

Entech Design, Inc.

Online Interface/Sludge Blanket Level Analyzers Performance Evaluation Report Instrumentation Testing Association (ITA) Henderson, NV

REVIEW BY ENTECH DESIGN, INC.

Following is a review of the ITA report on independent field evaluation of ultrasonic sludge level analyzers provided by four manufacturers. The evaluation was conducted over a period of 15 weeks at the Blue Plains Advanced Wastewater Treatment Plant in Washington, D.C.

Participating Manufacturers & Products

Entech Design, Inc. – BinMinder 9300

Hach Company – OptiQuant SLM

Royce Technologies – Model 2501A

Solartron Mobrey, Ltd. – Model MSL 600

Test Protocol

- Manufacturers installed and calibrated their instrument and signed off on its operation.
- Manufacturers provided instructions regarding routine repair and maintenance to be conducted by plant staff in the event of measurement non-conformance or instrument failure.
- Manufacturers were not allowed to make adjustments to their instrument during the test except as prescribed in the Test Protocol in response to a repair event or instrument failure.
- Analog signals were routed to a common data collection computer with instrument readings date/time stamped every 15 minutes.

- Plant operators collected secondary Reference Measurements using a Sludge Judge® and an optical suspended solids meter.
- Plant operators maintained logs of Process Characteristic Data (13 process parameters recorded daily), Field Notes (Operator notes on data acquisition system functioning, observations about general sludge level and weather events), Subjective Observations (Instrument set-up, ease of use and operation), and Analyzer Field Notes (Individual instrument routine maintenance and troubleshooting events) – for inclusion in the Test Report.

Summary of Instrument Performance

Three of the four instruments demonstrated a high degree of reliability and provided measurements that corresponded well with secondary Reference Measurement data. More importantly, there was a remarkable correlation in the trend of data among these instruments – the instruments provided strong confirmation of the overall performance of the other.

General Conclusions

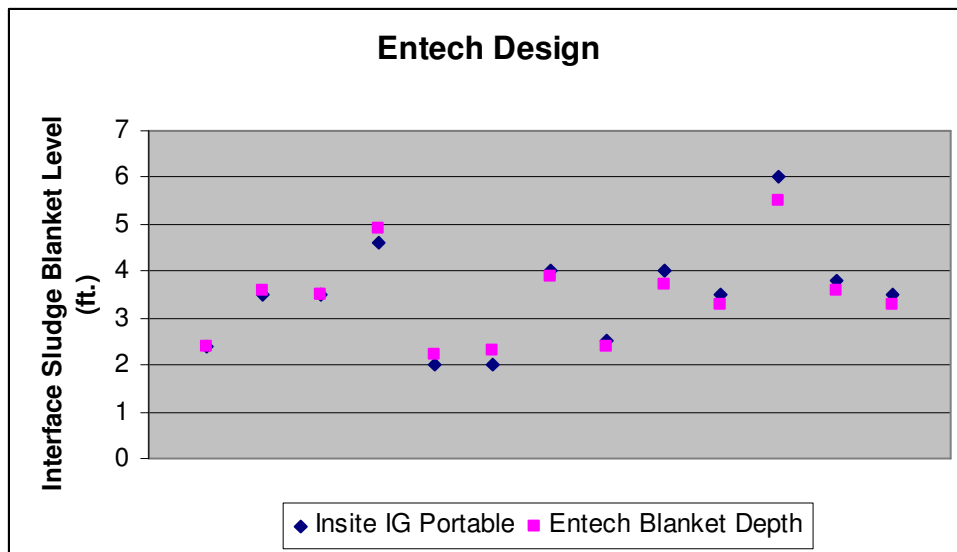
The following general conclusions can be drawn from the study:

- The analyzers handled a wide range of process and environmental variations – even the occurrence of Hurricane Isabel.
- Comprehensive instrument data illustrates blanket level trends that agree with normal and expected clarifier sludge level behavior.
- Instrument measurements conform well to potentially problematic hand measurements.
- Performance and reliability does vary among instruments. Ease of set up and operation, maintenance, repair and failures vary among analyzers.
- Most importantly, however, instruments vary in their ability to maintain reliable signals and prevent sudden tracking to erroneous measurements.

Conclusion Specific to Entech BinMinder 9300™

- BinMinder 9300 was the only instrument that did not experience a single repair, calibration, cleaning event or manufacturer call-out. It was the only instrument that operated for the entire evaluation period without being touched.

- BinMinder 9300 was one of two instruments that did not have a single mounting fixture failure.
- BinMinder 9300 measurements correlated closely with the Reference Device (Sludge Judge®) measurements and uniformly matched the suspended solids reference measurements.
- The average variance between BinMinder 9300 and the Reference Instrument (Insite IG optical suspended solids meter) was less than one inch. See the following exhibit.



- Consistent performance was recorded over the complete range of sludge depth (Variation > 5.0 ft), solids concentration (1038 – 2,550 mg/L), and changes in 12 other process parameters – including Flow, TSS, MLIS, SVI and others.
- BinMinder 9300 had no measurements that would suggest the instrument was not responsive to process conditions. It was the only instrument that had no occurrences of tracking suddenly away from the data trend and back over short periods of time.
- BinMinder 9300 data trend was entirely consistent with normal and expected sludge level behavior in a secondary clarifier over the entire test period – as illustrated in the following chart.

Table of Hourly Changes in Sludge Level
At 15 Minute Intervals

| Change in Sludge Level Ft. | Decrease In Blanket Level # | Increase in Blanket Level # | Total # | Percent % |
|-----------------------------------|------------------------------------|------------------------------------|----------------|------------------|
| ≥1 | 49 | 42 | 91 | 0.9% |
| 0.5 – 0.99 | 237 | 188 | 425 | 4.3% |
| 0.0 – 0.5 | 3680 | 5629 | 9309 | 94.7 |
| Total | 3966 | 5859 | 9825 | 100% |

Entech BinMinder 9300

Entech Design, Inc. complete Manufacturer's Comments are available at:
<http://www.entechdesign.com/pdf/ITAComments.pdf>

Instrumentation Testing Association and DC WASA Blue Plains Advanced Wastewater Treatment Plant

Instrumentation Testing Association (ITA), Henderson, NV is a non-profit educational and scientific testing organization that conducts independent performance evaluations in field applications. ITA reports factually on the accuracy of instrumentation and reports on operation, flexibility and maintenance based on real field experience by plant staff.

The sludge level analyzer evaluation was conducted at and in cooperation with the District of Columbia Water and Sewer Authority (DC WASA) Blue Plains Advanced Wastewater Treatment Plant, in Washington, D.C. in July 2003. The complete results of this test are presented in ITA publication PER03ISBLA-001. The Report is available from ITA at www.instrument.org or by contacting Instrumentation Testing Association, 631 N. Stephanie Street #279, Henderson, Nevada 89014, Phone: 702-568-1445, Fax: 702-568-1446, Email: ita@instrument.org

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