

## ENGINE OPTIMIZED TURBINE DESIGN



*CCGEX Research Day 2017-09-07/08*

*N. Anton*

*Gas Exchange System and Turbo Development*

**SCANIA CV AB**



**SCANIA**

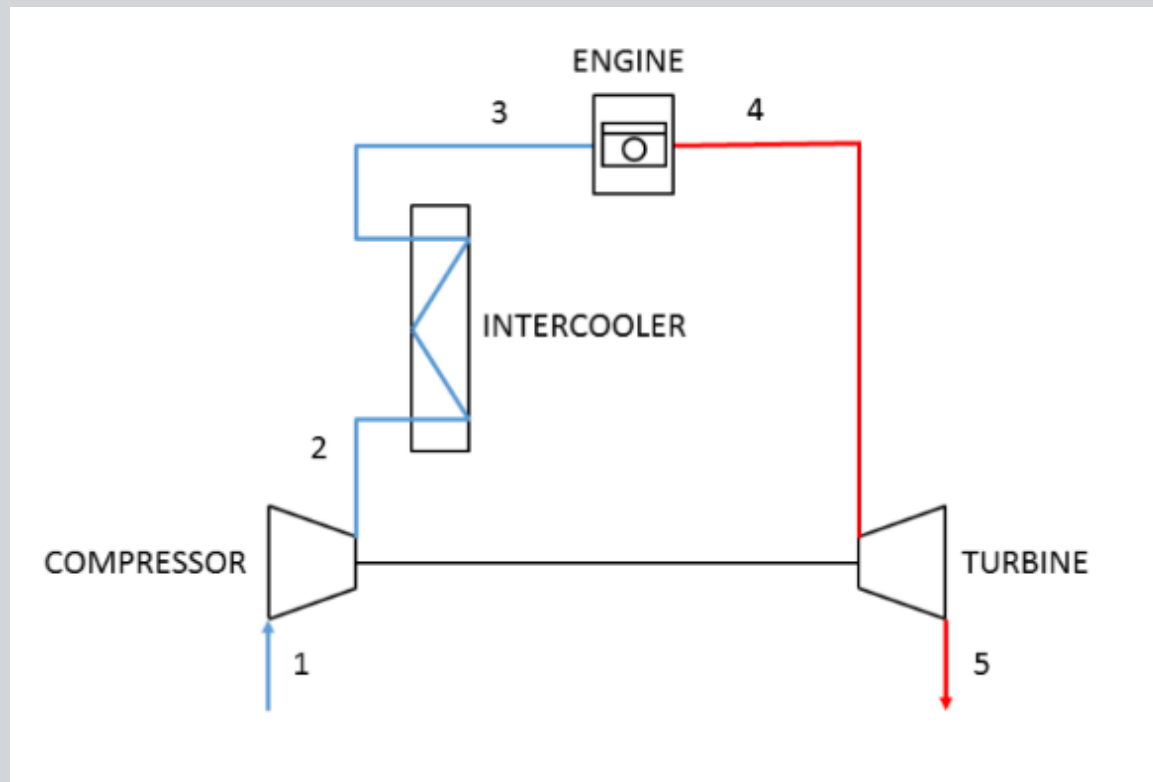
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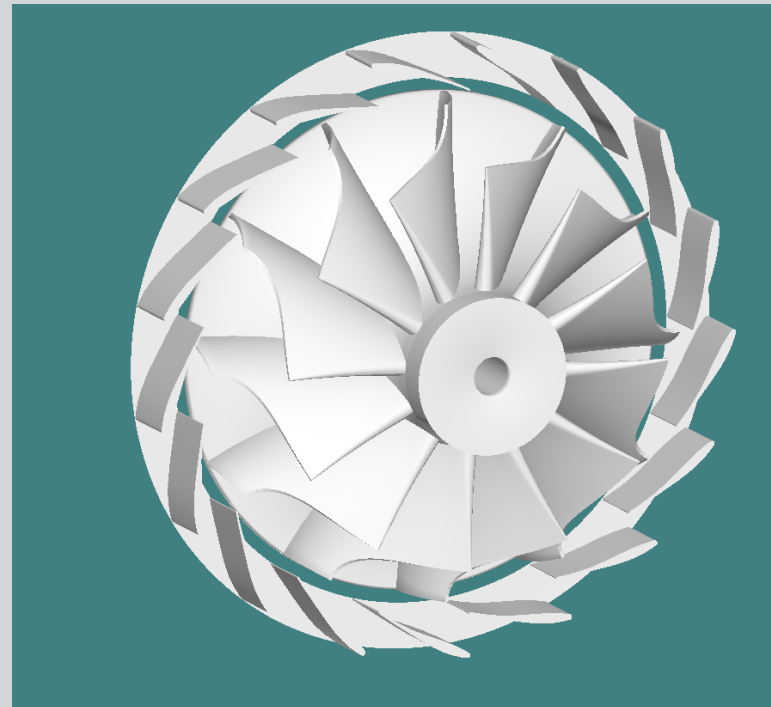
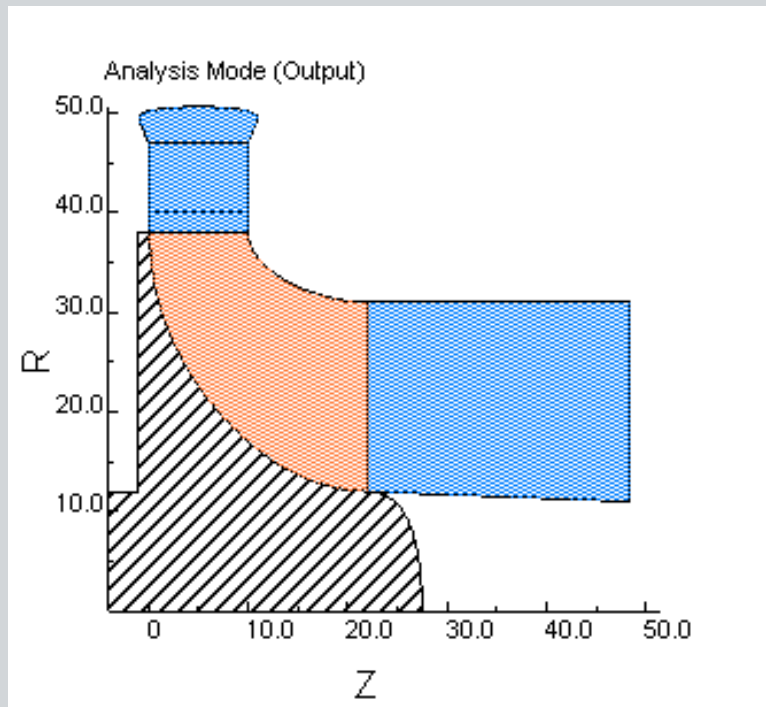
# INTRODUCTION

