



OBLANGATA CONSULTING

AUTOMOTIVE
ENGINEERING
CAPABILITIES

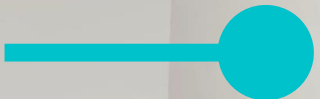
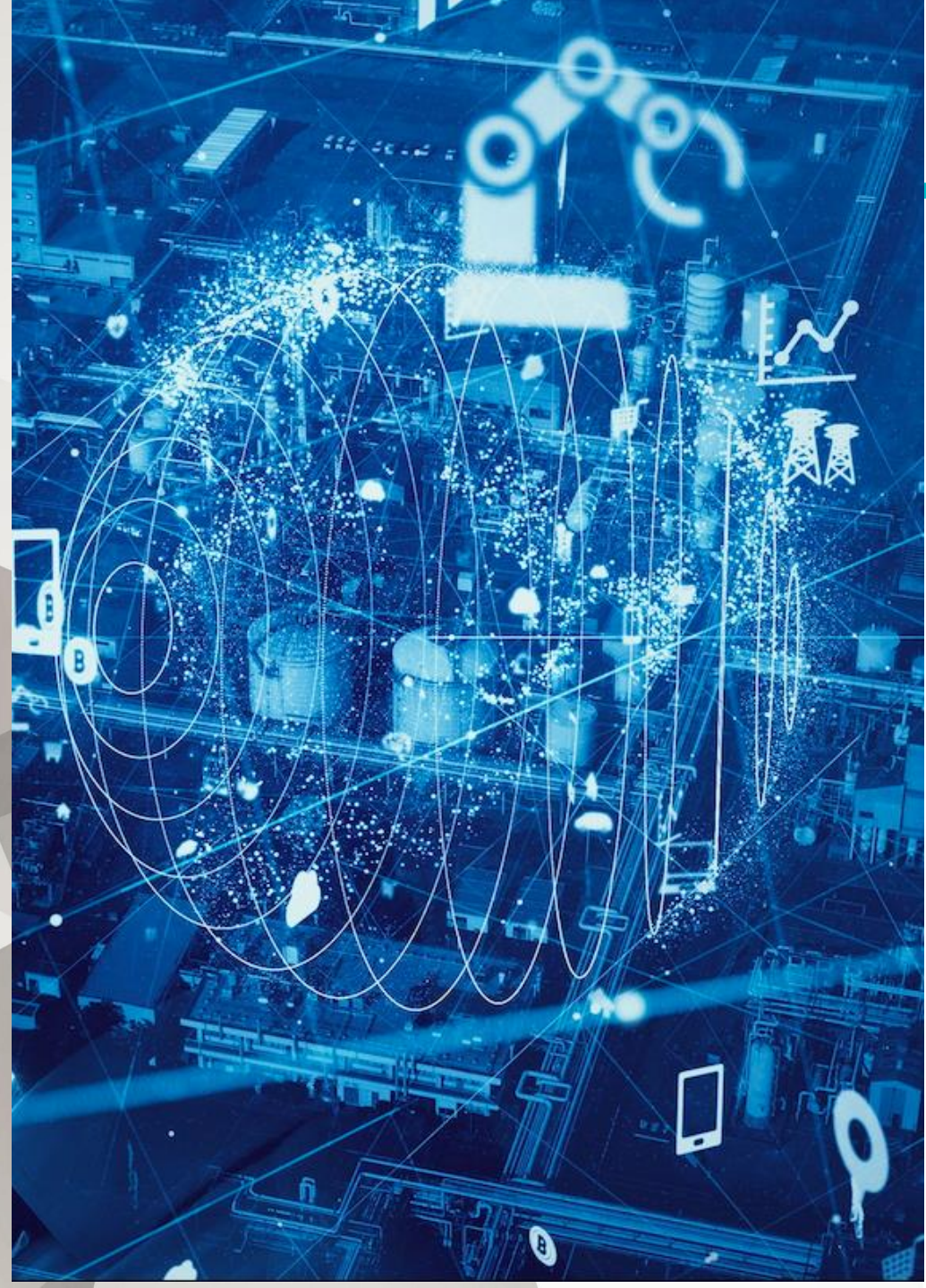
ABOUT US

Oblangata Consulting Private Limited is a Bangalore based engineering and technology solutions company.

Our focus is to deliver world-class product design and engineering and technology solutions to our clients.

Our engineering and technology expertise empowers our clients to realize their first-time right products enabling them to become market leaders.

We have strong and successful synergies with Global OEMs and Tier 1 suppliers across the globe.



