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NVSAGE

Newsletter on Noise and Vibration Engineering

www.nvdynamics.com
services@nvdynamics.com | +91 7760381818

NV DYNAMICS
VIBRATION. ACOUSTICS. BEYOND

FOREWORD

**By Ajith Krishna,
Lead Engineer**

This past quarter witnessed continued momentum in metro projects, with several opportunities progressing through advanced stages of bids and proposals. We successfully completed noise and vibration assessments for the full 19+ km alignment of Mumbai Metro Line 4 and are nearing completion of the construction and operational phase noise and vibration studies for the Ulaanbaatar Metro project in Mongolia.

20 YEARS OF ENGINEERING DYNAMICS 2005-2025

Beyond these engagements, the Madhya Pradesh Metro projects in Indore and Bhopal have moved into advanced bid evaluation stages and are currently undergoing technical assessment. Tender results are expected early next year and we look forward to being among the frontrunners.

Beyond our metro engagements, we continued to see strong demand from semiconductor R&D and manufacturing clients for micro-vibration evaluations of their facilities. During this period, we also successfully completed assessments supporting the national highway expansion project near Bhantawala, Karnataka and conducted onboard noise evaluations for two large vessels ranging from 3,000 to 5,000 tons. We are also proud to share that Bhilai Steel Plant (BSP) has renewed our contract for another three years—an endorsement of the trust and confidence in our service quality and delivery. In the last quarter, we look forward to finishing the year strong, meeting our KPI's and revenue targets. We are also working on a development project involving a portable, engineer friendly, 4-channel data acquisition system and I will be sharing more on this soon.

NOISE & VIBRATION ASSESSMENT OF MUMBAI METRO LINE-4

By Deepak D, Engineer - Technical Services

BACKGROUND

Mass rapid transit systems play a critical role in urban mobility, but their integration within dense city environments requires careful evaluation of noise and vibration impacts on nearby communities. Metro operations generate ground-borne vibrations and air-borne noise due to rolling stock dynamics, wheel–rail interaction, structural transmission paths and operational parameters.

NV Dynamics was engaged by Larsen & Toubro Limited Construction, to carry out a detailed Noise & Vibration Assessment Study for Mumbai Metro Line-4, an elevated corridor of approximately 19.48 km between Bhakti Park and Mulund Fire Station with seventeen stations.

TASK TAKEAWAY

This assessment highlights the value of combining field measurements, analytical modelling and comparative validation during the planning stage of urban metro projects. Establishing reliable baselines and understanding noise and vibration propagation studies enables early identification of potential impacts and mitigation needs. Such an approach supports regulatory compliance, protects sensitive receptors and contributes to the successful delivery of sustainable and commuter-friendly metro systems.

SITE ACTIVITIES

Ground-borne vibrations originate from dynamic wheel–rail interaction forces and propagate through the track structure, viaduct, foundations, and surrounding soil. Their transmission depends on ground characteristics, distance from the alignment and receptor building characteristics. To capture site-specific conditions along Line-4, baseline vibration measurements were conducted at selected receptor locations using seismic-grade transducers installed in three orthogonal directions. Ground transmissibility was assessed through calibrated weight-drop testing to evaluate vibration attenuation with distance.

Air-borne noise assessment involved establishing existing ambient conditions through continuous daytime and nighttime Leq monitoring using Type-1 noise data loggers. Train pass-by events of similar operating line in Mumbai (Line-7) were monitored for both vibration and noise to enable direct comparison of noise and vibration transmission characteristics. Analytical assessments considered train speed, headway, curvature and setback distances aligned with RDSO CT-38, FTA guidelines and relevant ISO standards to ensure consistent impact evaluation and mitigation planning.

ASSESSMENT OF BLAST-INDUCED VIBRATIONS DURING NATIONAL HGHWAY CONSTRUCTION ACTIVITY

By Chiranjeevi A M, Engineer - Technical Services

BACKGROUND

National highway networks are a vital component of inland transportation systems, enabling efficient movement of goods and services while connecting industrial hubs, ports, and economic corridors. The construction and expansion of such infrastructure often involve controlled rock blasting, which can generate ground-borne vibrations affecting nearby structures and public safety.

