

Significant Accomplishments

Preamble

As Subject Matter Expert, attended and solved many (more than 100) live World case studies at different Organizations that mattered a lot financially to solve specific problems related to Vibrations, Noise, NVH, Tribology (Friction, Wear, Lubrication), Rotordynamics, Turbine Blade Dynamics, Structural Dynamics (Base Frames, Steel Foundations etc) related to rotating machinery of Steam and Gas Turbines, Centrifugal Gas Compressors, Centrifugal Pumps, Turbo-Expanders, Mechanical/Dry Gas Seals, Electric Motors, Diesel Engines, Gear Boxes besides Two and Four Wheeler Vehicular Dynamic Problems. Also conducted design, testing and evaluation of GOEMs sailent canopies (green) of diesel power gensets. In all above cases submitted hundreds of technical reports to various organizations and some of them published/read National and International Conferences in the best interests of sharing knowledge to the professionals and also for future references.

I. Energy (Oil and Gas and Petrochemical) Sector:

M/s TCI-Sanmar Group, VCM Plant 3, Egypt, Consultancy from 24th August 2021 to 2nd Feb 2022:

The problem: High speed Centrifugal Refrigerator Gas compressor three months shutdown due to DE side Journal Bearing fatigue failure resulted productivity losses of USA \$10M

A systematic FRCA analysis performed by collecting historical processes gas operational data, machinery Vibration data, design inputs of Balancing Piston and its performance vis-à-vis vibration levels revealed design deficiency of Lab seal gap between stationary and rotating seal rings lead to fatigue failure of Lab seal ring and consequential damages to the NDE journal bearing and impeller discs. **OEM M/s Johnson Industries, USA** agreed the design defect and rectified the same by changing the BP ring material from Brass to AL and as well increased the existing 50 microns gap between rotary and stationary seal to 100 microns (Bearing vibration trip value + 25 microns more). The old BP is replaced with new in the month December 2021 and since then its working without any problem and giving design PVC throughput of 45 tones /hour

Petrofac International Ltd., Sharjah, UAE: SME/Technical Advisor- Rotating Equipments/Asset Integrity & Technical Assurance: March, 2009 - Nov 2016:

1. As subject Matter Expert conducted Rotordynamics Design review as per API, DEP for Steam Turbines, Gas Turbines, Centrifugal Gas Compressors, Centrifugal Pumps, Electric Motors, Screw Compressors, Integrated Centrifugal Gas Compressors, High speed step-up Gearboxes, Turbo-expanders of various makes i.e., GE-NP, GE-TD, Solar Turbine, Flowserve, Cryo-star, Man-turbo, Flender etc.. of about 60 of rotating equipments of various projects whose worth is about USA \$ 150M to ensure upfront design alerts to avoid unforeseen premature failures caused by border line design specifications

2. Six MW Reciprocating Compressor piston failure root cause analysis & mitigation by new piston design, a joint effort with vendor. New design in place and running without any problems -**OEM : Mitsubishi Engineering, Japan**
3. Ten MW Gas Turbine (GTG) catastrophic failure root cause analysis & mitigation by engineering improvements of axial compressor IGV root resting washer, bush and software correction of actuating system, a joint effort with vendor is successfully completed and implemented across all models produced by the vendor -**OEM: Solar Turbines, USA**
4. Engineering Change of centrifugal compressor shaft ends to avoid galling/scoring effect causing during coupling hub removal. Detailed FRCA conducted and mitigated successfully by surface laser welding treatment. A joint effort with **OEM: GE TD-France**
5. A18 MW rated gearbox high speed pinion vibration resonance near rated RPM. MRT test results were reviewed and directed the vendor to redo the rotordynamics calculation of lateral critical speed to shift the natural frequency by redesigning the pinion shaft. The revised design is in place & successfully eliminated the resonance problem. **OEM: Fender - Germany**
6. A 18MW rated centrifugal compressor shaft driven lubrication oil Pump seizure due to cavitation. Detailed FRCA was conducted and accordingly went for a proto design, development & testing from a vendor. The new pump was successfully tested and the results were quite satisfied. A technical article was jointly prepared with vendor and the same was read in ASME- Turbo Expo- 2013 internal conference, San Antonio- USA. It was well received by attendees and the same is now published in ASME journal for Gas Turbine & Power. **OEM-GENP- Florence, Italy**
7. A 5 MW MOL Pump Mechanical seal high leakage was analyzed by RCA and the reengineered seals with improvements of carbon filled (25% graphite) backing ring seating, 75% closing balancing force, coil spring constant, Metal backing ring instead PTFE ring with higher diametral clearance has resulted substantial reduction of inboard & outboard leakage i.e., below 100cc. A joint effort with vendor went very well. **OEM: Flowserve-Rosandal, Netherlands**
8. The same MOL pump of above was producing high NDE vibrations due to rotor instabilities and was resolved by changing the existing 4 lobe bearing to 3 lobe hydrodynamic bearing design. The new design is successfully worked and is now in place in all 4 pumps. A joint effort with vendor went very well.**OEM: Flowserve- Rosndal, Netherlands**
9. Turboexpander IGV / Impeller and shaft resonance resonances and axial thrusts were resolved by redesigning and increasing the impeller vanes and IGV numbers. Problem identified and got it resolved through OEM at their cost. **OEM: Cryo-Star-France**
10. HP Flash Gas compressor train bearing high vibrations and the same is resolved by conducting Lateral and Torsional vibration studies at their labs and re-deigning the same and implementation. Problem is resolved successfully by taking suitable actions on gearbox side also. **OEM: Man Turbo-Zurich- Switzerland**