- Engine Optimized Turbine Design
  - Exhaust Energy Utilization
  - Systems Based Approach
  - Turbocharger Turbine Design



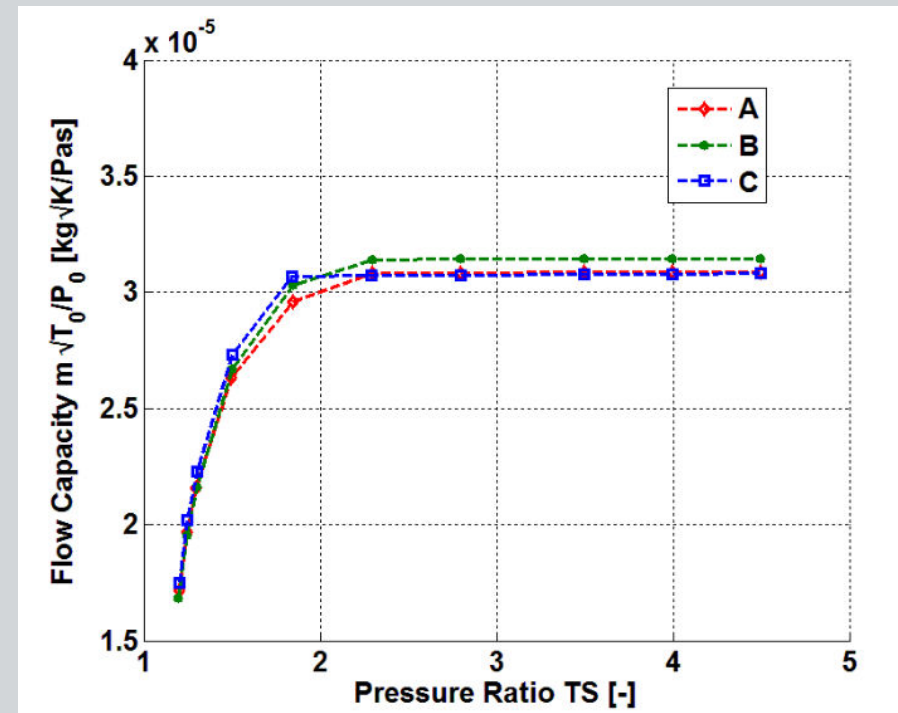
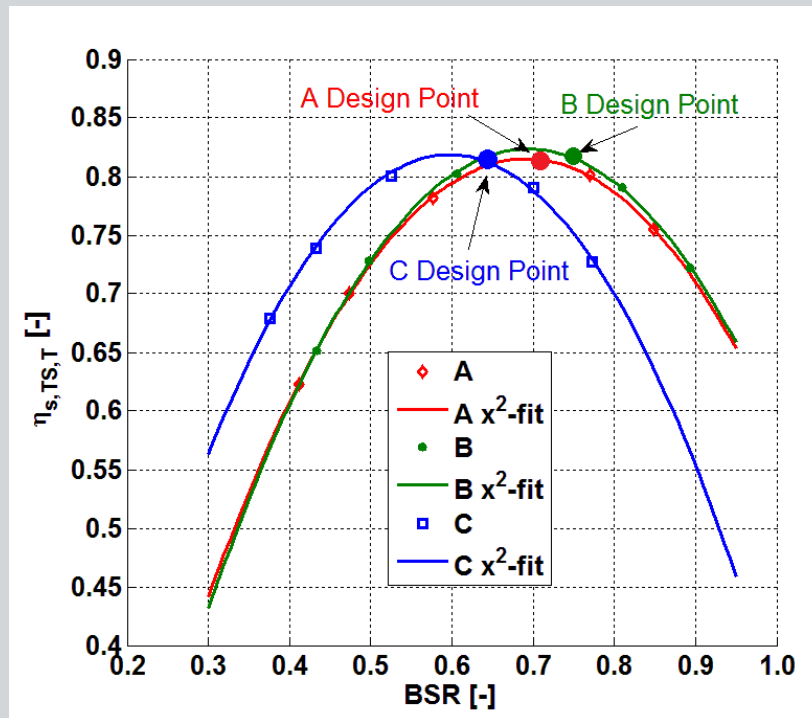
# PROJECT INVESTIGATION

- **Turbocharger Turbine Design, Heavy-Duty Otto Cycle Engine**
  - Turbine Design Point
  - Conventional Radial Turbine Design(A)
  - Design from 1D to 3D



