

# STRUCTURAL DYNAMICS LABORATORY

Verification, Validation and Value Addition



Bringing the road / track to lab



## ABOUT STRUCTURAL DYNAMIC LABORATORY (SDL)

- Test and analysis center with state-of-the-art technology, instrumentation and testing facilities
- Leading global brand in Automotive and Non-Automotive world
- Vehicle and component level evaluation over 3 Decades
- Client focused team committed to provide safe, reliable, economical & environment-friendly solutions, has experience of:
  - 1,800 Man-Years
  - 5,00,000 Kms of SLDA
  - 11,00,000 Hours of Component Testing
  - 80,000 Hours of Simulation Testing

## KEY SERVICES

### Accelerated Durability Evaluation

- Laboratory and field test
- Component, system and full vehicle
- Single to multi actuator coupled test
- Vibration Durability in climatic chamber
- 2 / 3 / 4 / 6 Poster testing

### Road Vehicle Interaction Analysis

- Road load data collection
- Customer usage correlation, Duty cycle evaluation
- Road / test track scanning – 2D and 3D
- Instrumentation – WFT, Gyro, load cell, telemetry
- Wheel force measurement and analysis

### DVP Development & Testing (EV and ICE)

- Chassis component
- Interior exterior components
- Vehicle level performance, pre-homologation
- Reliability, durability, performance
- Powertrain, HVAC, Cooling system

### Seat Developmental & Certification Test

- DVP level – Static, durability & environmental
- Validation as per IS/ FMVSS/ ECE/ ADR regulations

### Interior & Exterior Component Test

- Mechanical & strength
- Environmental
- Vibration, life cycle, durability
- Functional
- Regulatory

### Vehicle Dynamics – Ride and Handling

- Subjective and objective evaluation
- Full vehicle benchmarking
- Static and dynamic – Performance, Reliability, Characterization

### Non-Automotive: Durability, RLDA

- Railway, Metro – Frame Durability
- Construction equipment
- Trailer components
- Medical
- Agricultural vehicle
- Defence
- Aerospace

### Database/Products

- Road profile
- Tire model
- Road load

## FACILITY

### Test Lab

- Hydraulic Power Pack – 2,600 LPM
- Hydraulics/ Pneumatic/ Electric actuators – @150 nos (1kN to 500 kN capacity)
- Rotary Actuators – Up to 24 kNm
- Digital controllers – More than 100 channels
- Environmental test chambers – vehicle level



Environmental test chamber (-40° C to 120° C)

### State-of-the-art test rigs



Four / Six Poster



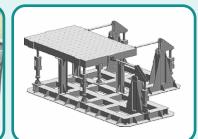
ED shaker



Seat robo ingress, egress



Seat Belt Anchorage



MAST



6 DOF full vehicle simulator

### RLDA: Sensors & Systems

- DAQ system (High speed 250 channels, low speed 300 channels): @ 5 - 6 Nos
- Wheel Force Transducers (WFT): PC to HCV
- Accelerometers DC, MEMS, ICP, Shock types (10g to 1000g): @ 100 Nos
- Displacement Sensors (25 mm to 500mm)
- Strain gauges (Uniaxial, Rosette, Delta, Miniature)
- Pressure Sensors (25 bar to 1000 bar)
- Slip ring, Telemetry systems for wireless data measurement
- Ride & Handing sensors: Gyro, slip angle, DGPS
- Vehicle tracking & video data logging.
- OBD / CAN data loggers
- Temperature loggers and sensors: @ 100 channels Anemometers
- Load washers: Engine & cabin mount force measurement
- Fuel, coolant flow rate measurement



WFT (12" to 22.5")



Telemetry



Strain Gauge



Accelerometers



LVDT



DAQ System

### Data Analysis Tools

- Glyphworks
- MATLAB
- Altair
- RPC
- ADAMS - Car

## E-MOBILITY – 2W, 3W & 4W

- EV Benchmarking – Database
- Battery and motor sizing
- Powertrain performance optimization
- RWUP Duty cycle evaluation
- Energy and thermal management
- Accelerated durability validation of e-Powertrain – Lab / Track / Road



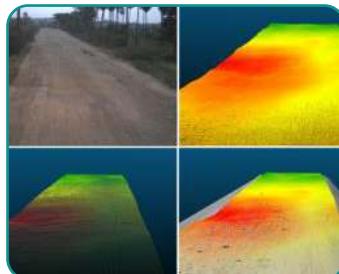
## ROAD VEHICLE INTERACTION



Road profile database (30,000 Kms)



Tire model generation (Ftire)



Test track & public road mapping



Virtual RLDA + Virtual Proving Ground

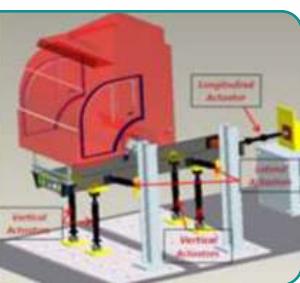
## ACCELERATED DURABILITY EVALUATION



Component level – Rubber parts, Knuckle, spring, shafts



System level – Chassis, axle, frame, cabin



Full Vehicle level - 6 DOF Multi axis & 4/6 Post test set up

Flexible test set up for testing of variety of components

## ROAD LOAD DATA MEASUREMENT

- Duty cycle
- Customer usage correlation
- Accelerated test schedule
- Performance measurement acceleration, braking
- Benchmarking



