Interface Phenomena for a Multifunctional Air-Water Micro-Particle Collecting and Filtering System

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Abstract

INTRODUCTION
A new device concept for a multi-functional particle collector was designed to meet the very specific regulations of clean rooms and medical/ biological environment. This device is meant to assist the existing installations on achieving better performances or to substitute costly installations for specific applications. (Figure 1 A, B)

USE OF COMSOL MULTIPHYSICS :
The 2D SolidWorks models of the device parts (Figure 1 A, B,C) were imported through LiveLink™ in COMSOL Multiphysics. The interface structures of the flowing and solid layers (Figure 2) were imported as well through LiveLink™ for SolidWorks®, considering on the model description the influence of particle sizes and their density of distribution on both air and water.
The SolidWorks® model was exported through the LiveLink™ for SolidWorks® add-on in COMSOL Multiphysics where Heat Transfer and Phase Transformation analyses were performed as well (Figure 3, Figure 4).

RESULTS
The effective design of the active elements has been readdressed based on COMSOL simulation results, thus the efficiency of the device parts being correlated (Figure 4)

Figures used in the abstract

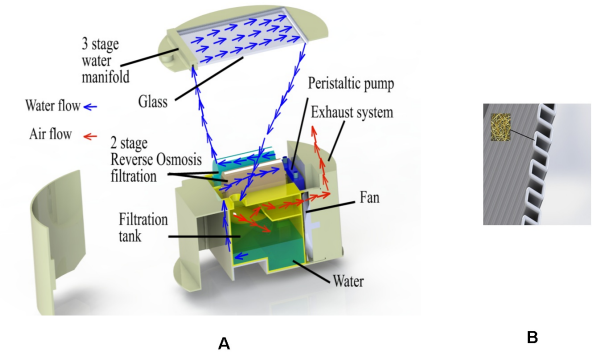

Figure 1: SolidWorks ® model (A) and HEPA filter detail (B) of a Multifunctional Air-Water Particle Collector (MA\WPAC)

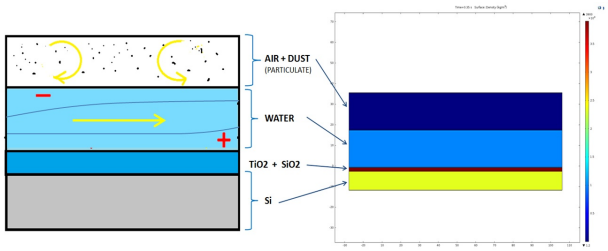

Figure 2: Interfaces within (MA\WPAC) exported in COMSOL Multiphysics ®

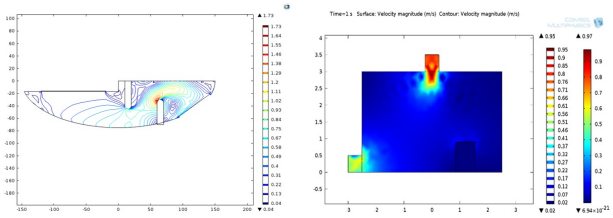

Figure 3: COMSOL Multiphysics ® for fluid-particle velocity inside MA\WPAC tank (A)

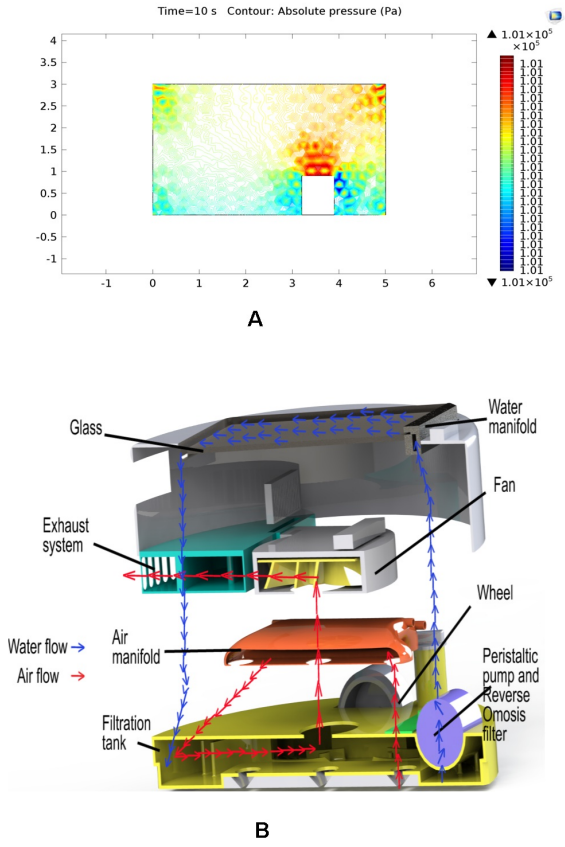

Figure 4: COMSOL Multiphysics ® for absolute pressure within flow regulators (simulation inside MA\WPAC tank) (A) and the redesigned SolidWorks parts of MA|WPAC using the COMSOL Multiphysics ® modeling-simulations results (B)