Capabilities – Interest & Expertise



Our other areas of expertise

- ◇ Excavators
- ◇ Mining Trucks
- ◇ Bucket Wheel Loader
- ◇ Backhoe Loaders
- ◇ Motor Graders

Area of Interest

System Expertise

Overview of Gear Design Capabilities

Types of gears

- ✓ Spur gear design
- ✓ Helical gears
- ✓ Spiral bevel gears
- ✓ Hypoid gears
- ✓ Double helical gears
- ✓ Herringbone gears
- ✓ Miter gears



Application

- ✓ Automotive rear drive axle
- ✓ Over head gearbox Drill rigs
- ✓ Design of gears for robotics
- ✓ Door opener
- ✓ PTO
- ✓ Geared motors
- ✓ Hoist gearbox
- ✓ Cross travel gearbox
- ✓ Long travel gearbox
- ✓ Cement mill
- ✓ Steel mill gearbox
- ✓ Cooling tower gearbox
- ✓ Agitator (Sewage and chemical)
- ✓ Pulper gearbox (Papermill)
- ✓ Pinion
- ✓ Heavy machinery
- ✓ Gear pump
- ✓ Locomotive
- ✓ Marine applications

Capabilities – Design Development

DESIGN & ENGINEERING

- ◆ Concept engineering & layout
- ◆ Gears design as per standards
- ◆ Gear units
 - Spur gear units - single / multi-stage
 - Helical gear units- single / multi-stage
 - Planetary gear units - single/multi-stage
 - Bevel Sets
- Harmonic drives
- Worm & worm gears
- ◆ Axles
- ◆ Lubrication selection
- ◆ Splines design
- ◆ Housing design
- ◆ Bearing selections
- ◆ Geometric calculations
- ◆ Life calculations
- ◆ Reverse engineering & Re-engineering
- ◆ 3D modelling & assembly
- ◆ Manufacturing drawings & GD&T
- ◆ Should costing

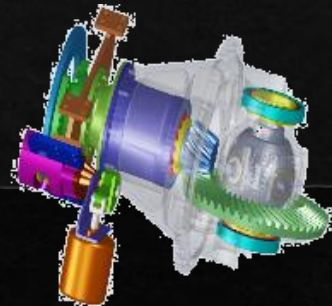
- AGMA
- DIN
- BS

- ISO
- ASTM
- ANSI

- IMPAC
- FESAFE
- ABAQUS

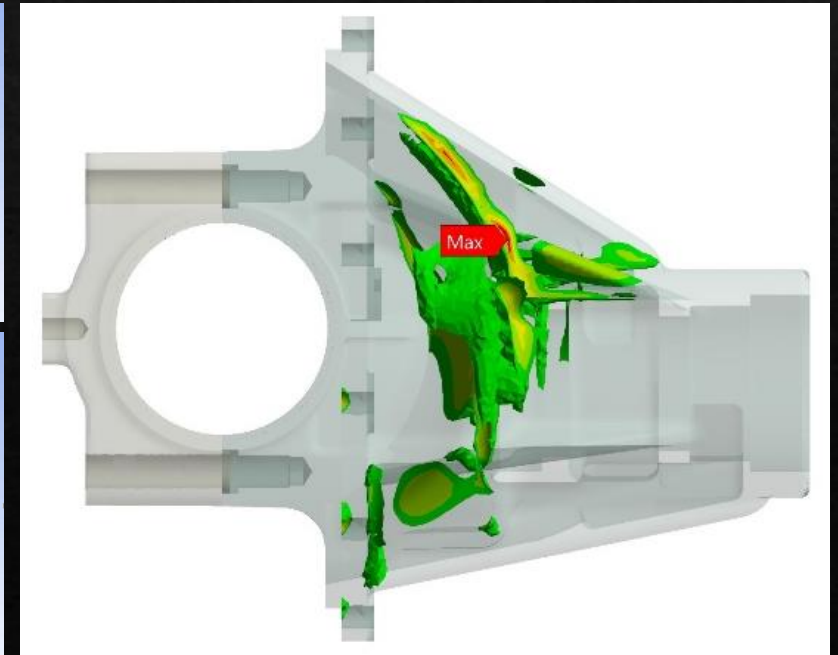
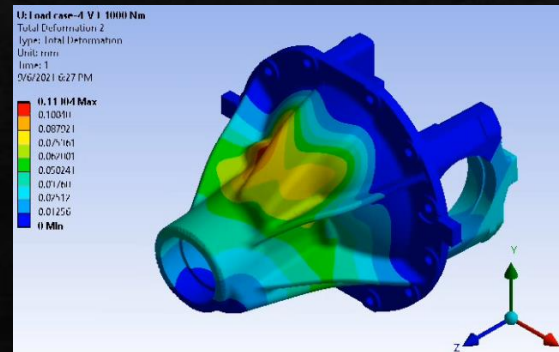
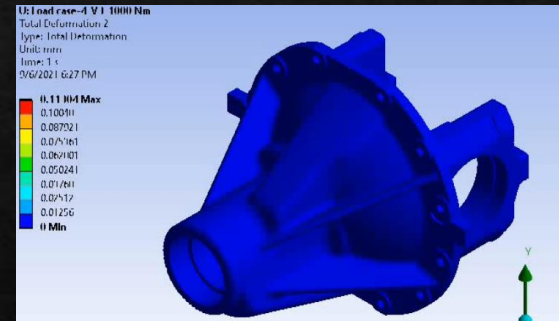
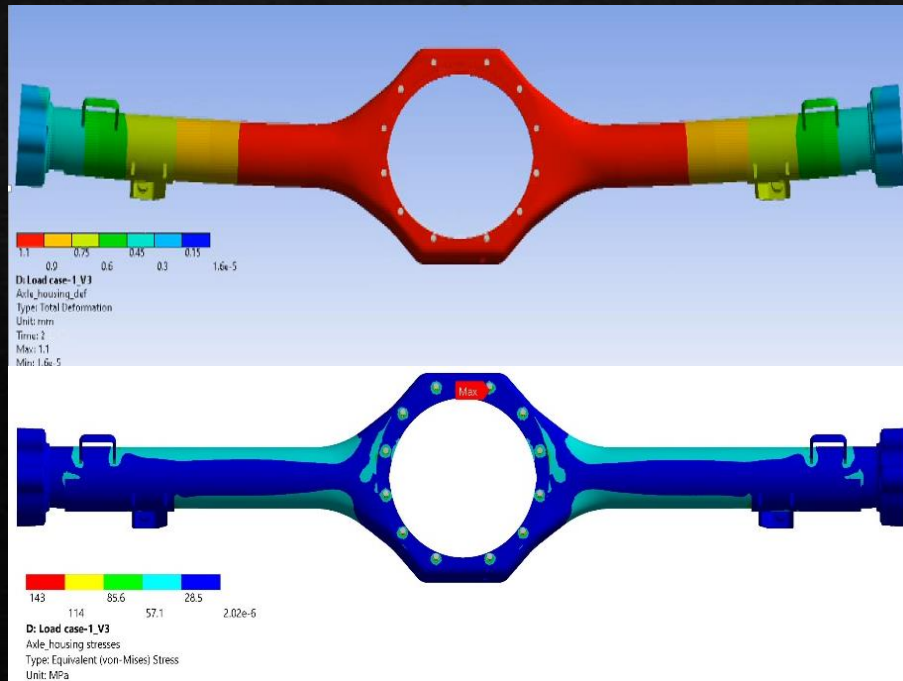
- ANSYS
- HYPERMESH
- KISSOFT &