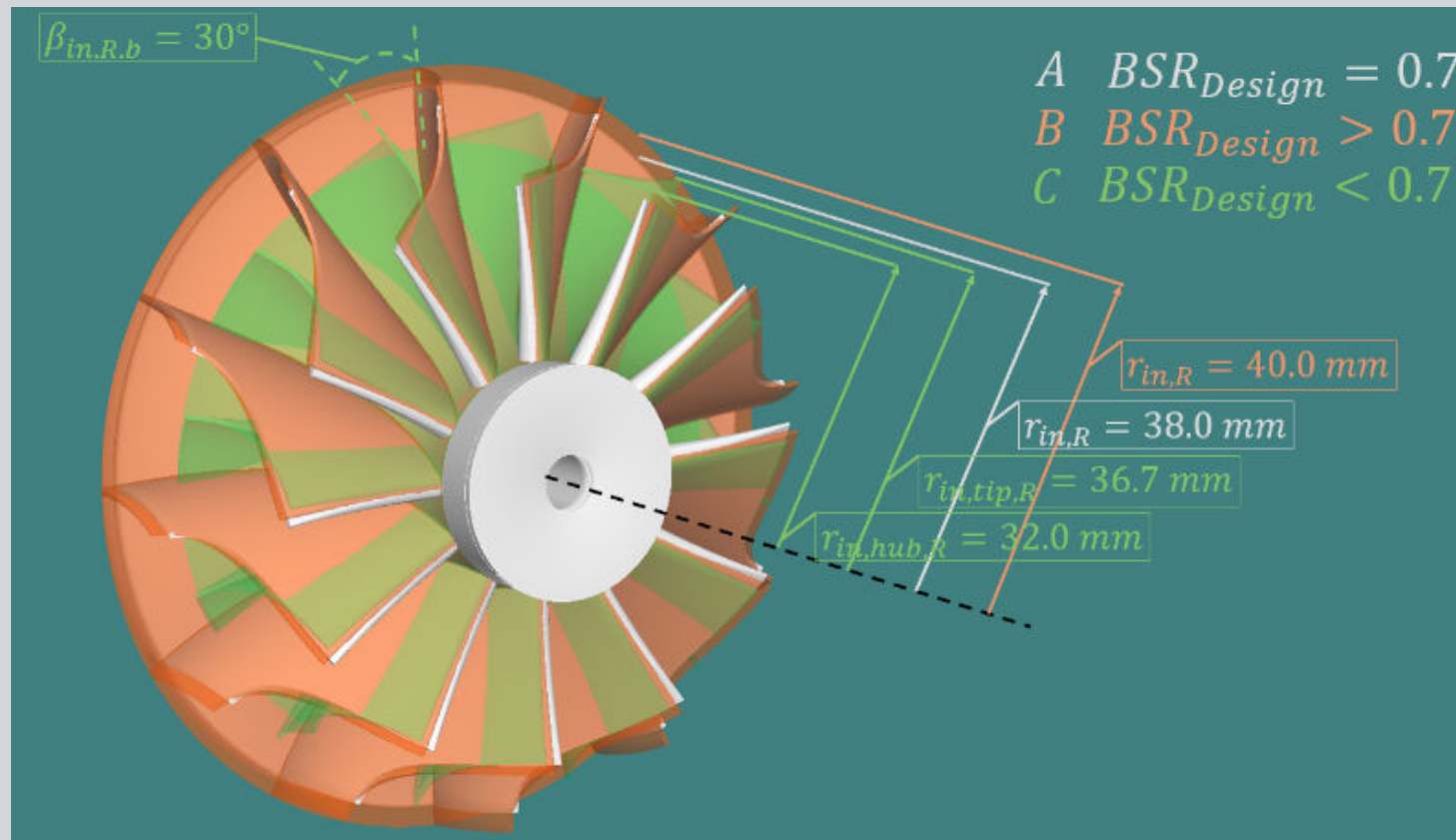
# PROJECT INVESTIGATION

- Turbocharger Turbine Design, Heavy-Duty Otto Cycle Engine
  - Turbine Design Point
  - Fully Radial Turbine(A, B), Mixed Flow Turbine(C)



