



ACCURACY & PRECISION OF THE TROLL 9000 TURBIDITY SENSOR

Tony Americh, Engineering Scientist, In-Situ Inc.

CALIBRATION OVERVIEW

The Multi-Parameter TROLL 9000 Turbidity Sensor is calibrated at the factory across the operating range of 0 to 2000 NTU. This calibration is performed at multiple points using EPA-approved polymer primary standards, and is permanently stored in the probe. The accuracy specification of the factory calibration is ± 2 NTU or $\pm 5\%$, whichever is greater, throughout the range. Figures 1 through 3 demonstrate the accuracy performance of five MP TROLL 9000s. The performance limits are indicated with the black lines.

Further improvements in accuracy are possible by use of the user-accessible calibration. One, two, three, or four calibration points may be used. The best results are obtained when the calibration points are concentrated within the range of interest. The limiting factor on the ultimate accuracy is the precision of the turbidity standards. At any time the user-performed calibration can be removed by selecting the "Reset to Factory Defaults" checkbox in the Calibration Wizard.

Fig. 1, Typical Accuracy, 0-50 NTU

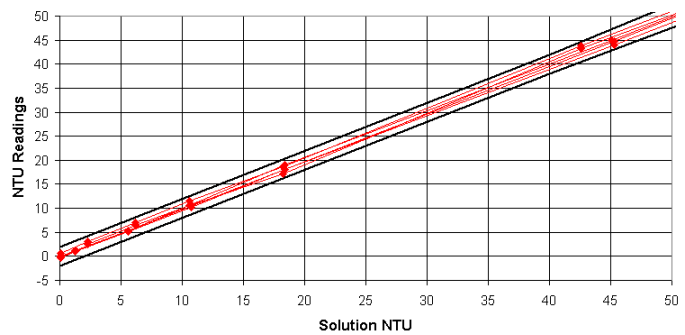


Fig. 2, Typical Accuracy, 50-200 NTU

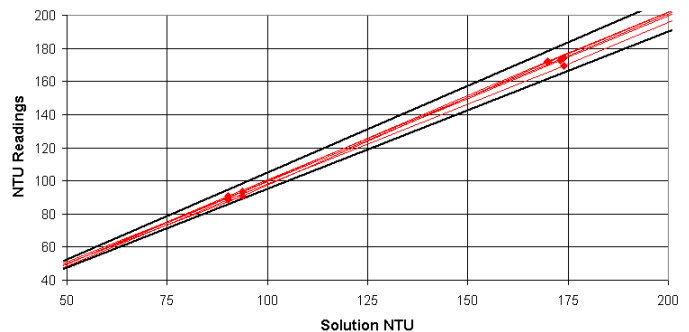
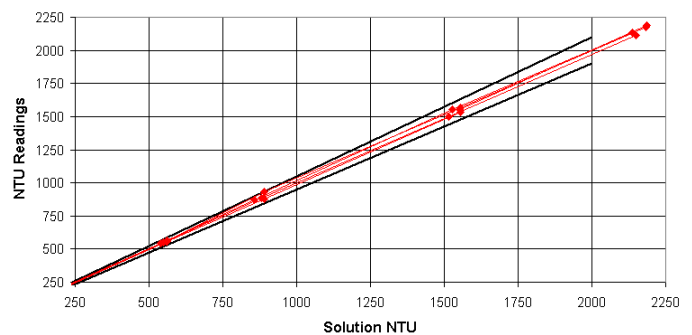


Fig. 3, Typical Accuracy, 250-2000 NTU



COMPARISON AGAINST LABORATORY TURBIDIMETERS

Figure 4 compares the accuracy of four Multi-Parameter TROLLs against three Hach Turbidimeters: the 2100P portable model and the 2100N and 2100AN-IS benchtop instruments. The 2100P and 2100N are white-light instruments, while the 2100AN-IS, like the MP TROLL 9000, uses near-infrared light at 870 nm wavelength. All instruments were calibrated with and verified using polymer standards. Note the excellent correlation of results between the MP TROLLs and the Hach 2100 AN-IS.

Figure 5 is identical except that all calibrations and measurements were performed using Formazin standards.

Fig. 4, Accuracy Comparison, 4 MP TROLL 9000s against 3 Hach Turbidimeters (Polymer)

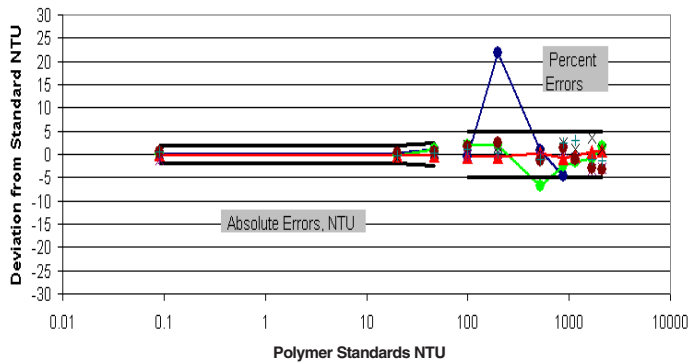
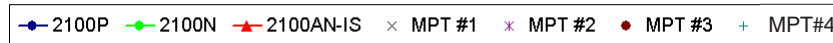
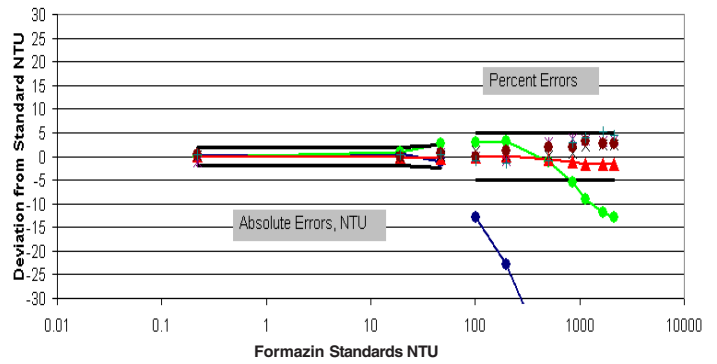


Fig. 5, Accuracy Comparison, 4 MP TROLL 9000s against 3 Hach Turbidimeters (Formazin)



PRECISION COMPARISON

Figure 6 shows the precision (repeatability) of the MP TROLL 9000. Thirty samples each were sequentially measured in an MP TROLL and a Hach 2100AN-IS benchtop turbidimeter. The first data set is for clean water, the second set is 10 NTU polymer standard.

Fig. 6, Repeatability Comparison of MP TROLL 9000 against Benchtop Turbidimeter

