Office of Health, Safety and Security
Operating Experience Level 3

OE-3: 2013-02 August 2013

Laboratory Tests Indicate Conditions that Could Potentially Impact Certain Type of HEPA Filter Performance

PURPOSE

This Operating Experience Level 3 (OE-3) document provides new information on a potential performance issue associated with certain axial flow high efficiency particulate air (HEPA) filters that do not contain separators in the folded media (separatorless).

Users of this filter type should review this document and consider whether actions are necessary to ensure that the HEPA filters used in safety applications will perform their intended safety function.

BACKGROUND

The Office of Environmental Management sponsored tests on HEPA filters to simulate, in part, upset conditions to which the filters may be exposed while in use. The HEPA filters tested were 24" x 24" x 11.5" DYN E2 media HEPA filters (model number 0-007-U-42-03-NU-11-13-GG-FU5).

The tests showed that when the filters were preloaded to 4 inches water column (wc) differential pressure, reflecting a typical filter "change-out" differential pressure, and then subjected to elevated temperature and relative humidity, the differential pressure increased very rapidly (in less than a few minutes) to 20 inches or more wc differential pressure before the tests were stopped.

Although the post-test visual examination did not reveal any permanent pleat ballooning effect (i.e., damage) and subsequent tests on these filters indicated filter efficiencies of 99.95 percent or greater, the rapid increase in differential pressure is of concern and, if the tests were not stopped, may have resulted in failure.

Tests on clean (unloaded) separatorless filters and loaded filters with separators showed adequate performance under elevated temperature and high humidity conditions.

Additional information about these tests can be found in the referenced paper.

DISCUSSION

The Office of Nuclear Safety within the Office of Health, Safety and Security (HSS) is working with the Program Offices to collect information on the use of separatorless filters in safety applications and the environmental conditions for postulated accidents under which they need to perform. This information will be used to support the conduct of additional tests to better understand the vulnerabilities caused by environmental conditions and filter loading for separatorless filters used in safety applications.

In the interim, DOE is distributing this OE-3 document to inform users of this filter type of potential performance issues and recommended actions to address this potential issue until additional testing can be completed.

RECOMMENDATION

Facilities and/or operations using DYN E2 separatorless axial flow filters to perform a safety function in environments that may approach or exceed flow rates of 1000 standard cubic feet per minute, exceed temperatures of 99°F and relative

humidity of 24 percent, should consider whether additional actions are necessary to ensure required performance during a postulated accident condition.

In considering the potential performance issue, users should consider the following: (1) fan capacity and other protective features that may limit or mitigate any steep rise in the differential pressure and filter failure, and (2) the frequency of filter change out or historical information on filter build-up that may help reach a conclusion regarding whether build-up is likely in the particular filter application.

REFERENCE

Is a Filter Loading Qualification Test Needed? Charles A. Waggoner, 32nd International Nuclear Air Cleaning Conference, June 17–19, 2012 Denver, CO. http://www.hss.doe.gov/nuclearsafety/qa/hepa/32_INAC_Conf/Is_a_Filter_Loading_Qualification_Test_Needed.pdf

ADDITIONAL PLANNED ACTIONS

In addition to collecting information on the use of separatorless filters to support additional testing, the Office of Nuclear Safety will continue to interact with the appropriate industry code/standards committees to review and address any new information that may impact safety and to support enhancements to industry and DOE safety standards and guidance.

Questions related to this OE-3 document should be directed to Subir Sen at subir.sen@hq.doe.gov.

This OE-3 document requires no follow-up report. However, updates will be considered as additional information becomes available.

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