# PROJECT INVESTIGATION

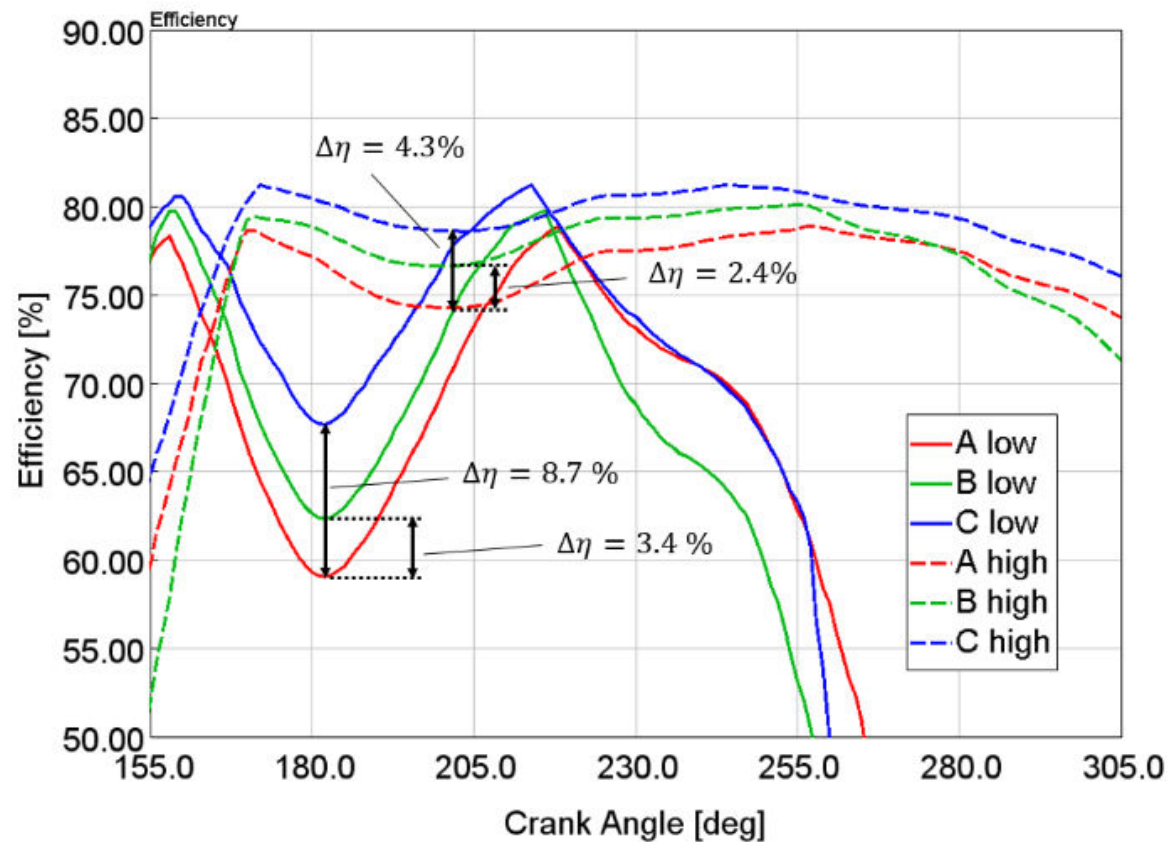
- Turbocharger Turbine Design, Heavy-Duty Otto Cycle Engine
  - 3D Overlay
  - Fully Radial Turbine(A, B), Mixed Flow Turbine(C)