In this context, M/s. KNR Constructions Limited is undertaking construction works for the Bengaluru–Mangaluru National Highway (NH-75) near Bantwala, Karnataka. Considering the proximity of residential areas to the blasting zones, NV Dynamics was engaged to carry out ground-borne vibration assessments to evaluate structural safety and ensure regulatory compliance.

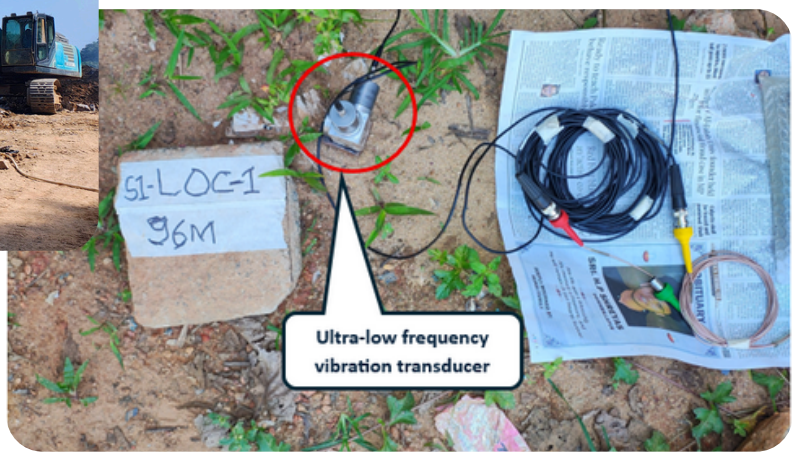
TASK INSIGHTS

The assessment confirmed that all measured vibration levels were well within the applicable DIN 4150-3 limits, indicating no risk of structural damage to nearby residential buildings. The study provided M/s. KNR Constructions with objective, standards-based assurance for safe continuation of blasting activities while addressing community and structural safety concerns through scientifically validated vibration monitoring.

SITE ACTIVITIES

Ground-borne vibration assessments were carried out at two blasting sites. Ultra-low-frequency vibration transducers were installed at all designated vibration monitoring locations across both sites. At each location, transducers were installed in both vertical and horizontal directions to capture the ground vibration response. The transducers were connected to a multi-channel data acquisition system configured to record vibration acceleration data during blasting events.

Two types of explosive devices (ED) were used at both sites. Blast site 1 consisted of four blasting locations, where XL ED were used at locations 1 and 2, and D-Guard ED were used at locations 3 and 4. Blast site 2 included five blasting locations; XL ED were used at locations 1 and 2, while D-Guard ED were employed at locations 3, 4, and 5. Vibration data were recorded simultaneously at suitably positioned monitoring locations to ensure comprehensive coverage of all blasting activities.



PHYSICS TO KNOW

Spiders do not rely heavily on their eyes to survive, especially in dark or hidden places. Instead, they use their webs as highly sensitive vibration sensors. When an insect touches the web, tiny vibrations travel along the silk threads. Spiders detect these vibrations through specialized hairs and sensory organs on their legs, enabling them to locate prey precisely. By analysing the strength and pattern of vibrations, they can estimate the size and movement of the trapped insects. This ability allows spiders to hunt effectively, repair their webs and stay alert in their environment.

GREAT MINDS & THEIR CONTRIBUTION TO THE WORLD OF SCIENCE

Sivaramakrishnan Pancharatnam, known as S. Pancharatnam, was an Indian physicist born on February 9 1934 in Kolkata. He specialized in optics and is best known for discovering the Pancharatnam phase, a geometric phase in polarized light that explains how light changes when passing through crystals. At a young age, he was elected as Fellow of the Indian Academy of Sciences for his early achievements. In 1956, while working under C. V. Raman at the Indian Institute of Science, he observed that polarized light through crystal plates produces an interference pattern with an additional phase shift depending on the geometry of polarization, not just path length. His work laid the foundation for modern studies in quantum optics and polarization; his contributions continue to influence optical physics to this day.

CERTIFICATIONS

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