COUNCIL OF VIBRATION SPECIALISTS INDIA
Diagnostics and Prognostics Practitioners

amplitude

DIAGNOSTICS & PROGNOSTICS NEWS

2025, Issue - 1

COUNCIL OF VIBRATION SPECIALISTS

www.covs.in

INDEX

CVS Vision & Mission

Our Vision

CVS aspires to be the center of eminence at the national and global level for the dissemination of knowledge in the field of vibration science and engineering, through training and post graduate studies, to formulate standards, collaborate with national and international regulatory bodies on vibration science and engineering, to develop and compile information in the field to assist engineers in building reliable, vibration free, stable and longer lasting products in the form of machines, structures and systems

Our Mission

To provide a platform for scientists, researchers and engineers to come together for exchange of vibration knowledge through training programs, seminars, conferences, campus and corporate visits, vibration solution services, recognition of contribution made by the experts in the fields.

To collaborate with similar national and international institutes and organizations for imparting customized various levels of certified training programs, certifying the asset's integrity in industry and enhancing people's capability in solving vibration problems.

To review, modify / establish vibration standards in the fields of emerging domains such as smart structures, transportation systems, machinery, etc.

IRISS
ENGINEERED RELIABILITY

The Game-changing Technology: Motion Amplification

Quick RCA with Real-Time Vibration Visualisation

VIBRATION MONITORING & MOTION ANALYSIS

THE POWER OF TECHNOLOGY

SEEING IS BELIEVING.

Visualizing motion. Finding solutions.

Motion amplification is a non-contact camera and software-based technology for vibration visualization and analysis that enables you to visualize as well as quantify vibrations invisible to the naked eye and help you perform the RCA in a matter of minutes with millions of data points in contrast to 10-12 from traditional analysis.

IRISS APAC had an exciting and interactive seminar at Navi Mumbai with the **Council of Vibration Specialists (CVS)** discussing about the Game-Changing Technology in the field of Vibration Analysis, Motion Amplification. Exploring about the wider spectrum of area of applications, Motion Amplification gives new ways to monitor asset health while significantly reducing the RCA time from days to minutes!

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From the Editor's Desk
Dr Barun Chakrabarti, FCVS

Dear Colleagues,

Greetings from the Editorial Team of ***"amplitude"***.

We take pleasure in bringing to you the latest issue of our Newsletter. This is the first issue of the Year 2025 (Issue-1/2025).

In this volume we have curated a collection of the notable activities, events and achievements within the CVS Family during the past quarter, along with our regular features.

As you are aware, our flagship event, INVEST-2025, originally scheduled during 29th - 31st May 2025, had to be postponed temporarily in view of the prevailing uncertainty arising from unforeseen geopolitical situation at the beginning of May 2025. This did cause some disappointment and inconveniences for all stakeholders due to the change in schedule and travel plans. However, the INVEST-2025 Organizing Committee and the Delhi Team lived up to the challenge by proactively reaching out to all concerned, explaining the situation and assuring a rescheduling of the event at the earliest. It speaks volumes of the resourcefulness and dedication of the core team members, who have now successfully rescheduled the conference during 3rd - 5th July 2025 at the original venue. Hats off to the team! With the stage all set now for the mega event, let us gear up to make INVEST-2025 a grand success. We hope you have blocked your calendar, registered yourselves and made your travel plan by now. We sincerely urge you to contribute your efforts to the last-mile preparations, in whatever way you can. INVEST-2025 belongs to each one of us and its success depends on our collective contribution. We hope to see each one of you at IIT Delhi when the curtain rises for this much-awaited event.

This issue of the Newsletter showcases several notable activities during the past quarter. These include celebration of the 4th Anniversary of CVS Foundation Day, launch of a new Students' Chapter at DYPCET - Kolhapur and a vibrant Women's Day event celebrating the spirit of women power. Of course, our esteemed members continue to make CVS proud by winning awards, bringing in laurels and getting recognized for their professional excellence. Our heartiest congratulations and best wishes to them in their pursuit of excellence.

The months of spring always bring forth a sense of renewal, freshness and the promise of a new beginning. It heralds the new harvesting season while communities at all corners of the country usher in their New Year and engage in festive celebrations. Close on the heels of the festivities, we have just endured a brief spell of summer and now looking up to the prospects of an early monsoon, bringing in the much-needed, rain-soaked relief. Let me conclude on this note till we connect again.

With best wishes,

INVEST 2025

International Conference on Vibration Engineering, Science, and Technology

Date : 03, 04 and 05 July 2025

COUNCIL OF VIBRATION SPECIALISTS (CVS)

A Non-profit Co., Section 8, Companies Act 2013, Ministry of Corporate Affairs, Government of India

(New Delhi Chapter)

Jointly with

DEPARTMENT OF CIVIL ENGINEERING

INDIAN INSTITUTE OF TECHNOLOGY (IIT) DELHI

(an Institution of Eminence)

HIGHLIGHTS

- Tutorials and Workshop
- Technical Sessions
- Exhibition and Demonstrations
- Business Meets
- Sponsorship Opportunities

HURRY UP

Dear Delegates!

Empower
Self and Your Organization

REGISTER!

"To Know the Latest in Vibration of Rotating Machinery, Structural, Piping Vibration and Noise, Critical Industry Cases, Latest Developments in era of AI and ML in Asset Management and Predictive Analytics"

Lecture Hall Complex (LHC)
IIT Delhi, Hauz Khas - 110 016,
New Delhi, India

INternational conference on
Vibration
Engineering
Science &
Technology

INVEST 2025

THEME:
Innovation and Smart Solutions in Vibration Science and Engineering

https://investcvs.covs.in

NEAREST

Metro Stn : 500 m || Airport : 16 km || Rly Stn : 12 km

ABOUT THE CONFERENCE

The International Conference on Vibration Engineering, Science, and Technology (INVEST 2025) will be held between May 29-31, 2025, at Indian Institute of Technology (IIT) Delhi. The conference will feature pre-conference tutorials and a workshop on May 29th, 2025. The event is organised by the Council of Vibration Specialists (CVS) New Delhi Chapter, and Department of Civil Engineering, IIT Delhi. The conference will emphasise innovation and smart solutions in vibration science, and associated specialisations. Awards will be given for the best paper and young researcher in each theme. Outstanding vibration experts will also be felicitated.

ABOUT CVS

The Council of Vibration Specialists (CVS) is a non-profit organization dedicated to promoting vibration science, and engineering in India. CVS aims to raise awareness about vibration-related issues, provide training, and certification to engineers, and foster collaboration between academia and industry in the field of vibration.

ABOUT IIT DELHI

IIT Delhi is a leading institution of engineering and technology education and research in India, known for its academic excellence and contributions to nation building. IIT Delhi has a strong alumni network, who have made significant contributions to various fields worldwide. Since its inception, over 60000 have graduated from IIT Delhi in various disciplines. Of these, nearly 5070 received Ph.D. degrees.

* The QS World University Rankings by Subject 2024 announced in April 2024, placed IIT Delhi among the top 50 institutions in the world in the broader subject area of Engineering and Technology with a Rank of 45. Moreover, IIT Delhi is also selected as Institution of Eminence by Government of India.

ABOUT NEW DELHI

New Delhi stands as India's powerhouse capital—a dynamic fusion of innovation and heritage that's perfect for global business interactions. With world-class infrastructure, a thriving industrial ecosystem, and premier networking opportunities, the city invites industry leaders to connect, collaborate, and explore new growth avenues.

DEPT OF CIVIL ENGG, IIT DELHI

The Department of Civil Engineering at IIT Delhi ranks #1 in India and #39 globally in the QS World University Rankings by Subject 2024, recognized for its cutting-edge research, and interdisciplinary excellence in structural integrity, earthquake vibration studies, and more. The department maintains strong industry ties, frequently organizes academic events, and actively engages in sponsored research.

INVEST 2025 COMMITTEE MEMBERS

Advisory Committee			
S.No.	**Name**	**Designation**	**Current Organization**
1	Dr T. G. Sitharam	Chairman, AICTE and Ex-Director, IITG	AICTE, New Delhi
2	Dr V. Narayanan	Chairman, ISRO and Secretary, Dept of Space	ISRO, Bengaluru
3	Dr R. N. Iyengar	Ex-Director, CBRI and Distinguished Prof.	Jain University, Bengaluru
4	Er M. K. Srivastava	Ex-Executive Director, Engineering	NTPC Ltd, New Delhi
5	Dr C. S. Manohar	Prof. of Civil Engineering	Dept of Civil Engg, IISc Bengaluru
6	Er Partha Sarathy Ghose	Group Director, Projects	Corporate Office, Kalyani Steels, Pune
7	Dr A. R. Upadhya	Ex-Director, NAL and Professor	Dept of Aerospace Engg, Jain Univ.
8	Dr A. R. Mohanty	Prof. of Mechanical Engineering	Dept of Mech. Engg, IIT Kharagpur
9	Dr R. P. Mohanty	Ex-Vice Chancellor and Chief Consultant	SOA University, Bhubaneshwar
10	Dr Ing. B V A Rao	Ex-Prof. of Mechanical Engineering	Indian Institute of Technology, Madras
11	Dr Minoru Sasaki	Sr Prof. of Mechanical and Robotics	Gifu University, Japan
12	Dr Debadatta Mishra	CEO - AASSC and Ex-Sr Scientist, ISRO	NSDC, Govt of India, New Delhi
13	Er Nilesh Kamath	Vice President, Projects	ESSAR E&P Ltd, ESSAR, Mumbai
14	Dr Chandan Chowdhury	Sr Associate Dean, ISB and ED, MIGM	Indian School of Business, Hyderabad
15	Dr C. Sujatha	Ex-Prof. of Mechanical Engineering	Dept of Mechanical Engg, IIT Madras
16	Er G. Narasimahulu	Executive Director, Projects	HRRL, Barmer, Rajasthan
17	Dr R. S. Jangid	Prof. of Civil Engineering	Indian Institute of Technology, Mumbai
18	Dr Deepankar Choudhury	Prof. and Ex-Head of Civil Engineering	Indian Institute of Technology, Mumbai
19	Dr Kartik Fojdar	Sr VP, Instrument and Control	Reliance Corporate Park, RIL, Mumbai
20	Er R. Sarangapani	ED, Business Development and Consultancy	NTPC, EOC, NOIDA
21	Dr N. Anandavalli	Director, SERC	Taramoni, SERC, CSIR, Chennai
22	Er T. M. Naidu	Ex-Project Director, ADA, DRDO	Aeronautical Dev. Agency, Bengaluru