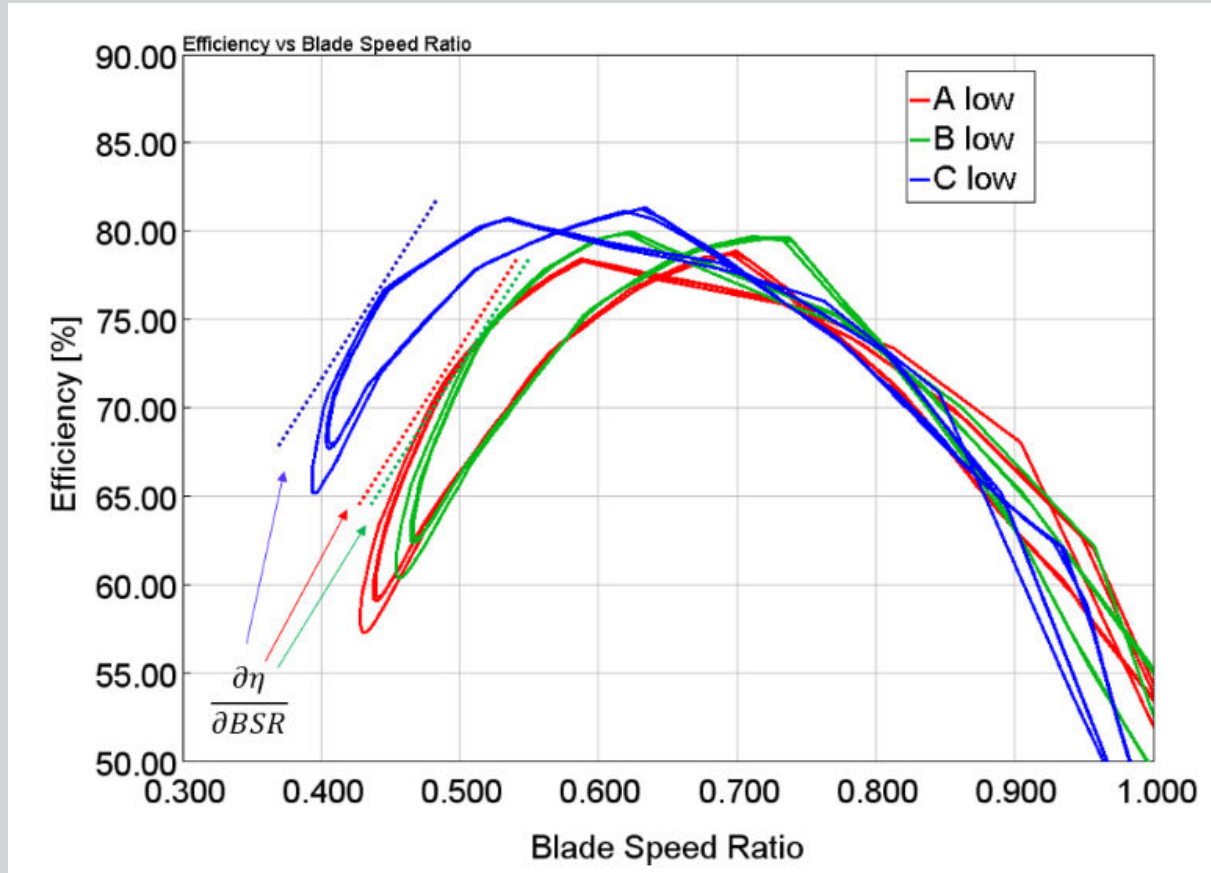
# PROJECT INVESTIGATION

- Turbocharger Turbine Design, Heavy-Duty Otto Cycle Engine  
- Crank-Angle-Resolved Turbine Efficiency



