

APPLICATION NOTE

Online Monitoring of Turbidity or HAZE Using a ClearView® db Photometer

Purpose

To determine turbidity or haze with our configurable GUIDED WAVE™ ClearView® db fiber optic Photometer. Turbidity is a measure of the clarity of a liquid. Suspended particulates or droplets of an immiscible liquid cause the turbidity to increase (i.e., the clarity to decrease). The cloudiness we see is caused by light scattering due to the presence of these particles. Consequently, turbidity causes problems with optical transmission (or absorbance) based measurements because not all of the light lost is absorbed by the sample. Some of the light is scattered by the particles causing error in the desired measurement.

Detection of turbidity can be used to indicate solid breakthrough in a process. This can be used as an alarm and to invalidate other optical measurements until the problem can be corrected. A single channel ClearView db configured with the turbidity option and coupled with a turbidity flow cell can provide the solution. The turbidity flow cell uses a third optical fiber placed at 90° to the transmission path to detect scattered light. This system can be calibrated with NTU or haze standards.

Haze is another term for turbidity typically used in the refining sector. In refining applications turbidity is typically caused by the presence of water. Water has very low solubility in fuel. ASTM method D4176 is a visual standard for measuring turbidity by viewing cards with black lines of various thicknesses through a 100 mm diameter glass jar of solution (Figure 1).

This is a somewhat subjective measurement that can be easily replaced with the ClearView db Dual-Beam photometer. Since up to 6 answers can be generated on a single channel ClearView db, with proper configuration additional parameters can be monitored at the same time. A common combination is turbidity and ASTM color in diesel fuel.

Distillate Fuel Haze Rating Standard



Figure 1: ASTM D4176 Standard Visually Measuring Haze

HAZE	TURBIDITY SENSOR
1	0.56
2	7.36
3	18.40
4	30.80
5	47.80

Table 1: Haze Sample Measurements

Experimental

Five samples with Haze values determined by ASTM D4176 were measured with the ClearView db analyzer equipped with the turbidity option. The cell pathlength used for the measurement was 20 mm, although the turbidity measurement is not dependent on the pathlength. The data for the samples is shown in table 1.

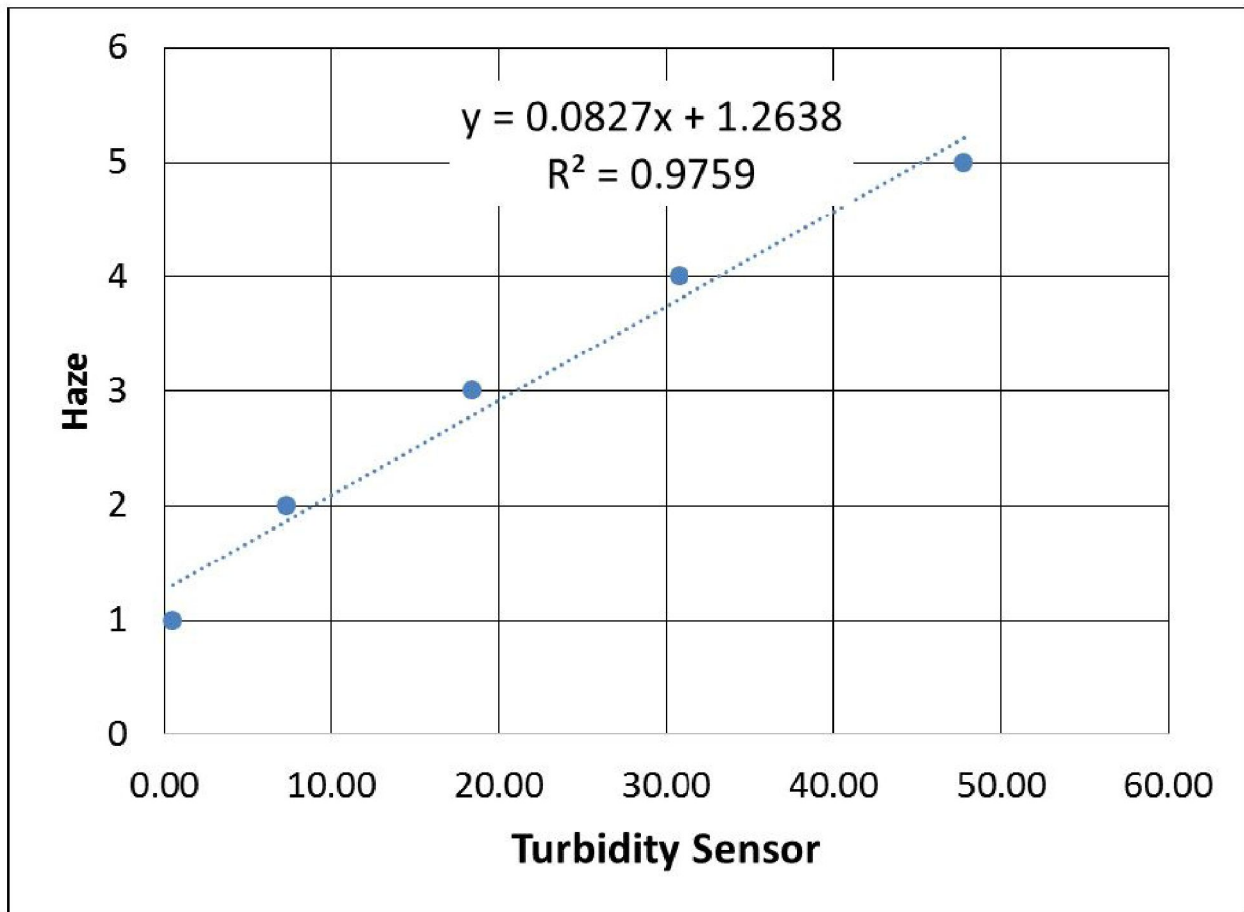


Figure 2: Turbidity Sensor

Results

A graphical representation (figure 2) shows the linear relationship between the turbidity sensor output and the ASTM D4176 Haze value. The ClearView db can be programmed to calculate the ASTM D4176 Haze value using the built in turbidity sensor.

Conclusion

The ClearView db photometer is an excellent choice for on-line, real-time haze measurement. The ClearView db can be configured with 4-20 mA analog outputs (6 answers max on a single channel system, and 4 per channel on a dual channel system) and corresponding contact closure outputs to alert error states. Modbus communication over ethernet is also standard. For more detailed information regarding system specifications and the ClearView db photometer please contact a Process Insights™ sales or technical specialist.

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