

PRESENTING,

MY
PROFESSIONAL
JOURNEY

by Kishore Mysore Nagaraja (Kishore M N)

SUMMARY OF CONTENTS

OUR MAIN TOPICS TODAY

- Portfolio History 2020 –
- Portfolio History 2014 – 2019
- Academic Credentials
- Work Experience
- Passion To Teach
- Research Statistics
- Research Projects Delivered
- Portfolio Conclusion

PORTFOLIO HISTORY 2020 -



DR. DONG QIAN

@UTD: Associate Head, Department
of Mechanical Engineering

My Role: PhD Student, Research
Assistant 2020 -



DR. WEI LI

@UTD: Assistant Professor,
Department of Mechanical
Engineering

My Role: PhD Student,
Teaching Assistant 2020 -



KISHORE M N

PhD Student & Research
Associate



**The University of
Texas at Dallas**

Department of Mechanical
Engineering

Research Objective 1 : Multi-Physics Modeling of Powder Bed Fusion (PBF) / Selective Laser Melting (SLM) Process

Milestones Overview

- 1. The idea is to develop a multi-physics model to capture powder bed fusion process.
- 2. It involves multi-track and multi-layer printing process.
- 3. Coupling DEM-CFD model and FEM model to predict the residual stresses at each layer as printed.
- 4. To develop a closed loop microstructure model to predict the surface morphology of the 3d printed layers.

Problem Statement : SLM Process

- Powder Consolidation
- Powder Settling
- Powder Spreading
- Powder Layering
- Melting
- Solidification
- Cooling

