

# Vishal Sharma

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## ABOUT ME

Battery Systems Engineer with Simulation & Modelling Specialisation — **15 years** of deliberate progression, across 5 automotive OEM R&D divisions and a cell manufacturer, from structural and system modelling through full EV architecture to electrochemical cell modelling and battery pack development. Built simulation teams in 3 companies. Proven record of translating domain depth into production-ready tools, scalable processes & cross-cultural delivery.

**Simulation Teams Built: 3 | Engineers Led: 10+ | Business Scaled: 5× | Model Dev Time Reduced: 60%**

## CORE COMPETENCIES

**Battery Modelling & Simulation:** Cell-to-Pack scaling, P2D / DFN / SPM electrochemical models, EEC modelling, Thermal & Ageing modelling (calendaric and cyclic ageing), Cell/Battery test data analysis, characterisation & parametrisation, NMC/LFP systems, SoC/SoH estimation, state estimation algorithms, multi-physics modelling

**Leadership & Delivery:** Simulation team building (×3), engineering problem ownership, RFI/RFQ technical strategy, SOPs & standardisation, cross-site collaboration (DE/IN/CN), Project management, Agile, IBM DOORS

**Simulation Platforms:** MATLAB/Simulink, Stateflow/Simscape, Modelica, OEM R&D in-house simulation frameworks.

**FEM/CFD:** ANSYS, ABAQUS, HYPERMESH, FEMFAT, ParaView — thermal, structural, multiphysics

**Tooling & ML/AI:** Python (NumPy, Pandas, Scikit-learn), ML (clustering, regression, surrogate modelling), PINN, advanced optimisation, on-premises LLM deployment, local RAG systems (GDPR-compliant)

## WORK EXPERIENCE

### A123 Systems GmbH, Germany

#### Senior Product Engineer | Simulation Lead, EMEA

| Nov 2022 – Present

- **Technical Governance:** Defined and cascaded simulation deliverables from OEM RFI/RFQ specifications — with full responsibility and final validation authority for all EMEA simulation deliverables.
- Developed end-to-end pack concept for multiple RFI/RFQ specifications - covering cell selection, packaging, BMS/EE integration, thermal management, and functional safety (ISO 26262) compliance.
- **Portfolio Enhancement:** Contributed to next-generation **cell concept development** — optimising chemistry, cell construction and form factor under simultaneous performance, manufacturing, cost, and physics constraints.
- **Engineering solutions:** Developed Current limits generator, Virtual cell scaling, pseudo-3D electro-thermal pack model for pre-concept feasibility checks and Pack Cost estimator (RFQ/preRFQ-phase) - all self-initiated, in-use.
- Conducted simulation-driven feasibility studies and extensive data analysis on raw electrical, thermal, and ageing test data — directly supporting engineering and commercial decisions.
- Developed Data Compilation Manager tool for large-scale test-data compilation for multiple projects & cell variants.

### Volvo Trucks R&D, India

#### Lead – Simulation & Analysis (Senior Manager)

| Mar 2022 – Sep 2022

- **Product Owner** for thermal, charging, SIL/HIL, and full-vehicle simulation/modelling workstreams (including VECTO compliance) — sharing responsibilities with Swedish counterparts in Gothenburg.
- **Led 10-person multidisciplinary team** focussing on enhancing in-house simulation tool capabilities for EV.
- Developed standalone battery simulation framework for focused battery & Battery Management System simulations.
- Developed rapid-execution PINN-based **battery degradation** and **charging models** - for Volvo fleet mobile app.

### Caterpillar R&D, India

#### Performance Engineer

| Sep 2021 – Feb 2022

- **Responsible for establishing a battery simulation & modelling team** in the new EV division — defining team structure, toolchain, and development processes for heavy construction vehicle architecture.
- Set up **Cell Testing Facility** end-to-end — from cell procurement to setting-up testing procedures and identifying testing equipment capabilities, coordinating with logistics, legal and purchase divisions (IN/US).
- Developed empirical degradation models for NMC/LFP chemistries from experimental data; conducted parameter estimation and identification for battery model development, and extensive thermal analysis on test data.

### Mercedes-Benz R&D India Ltd.

#### Technology Lead (Domain Expert)

| Jun 2018 – Sep 2021

- **Battery and Lithium-ion cell SME** across cross-functional collaborative projects; Individual Contributor on specialised in-house battery ageing and thermal modelling processes/tools.
- Led the development of **battery modelling toolchain** end-to-end — from strategizing, architectural design of tools/processes, and project planning till release of stable versions (Audit-ready).
- **Led the team of 4–6 engineers** across project planning, project management, technical review, and delivery.

