

# NVSAGE

Newsletter on Noise and  
Vibration Engineering

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## FOREWORD

By Krishna Balamurali,  
Principal Engineer

A good mix of varied testing and analysis tasks combined with a sizeable query build up all through the months of August and September is the highlight of this Q2. The results were overwhelming with Q2 results that crossed the numbers of the previous FY.

Two ultra precision factory floor vibration analysis were carried-out; one designated for a premium brand mobile phone manufacturing and the other is for a nano-grade chip design facility. In both cases, compliance to VC curves were to be met, both during site testing, data analysis and its presentation.

This further extended to analysing the lab floor for its installed robotic arm in a leading German automotive R&D centre, both the measurement campaign and the results were derived in strict compliance to customer requirements.

Mumbai Metro engaged NV Dynamics to conduct GBN and ABN assessments for the newly commissioned Line-3. This task and its site

execution were conducted to evaluate the performance of LVT over a 6 KM tunnel stretch; stringent norms of RDSO were considered for evaluating the operational performance of the track.

Q3 of the FY has just begun and we are already queued up with tasks of various definitions; We just received a large size order to address airport noise issues caused by luggage belt movements and we are also finalising on a high raise civil structure dynamic analysis in co-ordination with a famed university.

Testing of air-conditioner piping system for a Japanese brand, evaluating room acoustic performance for a high end glass manufacturing company to many such innovative tasks are in progress. We hope to accomplish and exceed our target assignments and the overall revenues to set new goalposts in the ensuing year.

# RCA OF BELT ALIGNMENT ISSUES IN A TWO-WHEELER DRIVETRAIN

By Varun Yadav, Engineer - Technical Services

## THE CHALLENGES AND APPROACH

A leading Indian automotive two wheeler manufacturer is developing a new electric variant bike; of the many challenges faced in such developmental activity, the critical aspect of belt transmission from the electric motor to the ensuing kinematics and drive train became a issue of concern.

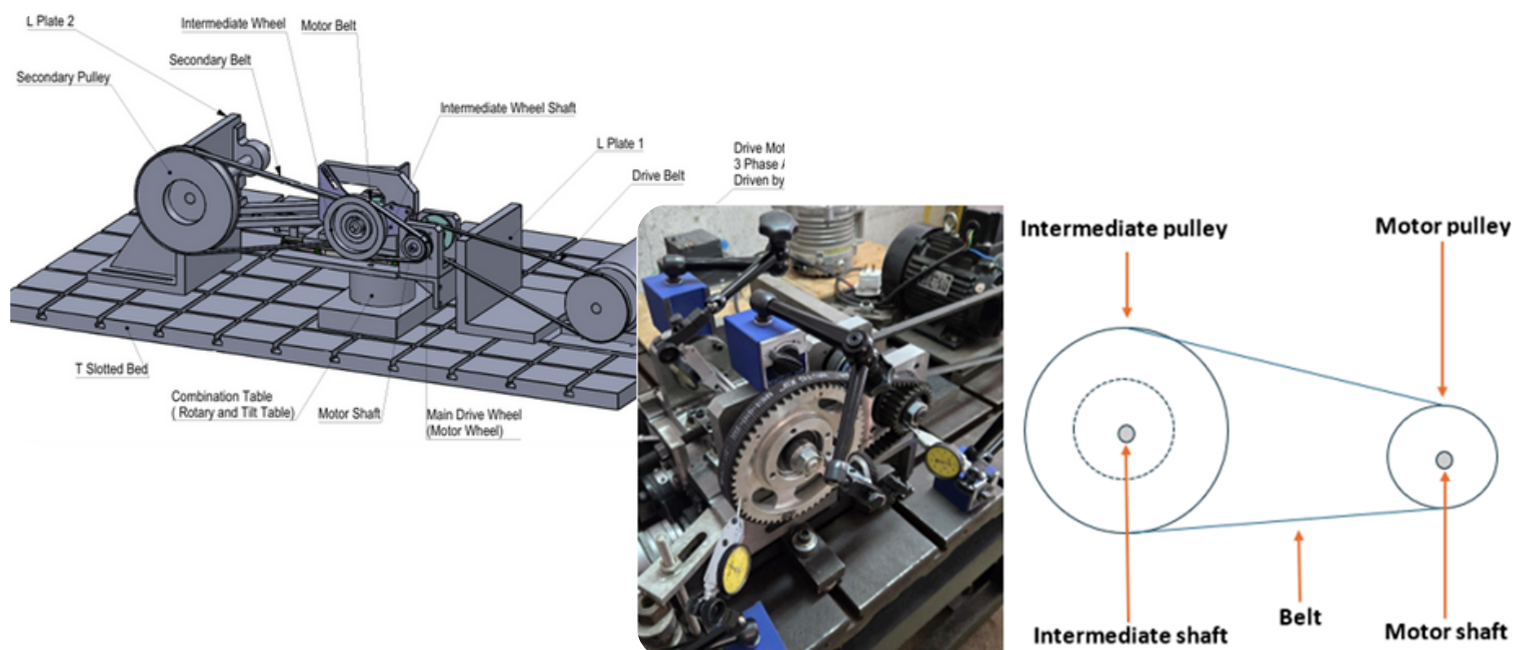
Given the speed, torque and load requirements of the drive transmission, customer reported drift in the belt axis over the drive and driven pulley. NV Dynamics was assigned the task of conducting test simulations to identify the probable causes and further to determine methods to address them.

