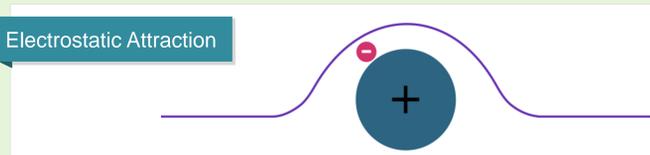
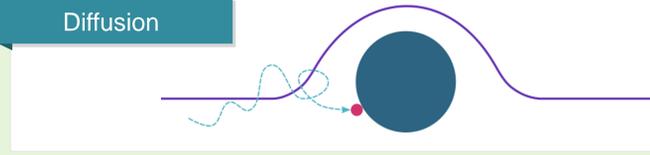
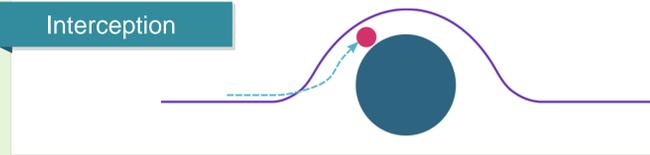
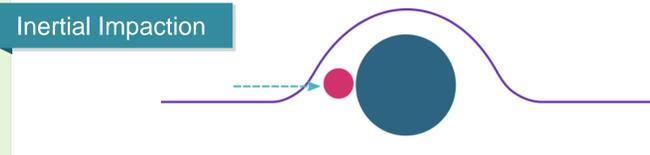


Design of test bench apparatus for study of enhanced species filtration

Objective

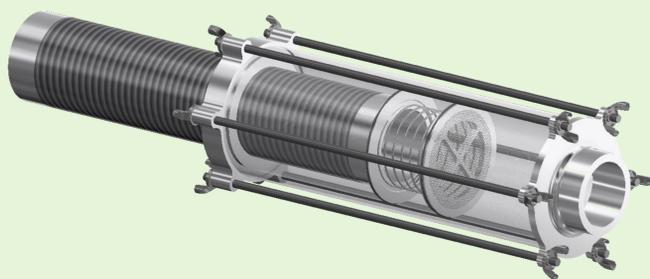
The purpose of the research is to examine filters that can be used to capture radioactive isotopes at nuclear facilities. North American and European air filter standards are limited by the fact that their classification indicates how it would perform against a simulated atmospheric particulate matter. In situations where special attention needs to be given to specific compounds or particulates, these general classifications do not provide any insights. In these situations general air filters may not meet the needs. To support this research, a test bench apparatus needs to be developed for testing the performance of filters against specific types of particulates and conditions.

