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Performance of the Water Lens Boron Assay

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The Water Lens Boron Assay is the safest and most accurate method on the market for quantifying boron in the field. It requires no significant sample preparation and no caustic chemicals for an accurate result. The assay can easily be completed with minimal training in less than 15 minutes.

Each batch of the Water Lens Boron Assay is individually calibrated using a 96-point calibration curve (11 different calibration standards + a sample blank, 8 replicates per standard). Beyond the initial calibration, each batch is regularly monitored for any drift in the calibration. If any drift is detected, new calibration curves are generated and sent to all customers using that batch.

To demonstrate the accuracy and precision of the Water Lens Boron Assay, eight of the most recent calibrations of different batches of the Boron assay were analyzed. The percent error at each point in the calibration curves was used to generate a histogram, shown in **Figure 1**. The histogram shows that 90% of the calibration points showed variance of less than 2.5%. The points with higher variance than 2.5% are overwhelmingly points that are near the LOD of the assay where the variance is expected to be higher.

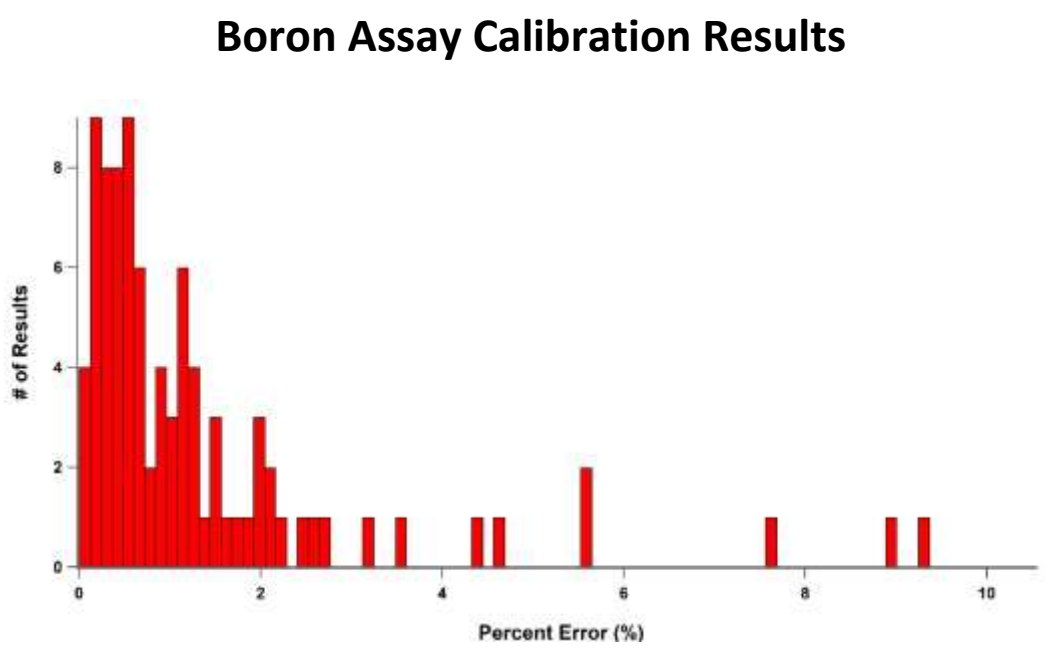

Figure 1. Histogram of the percent error observed during boron assay calibration.

While calibrations are performed using standards, performance on real world samples requires significant tolerance of matrix effects. Field tests for boron are notoriously susceptible to interferences. Performing standard additions for each sample run is often required. The Water Lens Boron Assay is designed to be run in tandem with other Water Lens assays to account for specific matrix effects on each sample. The effects of these interferences can then be removed from the raw data of the Boron Assay during processing, allowing a reliable result to be obtained in highly saline samples such as produced waters.

To determine the effectiveness of the Water Lens Boron Assay on produced water samples, the assay was run against a battery of in house produced waters collected from customers across the country. Only water samples which contained a detectable amount of boron were included. Results from the Water Lens Boron Assay were then compared with ICP based analysis. The results of this study are shown in **Table 1**. The Water Lens produced water battery contains waters of widely varying composition. Even with highly variable sample matrix, the Water Lens Boron Assay was capable of matching ICP based results to within a few percent on most samples, with higher variance typically encountered near the LOD of the assay as expected.

Produced Water Accuracy

TDS	Sulfate	Chloride	Magnesium	Calcium	Boron by Water Lens	Boron by ICP	% Variance
16,600	129	8,070	77	336	**6.9**	**7.1**	**2.8%**
24,800	12,204	4,438	4,380	865	**12.3**	**12.4**	**0.8%**
2,700	1,108	682	126	180	**1.0**	**0.9**	**11.1%**
137,900	982	89,983	522	3,542	**36.7**	**35.2**	**4.3%**
16,500	9	9,730	158	156	**157**	**160**	**1.9%**
14,700	4	8,570	130	184	**124**	**130**	**4.6%**
142,700	499	92,693	455	2755	**47.2**	**47.1**	**0.2%**

Table 1. Performance of the Water Lens Boron Assay on produced water samples. Water samples with no detectable boron content are not included.

In summation, the Water Lens Boron Assay is highly accurate and precise in its ability to characterize water samples of highly variable composition. This makes it ideal for application in the oil and gas industry.