KISSSYS



Capabilities – Virtual Analysis & Validation

- ◇ Structural analysis of gear cases, bearing houses, planet carrier, shafts, base frames, etc.
- ◇ Modal analysis
- ◇ MBD analysis to predict the loads, accelerations, velocities
- ◇ Dynamic analysis - stresses, deflections, strains in the shaft, mating gears, housing, etc.
- ◇ Identify the potential stress and fatigue hot spots for optimization
- ◇ Topology and parametric optimization to reduce the weight of housings



Case Study – 1: Design & Development of Front & Rear Axle

Customer: Pioneers in Development of Earth Moving Equipment's

Challenge: Intro of 60T Rear Dumper with stringent timeline

Requirement: Full Floating, Double Reduction, Std Differential with Calliper Disc Brake & Oil Cooled Wet Multiple Disc Service Brake with Planetary Axle

Scope

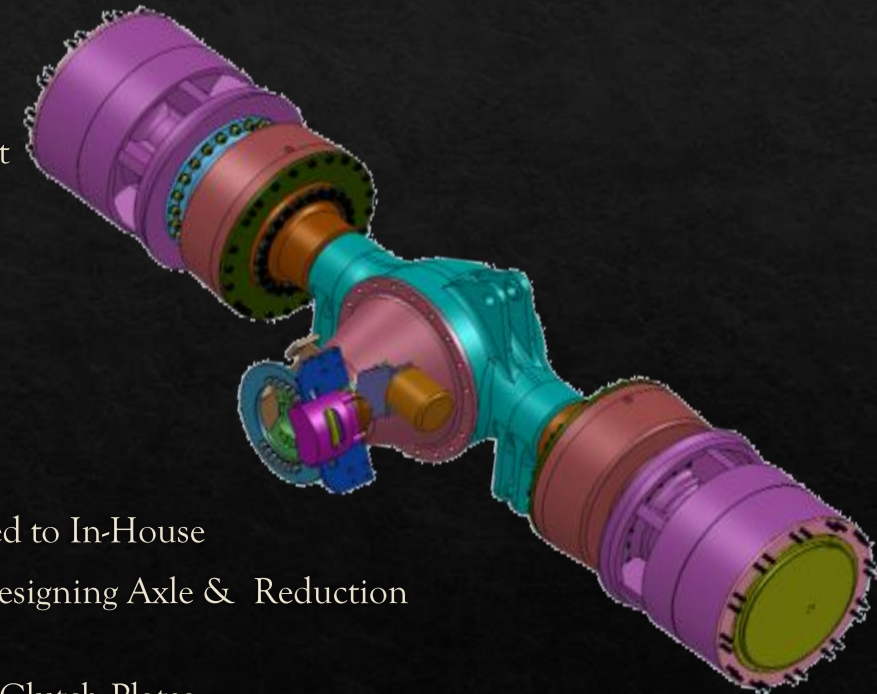
- Gears – Double Reduction Planetary, Spiral bevel gear for smooth transmission of power & Straight bevel gear for differential
- Brakes – Dry calliper disc at front & Rear(Parking) , Wet multiple disc at rear
- Design of rims & selection of tyres
- Aggregate selection & calculations
- Design of hydraulic system