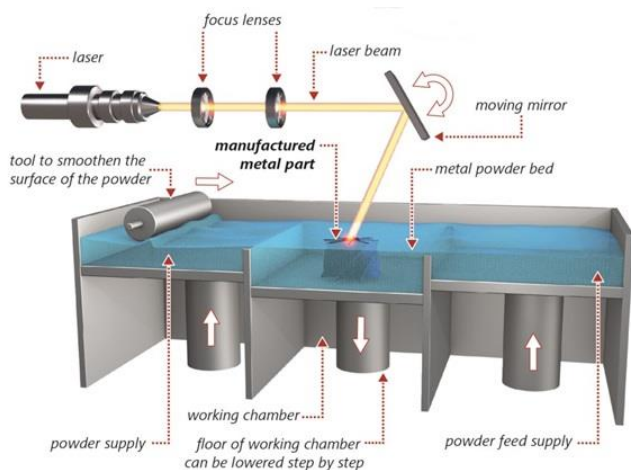


Figure 1: SLM Process

Reference: <https://scanandmake.com/additive-manufacturing>

Case Study : SLM Single Track

Material : Ti6Al4 Alloy
CFD Domain

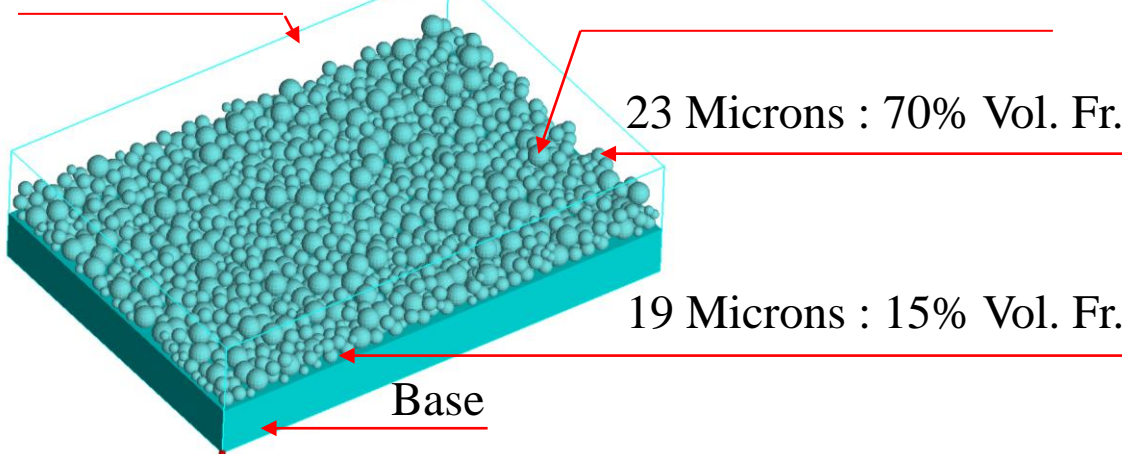


Figure 2: Powder Consolidation and Settling

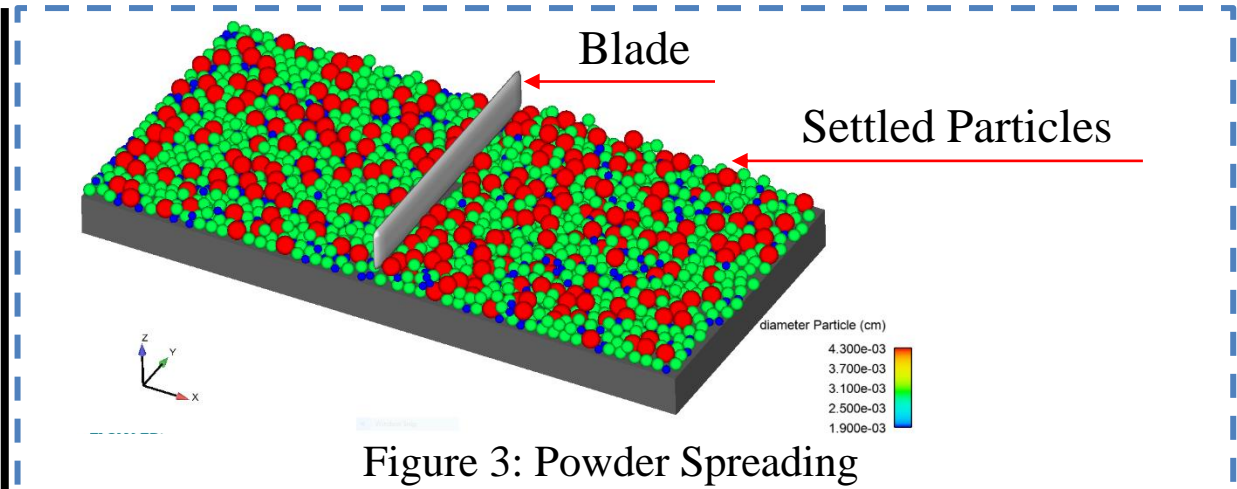


Figure 3: Powder Spreading

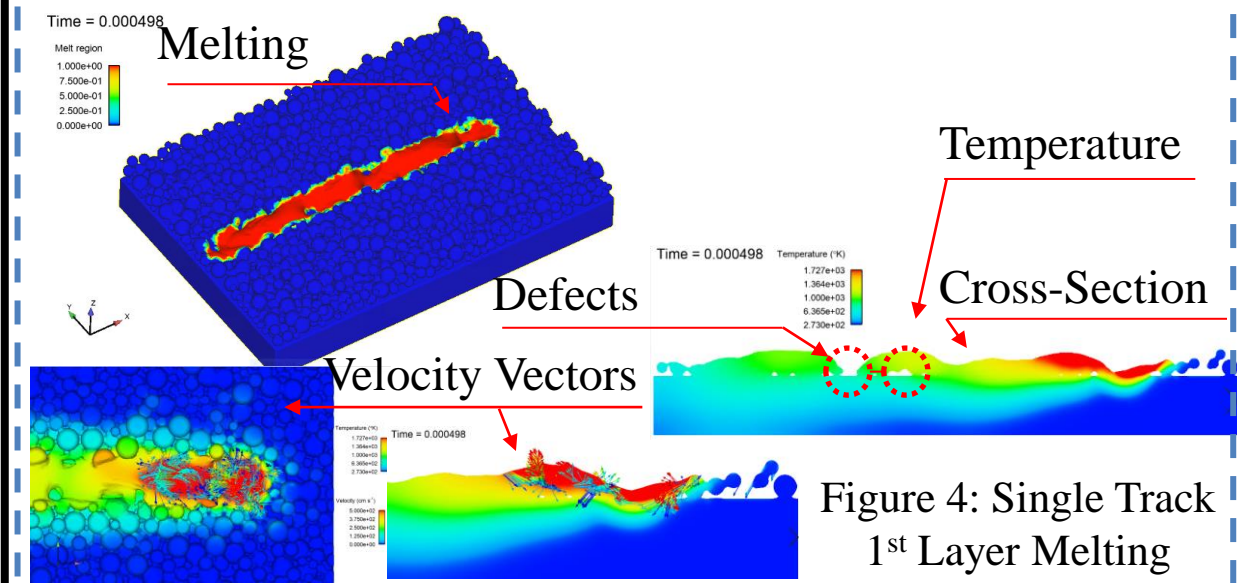


Figure 4: Single Track 1st Layer Melting

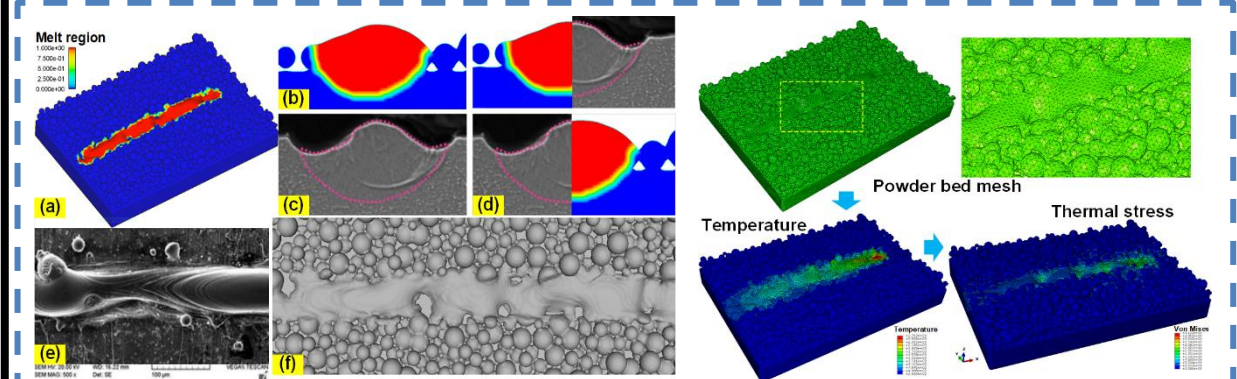


Figure 5: Experimental Validation

Figure 6: FE Analysis

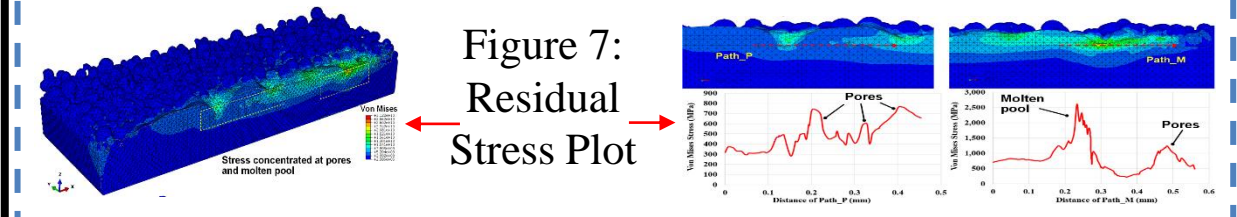


Figure 7: Residual Stress Plot

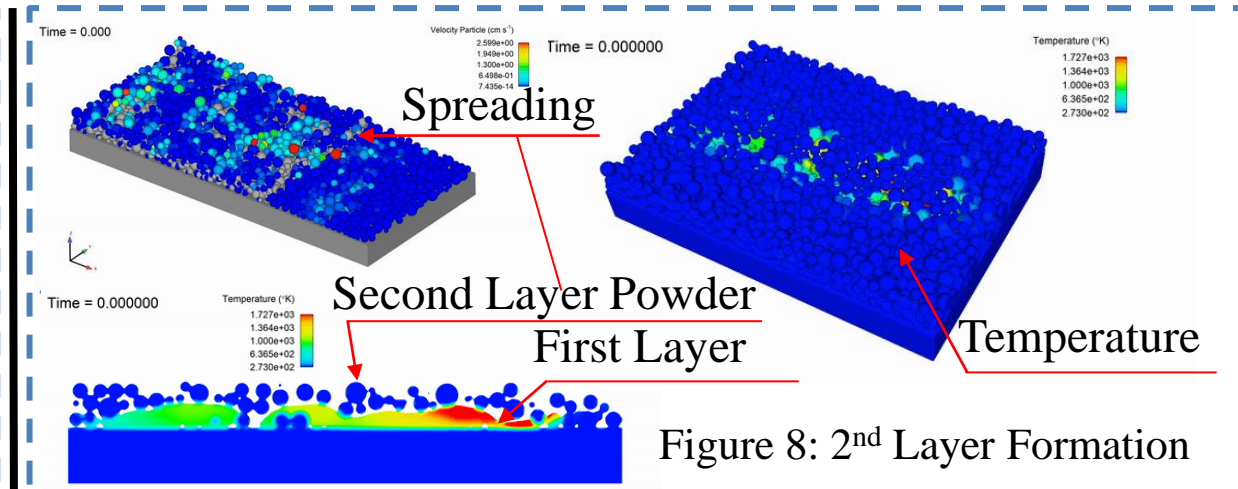
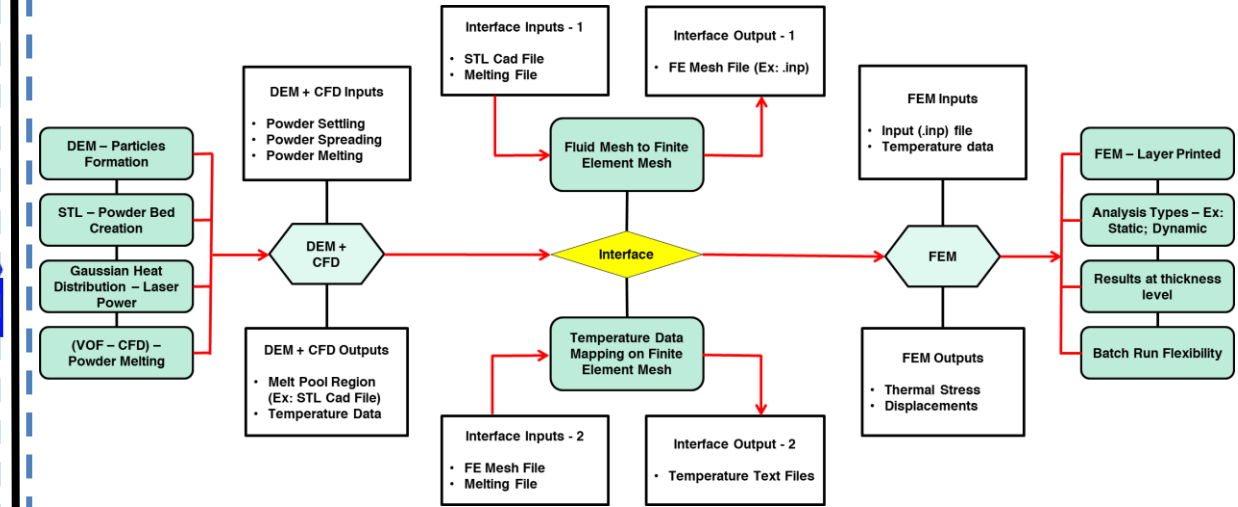


Figure 8: 2nd Layer Formation

Methodology Conclusion



Manuscript Submitted:

Wei Li, Kishore Mysore Nagaraja, Xinchang Zhang, Dong Qian, Hongbing Lu, “Multi-physics Modeling of Powder Bed Fusion and Thermal Stress”, 2020.

Manuscript To-be-submitted:

Kishore Mysore Nagaraja, Wei Li, Dong Qian, Hongbing Lu, “Multi-Physics Modeling Study of Multi-Layer Powder Bed Fusion and Thermal Stress”, 2021.

Experimental Reference:

I. Yadroitsava, J. Els, G. Booysen, I. Yadroitsev, South African Journal of Industrial Engineering 26(3) (2015) 86-95.

Research Objective 2 : Hybrid Manufacturing Model for Direct Energy Deposition (DED) Process

Milestones Overview

- ✓ 1. The idea is to develop a multi-physics model to capture Direct Energy Deposition (DED) process.
- ✓ 2. First stage involves FEM model.
- ✓ 3. Second stage involves CFD model.
- ✓ 4. Prediction of the Residual Stress.
- ✓ 5. Explicit/Implicit modeling Ultrasonic Nanocrystal Surface Modification (UNSM) technique.
- ✓ 6. Develop a hybrid manufacturing model for DED-UNSM technique.
- 🕒 7. To develop a closed loop microstructure model to predict the surface morphology of the 3d printed layers.

Problem Statement : DED and UNSM Process

DED Process:

- Nozzle powder feeding system.
- Melting, Solidification, Cooling

UNSM Process:

- Static Load Process
- Ultrasonic Vibration + Translation



Figure 1: DED Process

Reference: <https://www.3dnatives.com/en/directed-energy-deposition-ded-3d-printing-guide-100920194/>