INVEST 2025 COMMITTEE MEMBERS

Organizing Committee			
S.No.	Name	Designation	Current Organization
1	Dr H. S. Gambhir	Vice President	Ex- VP, Projects I&C, RCP, RIL, Mumbai
2	Dr Tarapada Pyne	Chief Knowledge Officer and Director	Center for Reliability & Diagnostics, Mumbai
3	Dr S. M. Khot	Principal	FCRIT, Navi Mumbai
4	Er Prasenjit Pal	ED and Project Director, MBRAPP	NTPC Ltd, Nuclear Cell, Mumbai
5	Dr Ravinder Goyal	Managing Director	EIP Enviro Controls Pvt Ltd, NOIDA
6	Dr Vasant Matsagar	Prof. Dogra Chair and Head of Civil Engg	Dept of Civil Engineering, IIT Delhi
7	Er H. S. Kalsi	Founder Director	Kollabral Ventures, New Delhi
8	Dr Upendra Joshi	VP and Head, I and C	Reliance Corporate Park, RIL, Mumbai
9	Dr Abhishek Goyal	Director	EIP Enviro Control Pvt Ltd, NOIDA
10	Dr Suhasini N. Madhekar	Ex-Prof., COEP, Pune and Founder, SEE	Structural Engineering Education (SEE), Pune
11	Er Niranjan Bhise	Director	NB Engineers, Mumbai
12	Dr Arun Jalan	Prof. of Mechanical Engineering	Dept of Mechanical Engineering, BITS, Pilani
13	Dr Pravin Jagtap	Principal Scientist	Dept of Civil Engineering, IIT Delhi
14	Dr Barun Chakrabarti	Managing Director	Bonitas Consulting, Mumbai
15	Er Rajshekhar Uchil	DGM Technical	Jost Engineering Co. Ltd, Bengaluru
16	Er Girish Doddamani	Chief Executive Officer	Enviro Sense Tech., Bengaluru
17	Dr Srinivas Voggu	Chief Scientist, SHM Lab., SERC	SERC, CSIR, Chennai
18	Dr Nilaj Deshmukh	Dean Admin and Faculty, Mech. Engg.	FCRIT, Vashi, Navi Mumbai
19	Er Soloni Gosalia	Consultant, SOROPA and Ex-VP, AIIPLTech	SOROPA Systems, Mumbai
20	Er N. P. Sundar	Independent Consultant	Stellar InnoStrat Consulting, Mumbai
21	Er Mahesh Shinde	Founder and Consultant	Sage Engineering and Consultancy Services
22	Er Sai V. Botha	Gp Principal Reliability Engineer	British Petroleum Technical Solutions India
23	Er Arun Gupta	Vice President (C and I)	Desein Indure Group, New Delhi

CONFERENCE TRACKS AND SESSIONS

The deliberations in INVEST2025 are grouped into various sessions, each corresponding to research and application domains in Vibration Engineering, Science, and Technology.

- Vibration Monitoring and Diagnostics - Turbomachinery, Pumps, Blowers
- Automotive Noise, Vibration and Harshness (NVH) incl. Aerospace, Rail
- SHM and Diagnostics - Static Structure/Bridges/High Rises/Structures under Blast and Impact
- Sensors, Sensing Systems, Smart Sensing (High Frequency, Fiber Optics, Remote, Ultrasonic)
- Human Health and Bio-Medical Engineering (Sensors, Analysis, and Instruments/ Equipment)
- Acoustics - Environmental Noise, Electroacoustics, Underwater
- Innovation in Energy Harvesting from Vibrating Mechanisms
- Education, Training, and Certification
- Power Industry Machinery - Renewable/ Green Energy- Hydrogen, Wind and Solar Power
- Technological Innovation with ML and AI, Predictive Analytics
- Vibration and Noise - Control and Isolation
- Simulation, Computational Methods and Probabilistic Models in Vibration Analysis
- Inter-Disciplinary Areas of Vibration, Condition Monitoring, Reliability, Asset Management

IMPORTANT DATES

Start of Submission of Paper	01 January, 2025
Last Date of Initial Paper Submission	08 March, 2025
Notification of Accepted Paper by	25 March, 2025
Last Date for Submission of Final Papers*	15 April, 2025
Last Date of Registration by Authors	15 June, 2025
Opening Day of Conference	03 July, 2025

- **Papers selected and presented in the INVEST2025 Conference will be considered for publication in an indexed journal (subject to the independent review by the journal)**

REGISTRATION DETAILS

Category	Fees (Including GST)
Industry Delegate (Author Presenting)	Rs 5900/-
Industry Delegate (Non-Presenting)	Rs 4720/-
Engineering College Faculty/ Govt Organization (Author Presenting)	Rs 4720/-
Engineering College Faculty/ Govt Organization (Non-Presenting)	Rs 2950/-
Student (Author Presenting)	Rs 2360/-
Student (Non-Presenting Delegates)	Rs 1770/-
Delegate from Abroad (Author Presenting)	USD 200/-
Delegate from Abroad (Non-Presenting)	USD 150/-

**Delegates can register anytime between 01 January 2025 to 15 June 2025. However, they can avail an early bird discount of 5% if they register on or before 15 April 2025. A further discount of 5% is offered to CVS members. More than 5 delegates from same organization, total discount of 10% is applicable.

Pre-conference Tutorials (8 Sessions by Expert Professionals): Rs 1500/-. If registered for conference, then Registration fees as above + Rs 1000/-only for tutotrials

For Corporate Exhibition and Presentation Opportunities, Please Contact the Organizers

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Er S. Mahesh Kumar, Dy. General Manager, EIL, New Delhi
(+91 98681 05971)

BANK DETAILS

BENEFICIARY NAME	: COUNCIL OF VIBRATION SPECIALISTS
ACCOUNT TYPE	: CURRENT
ACCOUNT NO.	: 100025012021
IFSC CODE	: ESFB0009006
BANK NAME	: EQUITAS SMALL FINANCE BANK LTD
BRANCH	: VASHI, NAVI MUMBAI

For all general queries on INVEST 2025, and CVS:

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CORPORATE ASSOCIATES

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COUNCIL OF VIBRATION SPECIALISTS INDIA RGIT STUDENT CHAPTER

International conference on Vibration Engineering Science & Technology INVEST 2025

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VIBRATION SCIENCE & ENGINEERING

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INternational conference on Vibration Engineering Science & Technology — INVEST 2025

03 July,2025

INVEST 2025

International Conference on Vibration Engineering, Science, and Technology

Venue: Lecture Hall Complex (LHC), IIT Delhi, Hauz Khas, New Delhi -110 016, India

Pre-Conference Tutorials

for

Diagnostic and Prognostic Engineers

(Industry Engineers, NVH engineers, Student Researchers)

COUNCIL OF VIBRATION SPECIALISTS INDIA — Diagnostics and Prognostics Practitioners

FORENOON -SESSIONS

Dr Tarapada Pyne, CKO & Director, CRD, Mumbai Er. L J Swaminathan, CEO & Director, ModAE Bengaluru

9:30 AM-10:10 AM

Topic1: Rotary Vibration Sensing (Offline Casing and Online Shaft) - Physics, Philosophy and Current Industry Practices (incl. Standards). Topic2: Principle of Operation and Calibration of proximity Probes incl. pitfalls)

Dr. Srinivas Voggu
Chief Scientist and Head –SHM, SERC-CSIR, Chennai

10:30 AM–11:10 AM

Topic: Vibration Analysis of Structures and Pipes, Key Technique in SHM of Vital Infrastructure

Topic: Structural and Tectonic Vibration – Concept, monitoring Instruments, and latest developments

Prof. Arnab Banerjee
Dept of Civil Engineering IIT Delhi

12:00 PM-12:40 PM

Topic: Turbomachinery Vibration Surveillance – Analysis of Common Dynamic Plots of Diagnostic Interest (with industry cases)

Er. Abhay Chandajkar
MD, Asset Innovative Services, Muscat, Oman
Dr. Pawan Pingle
NVH Consulting

11:15 AM-11:55 AM

INVEST 2025

03 July, 2025

COUNCIL OF VIBRATION SPECIALISTS INDIA — Diagnostics and Prognostics Practitioners

INternational conference on Vibration Engineering Science & Technology

INVEST 2025

03 July, 2025

COUNCIL OF VIBRATION SPECIALISTS INDIA
Diagnostics and Prognostics Practitioners

AFTERNOON -SESSIONS

Prof. (Dr) Minoru Sasaki
Retd. Sr. Professor
Gifu University, Japan

2:00 PM -2:40 PM

Topic: Vibration Sensors and Sensing System in AI / Robotic Applications

Er. BablaGhosh
Technical Head, SDT Ultrasound Solutions, Kolkata

2:45 PM -3:25 PM

Topic: Vibration Analysis of High Speed Rotors with Journal Bearings and Analysis of Anti-Friction Bearings Defects

Topic: Applications of AI and ML in Vibration-based Fault Diagnostics and Predictive Maintenance

Er. Praveen Gupta
COO
AIVA Tech Solutions, Hyderabad

4:45 PM -5:15 PM

Topic: 1. Ultrasound–based Diagnostics to Detect High and Low Frequency Machinery Faults 2. Ultrasound Technology–A Proactive Maintenance Tool

Er. Anoop Saxena
SME-Asset Mangt.
Er. Manohar C.,
Director UE System

3:45 PM -4:45 PM

INternational conference on Vibration Engineering Science & Technology

INVEST 2025

INVEST23 TUTORIALS

Pre-Conference Tutorials are planned to provide industry engineers, aspiring specialists, researchers an easy access to **valuable and practical insights** from renowned experts in Vibration Engineering & allied fields.

Registration Fee: **INR 1500 per participant** (includes lunch)

Note - Registration Fees:

Conference delegates registering for tutorials are to pay a minimum of Rs 1000/- in addition to delegate fees.. Others (only Tutorials) - INR 1500/-

REACH US:

Dr Pravin Jagtap
Mobile: 99119 90994
Er. S. Mahesh Kumar
Mobile: 98681 05971
Registration link:-

https://docs.google.com/forms/d/e/1FAIpQLSf2i-f4N7Izu_ITt-%20ReOQjdev8NEb1SW01q4O5eLqoXp0NaRg/viewform

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covshqs@gmail.com

website: www.covs.in
https://investcvs.covs.in/tutorial-session/

COUNCIL OF VIBRATION SPECIALISTS INDIA
Diagnostics and Prognostics Practitioners

INternational conference on Vibration Engineering Science & Technology

INVEST 2025

QR

Bank Details for Registration Fees:

Beneficiary Name	: Council of Vibration Specialists
Account Type	: Current
Account No.	: 100025012021
IFSC Code	: ESFB0009006
Bank Name	: EQUITAS Small Finance Bank Ltd.
Branch	: VASHI, NaviMumbai

Guidelines for Contributors to "amplitude" Newsletter

- Members are encouraged to contribute short technical notes, articles and other regular features for publication in ***"amplitude"***. Technical articles should be restricted to 4-5 pages (including all figures / illustrations).
- Submissions can be sent to the Editor at barunc1964@gmail.com, with a copy to CVS Headquarters at covshqs@gmail.com
- All text matters should be submitted in editable MS-WORD format with 12-pt Times New Roman font and 1.15 line spacing, in single-column A4 size page
- All figures/illustrations and photographs should be submitted as image files (.jpg. .jpeg, .png etc.)
- Please do not submit entries in PDF or MS-PowerPoint format.

Celebrating Women's Day: A Powerful Webinar on "Women in Vibration" hosted by CVS HQ

The Council of Vibration Specialists (CVS) Headquarters, Navi Mumbai, hosted a special webinar on 8th March 2025 titled “Women in Vibration : Celebrating Strength, Resilience, and Nation-Building”, to commemorate the International Women’s Day, The event brought together trailblazing women from the field of vibration and structural engineering, whose contributions have shaped the landscape of research and practice in India and beyond.

The webinar resonated with the powerful theme: “We Stand Equal, We Accelerate Actions, We Move Oscillation”, symbolizing the unity, momentum, and pioneering spirit of women in vibration. The program started with Saraswati Vandana. Er. Soloni Gosalia, FCVS and Treasurer, CVS Mumbai Chapter briefed about the program and made the opening remarks.

