

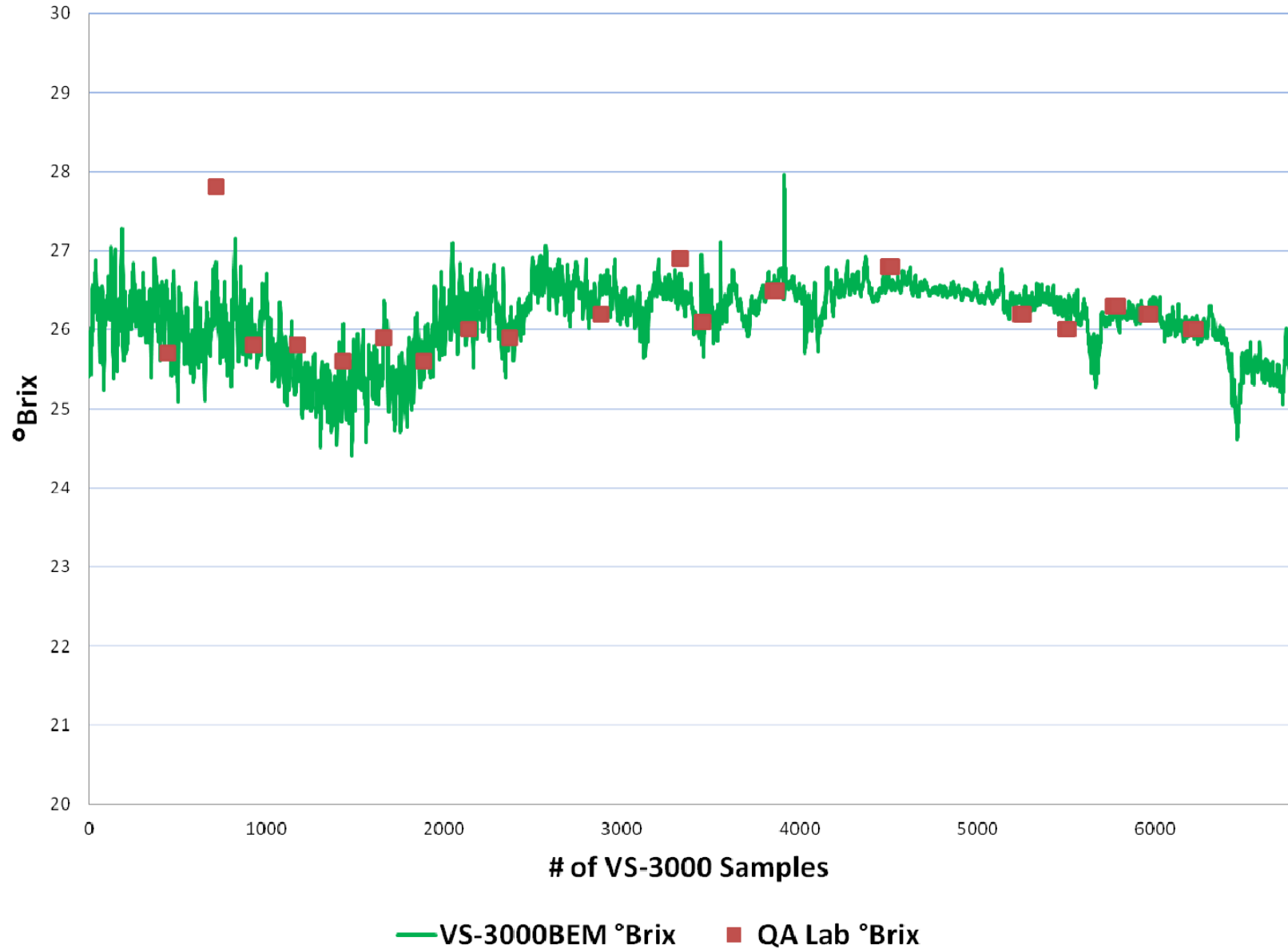


VS-3000 for BioEthanol Liquefaction

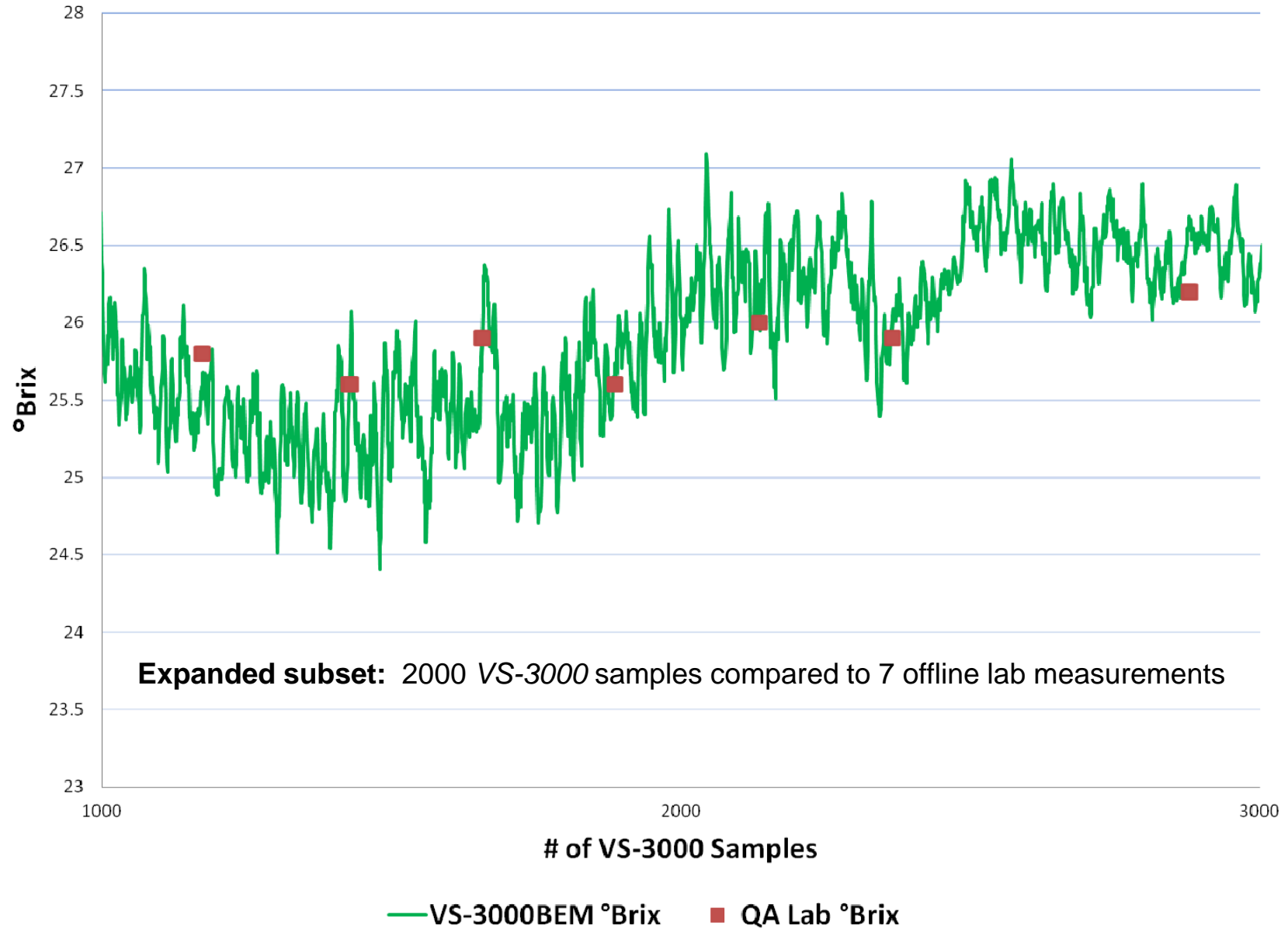
These slides show *VS-3000 BioEthanol Process Monitor* performance while measuring °Brix and Ethanol during LIQUEFACTION process. *VS-3000* is a solid-state, mid-IR instrument for measuring dissolved concentrations in solution, real time 24x7.

- Data comes from a *VS-3000* installation at a US BioEthanol plant with an output capacity of 50+ million gallons per year
- *VS-3000* data is compared to samples collected in the BioEthanol plant's QA laboratory
- Comparison samples were sourced from a **Refractometer** (for °Brix) and an **H.P.L.C.** (for Ethanol)
- The slides contain 1 instances of comparison between the QA Lab and *VS-3000* sensor readings
- *VS-3000* data recorded every 30 seconds, QA lab measurements taken approximately every hour