Deliverables

- Power Train Layout & Specs
- Calculations & Aggregate Selections
- Detailing of 3D & 2D
- Hydraulic layout
- Operation & Service Manual
- BOM & Parts Catalog
- FEA Reports

Customer Benefit

- Cost of Design was cut down to 20% compared to In-House
- Build Knowledge Base, which adds value in Designing Axle & Reduction in Design Time by 10% year over year
- Vendor Development over Gears, Castings & Clutch Plates
- Reduce Development time by 10%



Case Study- 2 : Design & Development of Cross Transmission

Customer: Leading OEM of heavy-duty transmissions for construction & mining equipment, material handling equipment, oil-field, railways & defense applications

Business challenge: Cross drive transmission introduction for defense tracked vehicles within the confined layout

Work executed

Designed:

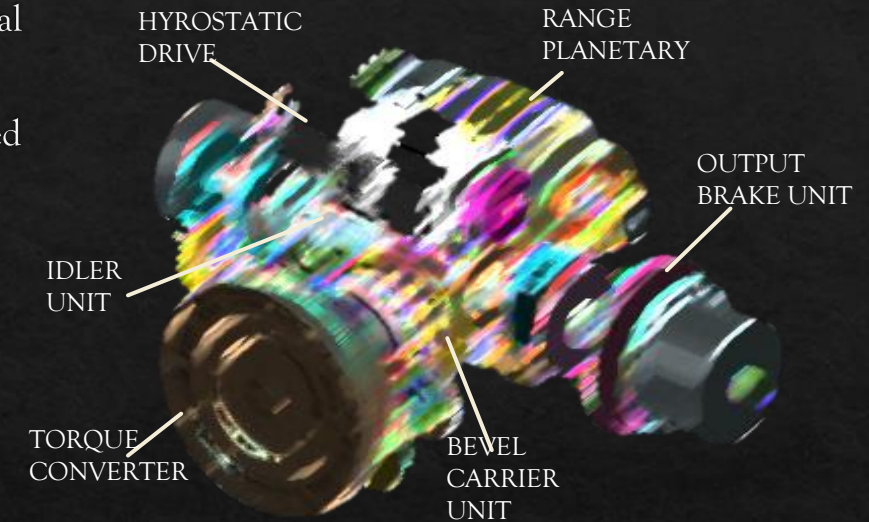
- ◆ High efficiency, low weight and low life-cycle cost
- ◆ Fully integrated vehicle brake system and parking brakes
- ◆ Final drive options, including close-coupled arrangements for minimal vehicle width
- ◆ Fully automatic gear selection and optional manual gear shift
- ◆ An integral driving axle and differential gear in a vehicle
- ◆ Hydraulic circuit, hydraulic line & clutch packs design

• **Design calculations:**

- ◆ Planetary gear ratio and load calculation
- ◆ Design of bearing layout, bearing load, hydraulics & lubrication layout
- ◆ Use of KISSsoft software for gear design parameters

• Mechanical design in 3D and 2D drawings with BOM

• Understanding and implementing customer standards for the design



Challenges:

Conceptualising the working principle of range pack & subsystems

Step wise working principle of each level of gear shift

Understanding and implementing customer standards for the design

Proactive learning & co-ordinating with customer design, quality, manufacturing & testing team

Aggressive timeline

Working towards perfection in concept stage by virtual validation & carried out DFM/DFA

Case Study - 3: 2T Rear axle

Overview:

Customer is the global leader in design and development of the axles and brakes for heavy vehicles in commercial, military and off-highway application.

Customer is targeting on the light commercial vehicle segment to expand its market reach in India. Intended to start with design and development of 2-ton Light Commercial Vehicle drive axle.

Customer requirement:

- Phase-1: Preliminary design and costing (Feasibility of design and cost)
- Phase-2: Value additions and design optimization
- Phase-3: Prototype manufacturing and testing