Ms. Shruti Katkar, a student of B. Tech. (Mechanical Engineering) at FCRIT Navi Mumbai, and CVS Students’ Chapter Member, expressed her views on “Scope of vibration studies and career path”. She mentioned about importance of considering vibration effects in design of machines, civil structures, medical equipment and such other applications. She emphasized that academic institutions and industries nation-wide have important role to play in the vibration related studies.

Prof. (Dr.) Aparna Dey Ghosh, Dean (Planning and Development) at IIEST, Shibpur and Founding Fellow & Vice President of CVS, was the first guest speaker. She talked on her journey in the field of structural dynamics and vibration control. She presented her voyage right from the days at IIT Kanpur, while working for her Ph.D. in an encouraging and supportive environment. Dr. Aparna started her career in structural engineering with structural consultants. She worked in design offices and also on sites. She was encouraged and supported throughout her career and did not face any gender-specific distinction in terms of handling responsibilities. She spoke on planning, development, and the evolving role of women in civil engineering.

The second guest speaker was Prof. (Dr.) C. Sujatha, ex-Professor of Mechanical engineering, IIT Madras. She is an Eminent Vibration Specialist and Fellow of CVS. She talked about her journey and career in vibration field, at ISRO and at IIT Madras. At IIT, she worked on vibro-optic communication, in Applied Mechanics and in Mechanical Engineering departments. At the age of 46, she was the youngest Professor of Mechanical Engineering at that time in IIT Madras. Along with teaching, she was involved in different consultancy projects. She worked with over 200 industries and R&D organizations and also on the sponsored research projects. She is author of two books and has handled administrative responsibilities at IIT Madras. While the machines were operating, she took noise measurements. She said that there are no short cuts and no substitute for hard work!! She shared her inspiring journey through academic challenges, leadership, and mentorship.

The Chief Guest of the function was Dr. N. Anandavalli, Director, CSIR - Structural Engineering Research Center (SERC), Chennai. "Move, Oscillate and Accelerate", was the title of her presentation, very catchy and apt for the occasion! A leading expert in structural dynamics, she inspired the audience with her insights on the human relevance of vibration and its impact on the built environment. Her address set the tone for a reflective and motivating session.

She described positive and negative effects of vibration and mentioned that the negative effects could lead to health issues and structural damages. She stated that we learned from each of the five basic elements of nature (Panch Mahabhootas), viz., sky, air, fire, water and earth. She addressed the audience about the celebration of Engineers' Day, and cited different works of Sir Mokshagundam Visvesvaraya. She also presented an overview of CSIR-SERC activities, funded projects, their six major thrust areas, unique laboratories and testing facilities. She highlighted the important contributions of CSIR-SERC in areas of unique structures and inter-disciplinary studies. She informed about the publication of the 'Journal of Structural Engineering' by CSIR-SERC.

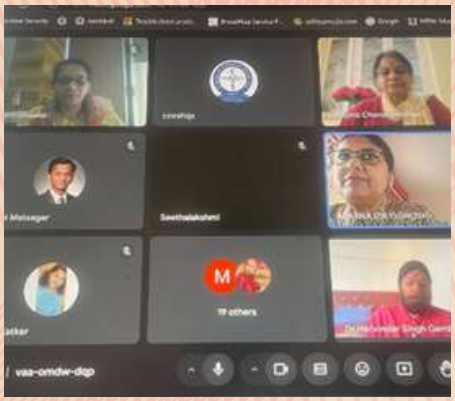
Dr. Anandavalli talked about a few ordinary women, doing extra-ordinary and pioneering works, by walking on the unconventional path. Started as 'movement' in 1909, CSIR-SERC gained 'velocity' in 1975, and now it is the time to 'accelerate' actions, she said. Mentioning various ways in which we can accelerate actions, she concluded her talk by

defining success. According to her, success is aspiration, thinking, dreaming, and turning thoughts into reality by following the goal-path and through hard work. She stressed upon preparing the plan, acting with persistence and sharing the success stories. She further mentioned about different important aspects for women, namely, physical fitness, vital energy, mental strength and knowledge.

Prof. (Dr.) Suhasini Madhekar, formerly of College of Engineering – Pune, the Founder of SEE (Structural Engineering Education), Pune and former editor of 'amplitude', provided deep insights into structural education and the critical role of women in vibration science. She summarized the program and proposed the vote of thanks. She expressed her gratitude towards Dr. H. S. Gambhir, Founding President of CVS and Dr. Tarapada Pyne, Secretary and Director General of CVS, for taking initiative in organizing such a wonderful program.

The event concluded with sincere thanks to all the speakers for sharing their rich experiences and encouraging the next generation of women professionals to excel in vibration sciences. It was a morning of learning, inspiration, and celebration - an unforgettable Women's Day tribute. Er. Soloni Gosalia, FCVS and event co-coordinator, hosted the session with heartfelt warmth, sharing her own reflections as a professional in the vibration domain. She expressed that her journey is a "subset" of the trailblazing paths paved by these senior women, and extended gratitude to Dr. Pyne and Dr. Gambhir for the opportunity to anchor the event.

Here are a few glimpses from this great event.



COUNCIL OF VIBRATION SPECIALISTS

GELEBRATES

THE PROFESSIONAL STRENGTH, RESILIENCE, DEDICATION, AND PASSIONATE CONTRIBUTION OF "WOMEN IN VIBRATION" TO NATION BUILDING

ON WOMEN'S DAY

8 MARCH, 2025, 11-12 AM

Chief Guest

Dr. (Mrs.) N. Anandavalli

PhD., FNAE, FIE, M.ASCE

Director, CSIR - Structural Engineering Research Centre [SERC], Chennai

Chief Scientist and an Eminent Person of Structural Dynamics

Guest Speakers

Dr. Prof. Aparna Dey Ghosh,
Dean, Planning and Development Dept of Civil Engineering
IIEST, Shibpur
Founding Fellow, & VP, CVS

Dr. Prof.(Ex.) C. Sujatha,
Prof. of Mech. Engineering
IIT Madras
Eminent Vibration Specialists and Fellow, CVS

Coordinators

Er. Soloni Gosalia
Ex-VP, AIMIL Tech, Mumbai
Consultant, SOROPA Systems, Mumbai
Treasurer, CVS Mumbai & Fellow, CVS

Dr. Prof. (Ex.) Suhasini Madhekar
College of Engineering, Pune
Founder, SEE (Structural Engineering Education), Pune
Fellow, CVS and Former Editor 'amplitude'

We Stand Equal, We Accelerate Actions, We Move Oscillation

Webinar joining link: https://meet.google.com/vaa-omdw-dqp

Supported by: CVS Headquarters, Navi Mumbai

Know Our Members

Dr. Santosh Devidaspant Chede,FCVS

Dr. Santosh Devidaspant Chede is currently the Principal of D. Y. Patil College of Engineering & Technology at Kas aba, Bawada, Kolhapur (Maharashtra). He has over 31 years of experience across Academia, Research and Industry. He holds a BE (Industrial Electronics) and ME (Electronics) degree from Sant Gadge Baba Amravati University. He completed his Ph.D. (Electronics & Communication) from VNIT Nagpur in 2010. He also did MBA (HRD) and several professional diplomas from IGNOU – New Delhi. His key research interests include: embedded systems, biomedical engineering, signal processing and industrial automation.

Dr. Chede has 33 research publications ininternational journals. He has also presented papers in 20 international and 6 national conferences, including several invited / keynote talks. He has contributed to two book chapters in books published by CRC Press and Taylor & Francis. Dr. Chede has filed for 3 patents and is actively involved as Member of various committees in academic institutions. He is a Ph.D. Supervisor at Shivaji University – Kolhapur and VTU – Belagavi. He has guided 5 Ph.D. students and currently supervising 7 Ph.D. scholars. He has also guide 22 M.E. / M. Tech. students and over 100 B.E./B.Tech. students.

Apart from CVS, Dr. Chede is a Fellow of Institution of Electronics & Telecommunication Engineers (IETE) and The Institution of Engineers – India, IE(I). He is a Life Member of Indian Society of Technical Education (ISTE). He has received several awards for academic excellence. Dr. Chede has successfully handled many positions of responsibility during his long stint as an academician. He has significantly contributed to the development of DYPCET and the institute has achieved several major milestones under his leadership.

Er. Mahesh Shinde, FCVS

Er. Mahesh Shinde is a senior Automobile Industry professional, with over 37 years of rich experience across passenger car, commercial vehicle and two-wheeler sectors. He superannuated in 2023 as Senior General Manager & Head (Vehicle Attributes & Technical Services) for Commercial Vehicle from the Engineering Research Centre of TATA Motors. He had earlier worked with Kinetic Engineering Limited (two-wheeler company) in their R&D Centre, covering multiple functional areas. He is currently the Founder-Consultant of SAGE Engineering & Consultancy Services.

He is a Mechanical Engineer with Masters in Management Science and Diploma in Business Management and Computer Science. He has undergone several Professional Certifications and Management Leadership Programs. Apart from CVS, he is involved with several professional bodies such as IMechE (UK), SAE India, India Tech Centre and Automobile Division – IMechE. He was bestowed with the Outstanding Leadership Award by CXO2.0 / Dubai in 2024.

Er. Shinde has delivered several keynotes lectures and presented papers in various international conferences in Germany, UK, USA, India and Sri Lanka. He has 14 IPs (Intellectual Properties) to his credit. He is actively engaged in training, mentoring and career guidance of students and professionals. He volunteered (personally and through his Company) for several noteworthy initiatives during COVID-19 Pandemic. He is one of the Authors in the book titled I.N.D.I.A.*71 on post-independence progress of India.

Er. Girish Doddamani, FCVS

Er. Girish Doddamani is the CEO of Enviro Sense Tech, a company at the forefront of delivering advanced solutions in condition monitoring, noise & vibration analysis, and motion amplification technology. With over 25 years of industry experience, he has successfully represented global technology leaders in the aerospace, defence, automotive, and industrial sectors, driving innovation and growth across multiple domains.

Alongside his corporate leadership, Girish holds several key roles in professional and community organizations. He is the Secretary – Council of Vibration Specialists (CVS), Bengaluru Chapter, where he contributes to the growth and development of India's vibration diagnostics community. Girish is also the President of Innovative Referral Trust, an entrepreneur-driven networking platform promoting business collaboration and growth. He is the President of Kengeri-Uttarahalli Road Apartments Association, working towards community development and residents' welfare. As a Sanchalak of Sri Patanjali Yoga Shikshana Samithi (SPYSS), Girish is actively involved in promoting yoga education and holistic well-being.

He is also a core member of the organizing committee for INVEST 2025, a flagship national event focused on vibration and condition monitoring, scheduled to be held at IIT Delhi in May 2025.

Members in News

Heartiest Congratulations! We are proud of you.

Dr V Narayanan, an esteemed Fellow of CVS and a Guest of Honour at the INVEST-2023 Conference, has been appointed as the Chairman of the Indian Space Research Organization (ISRO) with effect from 14th January 2025 for a two-year term. He succeeded Dr S. Somanath, FCVS and the Chief Guest at INVEST-2023 event. Hailing from a simple and humble family in Nagarkoil (TN), Dr Narayanan completed his Diploma in Mechanical Engineering and did his apprenticeship training at BHEL Ranipet. After joining ISRO, he completed his Masters and Ph.D. from IIT Kharagpur and also went to NASA for training. It is a matter of great pride for the CVS family that we have two successive Chairmen of ISRO as our honoured Fellows. Dr Narayanan is also a Member of the Advisory Committee of INVEST-2025. We wish him all the very best in his new role.