II. Training & Development:

1. Imparted six months Corporate Rotordynamics training for Sr Engineers and above in Sharjah, Indian offices and Saudi offices and developed in house Competencies

2. Developed a detailed e-learning course on Rotordynamics supported with real world cases studies using SharePoint Admin and shared the same to all trained participants across Petrofac. The course material is centralized at UK Woking office server and having copy rights only to Petrofac and to the self (the author) of the course material prepared

PEQUIVEN/PDVSA, Venezuela: Technical Advisor-Rotating equipments June 1994-May1999

1. Successfully completed Rotordynamic studies and implemented the retrofit design of Hydrodynamic bearings for high speed Centrifugal Gas compressor of Ammonia plant. OEM: GENP
2. Successfully completed trouble shooting and Failure Root Cause Analysis -FRCA & remedial solutions for Cloro-soda Centrifugal Gas Compressor gearbox
3. A 16 MW Centrifugal Raw Gas Compressor of Olefina plant had impeller shroud cracks, was investigated for the failure root cause by vibration impact test and superimposed those natural frequencies found on Campbell diagram drawn and found nodal diameter excitation and the same was verified by FEM results given by the supplier. After series of deliberations, OEM agreed to rectify the defect by shifting the natural frequency from operation zone by increasing the thickness of the shroud. OEM: Demag Delval, Germany,
4. Competencies developed to carryout in house theoretical Rotordynamics activities in the R&D environment and as well in the field
5. Imparted training and development for Senior Engineers and Managers in Rotordynamics & Tribology (emphasis on bearings) specialized subjects to PDVSA Oil and Gas and exploration companies i.e., Lagaven, Maraven and INTVEP
6. Imparted training to carryout vibration analysis and as well experimental model analysis
7. Successfully established a relation between blade to disc root gap and natural frequency by completing studies on 10 Westinghouse turbines discs. This relationship has helped the maintenance dept., to take appropriate preventive maintenance measures to avoid blade resonance & catastrophic failures

II. Power Sector:

N.T.P.C, (2000MW corporate, Ministry of Power, Govt., of India) New Delhi, India: Deputy Manager-R&D June 1986-Oct 1989

1. Successfully completed vibration studies & FRCA on 200MW steam turbine LPT-last but one stage lacing wire/ shroud / blade failures and confirmed the design deficiency through theoretically investigations and proved the same by conducting the rap test of bladed pockets i.e., 7th harmonic nozzle frequency excitation with Grid operating frequency band. The results discussed with the OEM supplier M/S Ansaldo, Italy and subsequently proved the correctness of findings by incorporating the modifications of shifting the 7th Harmonic by increase the group pocket from 5 blades to 25 blades. This modification was done one unit and conducted a live experiments at 70MW operation to validate the theoretical predictions

of shifting the 7th harmonic resonance with grid operating frequency band. After successfully proven the improvements the same design changes are incorporated in the rest 2 units of 200MW. This study has resulted huge cost savings in terms of reduction of maintenance, down time and plant shut-down of 3 x 200MW of 3 months, which resulted very huge savings to the company and great learning to Vendor designers to improve their future designs of same models and as well correcting the units already in operation at various customer field across the globe.

2. Successfully established Noise and Vibration lab facility to carry-out condition monitoring studies of Steam Turbines, Compressors, Pumps, Coal crusher units
3. Successfully conducted & completed the trouble shooting (RCA) & remedial solutions for major equipments like ID & FD fans, Coal Crusher units, BF pumps and implemented long lost design improvement solutions
4. Successfully Imparted training and development program to O&M Senior Engineers to carry out confidently the condition monitoring and fault diagnosis studies of all rotating equipments

Suzlon Wind Energy Limited, Pune, India: VP/Head-Technical Audit Mar, 2007-March 2009:

1. Implemented preventive and predictive maintenance programs in national & international wind farms by successfully conducting systematic /scientific Technical Audit programs at design office, manufacturing shops & field operations
2. Developed technical competencies in Rotor blade Aerodynamics, Reliability, Vibrations measurements and analysis, NVH, Tribology, Composite materials
3. Conducted several value engineering programs and cost saved about Rs50 corers
4. Conducted fire mitigations WTGs and implemented successfully the cost effective state of art Bus-bar ways technology on proto basis to replace the conventional cable technology. Corporate objectives are achieved.
5. Proposal submitted to establish full pledged Vibration and Noise instrumentation facility to carryout corporate level investigations. The job is completed & objectives of corporate requirements are achieved, top management satisfied
6. Created & completed successfully the data base management on blade profiles using JAVA -SQL software
7. Technology portal at concept level to attend field issues & solutions online (Expert escalation system) through satellite network is completed successfully and submitted a formal report to the management to implement the same.
8. Successfully established & completed the High computational lab (parallel processing system) to carryout CFD analysis of rotary blades in collaboration with C-DOC Pune, Parma Super computer systems.

IV. Automobile Industries:

Cummins India Ltd., (MNC) Pune, India: Senior General Manager-Engg, Mar 2006- Mar2007

1. Sponsored two DFSS (design for six sigma) projects i.e., Diesel Genset Electronic control panels & 350KVA Fan hub failures analysis successfully complemented and implemented results in the design stage to overcome the same. This has resulted for the substantial reduction of warranty costs and improved the customer satisfaction by delivering reliable product
2. Introduced successfully at corporate level Zero defective initiative by implementing the scientific concepts of Reliability, Durability and Safety techniques
3. Organized & completed successfully the Reliability Engineering course to senior engineers & managers (R&D, Quality dept)

Kirloskar Oil Engines Ltd, Pune, India: Associated Vice President-R&D Jan 2003-Feb 2006:

1. Successfully completed the design and Development of Eco-friendly silent Genset canopies for all ranges of engine ratings i.e., 5kw to 650kw (Total 23 variety engine ratings)
2. Established successfully and completed the State of art cost effective Reliability, Durability and NVH lab to carryout design verification and validation of in-house & vendors supplied components like crankshafts, engine crank case, radiators, Genset instrument panels, exhaust gas air bellows, silencers etc.
3. Successfully established and implemented the practical procedure to verify the theoretical crank shaft torsional results (AVL - BRICKS software results) by conducting experimental (using n-coder) investigations on 250KW & up rating diesel engines. The procedure is applied for all higher engine models and results obtained were quite agreeing with theoretical predications.
4. Used AVL- BRICK software and successfully designed a torsional damper for 250KW engine
5. Responsible to complete noise and emission norms complied by CPCB of Ministry of Environment & Forest, Govt of India for Gensets up to 600KVA (i.e., total 23 models starting from 5kva to 600kva air cooled & water cooled engines) and procedures to achieve the same was implemented at all GOEMs (Generator Original Equipment manufacturers), which is now as guide lines for ARAI, CPCB Certifying agencies for assessment of Gensets produced by various manufacturers. This was acknowledged by CPCB authorities of Ministry of Environment & Forest, Govt of India, New Delhi. Received Golden Peacock Innovation Award at the hands of Central Cabinet Minister -Technology, New Delhi for successfully completion of the first Indian Eco-friendly Green Genset of 250KW rating. The same Genset was inaugurated by President of India on centennial celebration of Kirloskar oil engines, Pune
5. Responsible and co-author for publishing and reading 3 SAE papers (Fatigue, Vibrations, Emission) in SIAT-SAE 2007 international conference, Pune, and received the 2nd best paper award for engine emissions
6. Competencies developed in use of CAE (FEM), AVL softwares for design and development of in-house cost effective, reliable, durable, safe engines and its components. The job is completed successfully and implemented for its use across corporate
7. Project Digvijay: Design, development and testing of family of Four Diesel Engines of Higher capacity i.e., 300, 400, 500 and 600 kva V-Type, 4 Valves engines as an import substitute for Daewoo Diesel Power Generator Engines. It's a game changer product for KOEL

from classical in-line to V type engines. To start with, totally responsible for procuring AVL - Austria softwares, inducting manpower, establishment of New NVH and Fatigue lab to conduct various tests to verify component designs. Associated with the project till first proto 300KVA test fired in the in-house power-line lab

Kinetic Motor Company Ltd., Pune, India: Deputy G.M-R&D, April 2000-Jan 2003:

