



## AmericanAirFilter®

# SAAF™ TechNote: Helipad Applications Gas-Phase Filtration

### Helicopter Emissions

Helicopter emissions from EMS helicopters may include a variety of gases and particulates. Gas emissions include carbon monoxide, hydrocarbons, nitrogen oxides, and sulfur oxides from the combustion of jet fuel. Carbon monoxide is the dominant byproduct, but is odorless and has a relatively high exposure limit. Therefore, the other byproducts are of higher concern to prevent odors and irritation for the building occupants.

Helicopter engines produce varying amounts of these contaminants depending on the operation mode: approach, climb, idle, and take-off. As shown below, one operation mode produces more hydrocarbons while another produces more nitrogen oxides with sulfur oxides being the lowest overall emission. At a minimum, these contaminant groups should be targeted in a helipad application.

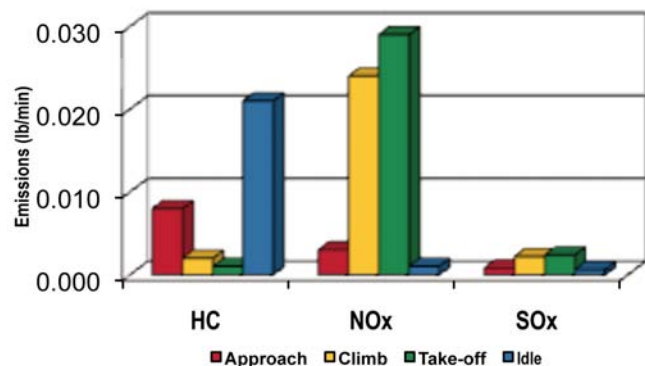
Estimated Emissions from a Bell 206 Helicopter<sup>1</sup>

Operation Mode	Emission (lb/min)			
	CO	HC	NO <sub>x</sub>	SO <sub>x</sub>
Approach	0.069	0.008	0.003	0.0008
Climb	0.037	0.002	0.024	0.0022
Take-off	0.035	0.001	0.029	0.0024
Idle	0.101	0.021	0.001	0.0006

CO = carbon monoxide  
 HC = hydrocarbons  
 NO<sub>x</sub> = nitrogen oxides  
 SO<sub>x</sub> = sulfur oxides

<sup>1</sup> Final Environmental Impact Report Lampoc Wind Project, 2008. County of Santa Barbara, CA.

Estimated Emissions of Odorous / Irritant Gases



Information on Emitted Gases

Emitted Gas	EPA Cont.	Description	EPA NAAQS
CO	CO	colorless, odorless, tasteless	35 ppm – 1 hr 9 ppm – 8 hr
NO <sub>x</sub>	NO <sub>2</sub>	irritant	0.053 ppm – annual
SO <sub>x</sub>	SO <sub>2</sub>	suffocating odor	0.14 ppm – 24 hr
HC	n/a	odorous or irritant	n/a

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## Media Selection

Combining proper location of building outdoor air intakes with helicopter operating instructions and gas-phase filtration is one solution to minimize the irritation and odor from helicopter exhaust. After measures have been taken to minimize the amount of helicopter exhaust entrained into the building's ventilation air, applying appropriate filtration will minimize odor or irritant events from the helicopter emissions. The filtration system should include particulate filtration to capture particulates first, then gas-phase media to address hydrocarbons, reactive organics, and inorganics. In cases where significant amounts of combustion generated particulates are entrained into the filtration system, higher efficiency prefilters are necessary (MERV 11-14).

Virgin activated carbon has the ability to adsorb many hydrocarbons with good capacity. For the inorganic compounds that are more reactive, a media with the ability to oxidize contaminants can achieve higher capacities than virgin carbon (SO<sub>2</sub>, NO). The oxidant media also oxidizes reactive organics produced by helicopter engine combustion with a higher capacity than virgin carbon (formaldehyde). AAF recommends utilizing both types of media to effectively address these contaminants. (See chart for respective media capacities.)

AAF provides SAAFCarb™ (virgin activated carbon) and SAAFOxidant™ (oxidant media) for use in gas-phase filtration systems to meet this need. These media can be applied in separate passes for optimum performance and media life. They may also be blended together

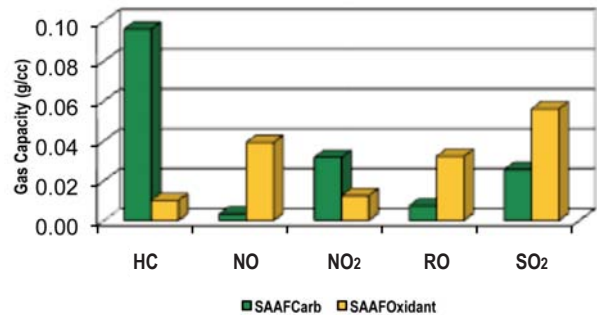
as SAAFBlend™ GP for applications using one pass of gas-phase filtration media.

### Heavy Airborne Particulate




For applications with a high presence of exhaust particulates, a MERV 11 to 14 air filter is recommended upstream of the media for its protection.

Note: Every application requires evaluation to determine specific requirements. The solution recommendations detailed here are typical and may not be appropriate for each application of this nature.

**Typical Capacities for Contaminants from Helicopters**



HC = hydrocarbons (as toluene)      RO = reactive organics (as formaldehyde)  
 NO = nitric oxide (a component of NO<sub>x</sub>)      SO<sub>2</sub> = sulfur dioxide (a component of SO<sub>x</sub>)  
 NO<sub>2</sub> = nitrogen dioxide (a component of NO<sub>x</sub>)

Media	Media Description	Gases Targeted
	<b>SAAFCarb™</b> Brochure GPF-1-110 SAAFCarb media is pelletized activated carbon that removes toxic and impure gases from the environment. The activated carbon is composed of bituminous coal substrate. It is UL Class 1.	chlorine, hydrocarbons, nitrogen dioxide, and VOCs
	<b>SAAFOxidant™</b> Brochure GPF-1-101 SAAFOxidant media is spherical and porous pellets, composed of a combination of activated alumina and other binders. Potassium permanganate is impregnated to this media combination, in order to provide optimum adsorption, absorption, and oxidation of various gaseous contaminants. It is UL Class 1.	formaldehyde, lower molecular weight aldehydes and organic acids, nitric oxide, and sulfur dioxide
	<b>SAAFBlend™ GP</b> Brochure GPF-1-102 SAAFBlend GP is manufactured from equal volumetric mix of SAAFCarb and SAAFOxidant media. It is UL Class 1.	chlorine, formaldehyde, hydrocarbons, hydrogen sulfide, lower molecular weight aldehydes and organic acids, nitric oxide, nitrogen dioxide, sulfur dioxide, and VOCs



AAF has a policy of continuous product research and improvement and reserves the right to change design and specifications without notice.

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