Optimisation of Angular Air Flow Distribution System using Symmetrical Air Foil Louvers in General Operation Theatres

Yogesh K Vishakarma
Research Scholar, Department of Mechanical Engineering, Lokmanya Tilak College of Engineering, Navi Mumbai, India

Dr. Santosh Dalvi
Department of Mechanical Engineering, Lokmanya Tilak College of Engineering, Navi Mumbai, India

Abstract

Operation theatres (OTs) require ultra-clean, unidirectional airflow to minimize surgical site infections. This study presents a comprehensive Computational Fluid Dynamics (CFD) analysis using ANSYS Fluent to evaluate airflow distribution using symmetrical air-foil louvers with different cases like 30°, 45°, 60°, and 90°. Performance is assessed through velocity uniformity, turbulence intensity, streamline behaviour, and airflow penetration. Results demonstrate that air-foil based diffusers significantly outperform conventional straight-blade systems. The 60° configuration yields optimal laminar flow characteristics, with maximum uniformity and minimum turbulence, making it ideal for critical OT environments.

Keywords

CFD, ANSYS Fluent, Operation Theatre, Air-foil Diffuser, Laminar Flow, HVAC.