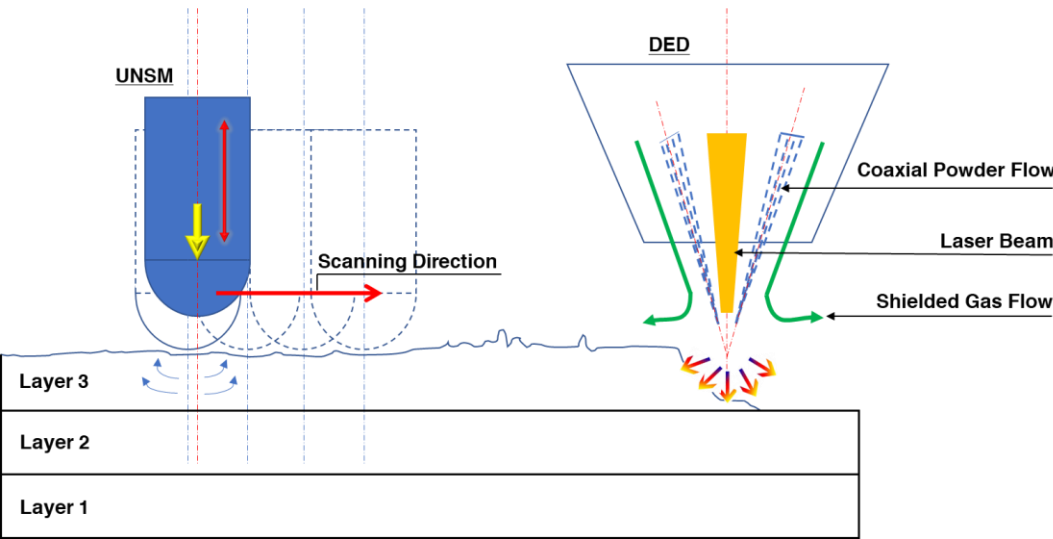


Figure 2: AM Hybrid Manufacturing Technique

Case Study : Single-Track Multi-layer Abaqus Model

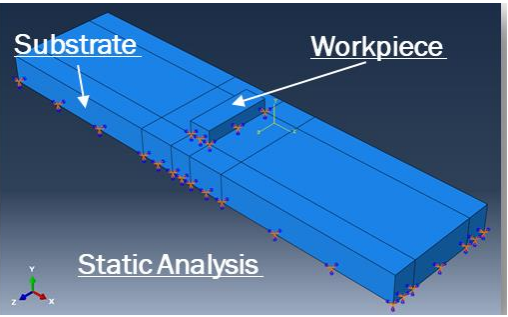


Figure 3: Case Study

- Material: Stainless Steel 316L

A	B	n	m	C
253 MPa	685 MPa	0.31	2.04	0.097

Figure 5: Johnson Cook Plasticity Properties

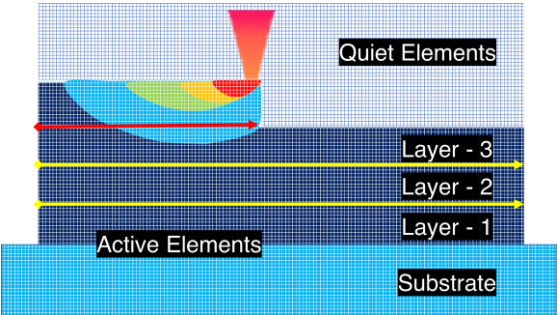


Figure 4: Methodology

FEA Modeling Approach

Results : Single-Track Multi-layer Abaqus Model

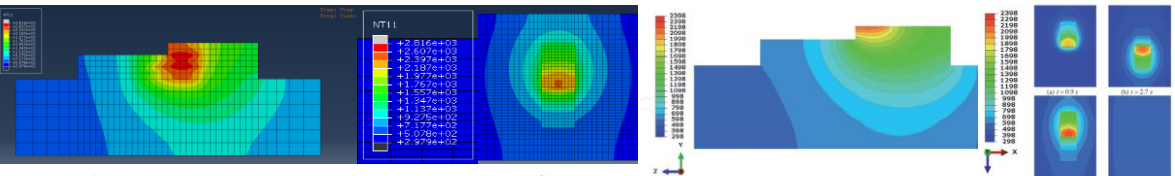


Figure 7: Temperature Profile

Figure 8: Literature Results

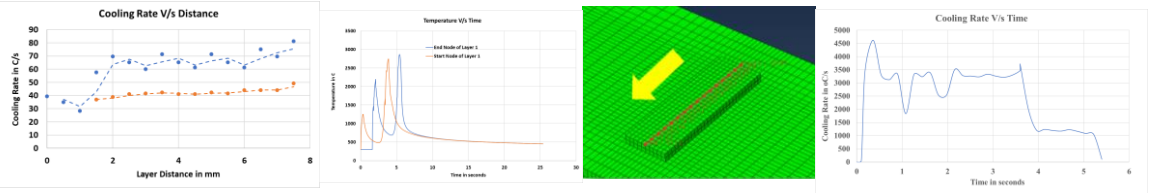


Figure 9: Different Cooling Rates during layer formation

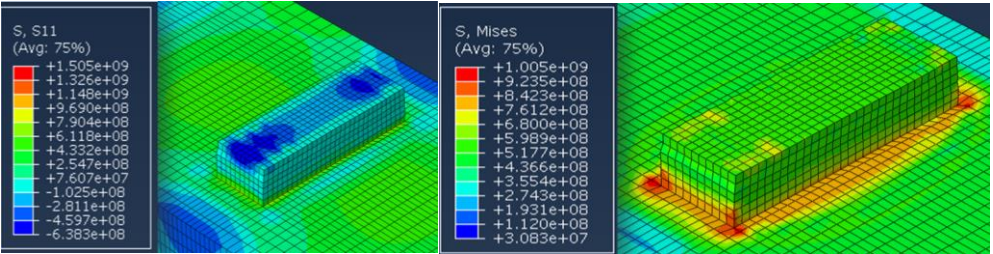


Figure 10: Thermal Stresses

Case Study : Single-Track Single-layer CFD Model

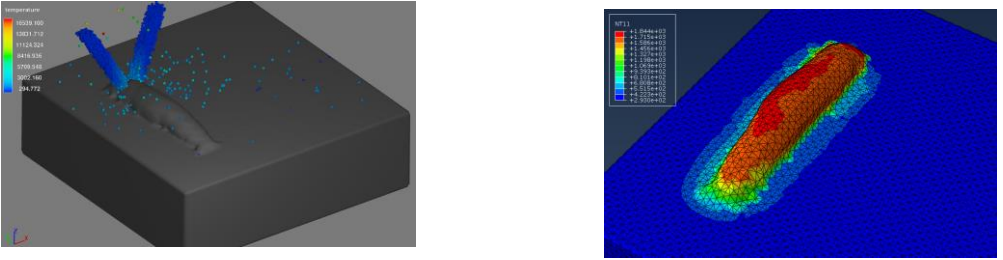


Figure 11: Surface Morphology Type 1

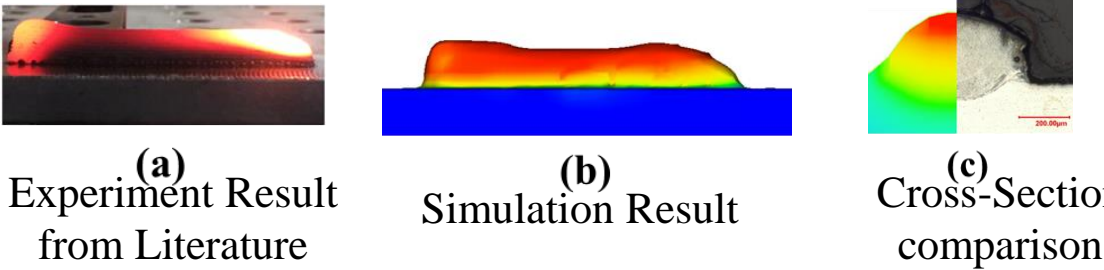


Figure 12: Surface Morphology Type 2

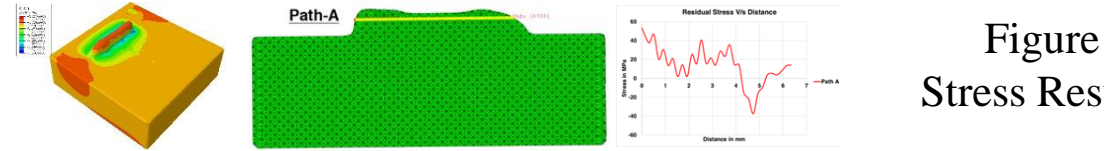
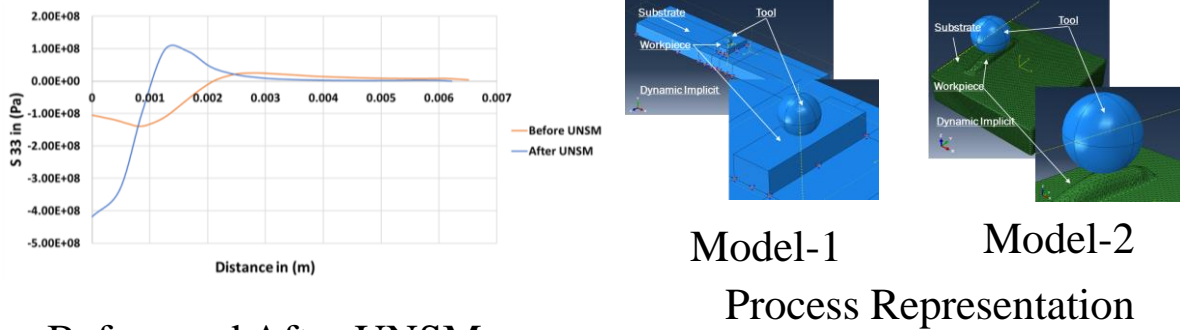


Figure 13: Stress Results

Results and Conclusion : DED-UNSM Hybrid Model



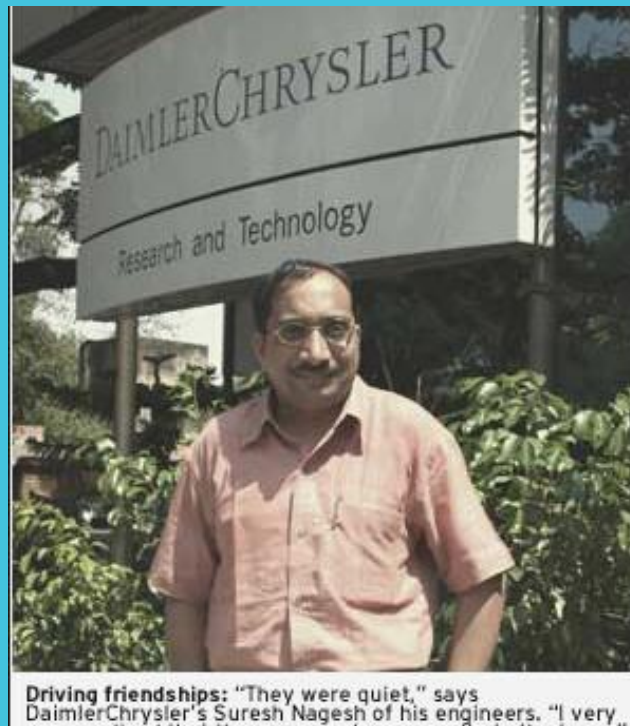
Before and After UNSM over AM Layer

- Static Load of 50N
- Tungsten Carbide Tool, 20kHz Frequency
- 40 mm/sec UNSM scanning speed
- Frictional Coefficient 0.2.

Number of Manuscripts To-be-submitted: 02

Experimental Reference: Mattias Miedzinski, "Materials for Additive Manufacturing by Direct Energy Deposition", Master's Thesis in Materials Engineering, Chalmers University of Technology, Sweden 2017.

PORTFOLIO HISTORY 2014-2019



DR. SURESH NAGESH

@PES: Chair Professor,
Computational Mechanics

Earlier: Headed Voith Aerospace,
Mercedes R&D, Daimler Chrysler, Ford
Teams, GE Teams and GM Teams.

My Role: Research Associate 2015-
2016 ; 2018-2019



DR. C S RAMESH

@PES: Chair Professor,
Material Science

Currently: Research Dean -
Presidency University

My Role: Research Assistant
2014-2015



KISHORE M N

Bachelor Student (2012-
2016) & Research
Associate



PES UNIVERSITY

Bachelor's in Mechanical
Engineering

ACADEMIC CREDENTIALS

UP TO 2010

Kindergarten
Primary
High School

Mysore



•UP TO 2013

Diploma in Mechanical
Engineering
Grade: Distinction
(Top 1% of the Class)

Mysore



•UP TO 2016

Bachelor's in Mechanical
Engineering
Grade: 8.13/10 or 3.44/4
(Top 10% of the Class)

Bangalore



•FROM 2020

Graduate Student : PhD
Student - Mechanical
Engineering - University of
Texas at Dallas

Dallas



•WORK EXPERIENCE

•A BRIEF TIMELINE

DEC 2013 - MAY
2014

Research Assistant

Guidance: Dr. C S Ramesh
Place: PES University

Responsibilities

Basic Material Property
Testing; Salt Corrosion
Testing; Wear Testing; HVOF
Coating.

Organize

National Tribology
Conference 2014

JUNE 2014 - FEB
2017

Research Assistant

Guidance: Dr. Suresh Nagesh
Place: PES University

Responsibilities

Design UAV Composite
Structure; New Composite
Manufacturing Techniques;
Rotordynamics

3 Conferences and 2 Competetions

ASME IDSC; IEEE GHTC; IEEE
Sustech; ASME COMS @ **USA**

MARCH 2017 - SEP
2018

Junior Design Engineer

Company : Siemens Technology
and Services Private Limited.

Responsibilities

FMEA; Composite Fatigue
Model; Digital Twin Technology
for Composites; Gas Turbine
Software Development

Patent Disclosure

New Composite Manufacturing
Technology Upgradation

OCTOBER 2018 - DEC
2019

Research Associate

Guidance: Dr. Suresh Nagesh
Place: PES University

Responsibilities

Design 16 seats vehicle
structure; Virtual Blast
Certification for a VIP Bus;
Virtual Digital Twin; Additive
Manufacturing

