

FATIGUE & MATERIALS CENTER OF EXCELLENCE



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About Us

Fatigue and Materials Center of Excellence (FMCE), is a synergy of 25+ years of experienced Fatigue and Materials groups of ARAI coming together along with its state-of-the-art facilities and expertise. The Dynamic and Experienced team of FMCE provides services in the fields of material characterization, component and vehicle level evaluation.

FMCE possesses diversified experience of :

- 40+ failure analysis case studies every year
- 300+ material characterization projects every year
- 2,000+ hours of laboratory simulation durability testing every year
- 20,000+ hours of component durability testing every year
- 20,000+ hours of environmental durability testing every year

Auto Sector

- Micro to Macro-level under one roof
- Combined evaluation : Load+Vibrational+Environmental



Non Auto Sector

- Medical equipment testing
- Elevator and Prime mover testing



Railway Sector

- Component testing as per IEC 61373
- Seat validation as per UIC 566,NF Standard



Defence Sector

- Cold Startability and thermal evaluation
- Climatic Testing as per JS 55555



Material Characterization

- Tensile, compression, shear, bending, hardness test; Impact at ambient, subzero and elevated temperature
- Metallurgical characterization: Microstructure, elemental mapping, Grain size. etc.
- Residual stress analysis
- Axial fatigue testing (S-N & E-N curves),
- Rotating Bending Fatigue (RBF) at high temperature
- High Strain rate tensile testing with DIC strain measurement
- Battery material analysis
- Material creep analysis



Component Validation

- Single & Multi-axial Load testing on Suspension and chassis Components
- Engine component durability.
- Contact & non-contact stress-strain mapping
- Universal test benches with portal frames
- Functional Tests using Pneumatic Actuator
- Impact & Pendulum Test

Certification Test

- ROPS / FOPS
- Bumper Anchorages
- Operator Seat
- Articulation Lock



COMPONENT

Aggregate Validation

- High frequency Multi Axis Simulation Table (MAST) for 6DOF / 8DOF testing of cabins, seats, intake-exhaust systems, engine mount etc.
- Data Acquisition & Simulation of actual field data on test rig
- Objective and Subjective assessment on seats on Human-Rated Rig for dampening & SEAT Factor Optimisation.
- Seismic Testing & Transportation Validation.

Vehicle Validation

- 2/3/4/X Poster for 2W, 3W, Small Car and HCVs
- Drive-in Four Poster for Car, with climatic and sun simulation.
- Subjective & Objective Buzz, Squeak & Rattle (BSR) on human rated 4P Rig
- Cold Startability & Functional test of Exterior parts such as doors, bonnet, trunk etc. in controlled environmental conditions
- EV Charging/Discharging Cycles under controlled environmental.

COMPREHENSIVE

Environmental Validation

Climatic Chambers for Component/Material Level Testing:

- UV/Xenon • Temperature & Humidity • Corrosion Resistance
- Vehicle Level Sun Simulation & Heat Ageing

Failure Analysis

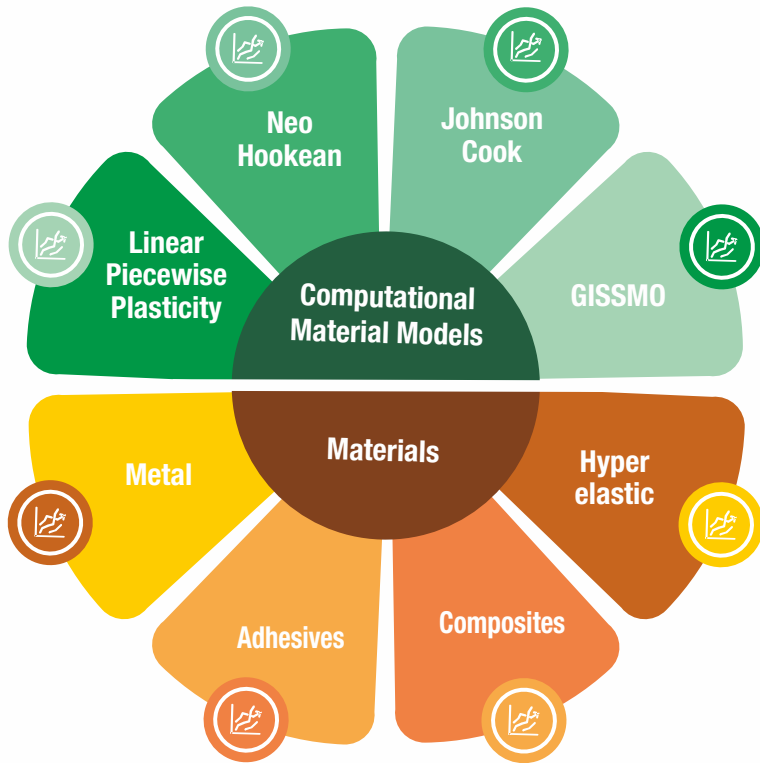
- Metallurgical Failure Analysis and Process Development
- Fractography and failure mode analysis & Process defect analysis
- Chemical zonation, Inclusion, corrosion product, segregation analysis,

