



## Technical Application Note: AIRPORTS

The main airborne contaminants in and around the terminal buildings at airports will be due to the expected large amount of vehicular and aircraft traffic. As can be seen in the table below, one can expect any number of different contaminants - gaseous and particulate - to be present at any one time. Therefore, any contaminant control system considered must be capable of addressing as many of these as possible.

EMISSION FACTORS	In Pounds per 1000 Gallons of Fuel		Jet Aircraft (pounds/flight)
	Automobiles	Diesel Engines	
Aldehydes (CHO)	4	10	4
Carbon monoxide (CO)*	2300	60	20.6
Hydrocarbons (C)	200	136	19
Oxides of nitrogen (NOx)	113	222	23
Oxides of sulfur (SOx)	9	40	--
Organic acids (acetic)	4	31	--
Particulates	12	110	34

\* carbon monoxide not controlled by gas-phase air filtration

Purafil's recommendation for a filtration system for an airport application would start with a 2-stage particulate prefilter section consisting of 30% rouging filters followed by a 90-95% polishing filter. Because a large part of the contaminant load to the systems would be particulate matter, a good prefilter section is needed. However, the removal of particulate matter is one part of the reason we recommend the 2-stage approach.

Much of what is considered as part of the particulate component of exhaust may be better described as semi-volatile matter. This material is produced as a by-product of the incomplete combustion of fossil fuels. This semi-volatile material is in the air as aerosol droplets which tend to plate out (or condense) on surfaces as a gummy or tarry substance. The size of these droplets are such that they can be removed with particulate filters. However, once this material has been collected on the filters, the movement of air causes chemicals to volatilize from this material and be released back into the airstream. (This is one of the reasons why you can tell that someone had been smoking in a room several days after the fact.) Therefore, the removal of this semi-volatile matter on particulate filters is only the first part of the solution.

Referring back to the table of **Emission Factors**, the numbers and types of chemical constituents are such that (at least) two different dry-scrubbing media would be required for their control. Just as in the particulate filter section, the chemical filter section should also consist of two stages. The first stage would contain our Purako<sup>®</sup> brand activated carbons for the removal of the higher weight aldehydes, hydrocarbons, organic acids, and nitrogen

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dioxide. This stage would be analogous to a roughing filter. The second stage would contain of Purafil® Select Chemisorbant media for the control of the lower weight aldehydes (formaldehyde), hydrocarbons, organic acids, nitric oxide, and sulfur dioxide. This would be our chemical polishing filter.

This two-stage approach would provide a longer service life and higher removal efficiencies than a single-stage system. Removal efficiencies of 97+% would not be uncommon over the useful life of the media. Due to the higher contaminant loads expected, make-up air units should use bulk media contained in either disposable or refillable modules. Purafilters or Purasource filters should not be used. These filters may, however, be considered for use in the recirculation air units if they are separate systems from the make-up air units.

The final section of the filtration system would be a 30% final filter to catch any dust which may be generated during maintenance of the system.

To summarize, the preferred system for airport applications would consist of (in the direction of airflow) a 30% particulate filter, a 90-95% particulate filter, a chemical filter section containing Purakol media, a chemical filter section containing Purafil Select media, and a 30% final particulate filter. Other system configurations may be discussed if there are physical or mechanical considerations.

One final comment about the two-stage prefilter section. Because the semi-volatile material tends to plate out on surfaces, and the dry-scrubbing media we would have in the system presents an extremely high surface area, the removal of this material is imperative for the optimum performance of the chemical filter section. If adequate particulate control was not employed, this material would literally “coat” the media, rendering it essentially useless. Also, the off-gassing from the material collected on the particulate prefilters would be yet another source of chemical contaminants which would negatively impact the service life of the media. Therefore, the most important maintenance item for the optimum performance of the system is the 30% prefilter section. These filters should be changed as often as necessary. This not only protects our chemical filters, but also the more expensive 90-95% filters.