Prof. T G Sitharam, FCVS and Chairman – AICTE, is a renowned researcher, educationist and administrator. His excellence as a researcher has again been reaffirmed globally in the AD Scientific Index ranking framework. AD Scientific Index data released in February 2025 ranked Prof. Sitharam as 193 in India in Engineering and Technology and 6th in Earth Sciences (top 3% Level in both the categories). Despite his significant administrative responsibilities, Prof. Sitharam continues to be actively engaged in the pursuit of scientific research and serves as an inspiration for all engineers and researchers.

Prof. Aparna (Dey) Ghosh, CVS Founding Fellow, Professor of Civil Engineering and Dean (Planning & Development) at Indian Institute of Engineering Science & Technology (IIEST) – Shibpur, has been conferred the Women in Tech 2025 Award by the Industrial Automation magazine. This honour comes in recognition of her role as an innovative educator and researcher par excellence. The citation lauds her contribution towards structural engineering, vibration control, sustainable building materials development and specifically, her work on microbial concrete, with the potential to transform the concrete industry, reduce carbon footprint and enable earthquake-resistant designs.

Dr A R Upadhya, FCVS served as the Chairman of the Design Review Committee (DRC) that facilitated the development of the 10-tonne capacity vertical planetary solid propellant mixer. The unit was designed and developed by Central Manufacturing Technology Institute (CMTI) and was formally handed over to Chairman – ISRO, Dr V. Narayanan on 13rd February 2025. Dr Upadhya also served as a Jury Member to decide the Best Design Awards at IMTEX 25 (International Machine Tool and Manufacturing Technology Exhibition) in Bengaluru for the Indian Machine Tool Manufacturers' Association (IMTMA).

Dr Barun Chakrabarti, FCVS and Editor - ***amplitude***, conducted a 3-Day Rotating Machinery Bootcamp during 16 - 18 January 2025 at the Centre for Reliability & Diagnostics (CRD), Navi Mumbai. This program was part of the SamridDHI Skill Development initiative of the Ministry of Heavy Industries (MHI), Govt. of India. The course content is developed by ModeliCon InfoTech LLP, Bengaluru under the mentorship of professors from Indian Institute of Science (IISc). Dr Chakrabarti serves as the Skilling Course In-Charge for this project.

Er. Anoop Saxena, FCVS delivered a training course on Maintenance Management for Jindal Stainless Steel Limited during 18 - 19 February 2025 at Jajpur, Odisha. He also conducted a training program on Alignment & Balancing for the engineers from IFFCO Paradip Unit during 6 - 7 March 2025. Er. Saxena was a faculty for the outbound training program for Reliability Champions from BPCL Kochi Refinery, which was held at Munnar during 24 - 25 March 2025.

Er. N P Sundar, FCVS, from Stellar Innostrat Consulting, participated in the One-Day training program on ISO & IEC Online Standards Development, organized by the Bureau of Indian Standards (BIS) at the Western Regional Laboratory, Mumbai on 28th February 2025.

Dr. Bubhathi, FCVS, from Honeywell, delivered an invited plenary talk at the Industry – Academia Conclave organized by the Vellore Institute of Technology (VIT), Vellore on 8th March 2025.

आत्मनिर्भर भारत

CVS Mumbai Chapter and FCRIT - Navi Mumbai Join Hands to Commemorate CVS Foundation Day through Technical Webinar

The Mumbai Chapter of CVS and Fr. C. Rodrigues College of Navi Mumbai came together to celebrate the 4th Anniversary of CVS Foundation Day through a technical webinar organized on 26th January 2025.

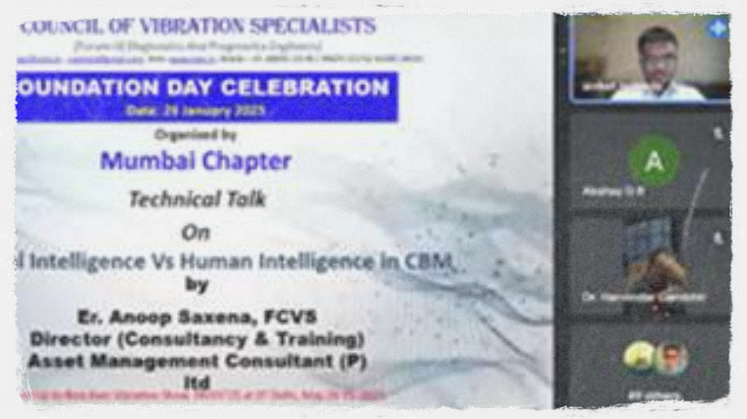
The event brought together over 60 participants, including CVS members and students from FCRIT, to exchange knowledge and insights in the field of vibration and acoustics.

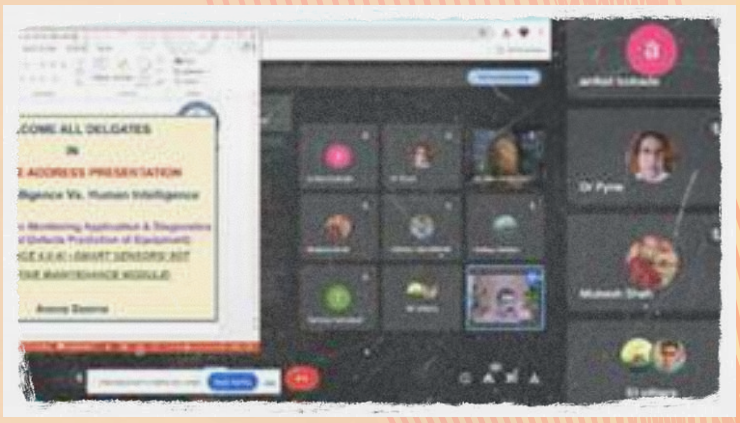
The program commenced with a warm welcome and greetings, followed by an inspiring Welcome Speech by Dr. Nilaj Deshmukh, Chairman – CVS Mumbai Chapter and Dean (Admin & Faculty) – FCRIT, who highlighted the importance of fostering collaboration and innovation in engineering. The event was enriched by the presence of Principal Dr. S.M. Khot, Dr. Tarapada Pyne, Secretary & Director General of CVS, and Dr. H.S. Gambhir, Founder President of CVS. Dr. Gambhir delivered a compelling address, reflecting on the journey and achievements of CVS, and emphasized the pivotal role of vibration analysis in various industries. Dr. Pyne shared valuable insights on the increasing industrial demand for expertise in vibration and condition-based maintenance.

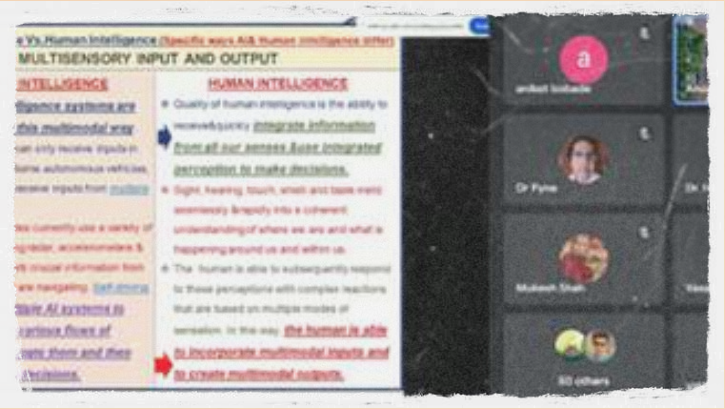
The keynote talk by Er. Anoop Saxena, a distinguished expert, was the highlight of the event. His thought-provoking presentation entitled Human Intelligence vs Artificial Intelligence in Condition-Based Monitoring (CBM) captivated the audience by exploring the integration of advanced technologies in vibration analysis and its transformative impact on diagnostics and maintenance.

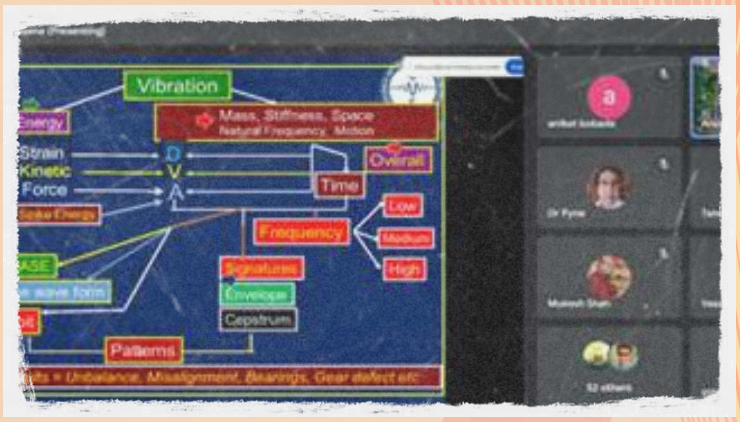
The interactive Q&A session encouraged active engagement from the participants, fostering a vibrant exchange of ideas. The event concluded with a vote of thanks by Dr. V.G. Salunkhe, SMCVS and Asst. Professor (Mech.) at FCRIT, who expressed heartfelt gratitude to the speakers, organizers, and attendees for their contributions in making the webinar a resounding success.

The 4th Foundation Day of CVS was a significant milestone, celebrating knowledge, innovation, and collaboration, while inspiring the community to strive for excellence in the field of Vibration and Artificial Intelligence.


COUNCIL OF VIBRATION SPECIALISTS
OUNDATION DAY CELEBRATION
Organised by
Mumbai Chapter
Technical Talk
On
Intelligence Vs Human Intelligence in CBM
by
Er. Anoop Saxena, FCVS
Director (Consultancy & Training)
Asset Management Consultant (P)
ltd




MULTISENSORY INPUT AND OUTPUT
HUMAN INTELLIGENCE


Vibration
Mass, Stiffness, Space
Strain
Kinetic
Force
Overall
Time
Low
Medium
High
Frequency
Signatures
Envelope
Cepstrum
Patterns

CVS Students' Chapter at RVCE Organizes Technical Talk on Dynamic Analysis

The CVS Students' Chapter at RV College of Engineering, Bengaluru organized a Technical Talk titled "Exploring Material Behaviour: The Role of Damping in Dynamic Mechanical Analysis" on 6th January 2025. The Talk was delivered by Mr. Sivakumar Ganapathy, Business Development Manager at Inkarp Instruments Pvt Ltd., Hyderabad. The students and faculty members from Mechanical Engineering and Aerospace Engineering Departments participated in this informative session.

CVS Students' Chapter Launched at D Y P College of Engineering & Technology, Kolhapur on 30th January 2025

The D. Y. Patil College of Engineering and Technology, Kolhapur, proudly inaugurated its official Students' Chapter of the Council of Vibration Specialists (CVS) on January 30th, 2024. This significant event marked a crucial step in fostering research, innovation, and practical learning in the field of vibration and acoustics for the students of the institution. The inauguration ceremony was graced by esteemed professionals and dignitaries, highlighting the importance of this initiative.

The ceremony commenced with a warm welcome address by Dr. S. J. Raykar, Head of Department (HOD) - Mechanical Engineering, who emphasized the significance of establishing the CVS Students' Chapter. He highlighted the potential benefits for students in gaining practical exposure and knowledge in vibration analysis and control.

Dr. S. D. Chede, Principal of D. Y. Patil College of Engineering and Technology, delivered an inspiring address, underscoring the college's commitment to providing students with opportunities for professional development and industry interaction. He expressed his enthusiasm for the Chapter's potential to enhance the technical skills of students and prepare them for future challenges.

