SCR Catalyst Testing for Improved Plant Performance

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Summary

As more power plants are equipped with SCR systems, there is a trend in SCR system management shifting away from a reactive to a proactive approach. More owners are becoming involved in the SCR management programs by taking advantage of the benefits from regular scheduled catalyst testing and preventative tuning and maintenance.

As demand for testing increases more labs are being built to meet the demand. Catalyst testing approaches vary in terms of experience base and test protocols. Results from catalyst testing determine the cause of deactivation, predict the useful lifetime of the catalyst, and allow the user to develop a catalyst replacement schedule. Many operators rely on catalyst activity as the primary test that determines the ability of the active material on the catalyst to convert NOx. NOx conversion activity tests are performed in a bench-scale (coupon) or pilot scale (full block) units where exhaust streams are simulated and the NOx conversion is carefully measured and compared to a standard. Both techniques can provide comparable results in terms of catalyst activity for a given sample if done properly.

Also important are chemical analyses in the catalyst management process to determine contaminants. Often a single analysis is done on the sample and a profile of contaminants is given. Common catalyst poisons are identified and the report prepared identifying the principal poisons as the cause of performance loss. The concern is that the various test methods are not comparable and can each impose a bias or even miss contaminants. A standard test for bench and pilot plant testing is desirable and will be described.

While a single chemical analysis test can show most contaminants, a combination of tests can more accurately identify their role in the extent of deactivation. Energy Dispersive X-ray Spectroscopy (EDS), Inductively Coupled Plasma Spectroscopy (ICP), X-ray Fluorescence (XRF) are used together with activity and physical tests to determine the most relevant cause of catalyst deactivation. This is particularly critical if a plant is considering using rejuvenated or regenerated catalyst.

This analysis compares results of the various test methods including bench scale catalyst testing versus pilot scale testing. The benefits and drawbacks of each technique are described along with options for improvement and standardization.

The common types of chemical analysis are compared by describing actual field samples to demonstrate the difference in technique and the merits of using multiple techniques to get to the bottom of catalyst deactivation for a specific catalyst or facility. Sample results from several units will be shared along with operating data trends for the units.