OE, SG | Beer, Malt Beverages |
| Aspen Aerogel | Ethanol | Insulation Manufacturing |
| Baxter Healthcare | Alcohol | Pharmaceutical Research |
| Boulevard Brewing Company | Alcohol , RE | Beer |
| Carlsberg | CO2 | Beer, Soft Drinks |
| Coca-Cola | Brix, Acid, CO2 | Soft Drinks |
| Colbar J&J | Ethanol | Biomaterial |
| Conestoga Energy Partners | Brix, Alcohol | BioEthanol |
| Craft Brewers Alliance | CO2 | Beer |
| Dogfish Head Craft Brewery | Alcohol, CO2, RE, OE, SG | Beer |
| Dr. Pepper Snapple Group | CO2, Brix, Acid (TA) | Soft Drinks |
| Eli Lilly | CO2 | Pharmaceuticals |
| General Mills | CO2, Brix | Beverage and Food, Yogurt |
| Hansa Brewery | CO2 | Beer |
| Honeywell Process Instruments | CO2 | Algae BioFuel |
| H.J. Heinz | Acid (TA) | Food, Vinegar |
| InBev | CO2 | Beer |
| Labatt Brewing Company | Alcohol, CO2, RE, OE, SG | Beer |
| Mahou San Miguel | CO2 | Beer |
| Max Leibinger Brewery | Alcohol, CO2, RE, OE, SG | Radler, Beer, Juice, Water |
| MillerCoors | Alcohol, CO2, RE, OE, SG | Beer |
| Molson Coors | Alcohol, CO2, RE, OE, SG | Beer |
| Ocean Spray | Organic Acid (TA), Brix | Food |
| Odwalla Minute Maid Coca Cola | Brix | Juice |
| Pedras Salgadas | CO2 | Sparkling Water |
| Poland Springs, Nestle Waters | CO2, Brix | Sparkling Water, Flavors |
| Polar Beverages | CO2, Brix, Organic Acid (TA) | Soft Drinks, Sparkling Water |
| Schlumberger | CO2 | CO2 Sequestration Research |
| Sleeman Breweries | Alcohol, CO2 | Beer |
| Stevens Point Brewery | CO2 | Beer |
| Vestfyen | CO2 | Soft Drinks |
| Unicer | CO2 | Beer and Soft Drinks |