



2820 South English Station Road, Louisville, KY 40299

Blue Heaven Technologies is an independent, third party testing lab for air filtration products. As such, we are commonly asked to respond to interpretation inquiries about many of the test protocols that we are capable of performing.

We respond to the most common of these types of questions with a concise, explanatory written description of the details. This with the goal of communicating a clear meaning and helping both our customers and their customers make better decisions. The following is a typical inquiry/response documentation:

Question: My customer has asked for performance data on one of our filtration products. Specifically they have asked for efficiency expressed in units of “grains per cubic feet” (gr/ft³). Can this be derived from ASHRAE 52.2 style testing (which has no such units in it’s reported results)?

Answer: Yes it can. But like most technical questions, there are some rules and conventions that need to be understood in order to make dependable filtration decisions using ASHRAE 52.2 data.

Terminology is Important!

ASHRAE 52.2 testing generates two different performance numbers with two different names. This is because the filters test results can be used for more than one application or use. The two names are:

1. **“Efficiency”** – where the performance is measured in terms of total **numbers of particles** in the air upstream and downstream of the filter.
2. **“Arrestance”** – where the performance is measured in terms of total **mass of particles** in the air upstream and downstream of the filter.

“Efficiency” is used to make decisions about critical applications where the impact of very small particles that pass through the filters can be important – examples would be hospitals, health care facilities and some heating and air-conditioning applications. “Arrestance” is used to make decisions about industrial processes and manufacturing applications where the total amount of dust that passes through the filter can be important – examples would be manufacturing plants, processing plants, power generation equipment and other heating and air-conditioning applications.

The point – this customer is clearly interested in an industrial application because they have asked for performance using mass/weight terminology – grains per cubic foot in this case! By the way - There are 7000 grains in one pound! It’s a really long story!



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But the units are important too!

The units to measure arrestance percentages in an ASHRAE test are typically expressed as a concentration of grams per 1000 ft³ of air. But since the total amount of airflow coming into and out of the filter remains the same during a test, you can drop the amount of air in the calculation and simply call it “grams” upstream and downstream of the filter.

But you could also choose to use any concentration units you wanted to. Since arrestance is expressed as an efficiency percentage, you could use grams per cubic foot or pounds per cubic yard or – in this case, grains per cubic foot. No matter what units you pick, the measured arrestance percentage remains the same.

Which brings us to the real point. It has been empirically shown many times that the measured arrestance of a filter in an ASHRAE test gets better as you go up in MERV ratings. The arrestance actually becomes too good to effectively measure above MERV 14. The filter in question here had a MERV rating of 12.

If you reference the table below - Table E-1 Application Guideline from page 45 of the 2012 publication of ASHRAE 52.2 standard, you can see that the arrestance for a MERV 12 filter is a minimum of 95%.

Since we have established that:

- 1. the units used do not impact the arrestance number percentage and*
- 2. the arrestance for a MERV 12 style filter is above 95%*

We can propose that the arrestance of the filter in question is defensible as greater than 95% removal of “grains per cubic foot”.

A handwritten signature in black ink, appearing to read "Robert B. Burkhead". The signature is fluid and cursive, with the first letters of each word being capitalized and prominent.

Robert B. Burkhead
Blue Heaven Technologies
4 September 2013