1 Conference

8th Beta CAE Systems @
Germany

FROM 2014

•TEACHING EXPERIENCE

TILL 2019

1

25+ STUDENTS

Offline Training on,
CAD: Solidworks, Nx CAD, Catia, and Autodesk
Inventor

3

40+ STUDENTS

Offline Training on,
CAE: Hypermesh, Nx Nastran, and
Ansys

2

20+ STUDENTS

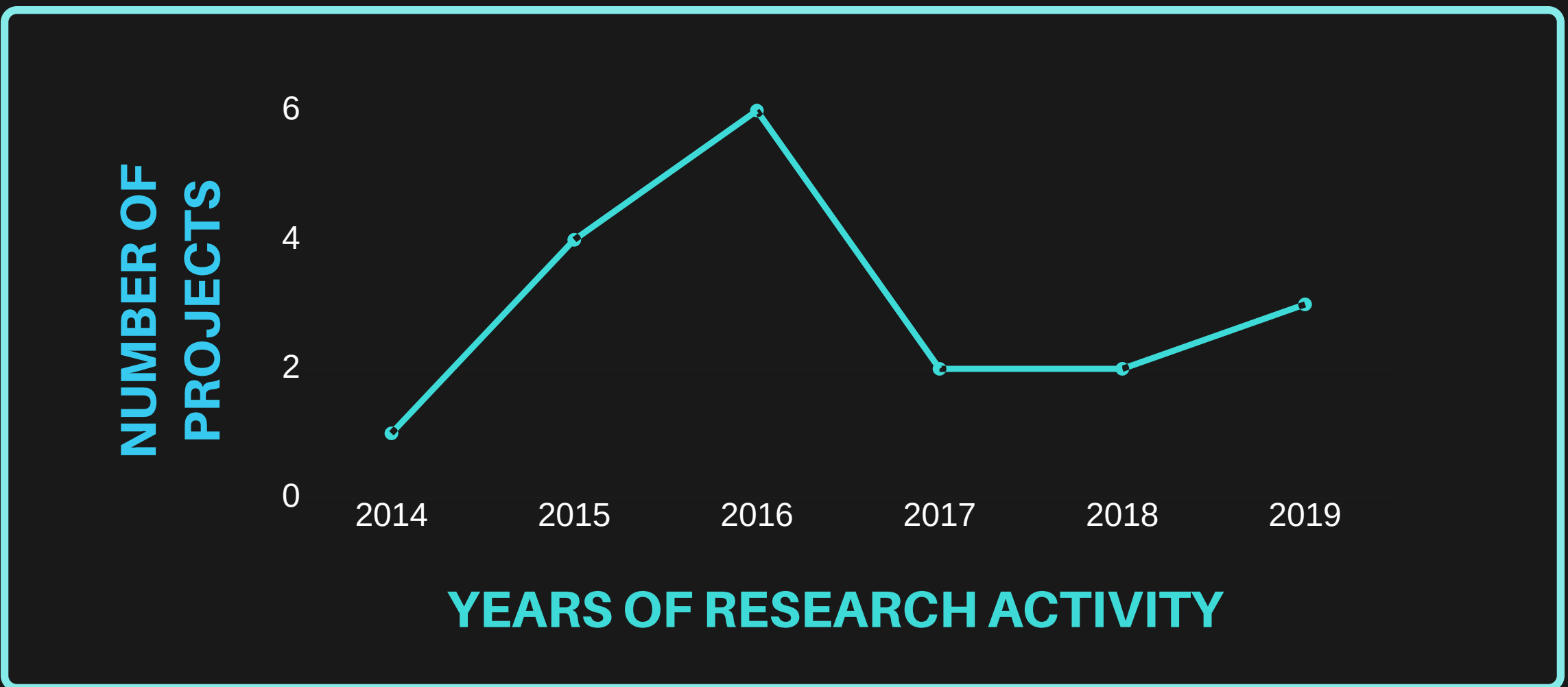
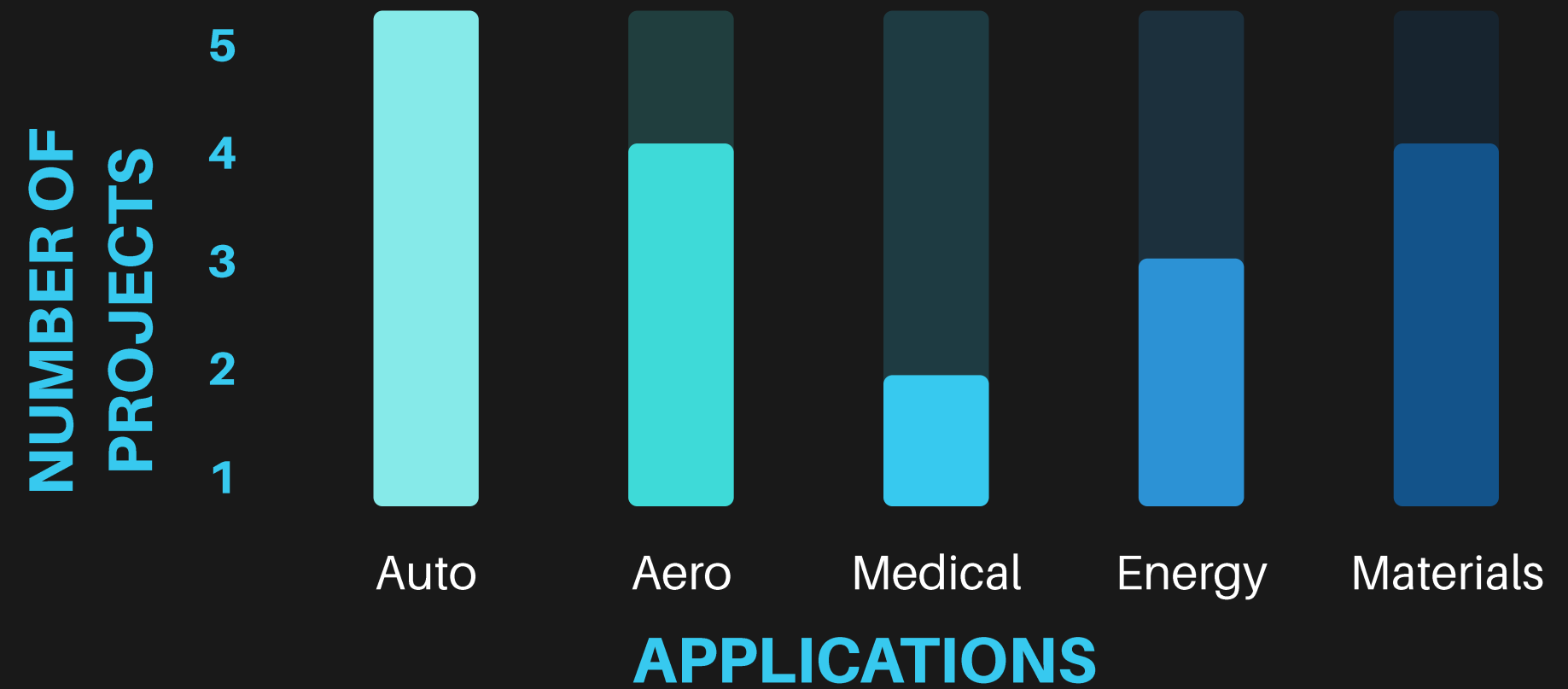
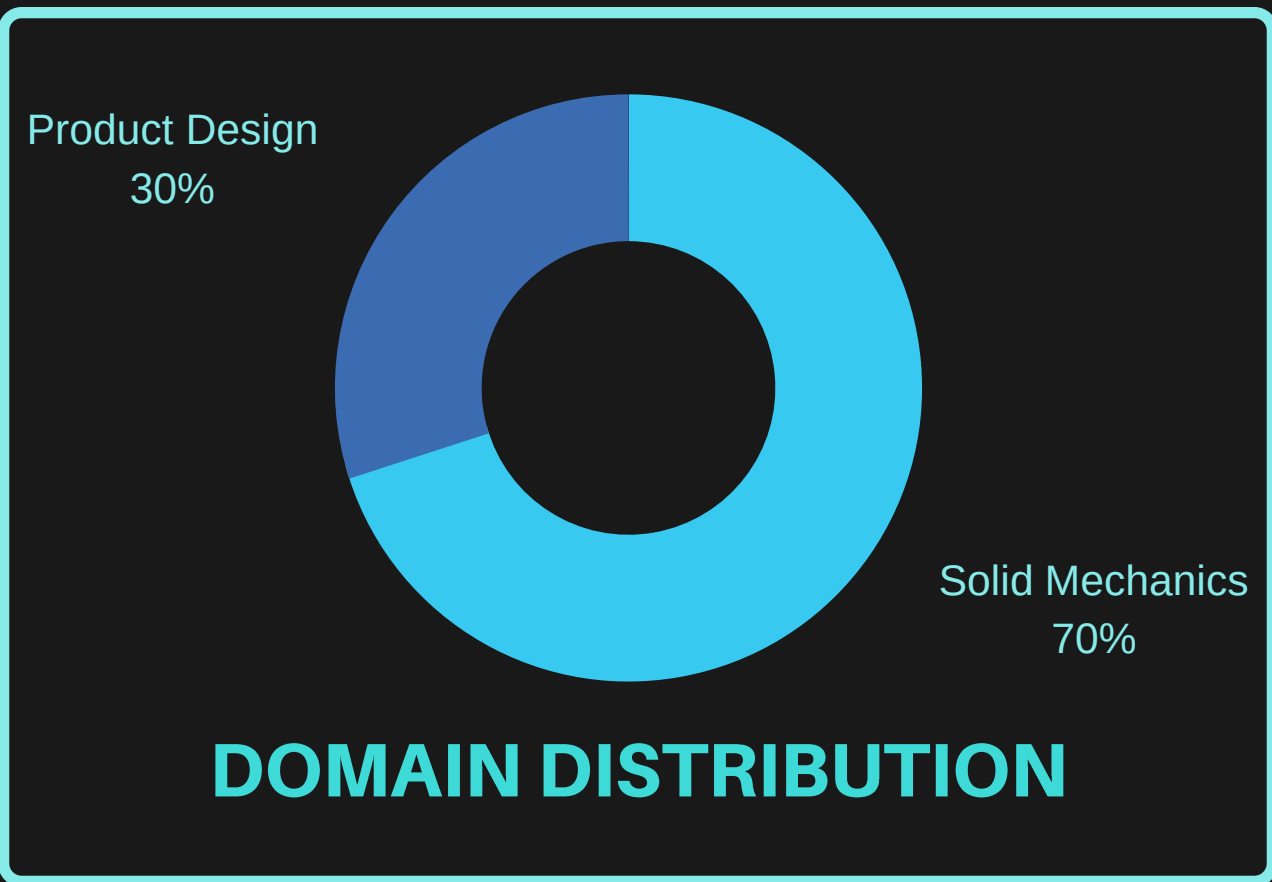
Online Training on,
CAE: Hypermesh, Nx Nastran, and
Ansys