Complexity/Challenges

Preliminary designing of the axle meeting target benchmark axle for costing

Achieving efficient hypoid gear set

Lack of duty cycles data considered for the benchmark axle

Getting benchmark axle

Solutions

Study of the specifications of the axles of same category

Hand calculations

Design of all gears, shafts, splines based on the hand calculations

3D CAD modelling and preliminary simulations and sizing of the parts

Teardown of the benchmark axle

Design finalization and costing

Staff Augmentation Services

Leverage our highly skilled technical resources to automate your business processes and increase your productivity and profitability

| | | | |
|---|---|--|--|
|  Software & Web Development and Maintenance Developers |  Mobile App Development and Maintenance Developers |  Front end and Backend Developers |  Data Migration & Application Migration experts |
|  Information System & Business Analytics Developers |  Scrum Master & Business Analyst Engineers |  Cloud Infrastructure & Network Engineers |  CRM,ERP & Automation Developers |
|  Business Process Automation & Data Integration Developers |  Digital Transformation Consultants & Developers |  Database Architects and Backend Developers |  Continuous Integration & Delivery Engineers |
|  Technical Support & Help Desk Support Engineers |  Quality Assurance & Testing Engineers |  Artificial Intelligence and Cognitive Developers |  SAP, Salesforce, MS-Dynamics & SharePoint Developers |

1. REDUCE LIABILITY

2. SAVE TIME

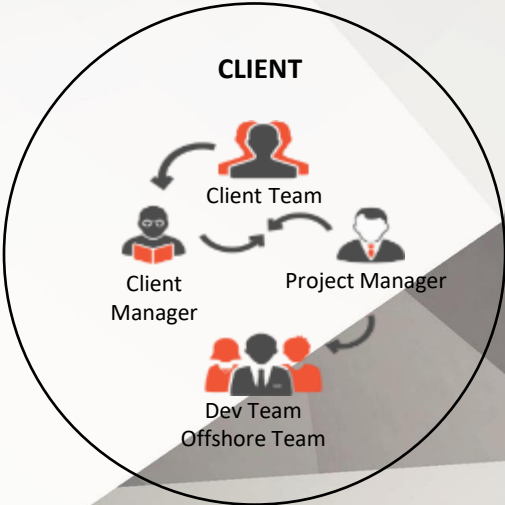
3. STAFF RAPIDLY

- *Highly skilled resources ready to step in.*
- *Specialty Technical skills to assist your IT Staff with special projects requiring advanced expertise.*
- *On-demand access to certified professionals in areas of emerging technologies.*
- *Hourly contracts eliminates expense of an unnecessary full time employee when you don't need one.*
- *Scalability to meet your fluctuating staffing needs.*
- *Cost savings.*

Delivery Model

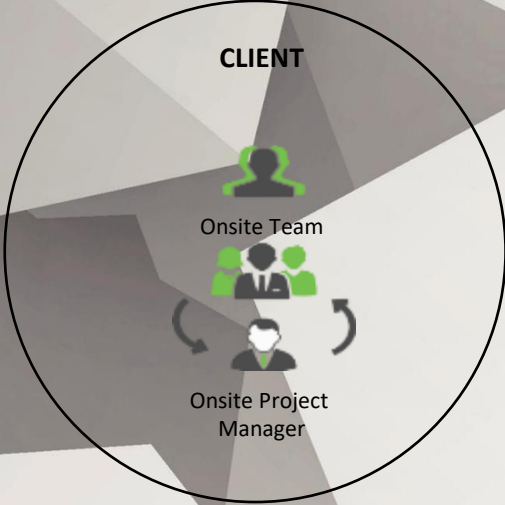
Delivering complete lifecycle of innovative web development services harnessing technological prowess to tap the full potential of IT for business excellence.

OFFSHORE DELIVERY



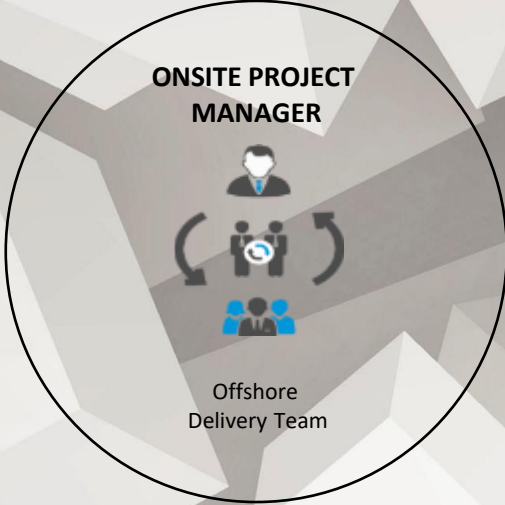
Entire project execution right from initialization to final delivery is done from offshore facility. This model is beneficial for quick resource ramp-up and reduced cost.

ONSHORE DELIVERY



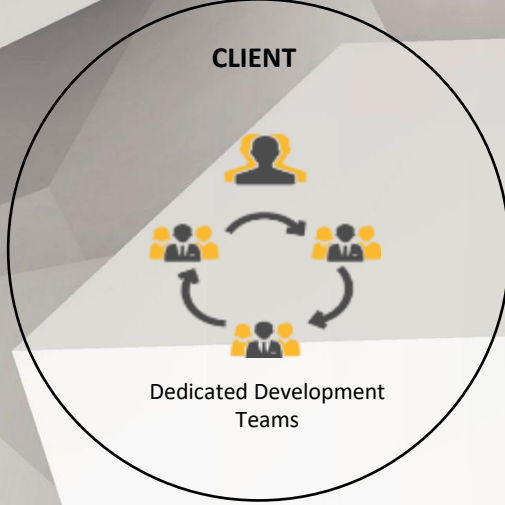
Development team works at onsite client location or at Oblangata's local Delivery center. Speed up development without adding to the additional in-house team, thereby saving costs.

