

Nanoparticle Filtration for Car Cabins

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Introduction

Filters in car ventilation systems remove large particles from intake air: however, nanoparticles mainly pass through these filters. As can be seen in Fig. 1 the nanoparticle number concentration inside and outside a car is almost equivalent. Levels on and near roads are frequently 10-100+ times higher than ambient air levels.

Such nanoparticles are now linked to a number of diseases, including heart attacks, cancer, lung diseases and immune system diseases, and are thus considered a serious health problem.

The nanoparticle filtration system

We are developing plug-in and retrofit systems to reduce nanoparticle concentrations in vehicle cabins (cars, trucks, urban public transport) and in homes and offices. Such systems can be particularly used as stand-alone or portable units in vehicles and in buildings, as retrofitted units to existing vehicle or building air-conditioning systems, and/or as components designed into new vehicles.

Technology

The technology uses a small, high performance fan to draw air through a filter operated at low face velocity. Prototype units consisting of a circumferential filter, radially pleated, with a blower enclosed within the filter to provide air flow from inside to outside, have been constructed (Fig. 2).

Fig.2: Filter system and measurement equipment in the test car.

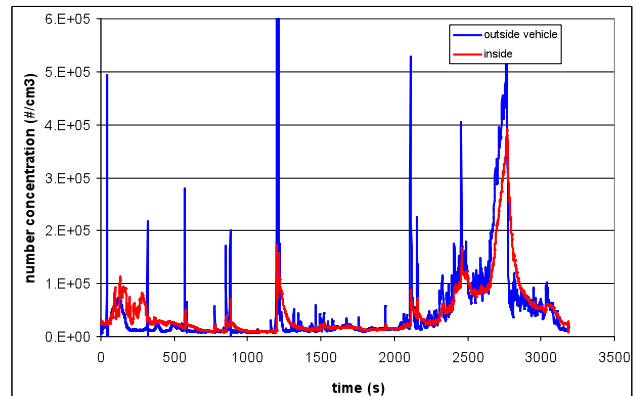


Fig.1: Particle number concentration inside and outside a passenger car (cabin ventilation turned on).



Results

The prototypes have been road-tested for extended periods under an extensive variety of traffic conditions, including high-exposure urban and tunnel situations, in cars with the air conditioning in recirculation mode. On start-up, an extremely rapid particle reduction ('clean-down') of 95-99% within 3 minutes is obtained (Fig. 3). Once cleaned down, the new filter system (air conditioning still in recirculation mode), can maintain a level of nanoparticles in the car at or below 5000/cc, the equivalent of a typical situation inside a closed office or in woodland, even if external peak counts are (transient) over 1,000,000/cc or (persistent) over 250,000/cc for extended periods. The total nanoparticle count inside the car over the journey is ~2% of that encountered outside. (Fig. 4).

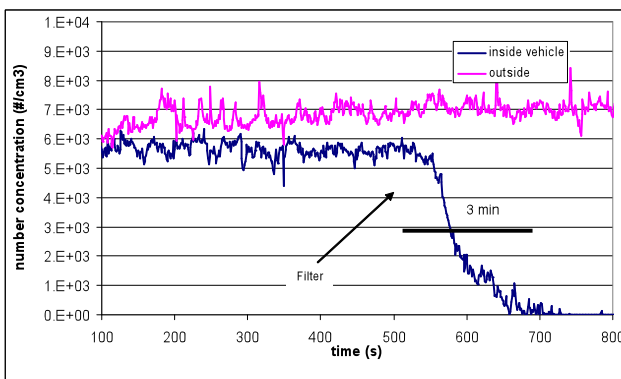


Fig.3: After turning on the filter, the particle concentration drops within about 3 minutes.

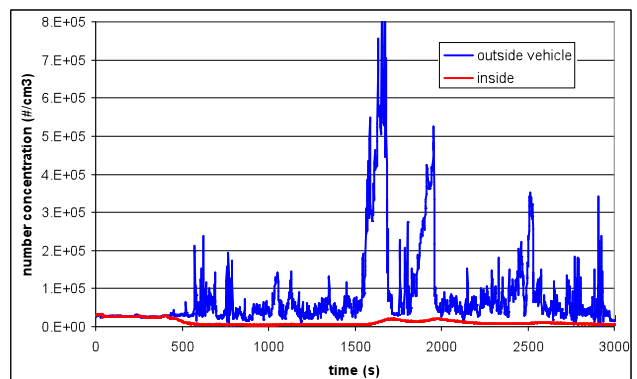


Fig.4: Particle concentration outside and inside with the new filter system.