4

INSTITUTIONS

04 Training Institutions on Software
Training;
02 Engineering Institutes on Project
Skills Training;

• **GUIDED 30+ STUDENTS ON THEIR
BACHELOR'S THESIS.**



RESEARCH PROJECTS
DELIVERED

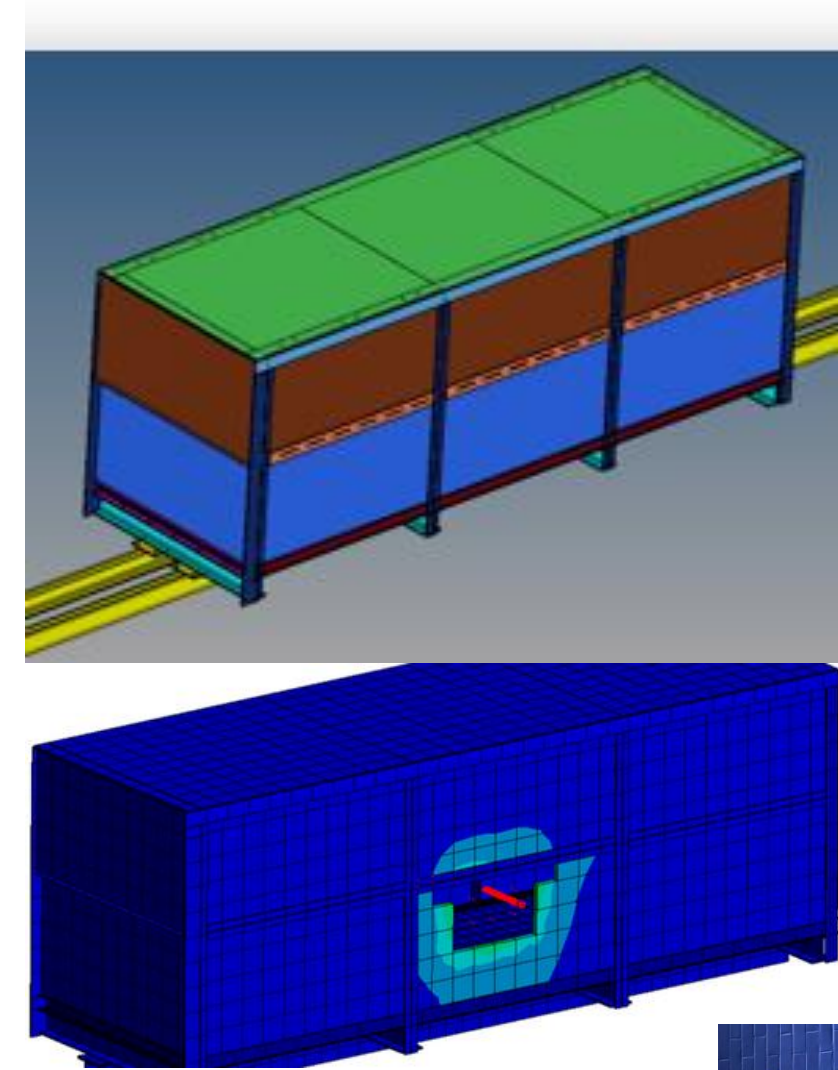
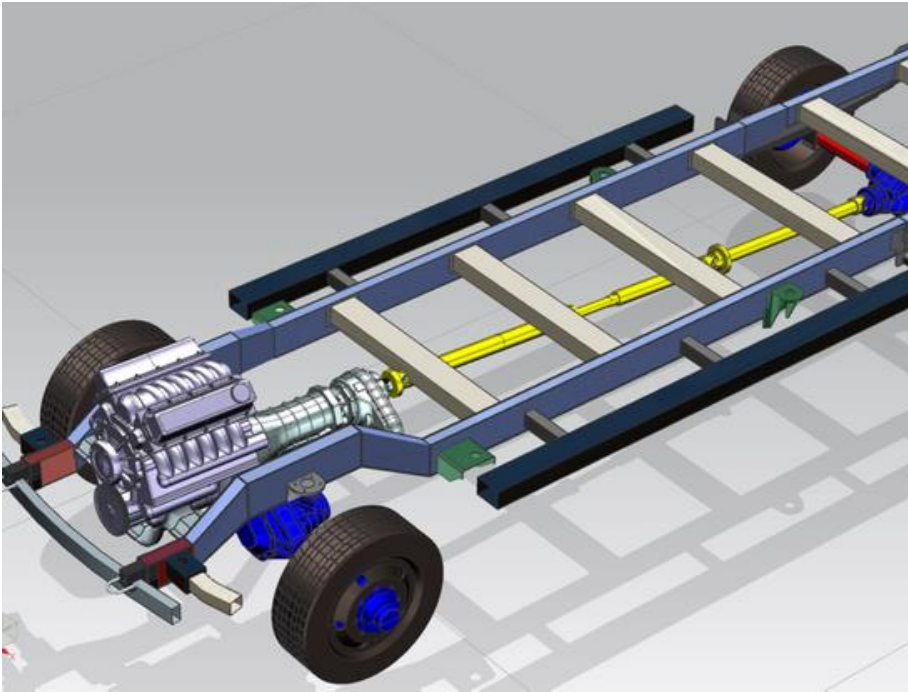
Major Challenges

- Design and computationally certify a Running Chassis for a 16 seats LCV.
- Computationally certify the blast proof bus.
- Computationally predict the wear between Cam and Follower.
- Design and verify the seamless transmission system for E-Vehicle.

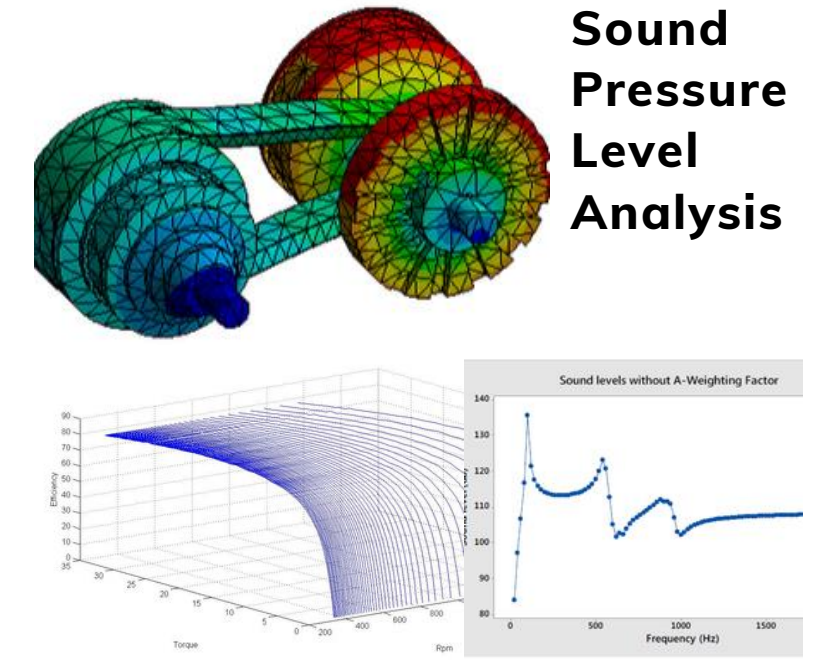
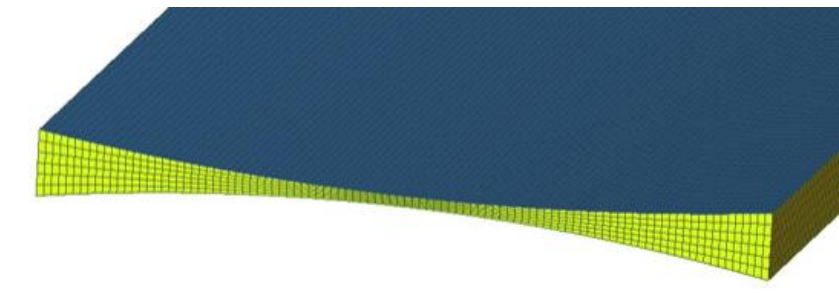
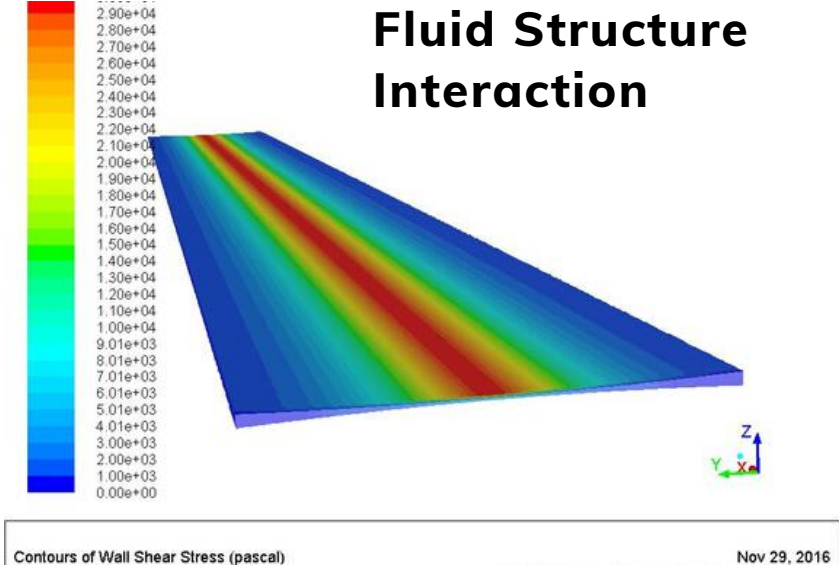


Automotive

- Design of a Running Chassis.
- Stiffness Simulations
- Durability Simulations
- Impact Simulations
- Additive Manufacturing for joints design.
- Integration and Packaging.
- 3D Printed Scaled Modeling.



- Composite Wall
- Scaled Model of the Bus.
- Explicit Dynamic Analysis models.
- Bottom Blast with 2 Kilograms of TNT.
- Side Blast with 5 Kilograms of TNT.