HYBRID/NEARSHORE MODEL



Key resource work at onsite client location and rest of the development team at offshore. our onsite and offshore team. This enables to deliver quality solutions in guaranteed time.

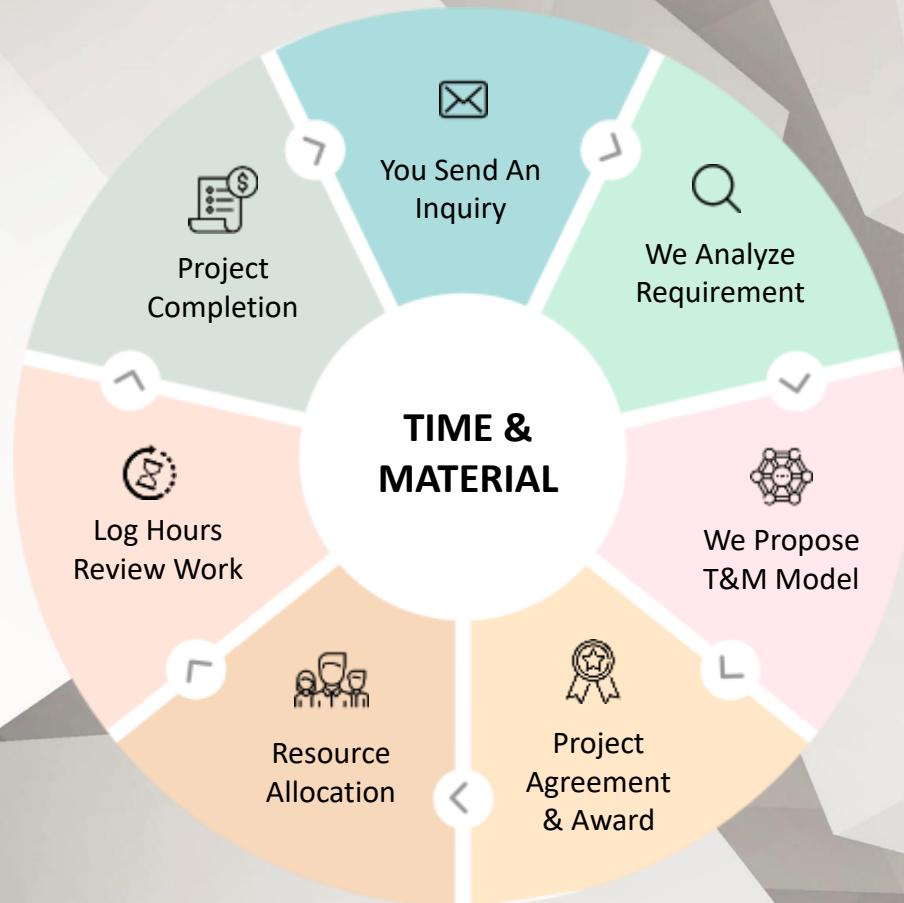
DEDICATED DEVELOPMENT TEAM



Works like an clients extended development center. Comprises of a professional team trained as per client's business model, operation and processes..

Pricing Model

We are committed to delivering outstanding services for software development, internet marketing, and IT outsourcing at affordable packages. Providing different types of pricing models to suit changing business scenarios and needs. Our pricing models comprise of:

