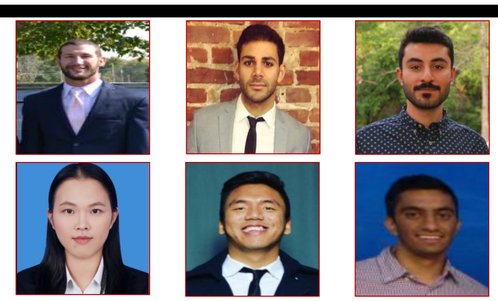
IUPUI | DEPARTMENT OF MECHANICAL ENGINEERING
SCHOOL OF ENGINEERING AND TECHNOLOGY
A Purdue University School
Indianapolis

Diesel Supercharged Snowmobile Rotor Integration

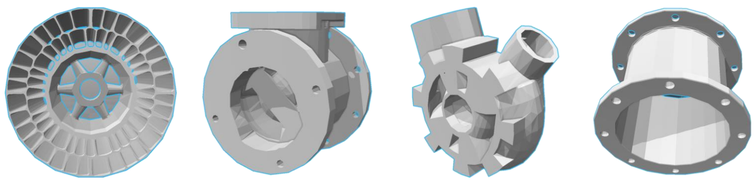
Course: ME 46200 Spring 2017 Senior Capstone Design
Instructor :John Stang Sponsor: Dr. Razi Nalim

Group Member: *Ali Alamer, Gamil Hanna, Ngunlian Lian, Soham Patel, Brian Struewing, Yuting Zhan*



Background and Objective

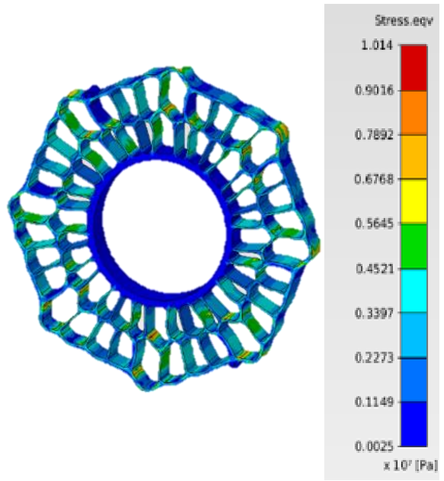
- **Pressure wave supercharger for 900cc diesel engine**
- **Comprex is 85.7% of original Mazda Cabella rotor comprex**
- **Manufacturing cost under $1,000**
- **Minimize thermal expansion**



Design Development & Achievement

ROTOR COMPREX CAD MODEL

APPROACHED WATER JETTING METHOD



FINITE ELEMENT STRUCTURAL ANALYSIS

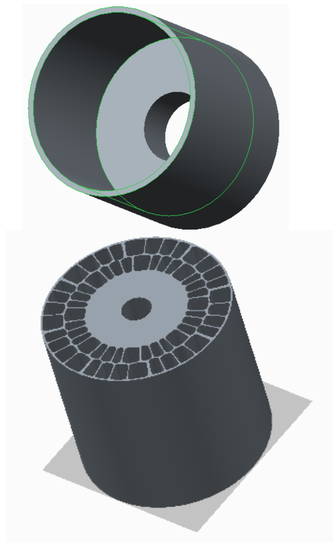
Design Requirements

Customer Requirements	Wt.
Bearing Prototype	20%
Rotor Prototype	25%
Enclosure Prototype	5%
Inlet and Outlet Housing Prototype	10%
Light Weight	5%
Minimal Leakage	20%
Affordability	15%

Design Criteria	Goal
Withstand Temperatures	555 ^{0}C
Withstand Pressures	3 Bar
Clearance Space	< 3 mm
Withstand Speeds	< 15,000 rpm
Flow Space	< 3%
Costs	< $ 1,000

Final Product

MATERIAL: STEEL 1010



Recommendations

- **Cut off unnecessary weight or dimensions to future designs**
- **Perform dynamic loading test on the rotor once a complete prototype has been produced**
- **Run multiple structural, flow, and pressure simulations using Finite Element Analysis (FEA)**
- **Use steel based or cast iron materials when manufacturing**