

Abstract Submitted
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Optimization of Extraoral Aerosol Suction Device using CFD PETER LIU, Upper Dublin High School, MEHDI NIKFAR, RATUL PAUL, Lehigh University — Dental professionals are exposed to contaminated aerosols and droplets produced during dental procedures. To prevent airborne disease transmission, extraoral suction is needed. Due to its bulky size, high cost, and loud noise, current Extraoral Suction Units are not widely adopted in dental offices. To fulfill this need, a smart extraoral suction cup is designed to attach to an HVE (high-volume evacuator) commonly present in dental offices. Computational fluid dynamics (CFD) simulation is performed using ANSYS to test the droplet and capture efficiency of twenty different designs with consideration of vacuum's pressure. To simulate aerosol, air and droplets were dispersed from a model mouth at various testing speeds under several factors, such as turbulence and dispersion angles. The optimal design had a simulated 84.15% suction efficiency. To improve the design, a clear cover is added for increased droplet capture while maintaining vision for the dentist. CFD simulation was performed to optimize the device with clear cover designs. Appropriate distance between the device and a patient's mouth and device performance are validated. These findings result in a smart suction device with high capture efficiency for easy use with further improvement in the future.

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