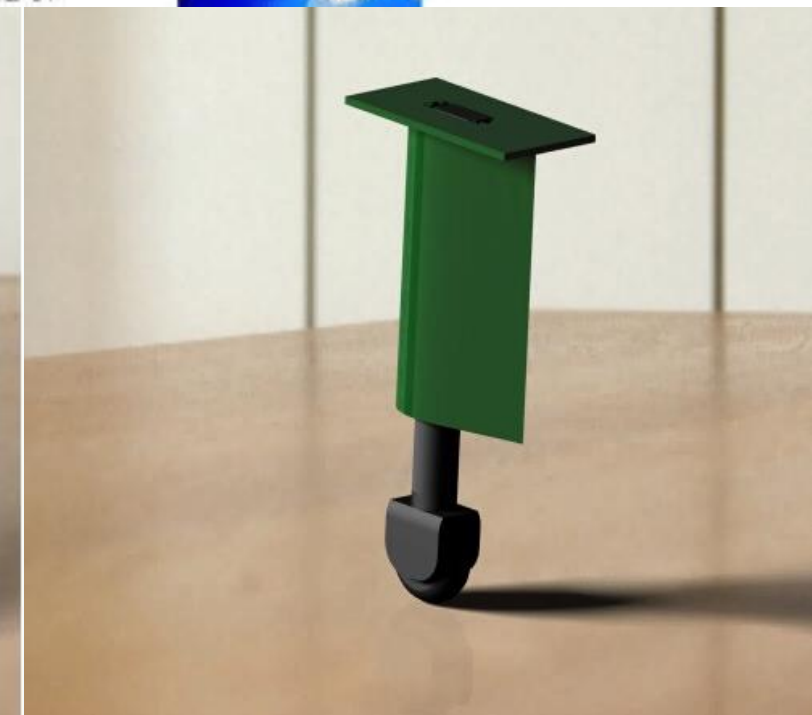
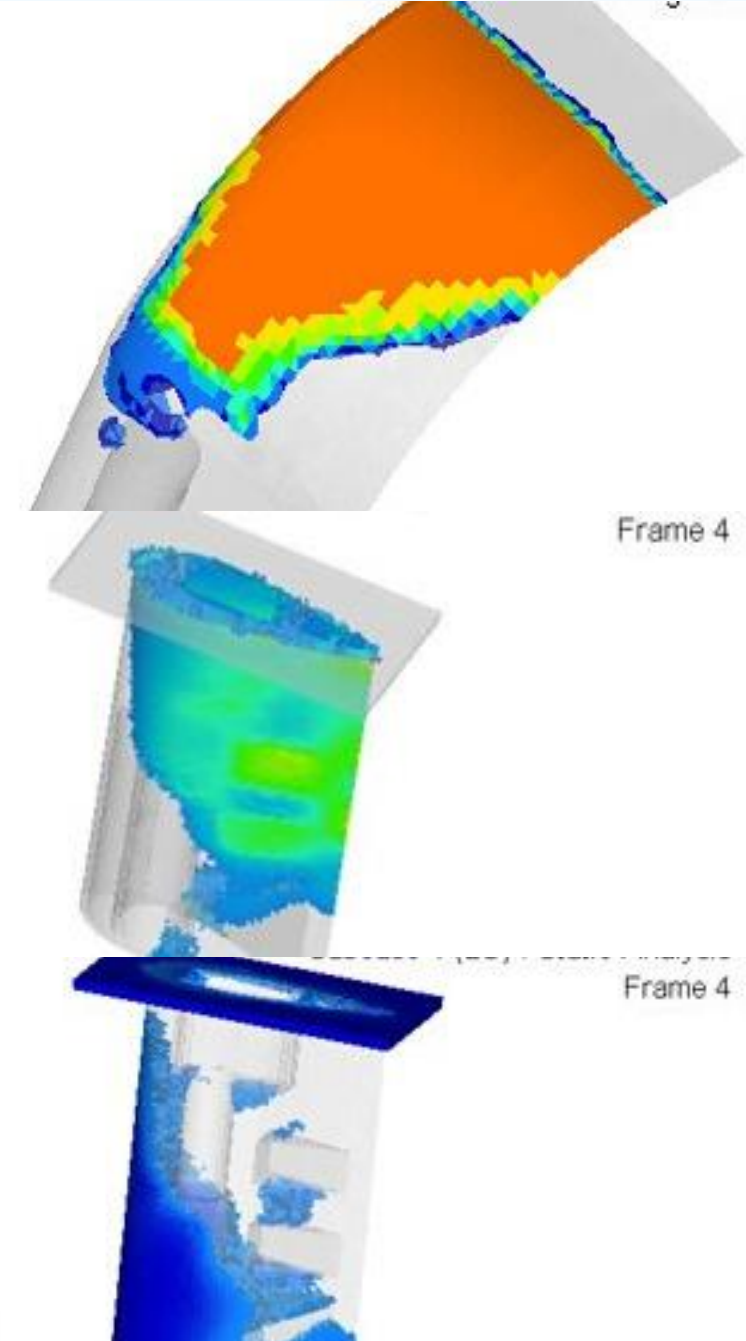
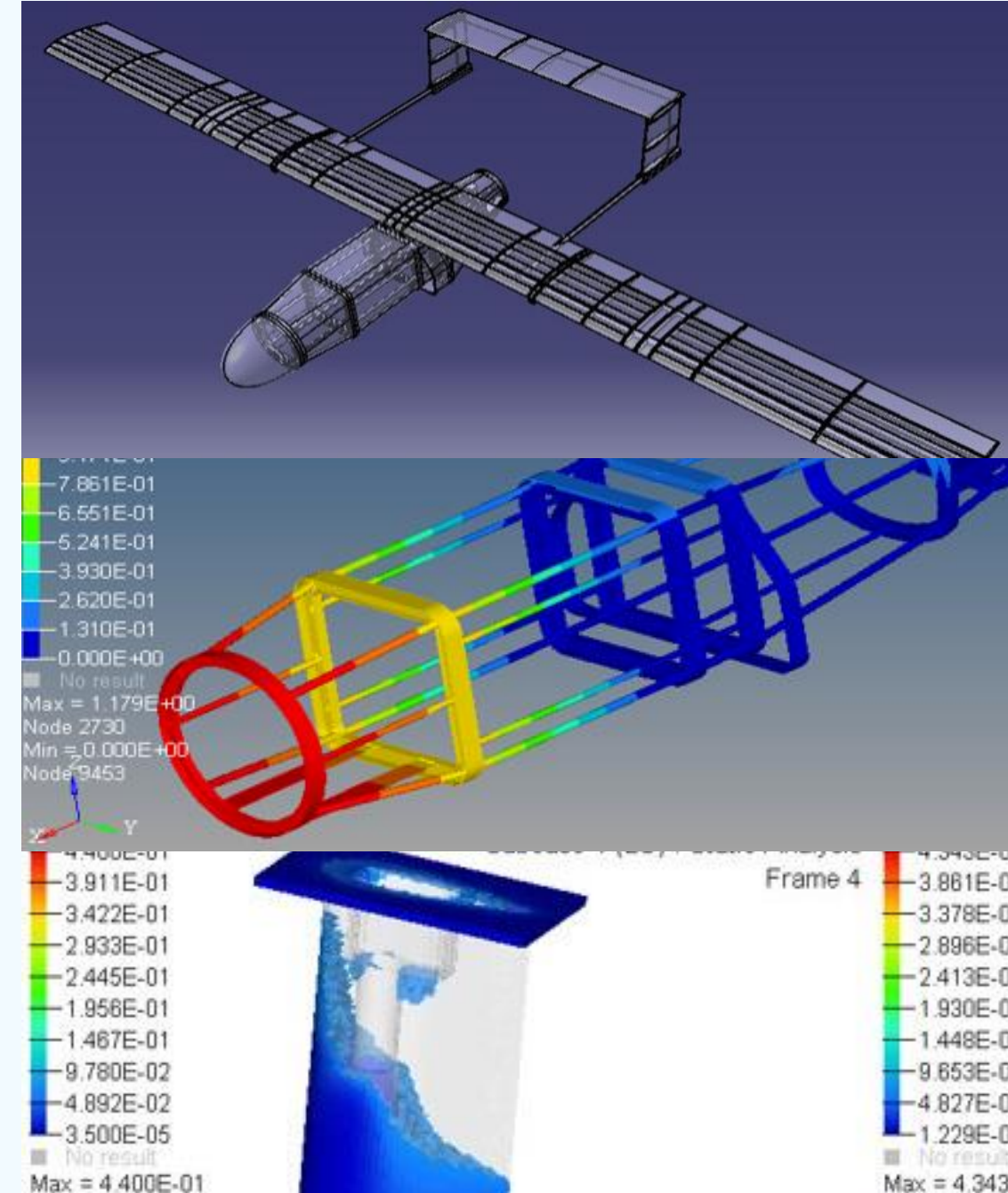
RESEARCH PROJECTS DELIVERED

MAJOR MILESTONES

- Design and develop a composite structured dual propulsion Unmanned Aerial Vehicle.
- Design a 3D Printed Nose Landing Gear and Main Landing Gear which can accommodate 4g Loads which incorporates damper mechanism.
- Topology Optimization of the shape of the unmanned aerial vehicle including its 3D printed components.



AEROSPACE



CHALLENGE 1

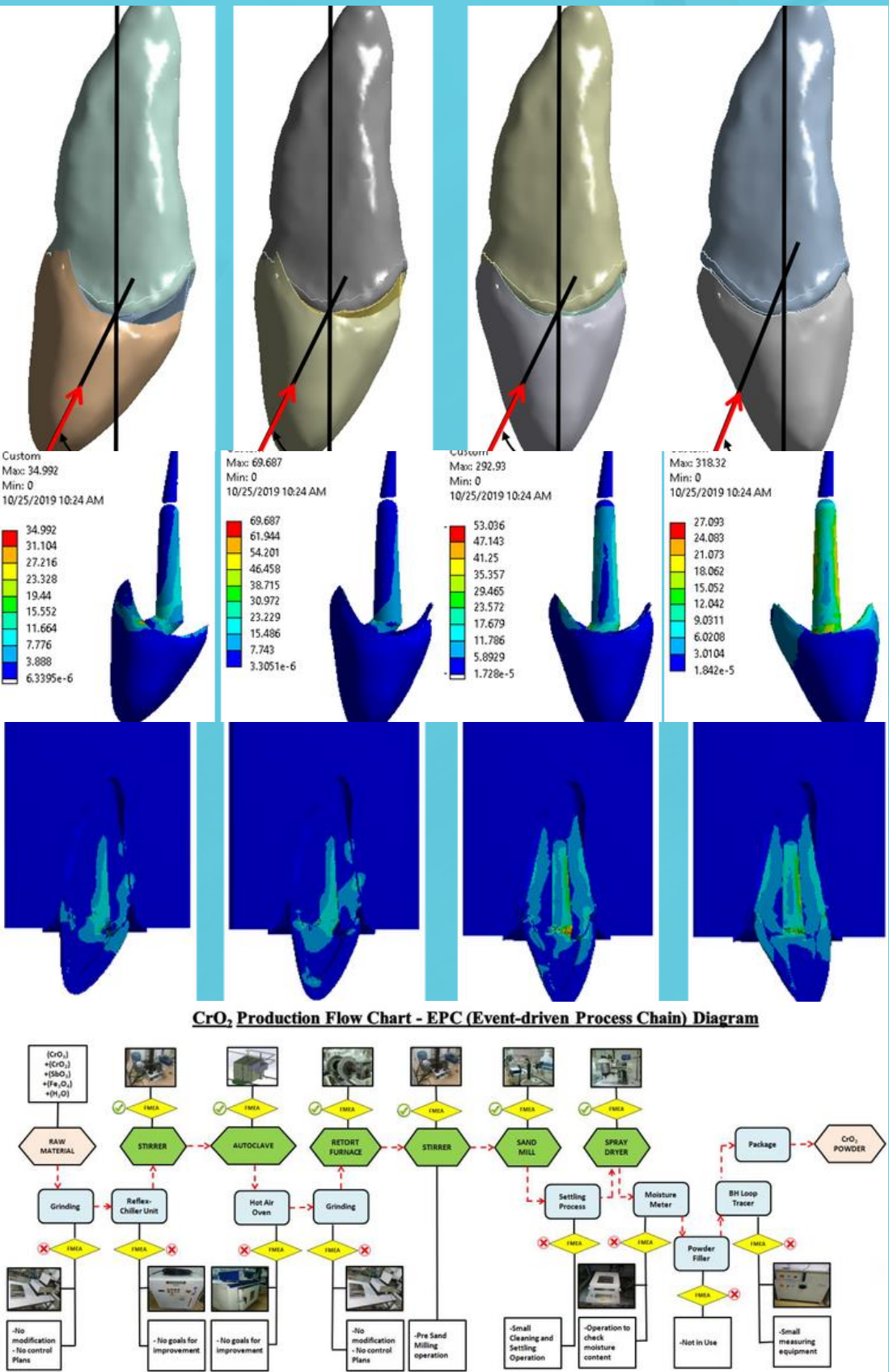
Study the behavior of the tooth for different inclinations for endodontic failure.