Instrumented test vehicles – 200 + channels

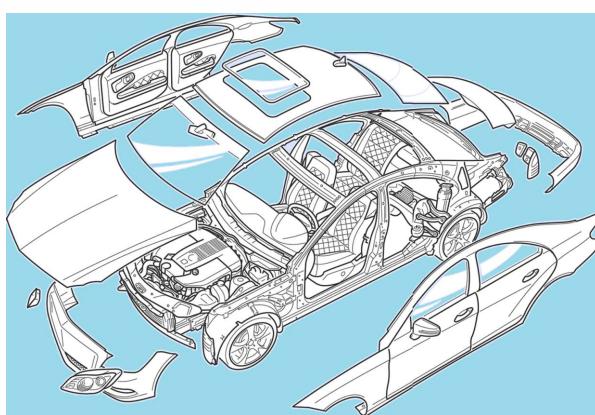
## INTERIOR / EXTERIOR TESTING

### Mechanical Strength Tests

- Retention test / pull out
- Static Load test
- Ease of Assembly disassembly
- Stiffness measurements
- Buckling measurements
- Impact tests

### Durability

- Durability test
- All life cycle testing for all components with and without environmental conditions
- 6 Degree of freedom test on complete vehicle
- Continuous operation test
- Full system rigidity - 4 poster
- Vibration test with / without thermal condition



### DVP LEVEL TESTING FOR INTERIOR AND EXTERIOR COMPONENTS

#### Regulatory

- Seat belt anchorage, head restraint performance, energy dissipation, performance, seat anchorage test
- Abuse / misuse / slam tests
- Airbag static deployment test
- FMVSS 206,218,210,225
- ECE R17,14
- Interior fittings - head impact

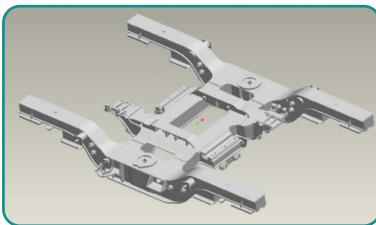
#### Environmental

- Climatic cycle test for interior parts
- Thermal aging test
- Freezing tests
- Humidity tests
- All life cycles and performance tests in environmental conditions

Doors	Parcel Shelf	Trims
Tailgates	Glove Box	Consoles
Bonnets	Sun visors	Seats
Sunroof	Arm Rests	BIW
Floors	Windows	Bumper
Claddings	Spoiler	Badges

## RAILWAY / METRO

- Bogie Frame testing: EN 13749 / UIC615 / UIC515



- Vibration testing: IEC 61373
- Performance / accelerated durability testing: Damper, spring, centre pivot, bellow, axle etc.

## OFF-ROAD

- Farm / construction equipment data acquisition, analysis
- Accelerated fatigue testing: Machine, assembly, component level
- Hydraulic lift actuator performance evaluation



## OTHER NON-AUTOMOTIVES

- Defence - On site instrumentation, SLDA
  - Vibration testing (JSS-55555)
  - Component, assembly level testing, validation
- Civil -
  - Testing of reinforcement rebar couplers for mechanical splices of bars (IS16172)
  - Testing of railing system
- Medical -
  - equipment testing as per JIS and MIL
  - Climatic fatigue testing of the components used in hospitals

## SEAT TESTING

## Certification



- Seat Belt Anchorage test (IS15139 / ECER14)  
Isofix test (ECER145)
- Component level (Is15546 / ECER17)
- Construction equipment (IS6683)

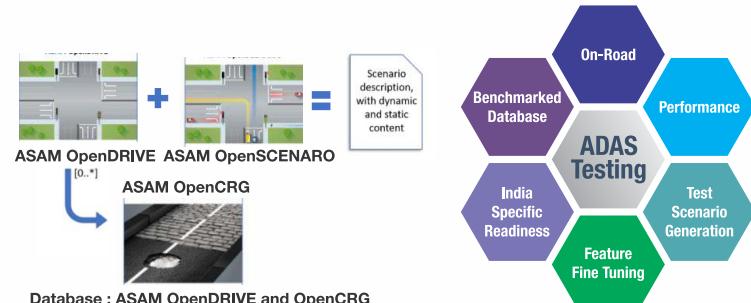
## Development

- Static
- Ingress / Egress
- Durability



## PRODUCT / SERVICES

- ARAI's MARG – Indian public road database in rdf & open CRG format - Includes special events like bump, potholes, railway crossing etc.
- Tire characterization and model Database - FTire and PAC 2002
- Indian public road corridor database in open DRIVE / open SCENARIO format for ADAS development - Includes typical Indian assets like building, curb, road dividers, signal, road marking etc. along with open CRG road



**YOUR PARTNER IN FULL VEHICLE DEVELOPMENT PROGRAMS**



# The Automotive Research Association of India

(Affiliated to Ministry of Heavy Industries, Govt. of India)

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