- **5× Business Growth:** Developed/improved Daimler counterpart collaboration — proactively captured business requirements, sharing responsibilities, and improved team competency. *Number of projects increased by 5 times.*
- Developed **Battery Thermal Model Configurator** — reduced model development time by **60%** — generating high-fidelity parameterised coupled CFD-thermal ROM for high voltage battery systems.
- Established tools development standards for ageing and thermal modelling — reducing onboarding time, development time and enabling cross-site knowledge transfer.

### Senior Engineer (Top Expert)

| Jun 2015 – Jun 2018

- Joined at an early stage of EV programme ramp-up — modelled subsystems and component models to enhance in-house **full-vehicle simulation framework** for different vehicle configurations (E-Class, S-Class, AMG, & EQC).
- Developed high accuracy **thermal model of DC-DC converter** to solve the critical problem of overheating in field vehicles and validated the modelled components against experiments with **96% accuracy**.
- Integrated combinatorial optimisation capability into simulation framework - evaluating across component variants.
- Expanded simulation framework to Electric, Hybrid, Plug-in Vehicle architecture, by developing and integrating **BMS logic, Charging System** and **Thermal Management System** modules/subsystems.
- Conducted full-vehicle and component-level performance simulations across different EV/HEV/PHEV configurations and different subsystems configurations at preconcept, concept, and post-production stages.

### Hero MotoCorp Ltd., India

#### Deputy Manager, R&D — Engine Design Group

| Nov 2013 – May 2015

- 1D/3D engine modelling, non-linear structural, thermal-structural, and fatigue analyses
- Developed a new analysis methodology to optimise engine mounts for engine vibration reduction.
- Developed SOPs for consistency & reduced review cycles; introduced automation of data analysis and post-processing - establishing simulation automation practices later scaled to EV & battery toolchain development.

### TVS Motor Company, India

#### Member, R&D — Design & Analysis Group

| Nov 2011 – Oct 2013

- Conducted Linear and non-linear structural analyses of chassis components & topology optimisation.
- Developed ANSYS APDL Macros reducing pre-processing and analysis time by ~50%; modelled/simulated standard laboratory tests to set up experiment-computation correlation - building the computational modelling foundation.

### Victoria University, Melbourne, Australia

#### Research Intern

| Jun 2009 – Aug 2009

Optimised material properties for CFD fire modelling using Genetic Algorithms; resolved simulation convergence.

## EDUCATION

**Master of Technology (M.Tech)** — Mechanical Engineering | IIT Kanpur, India | Jun 2010 – Aug 2011  
Thesis: Critical Velocity and Standing Waves in High-Speed Tires

**Bachelor of Technology (B.Tech)** — Mechanical Engineering | IIT Kanpur, India | Apr 2006 – Jun 2010

**Languages:** English (Professional), German (A1/A2 — in progress), Hindi (Native)

## PATENTS & PUBLICATIONS

Patent: Cooling system for fuel cell vehicle/EV to improve fuel efficiency (Inventor's Award recipient) | 2016

Patent: Efficient power recapturing from vehicle suspension | 2017

[Publication:](#) Estimating wood material properties using optimisation techniques for CFD-based fire modelling | 2010

## NOTABLE TOOLS & PROJECTS

**Current Limits Generator** | Python | A123 Systems

Self-initiated project for limits envelope ensuring safe battery functioning, to meet specific ageing requirements.

- Pack Current limits and operating windows are generated considering lithium-plating, side reactions and cell level thermal limitations; included thermal runaway onset, system level limitations across operating conditions.

**Virtual cell scaling** | Python | A123 Systems

Application to scale the battery cells models to different capacities, construction & form-factor as per the requirements.

- Developed the strategy to tune the model to scale up or scale down the battery cell capacities and to vary the form-factor for same chemistries to conduct cell and pack level simulations, and meet performance requirements.

**Model Validation Framework** | MATLAB/Python | Mercedes-Benz R&D

Application to automate the process of battery model Validation with the test data collected from multiple sources.

- Developed automated pipelines to fetch test data and corresponding battery models from the internal portal.
- Automated the process of test case creation, simulations, validation of the results and upload of the report.

## REFERENCES

Professional references are available upon request