## TASK TAKEAWAY

After extensive testing, the primary cause of the drive belt shifting outward was found to be the intermediate shaft bending beyond its intended design limits due to excessive overhang from the nearest support point. This overhang affected bearing clearances & contributed to the shaft's deformation. Subsequently, several crucial design modifications have been recommended and are being implemented by the vehicle manufacturer.

## SITE ACTIVITIES

To perform the root cause analysis (RCA), the customer provided key components of the drivetrain system, including the primary and intermediate shafts that house the motor and intermediate pulleys, respectively. After assembling the necessary fixtures to replicate vehicle operating conditions, static and dynamic tests were conducted to pinpoint the source of the issue. These tests involved adjusting belt tension to simulate various load scenarios, measuring shaft axis deflections with dial gauges precise to the micron, assessing flange bending angles and repeating the trials with different shaft materials. These steps helped identify the root cause of the problem the manufacturer was encountering.



# VIBRATION ANALYSIS AND IN-SITU BALANCING FOR LARGE SIZE FLUID COUPLERS

By Deepak & Chiranjeevi, Engineer - Technical Services

## THE CHALLENGES AND APPROACH

Unbalance in rotating equipment such as motor and fluid coupler lead to excessive vibrations that induces stress in bearings and connected mechanical components, risking premature failure. The danger of resonance increases at critical speeds, potentially causing catastrophic failures in such key machinery which are typically used in process and manufacturing industries. Despite quality controls, some residual unbalance remains due to installation and maintenance variations. To address these challenges, vibration analysis along with in-situ balancing is carried out to reduce the unbalance forces in the system. This technique of in-situ balancing allows for precise, real-time modifications in the installed condition of the machinery and help reduce the overall unbalance forces within acceptable limits. One such case involving in-situ balancing of motor and fluid coupler units at Bhilai Steel Plant is discussed in this article.