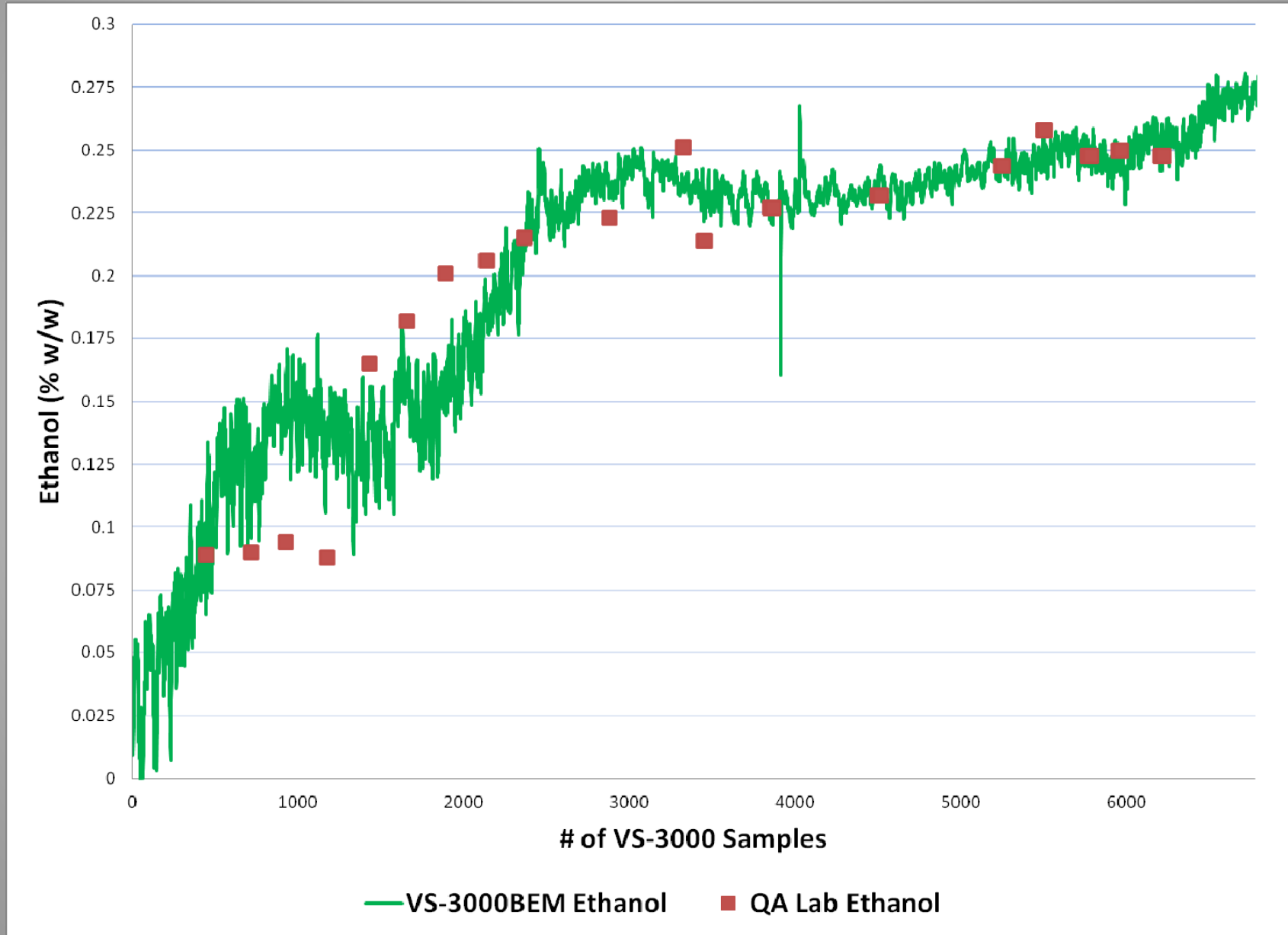
VS-3000 °Brix vs. QA Lab °Brix



Zoom: VS-3000 °Brix vs. QA Lab



VS-3000 Ethanol vs. QA Lab Ethanol





Observations based on data

- During LIQUEFACTION process, *VS-3000BEM* measurements accurately trend along with measurements performed on instruments in the BioEthanol plant's QA laboratory.
- *VS-3000BEM* data is highly repeatable.
- *VS-3000BEM* is able to **measure °Brix and Ethanol precisely** despite the extreme temperatures seen in the LIQUEFACTION process.
- *VS-3000BEM* measurements are not adversely affected by solids seen in LIQUEFACTION process, nor the viscosity of the solution.
- *VS-3000* operates 100% in-situ and does not require a slip-stream or CIP. *VS-3000* contains no moving parts and measurements are not adversely affected by un-dissolved solids.