New Test Methods for Air Filters – Do They Reflect the "Real Life" Performances?

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Abstract

New laboratory test methods using different dusts have been developed for measuring and classifying air filters but could give very misleading results compared with filter behavior in an installation. The paper describes the differences between laboratory tests and performances in atmospheric air. It provides a basis for a better understanding of air filters and filter testing to meet IAQ problems and to reflect a filters' behavior "in service".

Laboratory Test Methods for Air Filters

As a result of modern technology and indoor air quality requirements, Eurovent submitted 1992 a recommendation, Eurovent 4/9, *"Method of testing air filters used in general ventilation for the determination of fractional efficiency"*.

CEN has proposed a revision of the old EN 779, which will come into force in the year 2000. The new standard will be based on a filter's fractional particle efficiency and follow the Eurovent 4/9 method. It will also include procedures for electrostatically charged filters.

In the United States, ASHRAE has been thinking along the same lines as Eurovent and proposed a new standard – ASHRAE STANDARD 52.2, *"Method of Testing General Ventilation Air-cleaning Devices for Removal Efficiency by Particle Size"*. This standard will come into force in the beginning of 2000. The old ASHRAE 52.1 will continue to be used as a test method for low efficiency filters.

Classification of Air Filters

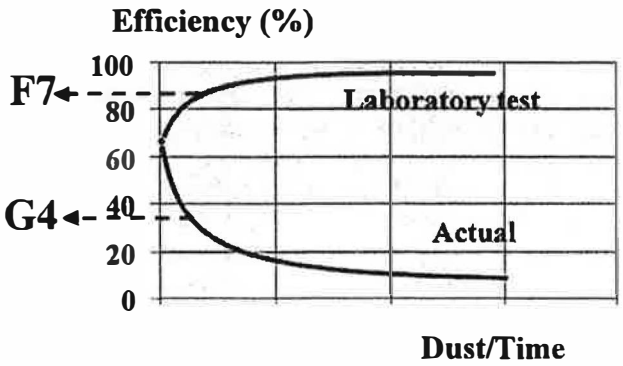
Classification is based on laboratory tests with synthetic loading dust and does not provide a basis for calculating the life of air filters or assessing the filter's performance in actual application. Electrostatically charged filter materials with a high initial removal efficiency will be favored very much. The loading dust used will compensate for the loss of efficiency due to discharging of the filters, and the efficiency in the laboratory test will increase and result in a higher average efficiency and class.

For fine filters the EN 779 classification is based on 450 Pa final pressure drop. However a normal HVAC installation is not designed for such a high final pressure drop. A Life Cycle Cost analysis will probably show the most economical final pressure drop to be in the range of 100-200 Pa, which is far away from the pressure drops used for classification. From an environmental point of view, the best final pressure drop is

also much lower than those used for classification. Also from a hygienic point of view, filters are changed more frequently and the actual final pressure drop could be very low at the time when the filters must be replaced.

The difference between final pressure drop used in classification and actual life will "upgrade" the filters and give them a higher class.

With the filter material, commercial available today, it is relatively simple to make filters to meet the laboratory requirements. But many of them will fail the real world. A filter tested to be a F7 filter in laboratory could be an G4 filter in an actual installation.



The classification is based on average efficiency during laboratory test. A filter tested to be a F7 filter in laboratory could be an G4 filter in an actual installation.

Future

There are different ways to overcome the discrepancy between laboratory test results and the real behavior in an installation. The best way would be if the loading dust could give more representative figures for efficiency and other filter performances.

Not to address this problem is to mislead the users of air filters. A quick way to check the influence of the electrostatic charge is to neutralize the filter or the material and see how much the efficiency decreases. The Nordic countries have developed a special test method for this, Nordtest NT VVS 117, 1998. The proposed revision of the European EN 779:2000(?) test method will also include an discharging procedure for electrostatically charged material.

Certification

Air filters have been lively discussed during the last years. Test methods, classes, material and especially lifetime performances have been discussed and debated between manufacturers and users. In Sweden this has led to a voluntary P-certification of air filters, which means that the Swedish National Testing and Research Institute verifies that the air filter performs in "real life" and fulfills requirements according to standards and branch recommendations. P-certification means that the filter meets some quality requirements in contrary to ISO 9000, which request the products be made in the same way.

During the last five years Eurovent has been establishing programs for the certification of published product performances and today more than 110 manufacturers participate in the programs covering most equipment used in HVAC installations. Air filters are not yet included. The proposal for an Eurovent certification has met hard resistance from most filter manufacturers in Europe. Some of the arguments are that certification is too expensive and not needed or useful for the filter industry and that customers do not care about quality.

Summary

Laboratory test methods using different dusts have been developed for measuring and classifying air filters but could give very misleading results compared with filter behavior in an installation. The best way to verify filter performances are real lifetime tests which, could be included in a certification program for air filters. The classification should be based on realistic final pressure drops.

For a better understanding of air filters and air filter testing to meet IAQ problems, and to reflect a filter's behavior "in service" it is important to develop a new loading test dust. During the meantime a quick and simple solution is to discharge the material according to the Nordtest method VVS 117 or the method in the proposed revised EN 779. The minimum efficiency in an installation could then be predicted.