# PROJECT INVESTIGATION

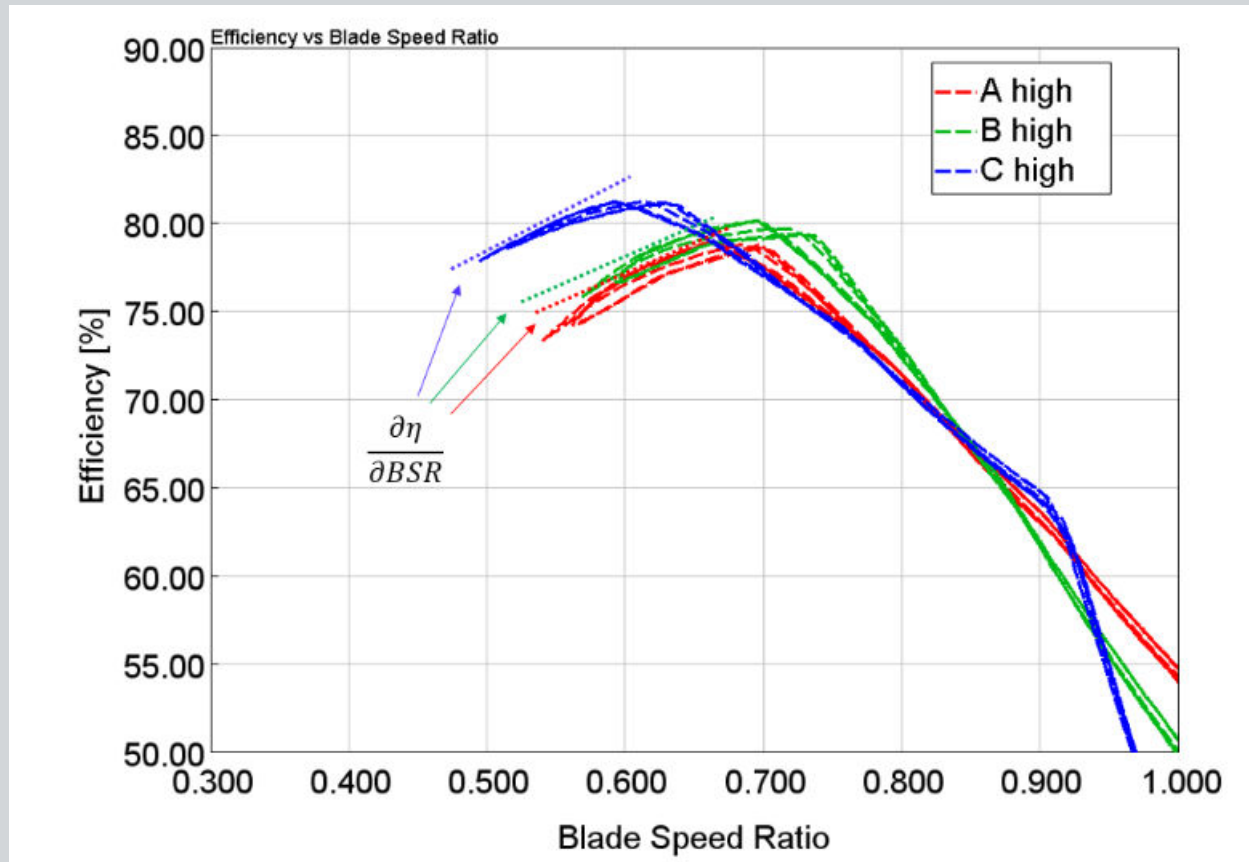
- Turbocharger Turbine Design, Heavy-Duty Otto Cycle Engine  
- Crank-Angle-Resolved Efficiency vs. BSR, Low Volume





# PROJECT INVESTIGATION

- Turbocharger Turbine Design, Heavy-Duty Otto Cycle Engine  
- Crank-Angle-Resolved Efficiency vs. BSR, High Volume



# PROJECT INVESTIGATION

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- **Concluding Remarks**

- Sub-optimum Design Point Parameters can be superior in an unsteady environment
- Turbine Design and performance is more sensitive to low exhaust manifold volumes
- The Mixed-Flow turbine could be a viable choice for high efficiency at low exhaust manifold volume

- **Future Work**

- Increased Design Space
- Axial Turbine Type
- Pulse Separation



# THANK YOU!

