

## EDUCATION

University of Michigan, Ann Arbor

Fall '07

*Master's in Mechanical Engineering*

*Relevant Courses:* Design Optimization, Finite Element Methods, Continuum Mechanics, Auto Body Structures, Electromechanical System Design, Smart Materials, Intermediate Dynamics, Linear Algebra, Statistical Quality Control

**University of Pune, India**

May '02 – Aug '06

*Bachelor's in Mechanical Engineering, 1st Class with Distinction, Rank 3 of 80*

## PROFESSIONAL EXPERIENCE

## Stress Group, Midrange Engineering, Cummins Inc

Mar '10 - Present

*Senior Structural Analyst*

- Responsible for lubrication & cooling components, and cylinder block validation for 2013 B and L engine families, and current product support for all B, C and L engine families
- Analytical Work
  - Performed FE analyses using ANSYS Classic & Workbench 12.1; modal analyses, structural analyses subject to non-linear material properties, contacts, large displacements, and gaskets
  - Developed calibrated FE models to predict / understand on-engine failures, and formulate solutions using analysis-led-design methods
  - Developed 1-D hot bolted joints tool to predict load loss of exhaust manifold capscrews at elevated temperatures
  - Guided analysts in off-shore location (Cummins Research and Technology India)
- Experimental Work
  - Performed on-engine strain & acceleration based validation of engine components (Frequently used tools: Waterfall plots, FFTs, Overall Levels, digital filters, Modified Goodman Plots, Reliability calculations etc.). Used FE results to decide strain gage and accelerometer locations.
  - Conducted ultrasonic bolted load testing, using MicroControl MC900 transient recorder, MC911 software to quantify cold relaxations, thermal relaxations, assembly loads etc.
  - Quantified gasket sealing pressure distributions using pressure sensitive paper (Prescale Fujifilm paper)
  - Determined fatigue properties using resonant dwell and staircase fatigue methods on shakers
  - Measured friction coefficients and strengths for bolts using Torque-Tension & MTS machines
- Capability Development
  - Developed Functional Excellence Processes for analytical & experimental validation of turbocharger oil drain tubes
  - Developed processes for standardization of analysis and documentation of oil & coolant lines, to drive efficiency, consistency and quality
  - Responsible for identification of opportunities for process and capability improvement, and execution of projects to drive continuous improvement
  - Led turbocharger stud capability; which resulted in quantification of cold joint measurement error across facilities, and determination of high temperature material properties

## Midrange Customer Engineering, Cummins Inc

Jan '08 – Mar '10

*Current Product Validation Engineer*

- Managed multiple engineering projects each dealing with reducing high warranty costs on Customer Engineering component/subsystem
- Lead geographically diverse teams of designers, analysts, service & quality engineers, personnel at distribution centers & manufacturing plants, as well as external suppliers & contractors, to solve major product problems
- Utilized Fault Tree Analysis method to identify potential root causes of component failure, carried out numerical analysis (FE analysis, Dimensional Variational Analysis), design of experiments, reviewed metallurgical reports, metrological reports, supplier capability reports, conducted in-field testing etc to narrow down and identify key root causes to product failure
- Chaired meetings with Korean & Japanese counterparts; Was responsible for Hyundai Heavy Industries' engineering account for warrantable failures

## 6 SIGMA PROJECTS

### **Reduction of Exhaust Gas Leaks between Cylinder Head & Exhaust Manifold**

- Lead a team of cross-functional engineers; Applied 6S tools to identify factors contributing to high warranty costs due to exhaust manifold gasket and capscrew failures
- Improvements resulted in an annual savings of \$140,000 for current product; and improved components, FE analysis procedures, application engineering bulletins, service procedures for new product introduction programs
- Nominated for the Cummins 6 Sigma Chairman's Award, 2010

### **Growth of SAE International in Emerging Markets**

- Lead the Executive Team at SAE International, Warrendale, PA in a project to define the business model for growth of SAE Int'l in India
- Identified Indian market requirements via Process Mapping, Voice of Business, KJ, and Voice of Customer exercises. Results were presented to the Board of Directors.