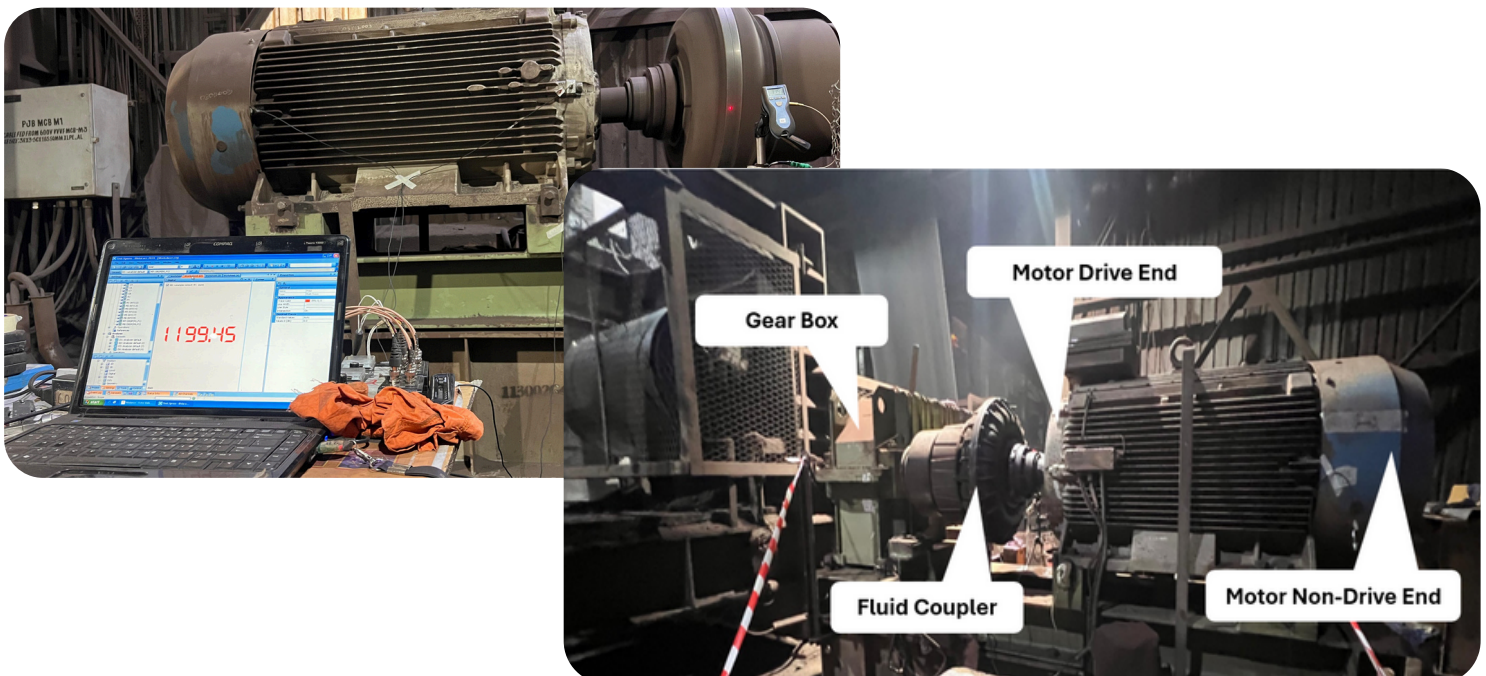
## TASK TAKEAWAY

Following dynamic tests and assessments, in-situ balancing is successfully performed by implementing the necessary unbalance corrections on both the motor and fluid coupling planes. This accomplishment reaffirmed our expertise as a dedicated Condition Monitoring and In-situ Balancing Services team, demonstrating our project management skills, technical proficiency, and commitment to delivering high-quality service within established constraints.

## SITE ACTIVITIES

The drive system, comprising the motor, fluid coupling and gearbox are sequentially operated at its designated speed without any connected load. Tri-axial accelerometers are configured on both ends of the motor bearing housing and on the gearbox ends. These are then connected to a multi-channel data acquisition system for data recording and analysis. RMS vibration velocity values are analysed against ISO 20816, prompting in-situ balancing if necessary.

If balancing is deemed necessary, oil is completely drained from the fluid coupler, allowing the motor (prime mover) to operate independently. The unbalance forces in the motor are first addressed with addition of trial weights on the motor drive end & performing calculations to accurately determine the required corrections. Once the residual unbalance in the motor is within acceptable limits, oil is refilled into the fluid coupler and the balancing corrections are repeated on the entire motor-fluid coupler assembly to achieve the acceptable vibration velocity levels.



## ➤➤➤ PHYSICS TO KNOW



**Sound Can Levitate Objects** Yes, you read that right—sound can levitate objects. This intriguing phenomenon, known as acoustic levitation, uses sound waves to counteract gravity's pull on small objects. By precisely controlling sound waves, scientists can create areas of high pressure where objects are suspended in mid-air. This scientific marvel not only showcases sound's real effects but also opens doors to applications like medical research and material manipulation.

## ➤➤➤ GREAT MINDS & THEIR CONTRIBUTION TO THE WORLD OF SCIENCE

**Pisharoth Rama Pisharoty**, a distinguished Indian scientist and the revered "Father of Remote Sensing" is renowned for his groundbreaking contributions to telecommunications and electrical systems, particularly in the realms of wave propagation and transmission line theory. His innovative research significantly advanced both theoretical frameworks and practical applications, through meticulous studies. He enhanced communication infrastructure in India, facilitating greater connectivity and accessibility for urban and rural populations. As a passionate educator and mentor, Pisharoty has inspired countless students, instilling in them a profound appreciation for the intricacies of engineering and fostering a spirit of curiosity and innovation. His prolific body of work comprising numerous influential publications and active involvement in professional societies continues to shape the field, ensuring that his legacy of excellence and innovation endures in future generations of engineers.



## CERTIFICATIONS



## CLIENTELE