Dr. A. K. Gupta, Executive Director, further elaborated on the strategic importance of the CVS Students' Chapter in aligning the academic curriculum with industry needs. He emphasized the role of such initiatives in bridging the gap between theory and practice.

The ceremony was further enriched by the presence of esteemed guests of honour, who joined online to inspire the students. They included Dr H S Gambhir, President (CVS), Dr Tarapada Pyne, Secretary & DG (CVS), Dr. S. M. Khot, Treasurer (TSI) and Principal of Fr. C Rodrigues College of Engineering (FCRIT), Navi Mumbai and Dr Nilaj Deshmukh, Chairman - CVS Mumbai Chapter and Dean (Admin & Faculty) at CVS. The dignitaries contributed to the event by sharing their expertise and offering valuable insights to the students.

The official inauguration of the CVS Students' Chapter was conducted with a formal ribbon-cutting ceremony. The event was followed by the distribution of membership certificates to the student members.

The inauguration ceremony featured two distinguished keynote speakers:

- Er. Munna Naik, FCVS, Founder & CEO, AIVA Tech Solutions Pvt. Ltd.: He delivered an insightful presentation on the latest advancements and industry trends in vibration analysis and control. He shared his extensive experience and offered valuable advice to the students, inspiring them to pursue careers in this field.

- Er. Rajshekhar Uchil, FCVS, Member of Acoustical Society of India and International Society of Automation: He provided a comprehensive overview of the applications of acoustics and vibration in various industries. He highlighted the importance of interdisciplinary collaboration and encouraged students to explore research opportunities in related fields.
-

The establishment of the CVS Students' Chapter at D. Y. Patil College of Engineering and Technology, Kolhapur, is expected to have a significant impact on the students and the institution. The Chapter intends to provide a platform for:

- Organizing workshops, seminars, and technical lectures on vibration analysis and control
- Facilitating industry visits and internships
- Promoting research and development activities
- Enhancing students' practical skills and knowledge
- Providing a network for students and professionals

The official inauguration of the CVS Students' Chapter was a resounding success, marking a significant milestone for D. Y. Patil College of Engineering and Technology, Kolhapur. The event was well-attended by students, faculty, and industry professionals, demonstrating the strong interest in vibration and acoustics. The Chapter is poised to play a vital role in nurturing the next generation of vibration specialists and contributing to the advancement of this critical field.

CVS Mumbai Chapter and FCRIT - Navi Mumbai Join hands to Organize Technical Project Competition

Dr. V. G. Salunkhe, SMCVS & Dr. Nilaj N. Deshmukh, FCVS
Fr. C. Rodrigues Institute of Technology, Navi Mumbai

The Mumbai Chapter of CVS and FCRIT – Navi Mumbai collaborated to organize a Technical Project Competition in Vibration and Acoustics on 19th April 2025 at the FCRIT Campus. This event aimed at fostering innovation, stimulating interest, and driving progress in the field of vibration and acoustics among engineering and diploma students. Under the guidance of senior CVS Leadership Team comprising Dr. Tarapada Pyne, Mrs. Soloni Gosalia, and Er. NP Sunder, students showcased their projects, addressing real-world challenges in the domain.

Eight groups from nearby engineering and diploma colleges participated in the competition, presenting innovative solutions evaluated by Er. Sunder and Mrs. Soloni Gosalia. Projects were scrutinized based on technical proficiency and social relevance, incorporating state-of-the-art techniques.

The event commenced with warm greetings from the Activity Co-Heads, Aditya Jadhav. And Harsh Karkera, followed by an insightful address by Principal Dr. S. M. Khot, who emphasized the importance of engineering excellence and its impact on society. Dr. Tarapada Pyne shared valuable insights into industrial exposure in condition-based maintenance and the pivotal role of vibration analysis in various industries. Dr. Tarapada Pyne highlighted the growing need for expertise in vibration within industrial settings.

The valedictory function, graced by the esteemed guests, culminated in the recognition of outstanding projects and participants.

The prize distribution ceremony event was carefully planned to recognize and reward the achievements of the participants. The first prize, amounting to 5000/-, symbolized excellence and outstanding performance, serving as a testament to the hard work and dedication put forth by the winner. Following closely, the second prize, valued at 3000/- acknowledged the commendable efforts of another deserving participant, highlighting their skill and commitment. Securing the third position entitled the recipient to a prize of 2000/-, marking their significant achievement and contribution to the event. Together, these prizes aim to celebrate the diverse talents and efforts of all participants, fostering a spirit of camaraderie and accomplishment within the event community.

The event concluded with a vote of thanks from the Activity Head, Mr. Aniket B., acknowledging the efforts of all involved and underscoring the significance of such initiatives in nurturing future engineering talent.

The following images capture the key moments from this memorable event

Tuned Dampers (Book Preview)

Prof. (Dr.) Suhasini Madhekar, FCVS
Former Professor, College of Engineering, Pune
Prof. (Dr.) Vasant Matsagar, FCVS
Professor & Head, Dept. of Civil Engineering, Indian Institute of Technology, Delhi

(I) Tuned Mass Damper

Structures could be subjected to severe vibrations due to dynamic excitations, such as earthquake and wind. When the vibration amplitudes are large, there will always be safety issues to the occupants. Further, the occurrence of excessive vibration also affects the comfort of the occupants. One of the most widely used passive response control devices is the tuned mass damper (TMD), which uses the concept of tuning the frequency of the control device to the frequency of the structure. Passive TMDs are typically reliable, efficient, and have low maintenance cost. TMDs are generally installed at the rooftops of buildings to control the response of buildings produced due to wind or an earthquake. TMDs may be installed in other structures also, e.g., flexible bridges, such as, suspension/cable-stayed bridges to control the wind-induced vibration. A TMD consists of a mass, a spring, and a damper, which is attached to one side of the building. Figure 1(a)shows a building without any control device, whereas a schematic representation of a typical multistory structure fitted with a single TMD (S-TMD) on the top floor is shown in Figure 1(b). Usually, the frequency of the TMD is tuned to be equal to the fundamental frequency of the structure.

1. Principle of TMD

A TMD is a simple mass attached to the primary structure in such a way that the vibration response is countered. Harmonic vibrations make violent motion, and TMDs stabilize against them. This suppression of the vibration of the primary structure is generally achieved by tuning the frequency of the TMD to that of the fundamental frequency of the structure. During excitation, a properly designed TMD tends to move in the opposite direction to that of the structure. This, coupled with the energy dissipation due to damping of the TMD, suppresses the vibration of the structure. The vibration of a system can be reduced by a tuned damper with a comparatively lightweight component so that the worst-case vibrations are less intense. Mass dampers are frequently implemented with a frictional or hydraulic component that turns mechanical kinetic energy into heat. Application of a dynamic absorber or a TMD to a building structure is more complex as building structures are large and heavy.

The TMD responds to structural vibrations, and part of the energy is transferred to the vibration energy of the TMD. The TMD damping dissipates its vibration energy, and as a result, the vibration energy of the structure is absorbed by TMD damping. On the basis of the mechanism of the undamped vibration absorber, the energy-absorbing capacity of the TMD is related to the tuning frequency ratio of the TMD, which is influenced by the mass ratio of the TMD, the stiffness ratio of the TMD and, the damping ratio of the TMD. To control the response quantities in two directions, the TMDs may be placed in two directions on the top of a building.

The TMD can be modeled as just another additional degree of freedom to the structure. The concept of a TMD originated from the attempt made by Frahm (1911). The author tried to use a vibration absorber to control rolling motion in ships. TMDs are most effective when the first mode contribution to the response is dominant. This is generally the case for tall and slender structural systems. The optimum absorber can reduce the peak response for input frequencies close to the natural frequency of the main system. Uncertainties in the dynamic properties of the main structure, as well as those in the characteristics of the excitation, may affect the performance of TMD. Therefore, the choice of the design parameters of the TMD must be specified carefully.

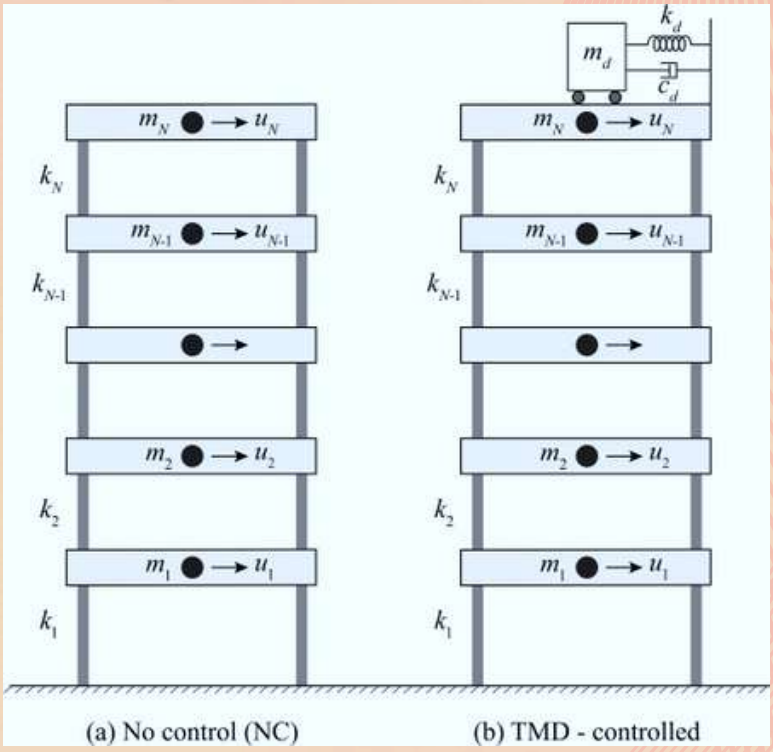


Fig. 1. MDOF systems

2.Pendulum with Damper

The performance of TMDs in delivering satisfactory response reduction is dependent on the characteristics of the excitation, i.e., wind-induced vibrations, earthquake excitations. Simple pendulums require a large area for installation and, hence, the overall assembly may become massive and costly. Further, uncertainties from ground motions, the structural nonlinearities, and the effect of soil structure interaction have to be taken into consideration during modeling. For such cases, these limitations of the pendulum TMD (PTMD) can be alleviated by modifying the TMD mechanism by providing damper to simple pendulum, as shown in Figure 2.

Such suspended mass system is known as PTMD. PTMDs replace the spring and damper with a pendulum; commonly modeled as a simple pendulum. The assembly of suspended mass system and damper counters the vibration of the primary structure and dissipates the energy induced by the excitation. Therefore, it suppresses the vibration and reduces the overall damage of the structure, economically.