Filtration Mechanisms

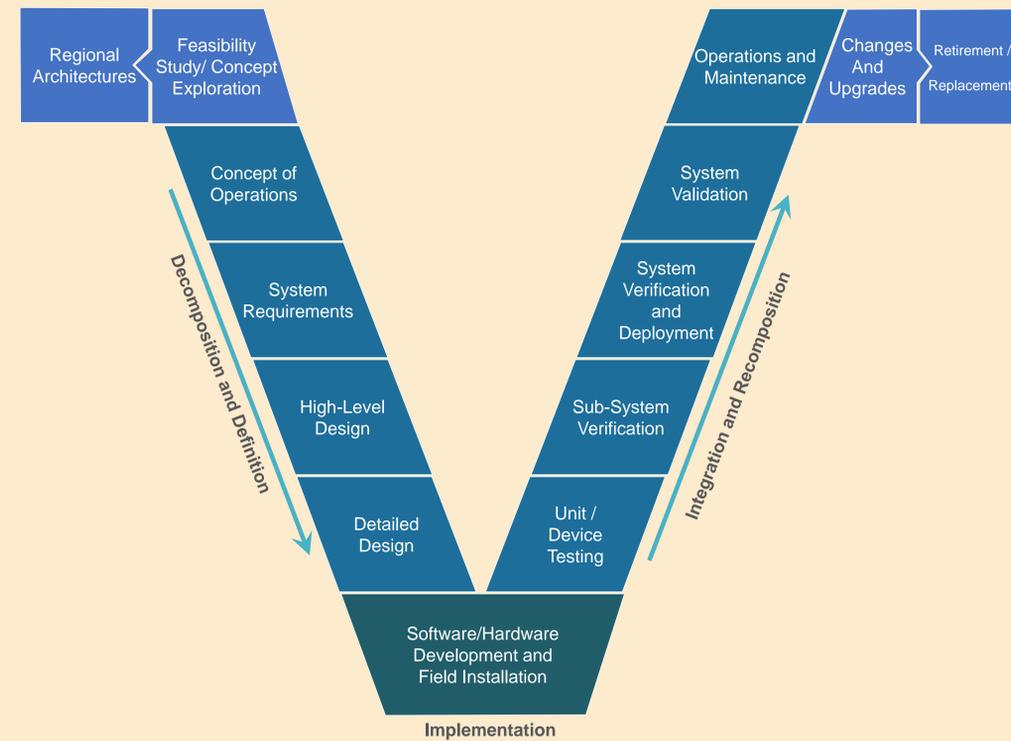


Legend: ● particle ● filter fiber — flow stream

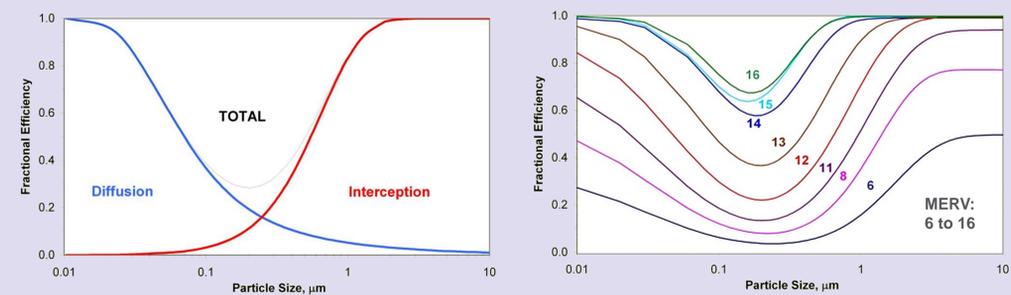
Air Filter Housing CAD model



Methodology



Ideal MERV Composite Minimum Efficiency Curve

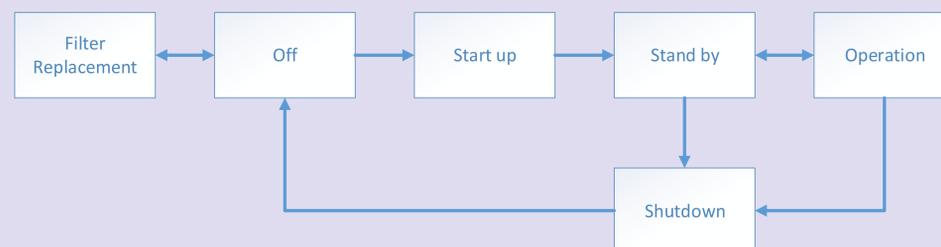


$$E = 1 - e^{-(ED + fER)S}$$

Where:
 S = fiber projected area, dimensionless
 ED = single fiber diffusion efficiency, fractional
 ER = single fiber interception efficiency, fractional
 f = fiber correction factor (typically = 0.615)

Minimum efficiency reporting value (MERV)

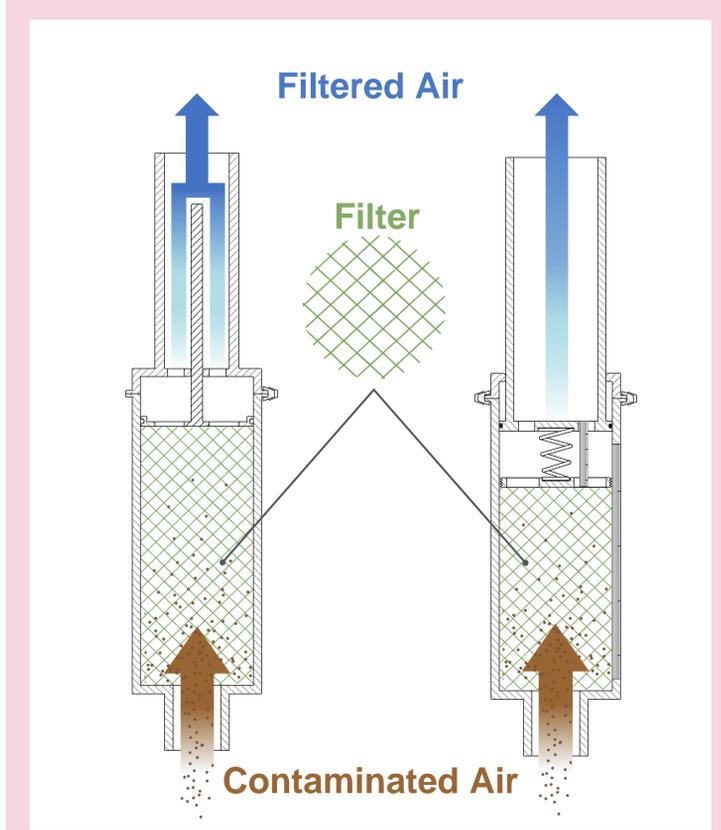
Mode Requirements



Functional Requirements

	Requirement
FHA-001	The filter housing shall allow for variation of critical filter parameters.
FHA-002	The filter housing shall provided a repeated and accurate method for filter tests.
FHA-003	The filter housing shall be able to intake contaminated air.
FHA-004	The filter housing shall be able to intake exhaust gas from the plasma source.
FHA-005	The filter house shall be able to continuously operate.
FHA-006	All air rejected to atmosphere shall be conditioned for safe release.
FHA-007	The filter housing apparatus shall be able to precondition the air to prevent damage to self or filter media and to meet experimental requirement.

Preliminary Concepts



Acknowledgments

- Financial Support from National Sciences and Engineering Research Council of Canada .
- Ideal MRVE graphs sourced from: MERV Filter Models; Summer 2002 issue of *Air Media* Author(s): W. J. Kowalski, PE, Ph.D; W. P. Bahnfleth, PE, Ph.D The Pennsylvania State University