For more than 30 years, Purafil has provided clean air solutions to museums and archives worldwide. Purafil specializes in the manufacture of air purification systems that remove gaseous and particulate contaminants to safeguard and preserve artifacts.

Sources of airborne pollution are everywhere — from automobile emissions to new office furnishings. Common particulate filters trap dust, pollen, and other particles, but only Purafil gas-phase air filtration systems eliminate gaseous pollutants, the true sources of poor indoor air quality and the deterioration of artifacts.

### Identifying the Problem: Airborne Pollution

Controlling airborne pollutants is essential to maintaining adequate indoor air quality (IAQ) for museums and archives. Pollutants can come from outside and inside the building. Outside sources of odors, including the incinerators, loading docks and waste disposal units, are usually located at the rear of the building within a few feet of primary HVAC air intakes. Emissions from nearby industrial facilities or residential furnaces can also result in damage to priceless pieces of artwork or archival material. Inside sources of pollution can include food service areas, cleaning aerosols and bioeffluents from guests. Office furnishings and printers can worsen indoor air quality.

For clean indoor air, Purafil offers an extensive product selection, from pleated chemical filters to modular front and side access units. Our systems are designed for easy maintenance and are incorporated into your makeup, supply, or return airstreams.

### Primary Causes and Effects of Gaseous Contamination in Museums & Archives

<table>
<thead>
<tr>
<th>APPLICATION AREA</th>
<th>GASEOUS POLLUTANTS</th>
<th>CAUSE</th>
<th>GASEOUS POLLUTANTS</th>
<th>MATERIALS AFFECTED</th>
</tr>
</thead>
</table>
| Cafeterias       | Hydrogen sulfide, aldehydes, mercaptans, VOCs | Burning of fuels in power stations, factories, buildings and automobiles | • Sulfur dioxide  
• Nitrogen dioxide  
• Ozone | • Calcium carbonate (marble, limestone, frescoes, alkaline, sandstones)  
• Cellulose (paper, cotton, linen, wood veneers)  
• Silk  
• Iron  
• Steel |
| Offices          | Sulfur dioxide, Nitrogen dioxide, Ozone, Acetic Acid | | Ozone | Organically-based materials (paper, textiles, animal skins, plant materials, paints)  
• Metals |
| Restoration/Conservation Laboratories | Hydrogen chloride, formic acid, formaldehyde | Food service areas, solid waste disposal, cleaning compounds, cooling towers | Chlorides | Metals |
WHICH AIR FILTRATION SYSTEM IS BEST?

Purafil’s systems are built-to-order to meet the needs of your budget, space, and air handling system. We offer solutions for retrofit applications and new construction.

PURAFILE MEDIA

Purafil offers a broad selection of dry-chemical adsorbents called media, which are the core of our built-to-order air purification systems. Purafil manufactures a wide variety of media to remove specific pollutants from specific sources. Purafil media remove contaminants through a process known as chemisorption. During this instantaneous process, gases are adsorbed, or captured on the surface of the media. Unlike adsorption, during chemisorption the contaminants are chemically transformed into harmless solids that remain trapped inside the media. Once the gases are removed from your environment, they cannot re-enter the air stream.

In most cases, we recommend Purafil® SP Blend media because it removes the widest variety of odors and gases. SP Blend is a combination of Purakol® media, a premium grade activated carbon, and Purafil® SP media, an activated alumina substrate impregnated with the active ingredient sodium permanganate. While Purakol is highly effective at removing VOCs, it performs poorly against hydrogen sulfide, sulfur dioxide and oxides of nitrogen. By using these media in combination, Purafil can ensure the removal of all contaminants.

PURAFILTER®

Purafil also recommends the use of the Purafilter, a combination chemical and particulate filter designed to replace existing particulate filters in retrofit or rework applications. The Purafilter, which contains Purafil blended media, is useful in applications where space limitations exist.

Purafil engineers are the first to successfully suspend sodium permanganate adsorbents in a bi-component fiber matrix, which does not require the use of adhesives, so adsorbents are fully exposed for reaction with gaseous chemical contaminants and odors. Adsorbents are evenly distributed throughout the filter structure to assure the highest filtration efficiencies.

