



## BBSE3002 Applied Research Project (2003-2004)

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**Project Title:** Local Exhaust Ventilation (LEV) for Protection Against Nosocomial Infection

### Summary:

Health care workers (HCWs) are at risk of nosocomial infection during treating infectious patients, such as Severe Acute Respiratory Syndrome (SARS). It is practically risky during bioaerosol generated medical procedures, such as emergency endotracheal intubation. Local exhaust ventilation (LEV) has been identified as a potential solution.

The objective of the project is to design a hood for LEV which is suitable under hospital environment that HCWs can be protected against nosocomial infection. Computation fluid dynamics (CFD) models have been developed to simulate the transport of droplets for design optimization of local exhaust hood. Moreover, the effectiveness of LEV system is also evaluated by CFD analyses. A LEV prototype has been built and tested under conditions simulating the resuscitation and dental procedures.

The analyses show that a horn-shape hood yields the best capture performance of particles without any recirculation and meeting the capture velocity at further away from the hood. The hood curvature has been optimized with a value of  $28.57\text{m}^{-1}$ . The hood surface diameter and extraction arm diameter for suction arm were 160mm and 300mm respectively. The comparison between the aerosols/droplets distribution between with and without LEV system in patient ward shows that LEV can effectively remove aerosols/droplets from the HCW's breathing zone. Experimental studies show that the particle concentration gradually is reduced under the operation of LEV in different aerosol generated medical procedures.

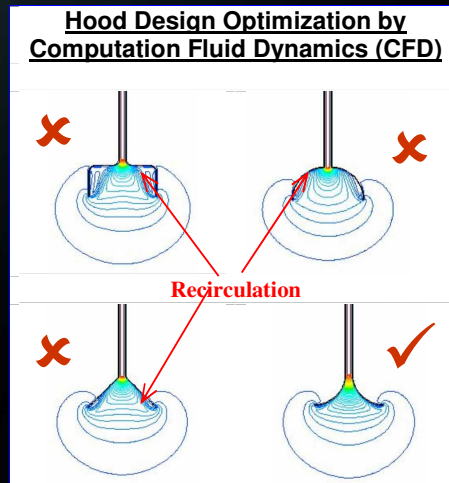


Figure 1. Preliminary hood shape design



Figure 2. Optimized hood



Figure 4. Resuscitation procedure



Figure 5. Dental procedure



Figure 3. LEV prototype