CHALLENGE 2

Study the behavior of tooth for composite material filling treatment.

CHALLENGE 3

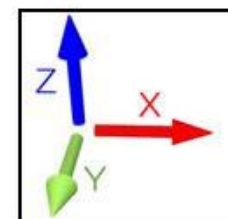
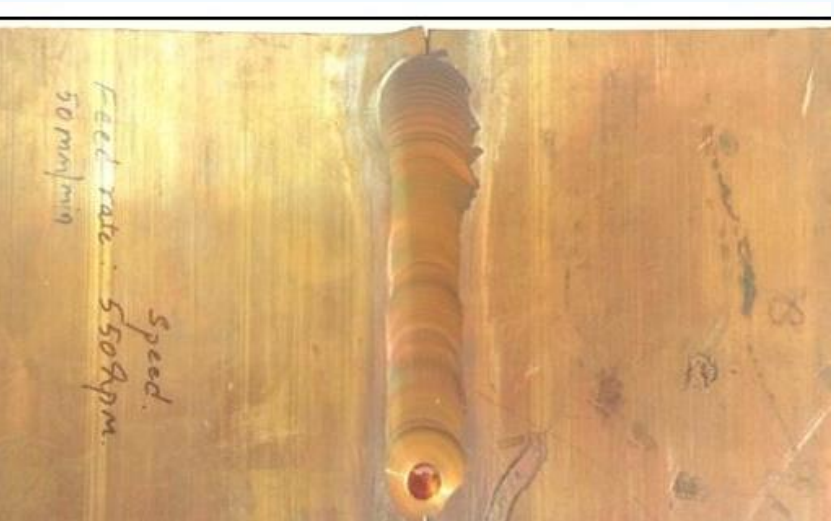
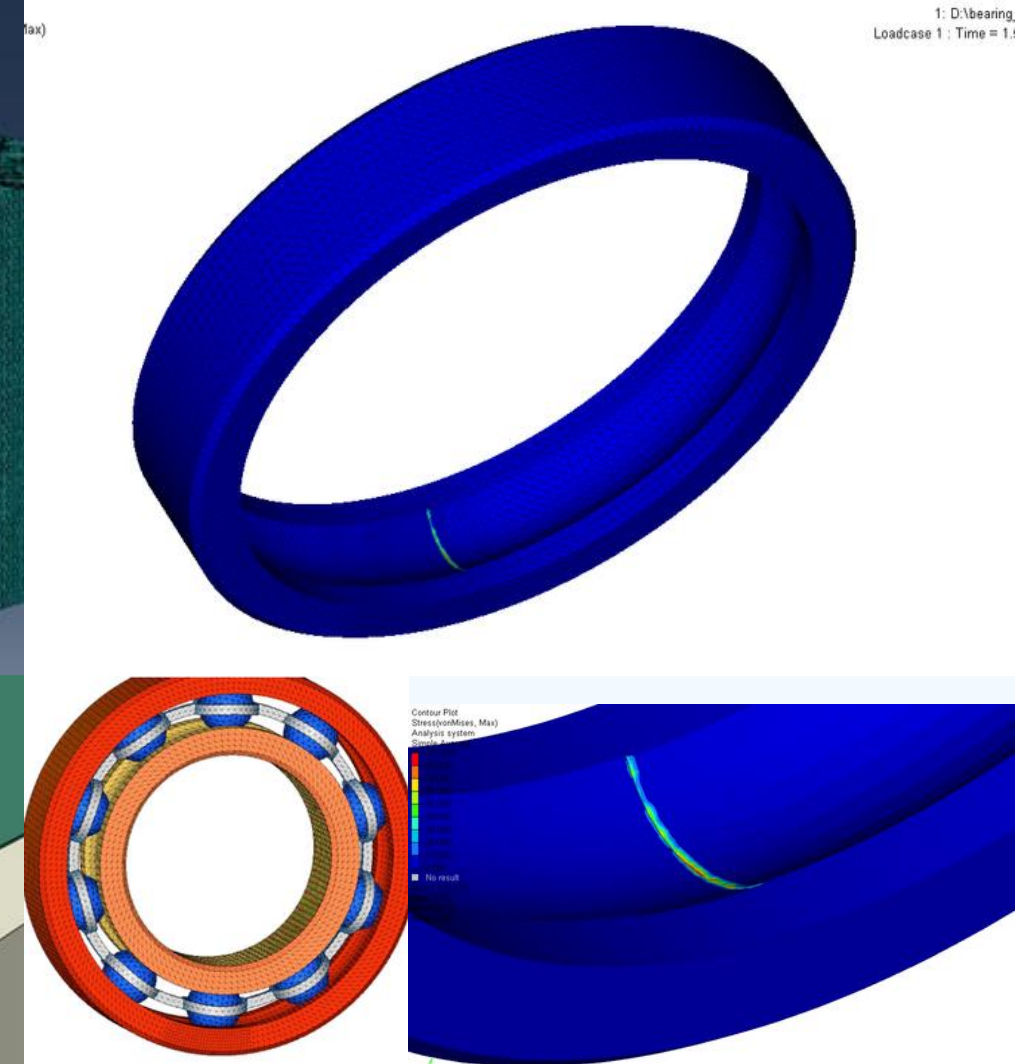
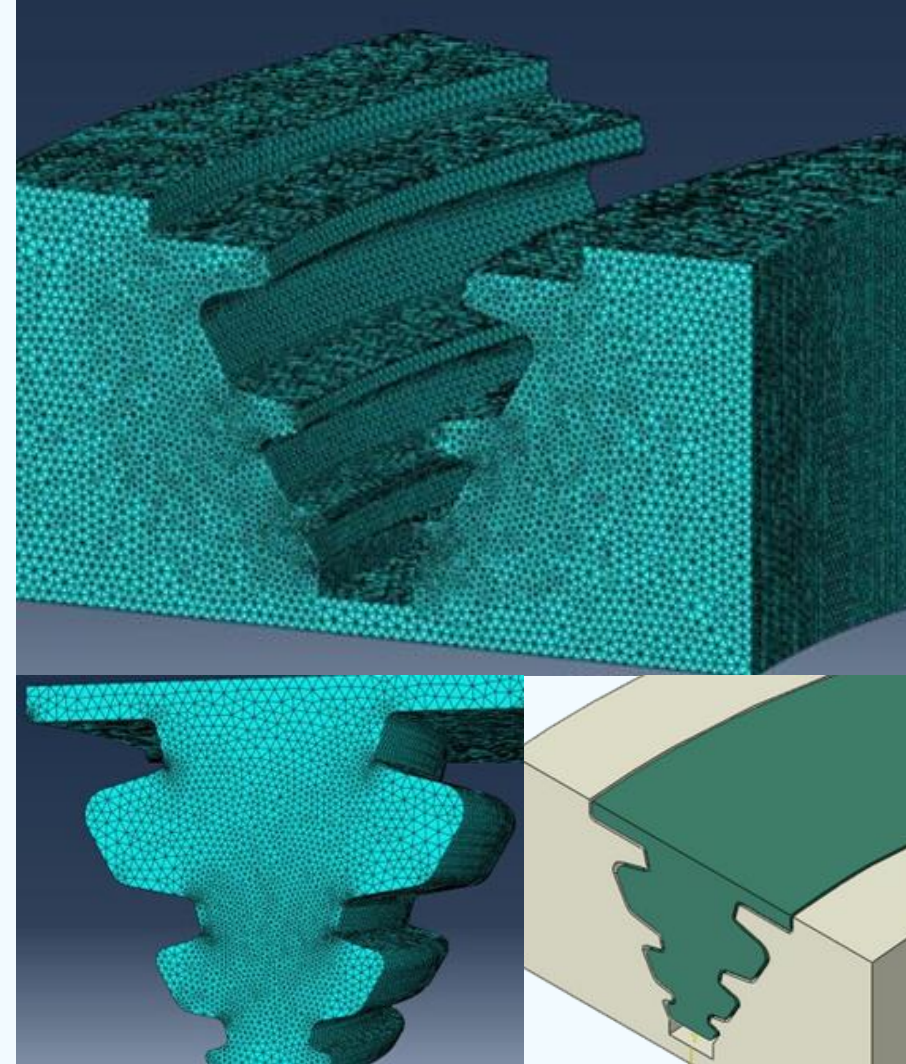
Failure Mode Effective Analysis for Chromium Oxide production equipment such as Stirrer, Autoclave, Spray Dryer, Retort Furnace, and Sand Mill.



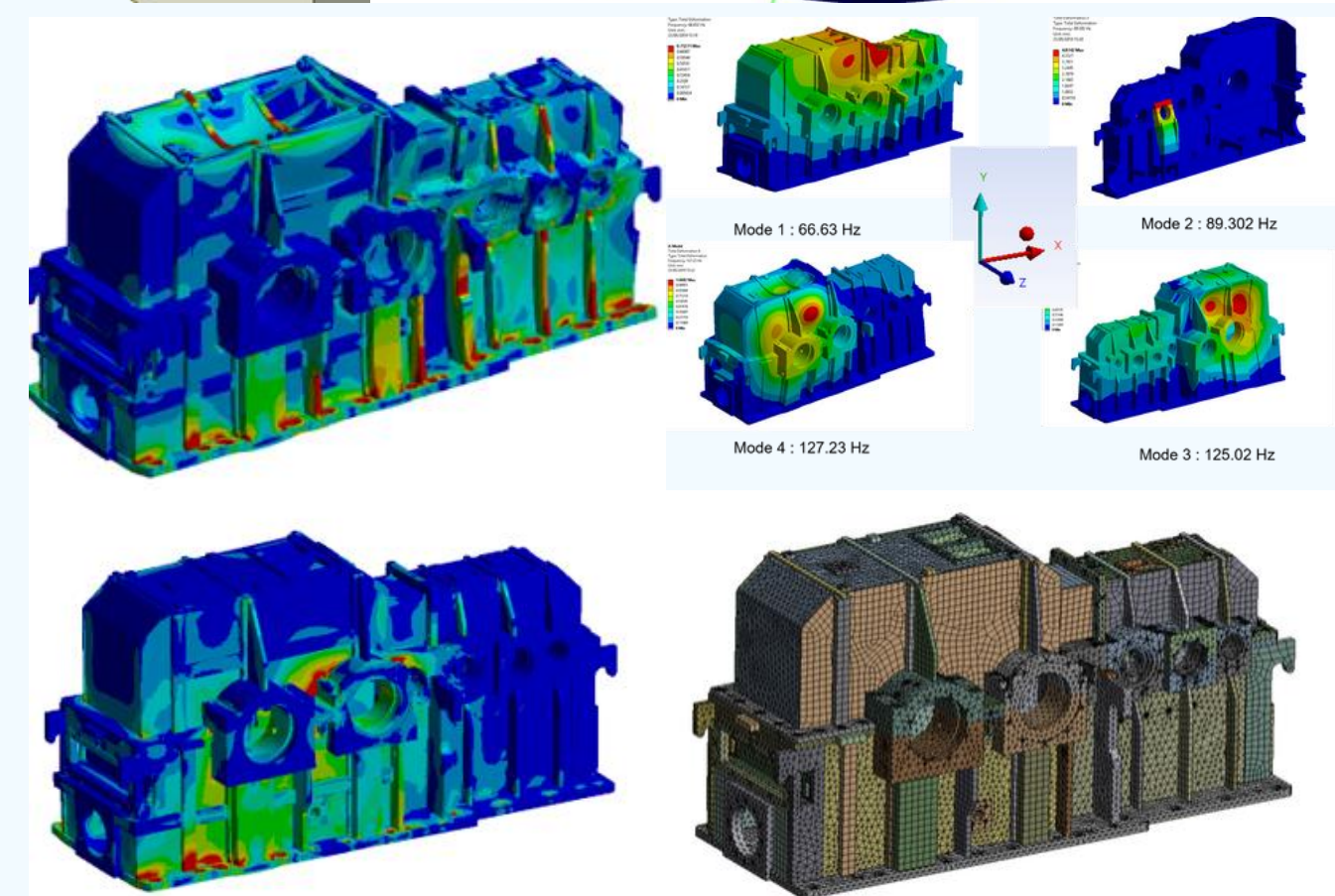
RESEARCH PROJECTS DELIVERED

ENERGY

- Parametric modeling for a Fir Tree of the Gas Turbine Blade.
- Dynamic Analysis of Bearings.
- Friction Stir Welding of Aluminium and Copper Plates.
- Structural Simulations of Turbine Casings.