PURAFIL SIDE ACCESS SYSTEM (PSA)

The PSA is designed for both particulate and gaseous contaminant control and works in conjunction with the facility’s air handling system. The PSA is a built-to-order system available in more than 20 size options. A full range of prefilter selections and particulate final filter selections are also available.

POSITIVE PRESSURIZATION UNIT (PPU)

The PPU is an all-in-one packaged air filtration machine for indoor use. Both particulate and chemical filtration are integrated into one unit, complete with a self-contained blower. It is used to filter low to medium concentrations of gaseous pollutants while providing continuous positive pressure within the space.

RECIRCULATION AIR SYSTEM (RAS)

The RAS, also designed to be located within the protected space, is an air purification machine with recirculation as its primary function. The unit is used to further filter and polish the room air to maintain very low pollutant levels. It offers a number of advantages not present in filtration systems that are integral with the HVAC systems. Both particulate and chemical filtration and a self-contained blower are combined in one unit.
ENVIRONMENTAL ASSESSMENT

Reactivity Monitoring is a widely accepted technique used to characterize the destructive potential of an environment. Because many of the contaminants targeted for control are corrosive in nature (i.e., sulfur dioxide), reactivity monitors have long been used to gauge the quality of ambient air and to indicate the effectiveness of pollution control strategies.

Purafil’s Environmental Reactivity Coupons (ERCs) may be used to indicate the presence of sulfur dioxide, nitrogen dioxide, hydrogen sulfide and chlorine compounds, which can cause deterioration of metals, cellulose or calcium carbonate within museums, libraries and similar environments.

For real-time corrosion monitoring, Purafil offers the OnGuard® Environmental Reactivity Monitor (ERM). The OnGuard ERM provides real-time information on the amount of corrosion occurring due to the presence of corrosive gases. The ERM measurements are transmitted to the building management system via a 4-20 mA output signal. The ERM features copper and silver Quartz Crystal Microbalance (QCM) sensors for the detection of contaminant concentrations as low as one part per billion.

ENVIRONMENTAL CLASSIFICATION

Both Environmental Reactivity Coupons and the OnGuard ERM measure environmental reactivity in Angstroms, a unit of length equal to one ten-billionth of a meter. Purafil’s understanding of the environmental challenges facing museums and archives has led to the following environmental classification scheme whereby monitoring results correlate to varying degrees of air quality.

<table>
<thead>
<tr>
<th>Class</th>
<th>Air Quality Classification</th>
<th>Reactivity Rate*</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Extremely Pure</td>
<td>&lt;90 Å/30 days</td>
</tr>
<tr>
<td>C2</td>
<td>Pure</td>
<td>&lt;150 Å/30 days</td>
</tr>
<tr>
<td>C3</td>
<td>Clean</td>
<td>&lt;250 Å/30 days</td>
</tr>
<tr>
<td>C4</td>
<td>Slightly Contaminated</td>
<td>&lt;350 Å/30 days</td>
</tr>
<tr>
<td>C5</td>
<td>Polluted</td>
<td>&gt;350 Å/30 days</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Class</th>
<th>Air Quality Classification</th>
<th>Reactivity Rate*</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>Extremely Pure</td>
<td>&lt;40 Å/30 days</td>
</tr>
<tr>
<td>S2</td>
<td>Pure</td>
<td>&lt;100 Å/30 days</td>
</tr>
<tr>
<td>S3</td>
<td>Clean</td>
<td>&lt;200 Å/30 days</td>
</tr>
<tr>
<td>S4</td>
<td>Slightly Contaminated</td>
<td>&lt;350 Å/30 days</td>
</tr>
<tr>
<td>S5</td>
<td>Polluted</td>
<td>&gt;350 Å/30 days</td>
</tr>
</tbody>
</table>

* Å = angstroms

* BASED ON THE ABOVE-MENTIONED ENVIRONMENTAL CLASSIFICATION, PURAFIL RECOMMENDS THE FOLLOWING LEVELS OF AIR QUALITY FOR LOCATIONS WITHIN THE MUSEUM OR ARCHIVE:

- Class S1/C1: Archives, Metal Collections, Rare Books
- Class S2/C2: Museums, Museum Storage, Libraries
- Class S3/C3: Historic Houses
- Class S4/C4: Short Term Acceptable
- Class S5/C5: Not Acceptable

© Purafil 2006 VG-Museum-01

www.purafil.com