Forging Research

- Ferrous & Non-ferrous metal forging and Heat treatment process design
- Energy saving projects by Heat treatment optimization
- Lubrication evaluation for friction & wear parameters
- Generation of TTT & CCT Curve through Dilatometry test

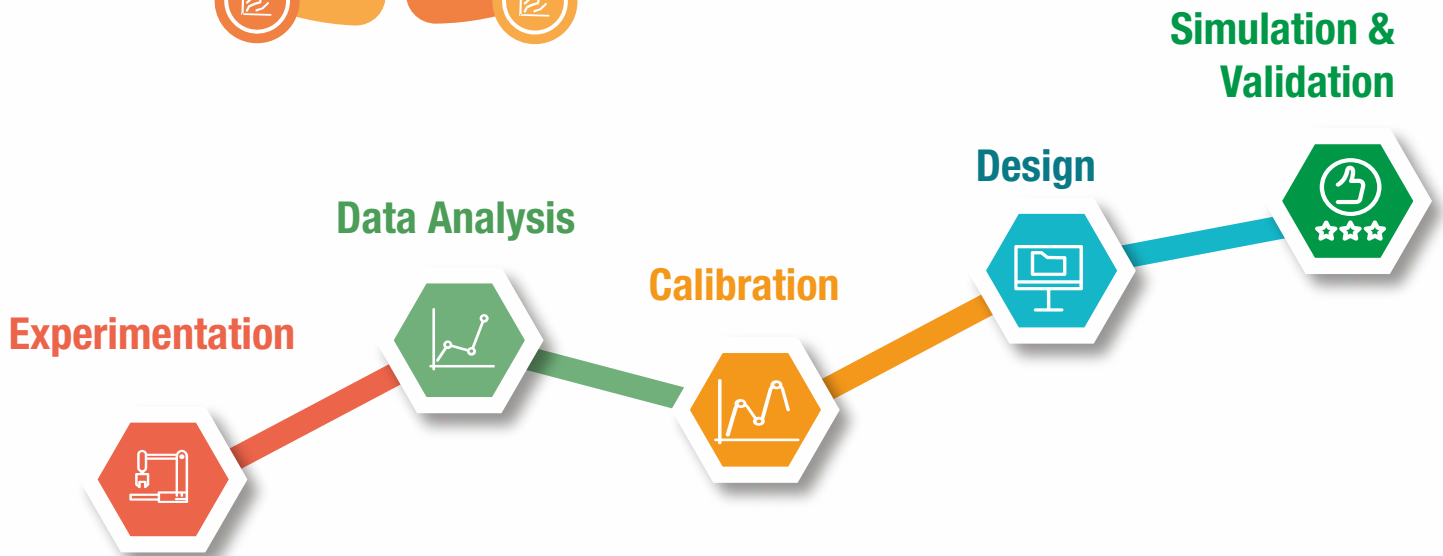
OPTIMISATION





Material Model Cards

- Material characterization for CAE & FEA simulation
- Material modelling for Static and Dynamic load cases
- Elasto-plastic, failure and damage cards
- Validated material cards for LS Dyna, Abaqus, such as: MAT_024, MAT_ADD_EROSION (GISSMO), Mooney Rivlin etc.
- Database of GISSMO material model cards for AHSS and aluminum alloys (project in progress)



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ARAI
Progress through Research



The Automotive Research Association of India
(Affiliated to Ministry of Heavy Industries, Govt. of India)

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