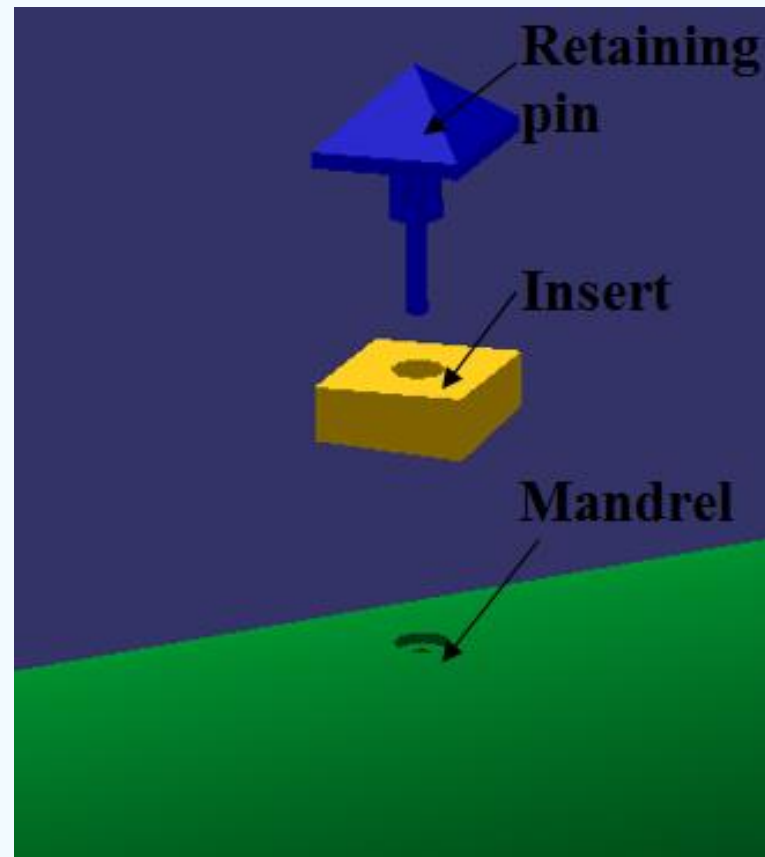
Triveni
TURBINES



SIEMENS
Ingenuity for life

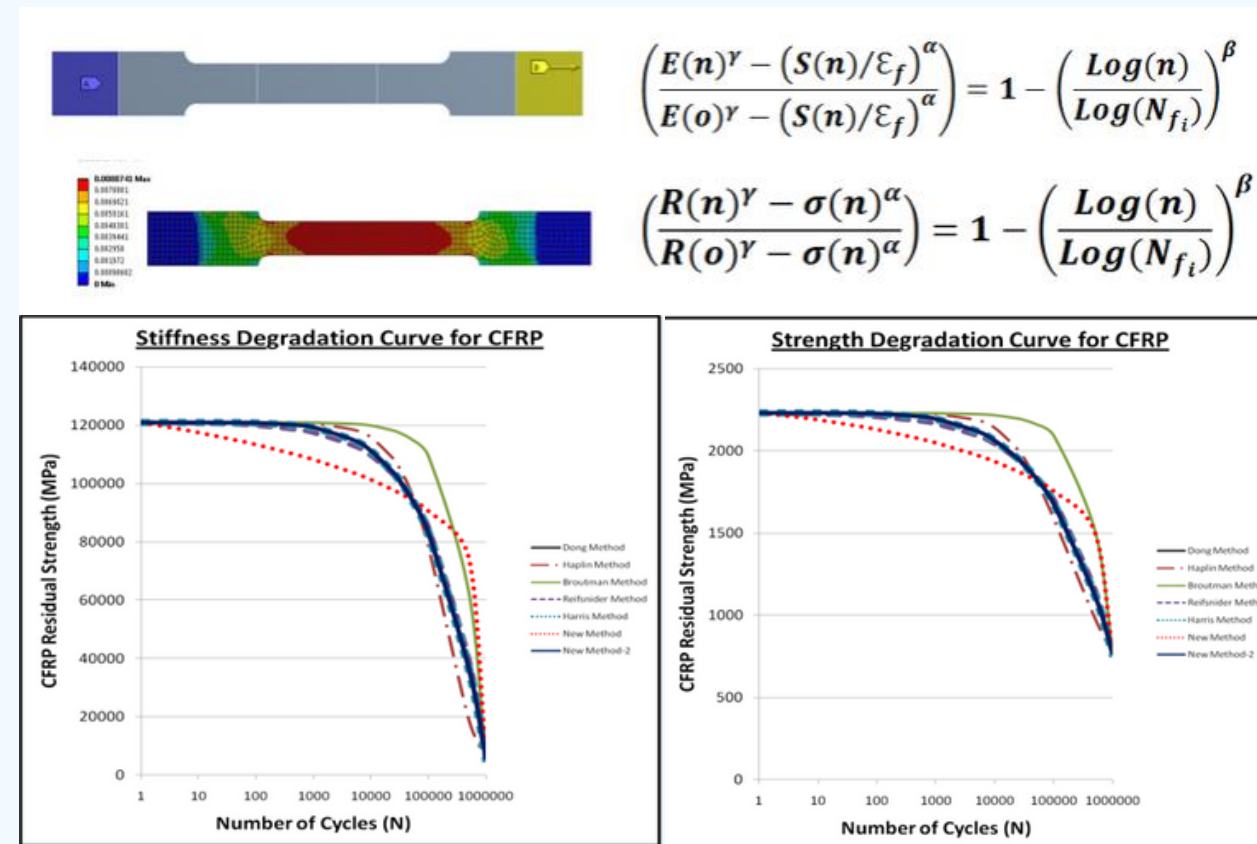
RESEARCH PROJECTS DELIVERED

Materials



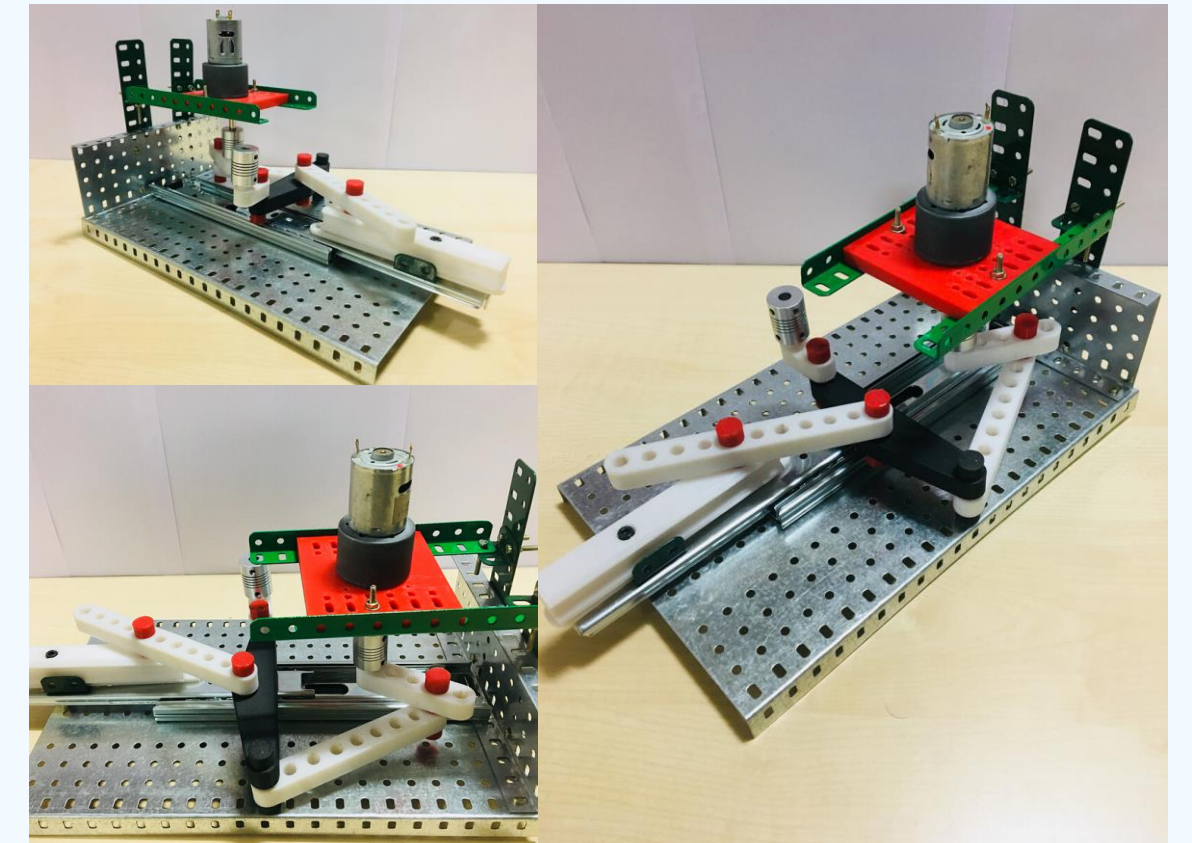
•COMPOSITE MANUFACTURING

Upgrading composite manufacturing technology using inserts.



•LIFE ESTIMATION OF COMPOSITES

Life Prediction Model based on degradation of properties of the material.



COMPOSITE TABLE TOP VARIABLE LOAD TESTING EQUIPMENT

Digital Twin table top machine to test the data and store it in the cloud.

•PORTFOLIO 2014-2019 CONCLUSION



THANK YOU