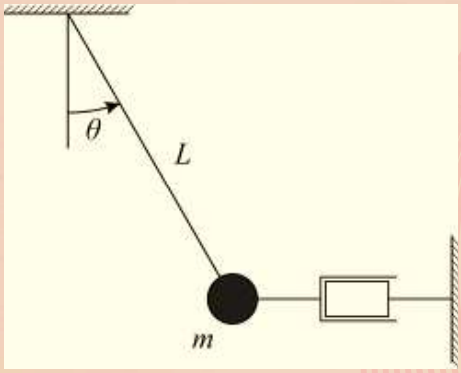


Fig. 2. Pendulum Tuned Mass Damper (PTMD)

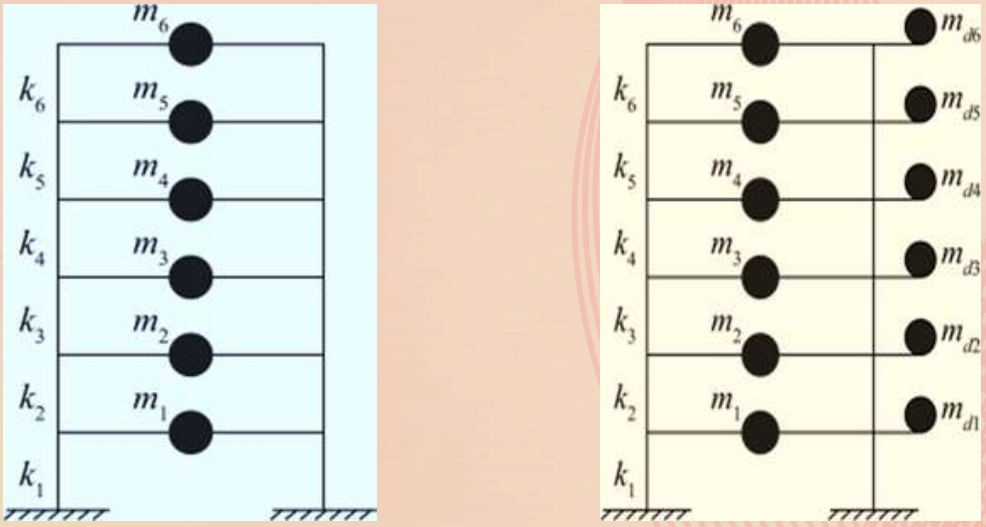
3. Multi-Stage Tuned Mass Damper

In multistage TMD (MSTMD) system, oscillators are placed at the different floors of the building. All the oscillators are tuned to the natural frequency of the structure so as to mitigate the dynamic response by decoupling the vibration modes of the structure. The idea behind using MSTMD system is that whenever any of the dampers becomes inoperative during strong earthquake shaking, all the remaining dampers will take up and work in combination to dissipate seismic energy. This leads to the steady dynamic performance as compared to the conventional S-TMD. Also, the mass values of dampers used in MSTMD system are very small, as compared to one large mass that is used in the conventional TMD. Figure 3 (a) shows MDOF structure without any control devices and Figure 3 (b) shows the MDOF structure equipped with Multi-stage TMD system.

4. Multiple Tuned Mass Dampers

An S-TMD installed in a structure has two main problems. A small offset in tuning of frequency may result in its reduced efficiency. Further, it requires a large floor space and a large mass. Because of various uncertainties inherent in the properties of the TMD and the structure, perfect tuning is very difficult to achieve. For earthquake application, investigators have shown that an S-TMD often is not effective in reducing seismic response, because earthquake-induced forces are typically impulsive in nature and reach their maximum values very fast during a short duration. A TMD subjected to a dynamic load filtered by the building structure is usually not set into significant motion in such a short period. As a result, its energy-absorbing capability is not fully developed when it is needed the most.

The heavier the TMD, the slower it reaches its full potential. Furthermore, earthquake ground motions include a wide spectrum of frequency components and often induce significant vibration in the fundamental and higher modes of a tall building. Therefore, an S-TMD may some- times not be effective in reducing the total response quantities of the structures. Several researchers have proposed and successfully verified the concept of installing multiple TMDs (M-TMDs) with varying dynamic characteristics.

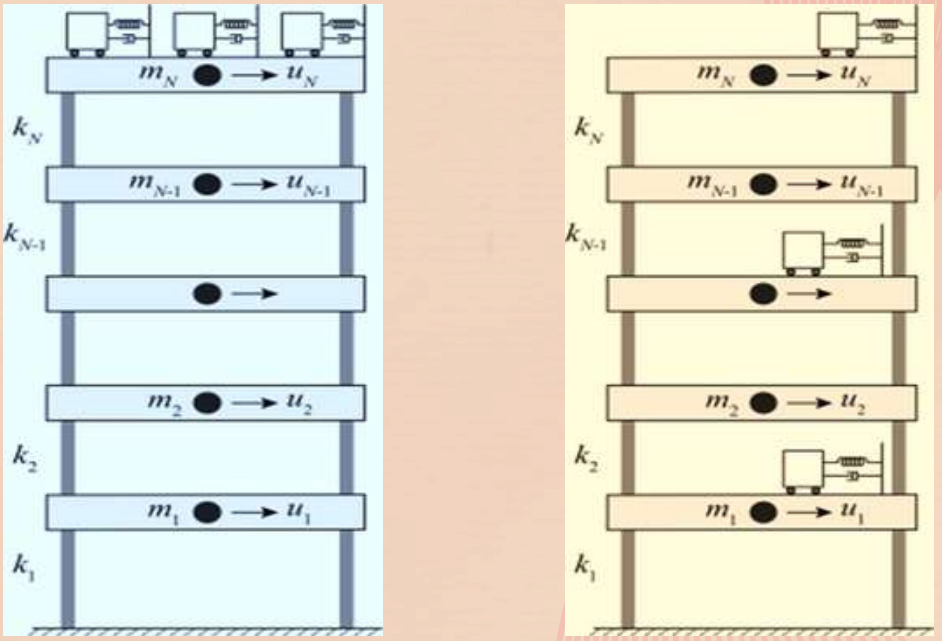


(a) Uncontrolled MDOF structure (b) Structure equipped with of Multi-stage TMD system

Fig. 3.

The concept of M-TMD was explicitly used in mechanical engineering and allied fields till late seventies. Warburton and Ayorinde (1980) extended the concept of the M-TMDs, for civil engineering applications. M-TMDs can be appropriately used where the damping of the oscillator is limited to low values. Many experimental and numerical studies have confirmed the effectiveness of M-TMDs and their insensitivity to the offset in tuning

frequency. M-TMD configuration is more effective in controlling the motion of the primary system. It offers the advantages of portability and ease of installation, because of the reduced size of an individual damper. This makes it attractive not only for new installation but also for temporary use during conetruction or for retrofitting existing structures. For the same mass ratio, the optimally designed M-TMD systems are more effective than the optimum S-TMD system. The optimum damping ratio for the M-TMD system is quite low, as compared to that of an S-TMD. Tuned to different frequencies of a structure, M-TMD systems can suppress the vibration of multiple modes.



(a) Equipped with M-TMD **(b) Equipped with d-M-TMD.**

Fig. 4. Idealized mathematical model of a multistory building.

Figure 4 (a) shows M-TMDs installed at the rooftop of a building.

Figure 4(b) presents the idealized mathematical model of a multistory building equipped with distributed multiple TMDs (d-M- TMD).

Optimizing the parameters of the M-TMDs is important for improving their effectiveness. It is reported that when the M-TMDs are placed at top floor of the building, optimum tuning frequency decreases with the increase in the mass ratio and increases with the increase in the number of M-TMDs.

M-TMDs are more effective in suppressing the accelerations at lower floors than at upper floors. The loss of effectiveness of the M-TMDs is minimal if they are distributed vertically based on the mode shapes of the main system. d-TMDs are placed according to mode shapes of the controlled and uncontrolled structure, and each one is tuned to

the corresponding modal frequency. They are effective for multi-mode control of the low-rise buildings with closely spaced frequencies under earthquake ground excitations. Figure 5 shows application of d-TMD system to a continuous bridge. The d-TMDs are installed at the center of each span, for controlling mid-span deflection. Moreover, Figure 6 shows the application of d-TMD system to a steel truss.

5.Tuned Mass Damper Inerter

The TMD inerter (TMDI)is a passive vibration response control device proposed for the mitigation of unwanted building vibration. The TMDI is composed of the traditional TMD configured together with an inerter device. The inerter, which is paired with the TMD, generates a control force proportional to the relative acceleration between its two ends. A single-story structure equipped with a typical TMDI is shown in Figure 7.

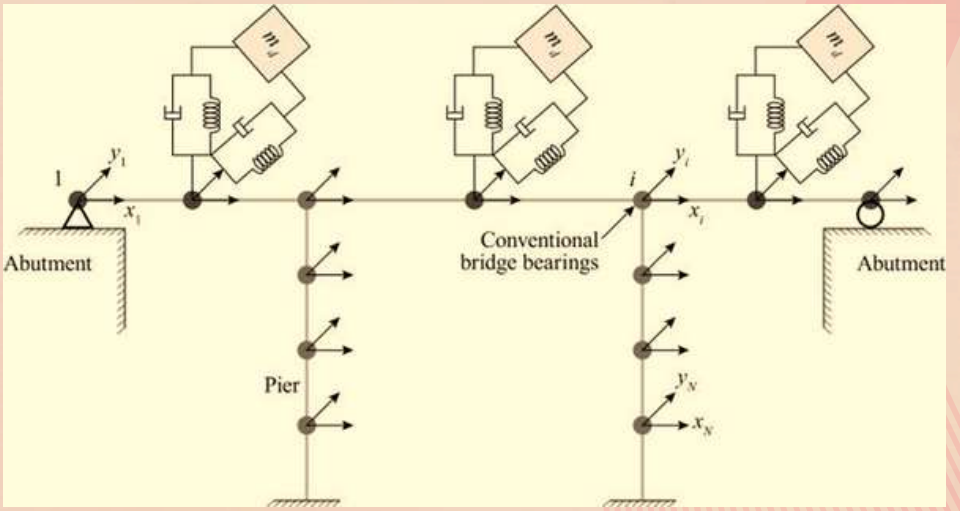


Fig. 5. Application of distributed TMD system to bridge.

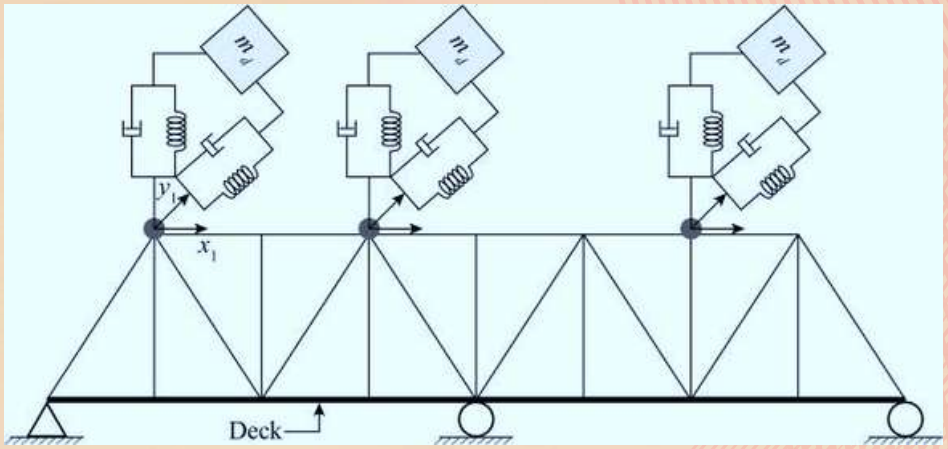


Fig. 6. Application of distributed TMD system to steel truss

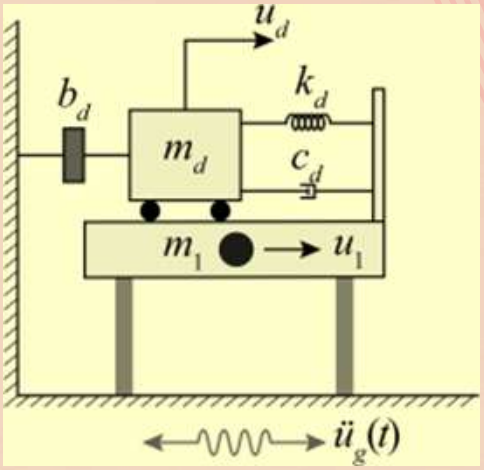


Fig. 7. A single-story structure equipped with a tuned mass damper inerter.

