

Developing Digital Opacity Methodology for Large-Diameter Stacks



Stack opacity

The ASTM D-22.03 committee recently approved a test method that utilizes digital cameras and associated software to make stack opacity determinations. The method is restricted to stacks less than 7 feet in diameter, primarily because it has never been evaluated on larger stacks. The method was developed to mimic EPA Method 9, and does not take advantage of the technology offered by the digital cameras available today; rather, it uses the same acceptance criteria applied to human observers qualified via “smoke school.”

This project will focus on developing data suitable for applying the precision and bias calculations mandated by ASTM, using a standard against which all method measurements are compared. The project will utilize the available software with multiple digital cameras compared to a certified transmissometer at a “smoke generator” used for Method 9 training, as well as field testing on large-diameter stacks with certified opacity monitors.

- Evaluate the use of digital opacity measurement methods on large-diameter wet and dry stacks
- Reduce potential compliance issues due to inaccurate visual opacity readings through the use of a digital camera calibrated with a certified transmissometer
- Develop the bias and precision data to support a revision to the American Society for Testing and Materials (ASTM) methodology that correlates the readings to certified transmissometers

The data generated will cover the full range required by Method 9 but will concentrate on the low 0-20% and 20-40% opacity ranges more typical of electric generating units with large stack diameters. Field studies will cover both wet and dry stack applications.

The project will be conducted with advice and consultation from the ASTM D-22.03 committee on data and procedure needs to support future modification of the current Digital Opacity Method.

Value

The proposed project will provide a more reliable opacity method for large stacks, eliminating much of the variability and inconsistency of current Method 9 readings. The resulting revision to the ASTM Digital Opacity Method will be a major step forward in opacity observations, removing subjectivity and providing a documented record of opacity events.

Drivers and Trends

The use of digital camera technology for opacity measurements is a significant technology advance that can potentially allow determination of stack opacity beyond the plant fence line. It is important to ensure that the technology is applied correctly and takes full advantage of its capabilities, removing the subjectivity inherent in the current Method 9 procedures.

Project Summary

This project will establish a methodology for using digital camera technology for remote measurement of opacity in large-diameter stacks. The project will be conducted in two phases: The first phase will establish the "calibration" of the digital camera(s) with respect to a certified transmissometer associated with an accredited "smoke school." The calibration phase will establish the precision and bias data required by ASTM. The second phase will be a field validation of the method on both wet and dry stacks.

Deliverables

A final report will summarize the performance of the digital opacity methodology, along with the required ASTM bias and precision data. This report will include proposed revisions to the existing ASTM Digital Opacity Method.

Cost of Project

The estimated cost to complete this project is \$220,000. The price to participate is \$44,000. EPRI member companies can use Tailored Collaboration (TC) funds for up to half their contribution.

Project Status and Schedule

Preliminary test plans are being developed, and the first phase could begin as soon as summer of 2010.

Who Should Join

Plant owners subject to opacity regulations and concerned with active enforcement by Method 9 determinations.

Contact Information

For more information, contact the EPRI Customer Assistance Center at 800.313.3774 (askepri@epri.com).

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