

# CFD Analysis and Validation of Axial Compressor Rotor Blade

**Prof. S. Q. Syed<sup>1</sup>, Mr. Nayan G. Chandankhede<sup>2</sup>, Mr. Mayur G. Sawdekar<sup>3</sup>,  
Mr. Manthan P. Tadke<sup>4</sup>, Mr. Aditya D. Gite<sup>5</sup>, Mr. Piyush V. Raut<sup>6</sup>**

Assistant Professor, Department of Mechanical Engineering<sup>1</sup>

Students, Department of Mechanical Engineering<sup>2,3,4,5,6</sup>

Shri Sant Gajanan Maharaj College of Engineering, Shegaon, Maharashtra, India.

**Abstract:** *This research paper employs computational simulations to investigate the consequences of inlet flow distortion, focusing specifically on inlet swirl and total pressure distortion, on the operational characteristics and robustness of an axial transonic compressor. Various permutations of inlet swirl and total pressure distortion are examined, uncovering diverse impacts on the compressor's operational robustness and efficiency. The analysis demonstrates that while co-swirl configurations marginally enhance the operational robustness of the compressor, counter-swirl configurations tend to diminish it. The combination of the effects of individual distortion patterns can provide insights into certain aspects of how a composite pattern of distortion would affect the compressor's efficiency, yet this approach falls short in accurately evaluating the compressor's operational robustness when subjected to a composite distortion pattern.*

**Keywords:** Axial Compressors, Total-Pressure Distortion, Inlet Swirl, Combined Distortion, Performance, Stability

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