6. Merits of Tuned Mass Dampers

TMDs have been widely implemented to different structures, worldwide, because of their several advantages. TMDs are inexpensive, provide large structural damping, and reduce the resonant peak of the amplitude of vibration. Pendulum-type TMD requires less space for installation as com- pared to the traditional TMD, and, hence, it does not affect the architectural design. MSTMDs or M-TMDs have a large deformation capability than that of S-TMD, with the same horizontal and vertical stiffness.

7. Demerits of Tuned Mass Dampers

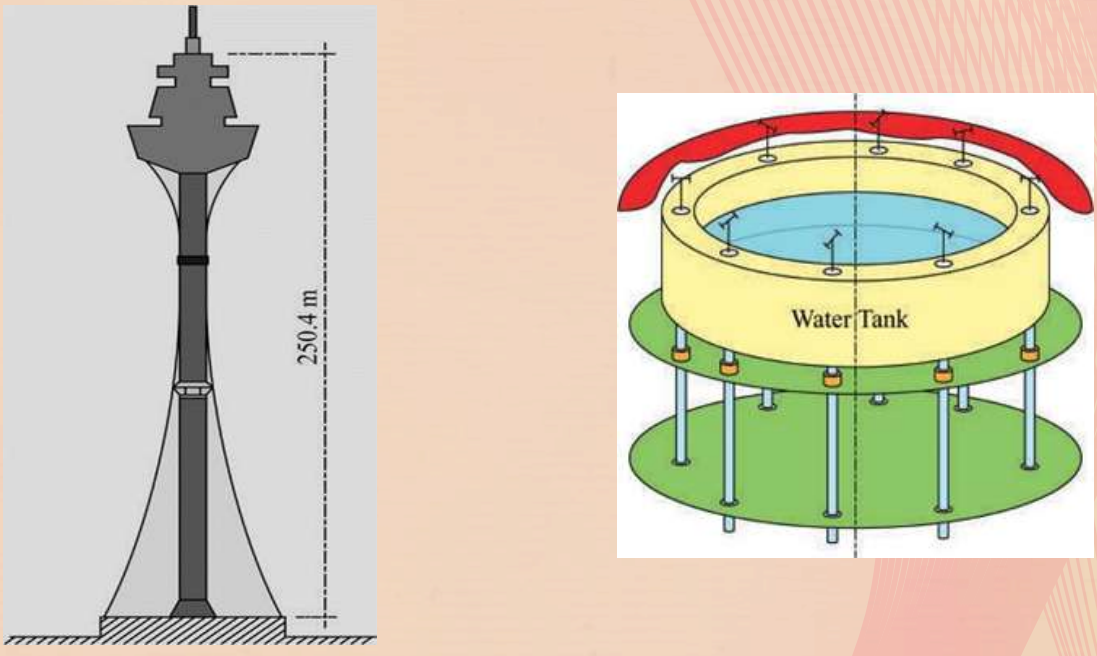
TMDs are specialized control devices, the performances of which are sensitive to the dynamic properties of the structure. Therefore, they require personnel specialized knowledge for design and implementation. Furthermore, they occupy a relatively large space and create additional gravity load to the structure. Mistuning of TMDs could lead to reduced effectiveness.

8. Worldwide Applications of Tuned Mass Dampers

Originally, TMD was used to reduce the impact caused due to wind vibrations. Later on as the research progressed, TMDs have been effectively used for mitigation of earthquake-induced vibrations. Some of the notable applications of TMDs in the world are mentioned below.

(a) Center point tower in Sydney, Australia

The TMD was first installed at the Center point Tower in Sydney, Australia. The height of the structure is 250.4 m as seen in Figure 8. The water tank located at the top of the tower, shown in Figure 10 is of capacity of 132.4 m3. In addition to supply water to the tower and fire protection supply, the tank, designed as TMD, controls the wind-induced vibrations. A 40-ton secondary mass was later installed in the tank, which increased the vibration control effect in first mode by 20%.



(a) The center point tower

(b) Water tank TMD

Fig. 8. Center Point Tower, Sydney, Australia

(a) Taipei 101 Tower, Taiwan

Taipei tower located in Taiwan, shown in Photo 1 has 101 floors, and is 501-m tall above ground. The building is used for communications, conference center, library, observation decks, office space, restaurants, and retail shopping malls, to Taipei Financial Corporation. Construction of the building started in 1999 and was completed in 2004. The building's most noteworthy structural element is its main TMD, shown in Photo 2. The TMD can be viewed from the indoor public observatory. The primary damper is a steel mass of 726 tons, built up from stacked steel plates to form a sphere visible to the visitors. The mass of the damper is 0.24% of the total mass of the building, and is suspended between the 92nd and 87th floors at the building's center. The swing rate is set up by simple pendulum action as it hangs from the 92nd floor. Under conditions of seismic stress or typhoon-force winds, the sway of the damper tends to counteract and thereby dampen any sway of the building. The inherent structural damping is supplemented by the massive TMD that uses building's motion to push and pull dashpots attached to it. The TMD is tuned to sway freely at about the same period or the same sway rate as that of the building. Fluid viscous dampers are bolted between the building frame and the TMD mass, as seen in Photo 2.

The damping effect of the sealed dashpots varies with the square of the velocity of the mass. The regular wind-induced sway creates a relatively small resistance force that provides damping, while permitting the mass to swing. In the event of sudden shock, like earthquake, the dashpot resistance will rise intensely and create a lockdown effect that limits the motion of the mass.

Photo 1. Taipei 101 Tower, Taiwan

Photo 2. Close up view of TMD in Taipei 101 Tower.

(b) Statue of Unity, India

The Statue of Unity is the world's tallest statue today. The total height of the statue is 240 m, with a base of 58 m and the statue measuring 182 m, as shown in Photo 3. It is a colossal statue of Indian statesman and independence activist Sardar Vallabhbhai Patel(1875-1950) who was the first home minister of India. It is located in Narmada District, in the state of Gujarat, on a river island facing the Sardar Sarovar dam on river Narmada, 100 km SE of the city of Vadodara. The scale of the project is reflected in the staggering size and weight of its materials. The construction of the statue took 25 lakh cubic feet of concrete, 5,700 ton of steel structure, and 18,500 ton of rebars. There are approximately 12,000 bronze panels covering the structure, weighing around 1,700 tons. Visitors have approach up to the viewing gallery, located near the chest of the statue at a height of 150 m. The statue is designed and built to withstand winds of up to 180 kmph and earthquakes measuring 6.5 on the Richter scale, which are at a depth of 10 km and within a radius of 12 km of the statue. The unique feature about the statue is that it is aided by the use of two 250-ton TMDs ensuring maximum stability. TMDs are located at the chest level of the statue, above the observation deck. This provides comfort to the visitors against high wind forces by controlling the sway in high winds.

Photo 3. Statue of Unity, Gujarat, India

(II) Tuned Liquid Damper

A TLD is a passive response control device that operates in a similar manner as the TMD, i.e., by countering the vibration of the primary system. In the case of TLD, the mass is replaced by a liquid, which is usually water, that serves as the mass in motion, and the restoring force is generated by gravity. The structural vibration shakes the TLD and induces the liquid movement inside the container. The turbulence of the liquid flow and the friction between the liquid flow and the container convert the dynamic energy of the fluid flow to heat, thus absorbing structural vibration energy. A TLD has the same elementary principle as a TMD, which is to absorb structural vibration energy. The difference is that all characteristics of auxiliary system mass, damping, and restoring mechanisms of TLD are provided by the liquid.

In a typical TLD, a rigid tank containing shallow water is connected rigidly to the structure. The liquid in the tank counteracts the vibration of the structure. The fundamental linear sloshing frequency of the TLD can be tuned to the natural frequency of the structure. This causes large amount of sloshing and wave breaking of the liquid. Such sloshing and wave breaking that happens at the resonant frequencies of the combined TLD-structure system dissipates a significant amount of energy; which helps in reducing the vibration of the parent structure and improving the level of protection the TLD can deliver. Broadly, TLDs are classified into tuned sloshing damper (TSD) and tuned liquid column damper (TLCD). Further, TSDs are subdivided into more subgroups, such as shallow and deep TSD. In addition, TLCDs are further classified into more subgroups, such as liquid column vibration absorbers (LCVA), double TLCD (DTLCD), hybrid TLCD (HTLCD), and pressurized TLCD (PTLCD).

9.Sloped Bottom Tuned Liquid Damper

Since 1950s,TLDs were used for stabilizing marine vessels again strolling operation in anti-rolling tanks. As the research progressed, the same concept was applied to control wobbling motion of satellite in space in the 1960s. Bauer (1984) proposed the idea of applying TLDs in civil engineering structures with the use of rectangular containers. The performance of liquid tank, however, can be modeled in two approaches. In the first approach, potential flow theory is used to work out the dynamic equations of motion. In the second approach, TLD is modeled as TMD, where the properties of the liquid damper are converted to corresponding mass, stiffness, and damping ratio. Sloshing of water is the motion of free surface of liquid in the container, in which it is placed.

10.Tuned Liquid Column Damper

U-shaped TLCDs are one of the most popular TLDs. Other than providing liquid in water tank, it is possible to induce oscillations in a liquid column. The energy dissipation is controlled through orifices provided at the base of the tank as shown in Figure 9.

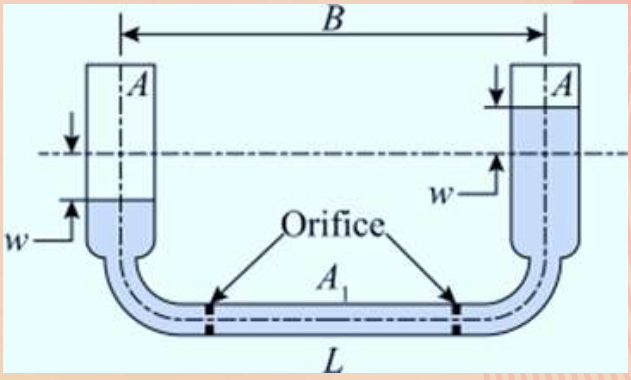


Fig. 9. U-shaped tuned liquid column damper

1. Merits of Tuned Liquid Damper

TLDs are effective against the strong motion of earthquakes and winds. The damper uses preexisting tanks for its damping function, thus results in use of less space. The system is inexpensive and easy to maintain. There is no mechanical friction in the system; hence, it is effective for even the slightest vibrations. TLDs are efficient for all amplitude levels, as it is easy to adjust the time period; the frequency can be controlled by adjusting height of liquid; and they are cheaper to incorporate in an existing structural design. The advantage of using TLCD system is that the containers are used for supplying building water, unlike a TMD where the dead weight is of no other use. TMDs require frictionless rubber bearings, special floor for installation, etc. for dissipating energy efficiently.

TLDs on other hand are low-cost inertial devices having a superior performance as compared to TMDs. Failure of the system is virtually impossible.