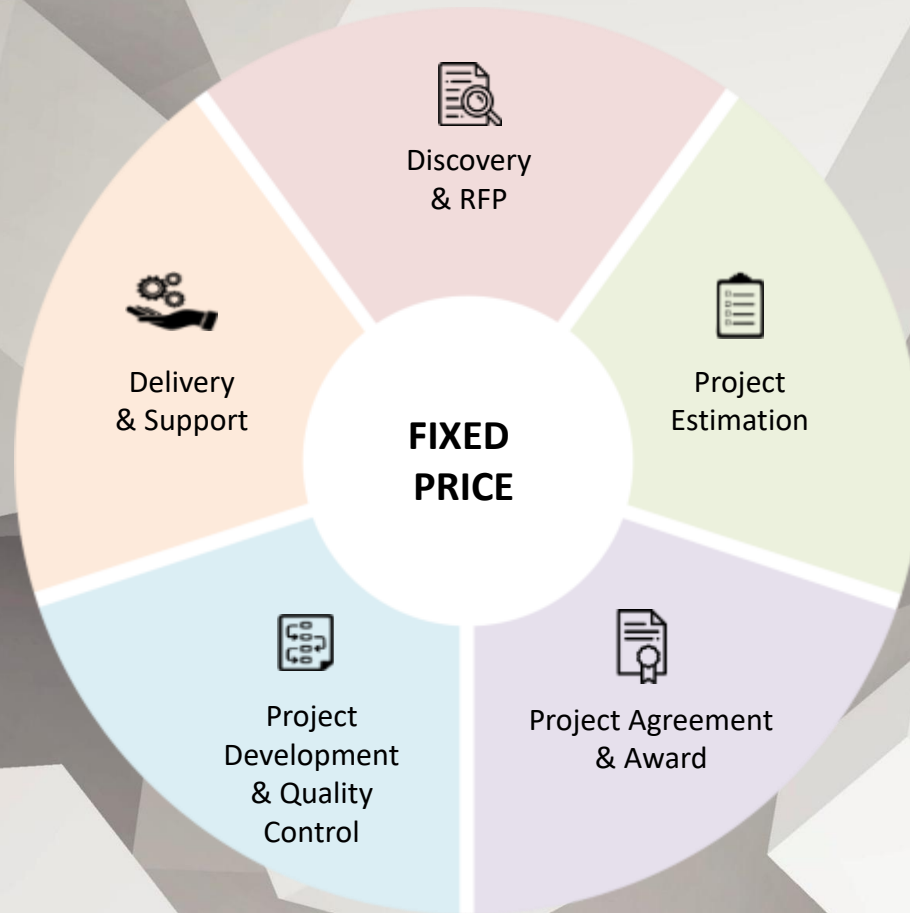


This model provides flexibility to define and change project specifications at any stage of its implementation.



Monthly Cost and resource engagement are specified before the beginning of the work on project and client manage the team.

Pricing Model.....Contd.



Cost and timeframe are specified before the beginning of the work on project as little supervision is required from the client, all requirements are defined beforehand.

Subject Matter Expert – Design, Development, Testing & Certification

Structural Design

SME with 30 years of experience in Product design, Manufacturing and Assembly of complex Industrial Machinery & Off-highway equipment,

Expertise in “Structural Design and Development including CABINs for various earth moving equipment”

Designed chassis and bodies for 35 ton and 60 ton dumpers, front boom and rear frame of motor grader, structures for aircraft weapon loader.

Worked in off-highway fabrication and machine shop for considerable time

15 years of management experience of leading independent units



Vendor Development, Manufacturing, Testing & Certification

32 years of varied experience in Industrial engineering, Technical coordinator, inventory management, purchase, factory maintenance, testing & certification of defense trucks & mining equipment, assembly and build, product inspection, six sigma quality, lean manufacturing, establishing company standards, heading the steel processing plant, Drawing quality of the construction and mining equipment

Expertise in Should Costing, manufacturing, supply chain, NPD, team management, Process planning, Assembly, Testing & Certification

Worked as plant head, working as delivery head and managing several projects of international repute



Subject Matter Expert – Drive train

Drivetrain Engineering

35 years of experience in Drivetrain engineering and developing axles for BEML dump trucks and motor graders

Developed full floating planetary axles (35, 40, 60, 70 & 100 ton capacity), tandem axles, oscillating axles, wet multiple disk brakes, slewing bearings and PTO's for dump trucks, 140 hp front end loader, 60ton bottom dumper, motor graders, hydraulic excavators and under ground mining equipment like side discharge loader & load haul dumper and monitoring of in-house and field trials at customer site

Expertise in performance requirement evaluation, powertrain matching & engine selection, electric drive engineering, design & development of front & rear axles, final drive & PTOs



Transmissions and Axles

- 35 years of experience in R&D of Earthmoving machines, Automotive/Tractor Design & Development.
- Headed Advanced Engineering COE consisting of New product development, Benchmarking and Field load data acquisition functions.
- Headed Transmission COE for 2 decades in BEML and Mahindra & Mahindra. Experienced in Design and Engineering of Power shift, Synchromesh and Collar shift type of Transmissions, Gears, Brakes, 4WD Axles, Final drives, Power Line Components etc.
- Expertise in stress analysis CAE, DFMEA, QFD, DMU
- Have been instrumental in executing the technology transfer of ZF transmission, Leading design collaboration with Ricardo & Lead the Configurability project with Mckinsey



Subject Matter Expert – Integration & Validation

Vehicle Integration & Program Management



- 35 years of experience in Engineering Design, Testing and Analysis in addition to people & business management. Over these years he has worked with BEML, Mahindra & Mahindra and HCL Technologies.
- Held various positions such as Aggregate leader for vehicle integration & testing, Head of CAE & NVH at M&M Farm Equipment Sector.
- Expertise in building Center of Excellences (CoE) like CAE, Testing, Reliability, Manufacturing engineering and Product Cost Engineering.

