Inlet Air Filter Testing and Performance Analysis

Inlet air filters for gas turbines reduce compressor fouling, erosion, and corrosion

- Identify optimum filter selection for specific gas turbine units and sites
- Quantify performance of new and used filters by measuring fractional collection efficiency and pressure drop
- Analyze gas turbine performance based on plant operating data to assess different filters
- Compare life cycle costs and benefits of alternative filters and water wash frequency

Key Research Question

Proper air filtration is an important aspect of operating a gas turbine power plant. Laboratory testing of inlet air filters according to standard test protocols such as ISO 16890 and EN 1822 (and earlier protocols such as ASHRAE 52.2 and EN 779) improves understanding of filter performance. New filter testing provides a baseline and verification of vendor's filter ratings. Testing and inspection of filters removed from service after a period of operation provides a snapshot of longer-term performance. The remaining useful life for site-specific conditions can then be projected. Gas turbine performance analysis over time provides field validation of model expectations and refines the physics-based modeling accuracy with higher confidence in the assessment. Alternative approaches to air filtration and water wash schedules can be compared for optimization.

Objective

EPRI has performed inlet air filter testing, analyzed gas turbine performance, and developed analysis software for air filter life-cycle cost optimization. Applying advanced filtration technology may reduce the overall O&M cost, increase output capacity, and provide additional revenue for gas turbine simple-cycle or combined-cycle power plants through plant performance and maintenance activities improvements.

Approach

The project is structured to support utilities in their continuing assessment of inlet air filtration options and optimization. Activities can include two key elements – filter performance testing and operating data performance analysis. Laboratory tests are performed using standard protocols to measure the fractional efficiency, dust holding capacity, and pressure drop of new filters. Modified test protocols may be used to measure fractional efficiency and pressure drop of filters removed from service.

Analysis of operations based on plant historian data are performed to identify the rate of compressor efficiency degradation and unit output over time, and the degree of capacity recovery after a thorough compressor water wash. The EPRI Gas Turbine Performance Analyzer software tool or other tools may be used as part of the analysis. The EPRI Air Filter Life Cycle Optimizer software tool may then be used to identify alternatives resulting in economic improvements.

Research Value

Gas turbine operators may be able to optimize their filter selections, replacement schedule, and water wash schedule. Improving current operating practices may reduce maintenance costs and increase net revenue. The public

benefits from electricity reduced cost due to more efficient gas turbine performance and reduced operations maintenance costs.

Deliverables

- Interim reports of new and used filter test results to verify expected performance and assess remaining useful life
- Analyses of unit operation over time to quantify performance recovery after water washes and filter changes
- Analyses of life cycle cost comparisons of alternatives

Price of Project

Project costs are scope-based and depend on the test types, number of tests, and analyses performed. Costs are estimated to range from $15,000 to $45,000 per operating unit for a two-year period. Funding may be spread over two years. This project qualifies for Tailored Collaboration (TC) and Self-Directed Funding (SDF).

Project Schedule

The performance period is typically 24 months, depending on the testing scope and schedule.

Who Should Join

Power generators that own or operate gas turbine-based simple-cycle or combined-cycle plants and are interested in quantifying the performance of inlet air filtration systems will benefit from participation in this project.

Contact Information

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

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