## COMMUNITY INVOLVEMENT

### **Society of Automotive Engineers (SAE) Indiana Chapter**

- Secretary and Communication Manager, *Jan 2012 – Present*
- Math and Science Committee, *Jan 2011 – Jan 2012*

### **University of Michigan Recruiting Team**

- Represented Cummins at career fairs and information sessions
- Conducted on-campus interviews for internships and full time positions

## ACADEMIC EXPERIENCE

### **Compliant Systems Design Lab**

*Research Assistant*

**University of Michigan**

Fall '06 – Fall '07

- Designed and modeled non-linear compact torsional springs using compliant members
- Developed algorithms to optimize geometry and material parameters using Matlab, ANSYS Classic & Optimus to obtain any desired non-linear force – deflection behavior
- Generated a library of behavioral curves thru optimization & DOE for further research and development

### **Engineering Research Center, National Institute of Science & Technology** *Intern*

**Univ of Michigan**  
Summer '07

- Developed a semiconductor factory network simulator to investigate IEEE 1588 time synchronization techniques in distributed systems in industrial Ethernet
- Implemented modules handling data requests & reports in XML, JAXB complying with SEMI standards. Achieved weekly goals in conjunction with a team in NIST, Maryland

### **Lighter than Air Lab – Program for Airship Design & Development, Intern**

**Indian Institute of Technology**  
Jun '04, Jun '05 – Jun '06

- Designed & fabricated two Remotely Controlled small scale airships (2 m diameter, 7 m length)
- Designed and fabricated unique 2 m PTFE hull for an indoor RC lenticular airship, with a centrally placed thrust vectoring system, enabling zero-radius turns in tight indoor spots
- Worked on parametric modeling of the hull, lift calculations to determine payload capacity
- Researched and characterized materials locally available, performed 3D to 2D petal decomposition, and fabricated and tested the airships
- Designed a gondola for reconfigurable payloads (for wireless cameras etc); thrust vectoring mechanisms using servo motors, neodynamic motors and 4 channel wireless transmitter-receivers

## ACADEMIC PROJECTS

### **Optimization of kinematic linkages of Caterpillar backhoe vehicle**

Winter '07

- Generated mathematical model of kinematic behavior of digging mechanism & hydraulic actuator system
- Performed multi-variable design optimization of power consumption by actuator sizing & selection of actuator pin locations resulting in lower power consumption

### **Mechatronic Gauge for Piano Regulation** (*Patent in progress*) *Client: Piano Technology Department, U of M School of Music*

Winter '07

- Designed & implemented a feedback control algorithm for constant velocity arm deflection and reaction force calculation in C++, LabVIEW using optical encoders & OOPIC microcontrollers
- Surpassed expectations of client – 80% reduction in measurement time, 0.01 gm least count achieved

## **PAPERS**

- ‘Precise Time Synchronization in Semiconductor Manufacturing’, Proceedings of the IEEE 1588 Conference, October 2007
- ‘Time synchronization for diagnostics and control in Ethernet-based applications’, Proceedings of the American Controls Conference, June 2008

## **6S SKILLS & TOOLS**

Voice of Customer, KJ, Pugh Matrix, Design Failure Modes & Effects Analysis (DFMEA), Fault Tree Analysis (FTA), Cause & Effect Matrix (C&E), Design of Experiments (DOE)

## **COMPUTER SKILLS**

- Applications: ANSYS WB12, ANSYS Classic, FeSafe 6, Pro/E, MATLAB, LabVIEW, NI Diadem, Optimus, Minitab, Eclipse, Altova, MS Office
- Languages: C, C++, JAVA (J2EE, JAXB), MS Visual Basic, XML, HTML
- Environments: MS Windows, Linux, MacOS