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### Original Article

#### Design and Set up of an Air Filter Testing Unit to Demonstrate Characteristics and Performance of Particulate Air Filters

 Corresponding Author:

Farhang Akbar-Khanzadeh, Ph.D., CIH, E-Mail: Farhang.Akbar@UToledo.edu

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#### Abstract:

An air filter is a significant element of any mechanical ventilation system. However, the importance and performance evaluation of air filters have not been well publicized and related scientific reports are scarce. In this study, a transportable, off-line, air filter-testing unit (the Unit) was designed and utilized to simulate the filter housing of a mechanical ventilation system. The Unit was designed, assembled, and operated in a laboratory. To demonstrate the applications of the Unit, a series of air filter handling and installation scenarios was performed to determine the characteristic curve and capture efficiencies of a selected set of HEPA filters. The research project produced a transportable, closed system air filter testing unit. The Unit incorporated a fan, a damper to adjust air flowrate, a filter-housing (consisting of a mixing chamber, a filter-frame, and a pressure-gauge), and ducting with ports to introduce challenge particles and monitor them after filtration. By using the Unit, the detrimental effects of damaged filter-media, damaged filter-gasket, and improper installation of air filters on their capture efficiencies were clearly demonstrated. An air filter testing unit, similar to the Unit presented here, can readily be designed, fabricated, and assembled to simulate the filter-housing of mechanical ventilation systems. The assembled unit can be used (1) to determine capture efficiency of air filters and their characteristic curve, (2) to demonstrate the negative effects of improper handling and installation of air filters, and (3) as an effective investigative and educational tool.

#### Keywords:

[Air filter testing unit](#) . [Filter capture efficiency](#) . [HEPA filter test](#)

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