

## Ultraviolet Usage Efficiency of in Supporting Particulate Filters to Disinfect Re-Circulated Air in Both ICU And O.R Rooms\*

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### Abstract

Air ability of carrying microorganisms is one of the most important factors effecting the indoor environment quality and sterility, and it will be critical parameter in sterilizing clean rooms (OR, ICU ...) in hospitals, especially those with high probability of infection risk for medical staff, visitors, and other people. All these elements prompt scientists to search for integrated solution that maintains indoor air quality and sterilization level.

This study discusses in-duct UVGI efficiency to disinfect O.R and ICU supplied air. Experiment setup was designed using three ultraviolet lamps were placed at the upper side of experimental duct, equipped with variable speed turbine to simulate flow rates of ICU and O.R. In order to determine organism irradiance time, UV intensity distribution is measured at different levels in duct, Thentese parameters combined in simulation program executed under LABVIEW programming environment to determine in-duct disinfection efficiency in relation to ICU and O.R designing requirement and sterility level.

Finally, we used this program to determine UVGI in-duct disinfection of ICU and O.R. The simulated results confirmed that UVGI system could be used as a standalone system for re-circulated air handling system's ICU in both cases when disinfection requirement is 90%. If 99% is needed we must replace normal output lamps with high output ones. As in ORs need Higher air changes per hour this system will be only used as a supporting system for high efficiency particulate air filter (HEPA), this could reduce the filtration load on HEPA filters duties, and eventually lengthen its life.

Instead of expelling air outdoors, using this air into such system could save money though energy saving by passing this treated air to other areas in the hospital.

**Keywords:** Ultraviolet germicidal irradiation (UVGI), In-duct, Disinfection, operating room (O.R), Intensive care unit (ICU), HEPA filters.

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