Testing & Validation



- Over 33 years of experience in testing and validation of powerline aggregates used in BEML - Earth moving machinery. Mainly transmissions, axles, torque converters, PTO's, etc., Design of automated test rigs for evaluation of the above aggregates. Conceptualization of various testing requirements as per the customer needs
- Endurance testing of transmissions (gear box) and axles, validation hydraulic aggregates like control valves, cylinders, gear pumps, etc.
- Noise and vibration measurement as per the standards and off-line analysis of data captured during testing
- Designed and developed the transmission control valve test rig for evaluating the performance of the control valve independently before mounting the transmission

Subject Matter Expert – Automotive

Automotive & Transportation - 1

- 32 years experience in Design & Development in Automotive industry
- Core Competence area are Chassis Systems, Suspension, Brakes, Steering, Drive Train, Axles, Seating, Safety systems like ABS / ESP, Airbag, Seat Belt, Vehicle Integration etc. Also worked on vehicle Exterior, Interior & Misc. Mechanical Systems, Battery Pack, Rear Tub Electronics packaging etc.
- Possess experience in component testing, system level and vehicle level testing etc.
- Vehicle Integration: Design & Packaging of all Mechanical, Electrical & Electronics items in vehicle, system & sub-system level; Routing of Wiring Harnesses, Piping, Cabling etc.
- FEA Analysis of Major Mechanical systems like Chassis, Suspension A-Arm, Trailing Arm, Pan Hard Rod, Knuckle, Hub, Anti-Roll Bar, linkages etc. involving Structural, ADT, Crash simulation, Pedestrian Safety (Lower leg form impact, Adult & Child Head form Impact on Bonnet), Seat & Seat Belt Anchorages, NVH, CFD etc. utilizing in-house resources & outsourcing from various agencies
- Vehicle Dynamics simulation using ADAMS & MOTION-SOLVE / SUSPROG etc. to optimize Kinematics & Compliance parameters & finalize Suspension & Steering Geometry Hard Points. Simulation for Vehicle Stability (Sine with Dwell Test)



Automotive & Transportation - 2

- 30 years experience in Design & Development in Automotive industry
- Experience in Automotive Design and Development of passenger cars, electric vehicles, tractors and two wheelers
- Development and validation of ABS and ESP systems for passenger cars
- Airbag system development to meet the Euro NCap requirement and Crash test data correlation to improve the performance
- Suspension development, tuning and performance validation
- Development of Power steering , tuning and optimisation
- ESP system performance tuning and testing at low friction surface
- Vehicle Crash structure development, vehicle crash testing and optimisation for better dummy injury requirement
- Component and vehicle validation
- Fatigue and stress level testing and validation
- Homologation expertise's – India , Europe, Japan, Australia
- Electric vehicle and systems design, development and Integration



Subject Matter Expert - HYDRAULICS

Hydraulics System



- 32 years of experience handling multiple CPI, NPI, VAVE projects, served BEML, L&T Hydraulics, Mahindra tractors, Defense system, Caterpillar, and Volvo
- Expertise in handling QFD, features, product architecture, DMU, test rig design and development, manufacturing process, materials, Fixture & gauges, costing, GD&T, CAE, DFMEA, proto build, reliability growth, failure analysis & problem solving, DFMEA, regulatory reviews, production build.
- Executed various projects in design and development of Hydraulic system & component design, control valves, cylinders, linkages, chassis, structural members, gearboxes, electronic controls, power steering, brake systems, seals, manifolds, filtration, lubrication & oil for tractors, loader, motor grader, backhoe, compactors, pavers, dozer etc.

Hydraulics System



- 35 years of BEML R&D experience in the hydraulic system development for construction and mining equipment
- Key contributor to develop various hydraulic components and systems for wheel loaders, dump trucks from 35 to 100 ton. Dozers, motor graders and hydraulic excavators
- Hydraulic system engineering: complete subsystem design, steering system, work attachments, hoist system, hydraulic braking system, suspension, hydrostatic drives
- Component design & routing: cylinders, accumulators, manifolds & valves, advanced sealing techniques, reservoirs & filtration

Subject Matter Expert – Virtual validation & tooling

Virtual product development expert

- Ph.D. in Applied Mechanics – Cornell University; M.Tech (Machine Design) & B.Tech(Mechanical) – IIT Kharagpur
- 35+ years experience in Product Design & Development
- Expertise in:
 - ✓ Fracture mechanics
 - ✓ Composite materials
 - ✓ Nonlinear elasticity
 - ✓ Fluid mechanics
 - ✓ Dynamics & NVH



Tooling Expert

- ~ 30 years experience in Engineering Design & Development, Tooling etc
- Master of Science in “Smart Product Design” from Nanyang Technological University, Singapore;
- Masters in Tool Design & Manf.”, TRTC, NewDelhi; B.Tech - JNTU
- TRIZ Professional, Rich experience in New Product Development, Product Innovation, Tooling engg etc.
- Through knowledge in Patent circumvention strategy using TRIZ based design around methods.
- Have worked with customers spread across USA, Europe & Japan
- Expertise in tooling engineering: Tool planning, design and manufacturing, tool qualification for plastics, sheet metal and die-casting components
- Have worked in Molex, Singapore, Thermo Fischer – Singapore, L&T etc.



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OBLANGATA CONSULTING DEVELOPMENT CENTRE

