GAS FILTER PERFORMANCE

This bulletin has been developed to assist with the understanding of micron ratings and test procedures used in the peformance evaluation of gas filters and the associated filter elements.

Typically, gas filters are not assigned a "micron rating" but are instead evaluated for life and efficiency over various specified ranges of particle sizes. The following exerpts from "Air Cleaner Test Code - SAE J726 SEP79" will help with the understanding of filter performance rating parameters.

The standard means of comparison and laboratory method of evaluation utilizes AC fine test dust as the particulate contamination for testing. The chemical composition and the and particle size distribution of AC fine test dust is specified in tables 1 and 2, respectively.

Although not taken from the Test Code, table 3 illustrates the particle size range of several common materials.

Defined by either total input grams of test dust or by elapsed time, element life is determined in the laboratory by flowing particulate contaminated air through the filter until a specified terminal differential pressure is attained. The airflow may be constant or variable but the contaminant concentration is always maintained at one gram per cubic meter (1 g/m3 or 28 mg/ft3).

The efficiency of the filter is determined by placing an absolute filter downstream of the test filter so that all particulate matter passing through the test filter will be retained on the absolute filter. The efficiency is then computed as the ratio of the total input weight of test dust less the incremental increase in weight of the absolute filter to the total input weight of test dust, thus;

Efficientcy (%) = (1.00 - Incremental Absolute Wt/Total Dust Input Wt) x 100

Apollo Engineering filter units and elements typically exhibit test efficiencies not less than 99.9% on AC fine test dust.

TABLE 1
CHEMICAL ANALYSIS OF
AC FINE TEST DUST

Chemical	Weight %
SiO_2	67 - 69
Fe_2O_3	3 - 5
Al_2O_3	15 - 17
CaO	2 - 4
MgO	0.5 - 1.5
Total Alkalis	3 - 5
Ignition Loss	2 - 3

Many variables influence the dust holding capacity of filter elements that are used in compressed gas service. The most signifcant variables are the;

(a) physical characteristics of the media,
(b) pressure drop across the media,
(c) face velocity at the media,
(d) number of pleats on the element ID,
(e) depth of the pleats.

The filter media used by Apollo Engineering is a 75# phenolic resin impregnated cellulose paper. The clean pressure drop across the filter media is usually less than 1" wc for flow rates of 10 to 12 acfm per ft² of media. Face velocities range from 4 to 11 fpm.

TABLE 2
PARTICLE SIZE DISTRIBUTION BY WEIGHT %

Size, microns	Fine Grade	Coarse Grade
0 - 5	39 +/- 2	12 +/- 2
5 - 10	18 +/- 3	12 +/- 3
10 - 20	16 +/- 3	14 +/- 3
20 - 40	18 +/- 3	23 +/- 3
40 - 80	9 +/- 3	30 +/- 3
80 - 200	----	9 +/-3

The dirt holding capacity of the filter element is proportional to the square root of the pressure drop across the filter element. Therefore, the capacity begins to diminish dramatically as the restriction increases above about 150" wc, thus illustrating that the low pressure drop region of the service life accounts for most of the dirt retention.

The dirt capacity of the element is also influenced by both the number and depth of the pleats. The capacity of the element increases as the area of the media is increased until an optimum geometry is attained. Increases beyond this geometric optimum may not significantly increase the dirt capacity of the element.

Typically, the elements used by Apollo will retain about 25 to 40 grams of particulate matter per ft² of media at about 7 to 10 net psid.

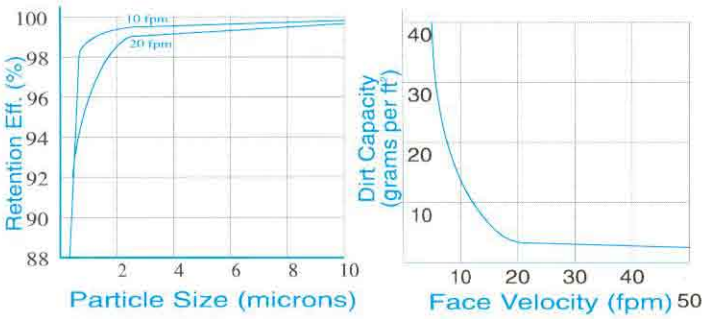

FIGURE 1 - TYPICAL PERFORMANCE

TABLE 3 - THE FILTRATION SPECTRUM