1. Established successfully the state of art NVH laboratory to carry out bench marking studies and as well test and verification of in-house designed scooter, motor cycle and its engines components
2. Developed competencies in use of CAD/CAE (FEM) software in design and development of components & scooter chassis
3. Successfully administered the production of cost effective plastic part moulds from Taiwan and completed the assembly of first 50 protos within record time of 90days.
3. Successfully administered and completed the most cost effective, reliable, and durable fuel efficient euro-2 emission standards, 65cc Kinetic Zing scooter project right from concept, design, development, manufacturing, testing and commercialized with-in a record time of 24 months.
4. Successfully administered for the establishment of Assembly Balancing-Line in production environment to produce faultless assembled vehicles. This faultless procedures completed and implemented on production shop floor with-in record time of 60 days

B.E.M.L-R&D (Ministry of Defence, Govt., of India), KGF, Karnataka, India: Senior Manager-R&D Nov 1989-June 1994

1. Developed competencies of engineers in use of NVH facility for the purpose of verification and validation of in-house engine & vehicle component development
2. Selected from a competitive group of more than 500 professional candidates for the number one position to spearhead cross functional task force team at corporate level to carry out Failure Root Cause analysis of various components of equipments in the field and evolving solutions for the same. The observations made from the field study & design improvements done has resulted the reduction of failures from 65% to 15% & warranty replacement cost reduced drastically by about 80%
3. Successfully administered, executed and completed the high tech centralized machining programming cell i.e., CAD/CAM, DNC system in a CNC manufacturing environment of 15 CNC machines. This has resulted the high productivity, consistence in product quality that lead to huge economic savings from component rejections
4. Successfully administered, executed and completed the design and development of 35 tone rear dumper as an import substitute for Dresser and produced first 5 proto models to perform field studies and validate the theoretical predictions by acquiring the static and dynamic stresses data (using telemetry system) when the truck is in the operation i.e., loading, hauling and dumping the material.

5. Successfully completed the experimental investigations to check the suitability of in house produced Tatra-truck for transportation of Radar systems (defence project) on a very rough terrain field conditions

6. As Head - Structural Lab, administered for the successful execution of FEM analysis of various structural components of dumpers, excavators, dozers & facilitated to carry out the durability (fatigue life) studies in the lab 24x7 to verify the theoretical predications and to ensure **right at first time designs** are in place to ascertain reliable products that will be produced. For example, conducted in-house 4 pole poster simulations (Hydraulic Actuators-MTS, Sank & Dartec) for the proto chassis, 2 pole posters for the front and rear axles & single poster for the shock absorbers etc., to ensure its design life cycle in place

7. Lead the design team to design & development of lab test rig to conduct experiments on PSLV Rocket (ISRO space project, Govt of India) the very 1st proto Base Shroud with strap on 3 motor to check design safety margin & reliability (stress analysis design verification)-ISRO-Trivandrum 28th November 1990

Escorts (Agricultural Tractor & Industrial Equipment manufacturing Industry), Faridabad, Haryana, India: Assistant Manager-R&D, May 1981- June 1986:

1. Successfully completed & established NVH lab to carryout in-house component design verification and validation in the lab and as well in the field

2. Successfully completed Design and development of dynamic balancer for 2 cylinder diesel engine (35HP) and implemented the same after testing in the R&D lab

3. Successfully completed the cost effective and ergonomically efficient mudguard design (by FEM), development and implemented the same after vigorous R&D tests in the lab. The same mudguard was further optimized its design such that the exciting natural frequencies would not affect human fatigue when it is used for transportation purposes in a rural areas.

4. Successfully completed the design and development of 1/8 size model low frequency (1HZ) Vibration Isolation Suspended Bed (active and passive) as a bench marking to construct an actual bed of size 5x4x1.5 meters

5. Developed A software (Fortran IV) to design cost effective Hydrodynamic bearings for diesel engines and the same was read as a research paper in an international sponsored conference (AMM affiliated to IFFToM world congress)

6. Successfully performed the failure root cause analysis of Engine crankshaft bearing failures and implemented design improvements to avoid the same.

7. Successfully developed & validated dynamic balancing procedure (fine tuning field balancing) to conduct direct dynamic balancing of engines when the engines are assembled on the tractor

V. Academy:

Vasavi College of Engineering (Autonomous), Osmania University, Hyderabad: Adjunct Professor from August 2017 to August 2019

1. Taught Vibration Engineering subject and took Seminar Classes to M.Tech Students

2. Internal Evaluation of M.Tech students thesis

I.I.T Delhi (Academic Institute, Ministry of Education, Govt., of India), India: Senior Research Assistant Oct 1977 - May 1981

1. Associated in the establishment of ITMMEC - Machine dynamic lab
2. Successfully completed the design and development of high speed 10000rpm turbine blade test rig and commissioned the same in the Machine Dynamics lab to conduct free vibrations of turbine blades in a vacuum chamber
3. Successfully completed an R&D work on impregnated Graphite aluminum material and it's compatibility with other material for industrial use.
4. Successfully completed Ph.D., on Turbine blade vibrations and received degree, in the year 1986