12.Demerits of Tuned Liquid Damper

The main disadvantage of the majority of TLDs is that they provide only one main oscillation damped frequency, which is not adequate for the structure, as different vibration modes are required to be considered simultaneously. All the water mass does not participate in counteracting the structural motion. This results in extra cost in terms of added weight to the structure without the benefit of commensurate response control.

13.Worldwide Applications of Tuned Liquid Damper

TLD, which works on the similar principle as TMD, is widely employed for alleviating wind-induced vibrations of tall structures. Further, investigations have confirmed the effectiveness of TLDs in reducing the vibrations caused due to ground shaking. TLDs, encompassing both TSDs and TLCDs have become a popular form of inertial damping device since their first applications to ground structures in the 1980s. Low initial cost coupled with their low maintenance requirements has guaranteed their wide use. In particular, the TSDs are extremely practical, currently being proposed for existing water tanks on the building by configuring internal partitions into multiple dampers without adversely affecting the functional use of the water supply tanks. Considering only a small additional mass to the building, these systems can reduce acceleration response to 35–50% of the original response, depending on the amount of liquid mass.

Currently, both deep and shallow water configurations of TSDs, which exploit the amplitude of fluid motion and wave-breaking patterns to provide additional damping, are in application worldwide. The shallow water configurations dissipate energy through the viscous action and wave breaking. The addition of floaters may also add to the dissipation of sloshing energy. Deep water TSDs require baffles or screens to increase the energy dissipation of the sloshing fluid. While the natural frequency of a TLD may be simply adjusted by the depth of water, and the dimension of the container, there are practical limitations on the water depth and on the frequency, which may be obtained by a given container design. Some of the notable applications of TLDs, installed in structures around the world are mentioned below.

(a) Hobart Tower, Tasmania, Australia

Hobart Tower in Tasmania, Australia is 105 m tall. The tower was covered in a protective cylindrical shell for shielding the transmission antenna from the harsh conditions. However, the shell increased the wind-induced response of the tower. This demanded the installation of vibration control devices. The tower was then equipped with 80 TSDs.

(b) Gold Tower, Kagawa, Japan

A total of 16 TSDs were installed in the top floor of the 158-m Gold Tower in Kagawa, Japan. The installation of 10 tons of TSDs was found to reduce the response to 35–50% of the original response. The tank, in the form of a cube, is filled with water and equipped with steel wire nets to dissipate the motion of the liquid. By adjusting these damping nets, the length of the tank, and the depth of water, the device is appropriately tuned.

(c) Nagasaki Airport Tower, Nagasaki, Japan

TLD originally found its application in 1987, in the Nagasaki Airport Tower, Nagasaki, Japan. A multilayer configuration of 25 TSDs, weighing 950 kg was proposed for the 42-m tall tower. A total of 12 cylindrical, multilayered vessels of vinyl chloride of dimensions of 0.5-m height and 0.38-m diameter were installed on the air traffic control room floor. The remaining 13 devices were distributed on each stair landing. Each vessel was divided into seven70-mm thick layers, each containing 48 mm of water of mass 38 kg. Tests conducted to calculate the frequency and damping ratio of the tower revealed that the displacement due to the across-wind component was more than the along-wind component. Further, it was noticed that beat phenomena was present, which was eliminated through the use of floating particles that helped to dampen the liquid motion in the containers. The installed TSDs have been found to improve the response of the tower considerably, even at higher wind velocities.

(d) Tokyo Airport Tower, Tokyo, Japan

In 1993, TLD system was installed in the 77.6-mtall Tokyo Airport Tower, Tokyo, Japan. The tower consists of 1,400 vessels of water, and floating materials. Each of the 1,400 vessels is a shallow circular cylinder of diameter 0.6 m and height 0.125m as shown in Figure 10. These vessels are stacked in layers and have injection taps and handles to serve as projections and four conical dents on the upside and base.

These projections and dents provide additional stiffness for stacking the polyethylene vessels.

The sloshing frequency of TLD is optimized at 0.743 Hz and the total mass of the system is about 3.5% of the first generalized mode of the tower. The TLD system reduced the dynamic response of the tower structure to 60% during high-intensity winds, as compared to the tower without TLD.

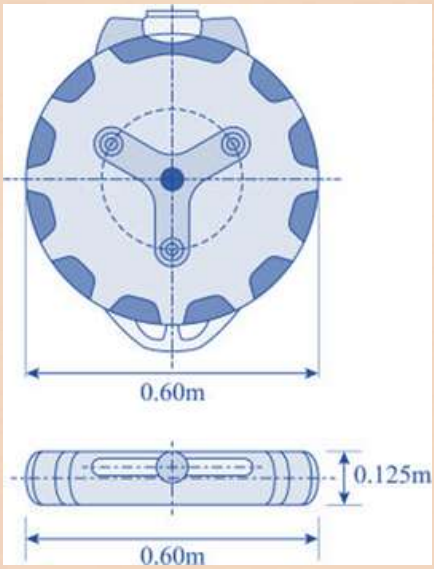


Fig. 10. TLD vessel in Tokyo Airport Tower, Japan

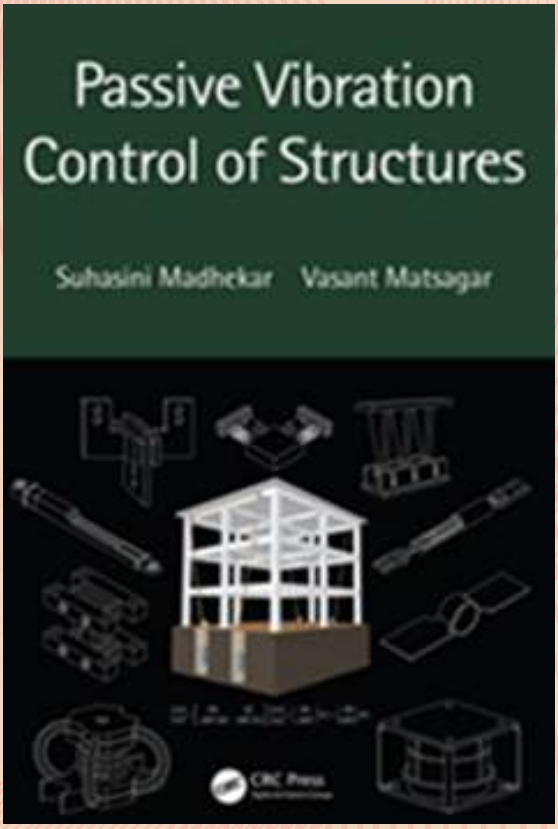
Photo 4. Shanghai World Financial Center, China

(a) Shanghai World Financial Center, China

Shanghai World Financial Center shown in Photo 4 is a supertall skyscraper, equipped with eight TSD units at its 91st floor. Each tank is 5.5 m in diameter, separated into six layers. The installation of the 800-tonne TSD system (1% mass ratio) is anticipated to successfully reduce the story drift and peak and RMS acceleration to acceptable limits. The tower's trapezoid aperture is made up of structural steel and RC.

Editor's Note

This article is a preview of Chapter-5 of the Authors' book entitled "Passive Vibration Control of Structures" (CRC Press). Chapter-4 was covered in the previous issue of ***"amplitude"***. We plan to present the previews of subsequent Chapters of the book in future issues of this Newsletter.



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HYBRID MODULAR MODELLING

This approach breaks complex assemblies into manageable substructures that can be tested and simulated separately. This allows engineers to create accurate system-level models early in development — even before physical prototypes are available.

TRANSFER PATH ANALYSIS (TPA)

Transfer Path Analysis (TPA) methods are various techniques to identify and evaluate the contribution of vibration sources in an assembly. Vibrations and noise levels can be predicted to further understand areas of improvement of the product

SOURCE DESCRIPTIONS

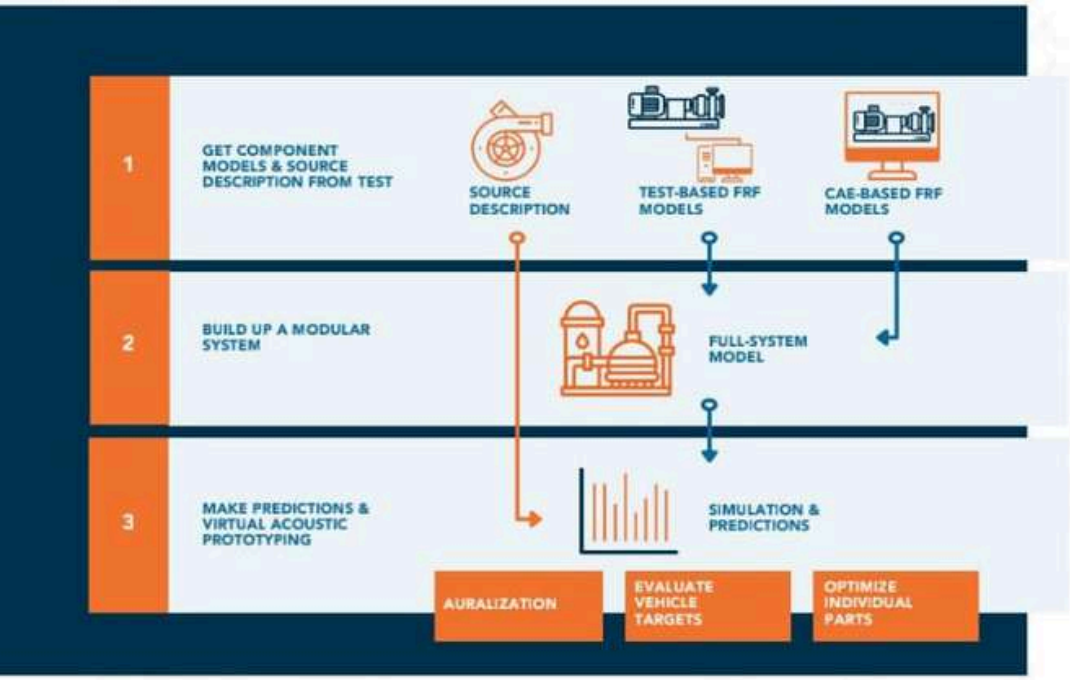
Standardized source descriptions, such as blocked forces, make it possible to characterize active vibration sources independently of the receiving structure. These models can be reused across platforms and integrated into simulations or benchmarking activities.

TEST-BASED MODELLING

When simulation models are not available or not sufficient, test-based modelling allows engineers to build dynamic models of passive components using physical measurement data. These models can be integrated into broader assemblies for NVH analysis.

MODAL ANALYSIS

Modal analysis identifies the natural frequencies, mode shapes, and damping of components or systems. This data supports validation and refinement of structural and acoustic behaviour, particularly in early development stages where accurate models are critical.



INSIDE THE SOLUTIONS

DIRAC

DIRAC enables engineers to prepare, perform and analyse dynamic measurements yielding high quality experimental component models. DIRAC ensures traceability of results and indicates the quality of the measurement. Overall, DIRAC helps to reduce the number of prototype variants needed – thus saving valuable time and resources.

SOURCE

SOURCE is a software tool for Blocked Force Source Characterization (SC) and component Transfer Path Analysis (TPA). It combines all SC and TPA methods in one clear workflow with quality checks. Results are then integrated into CAE simulations, helping engineers address NVH issues early in product development with traceable, reliable data.

COUPLE

COUPLE is a standalone application for assembling, predicting, and improving NVH designs through Dynamic Substructuring. It combines test models from DIRAC and SOURCE with simulation models in a full modular workflow. COUPLE helps avoid late-phase troubleshooting and reduces design cycles, making reliable full-system models available much earlier.

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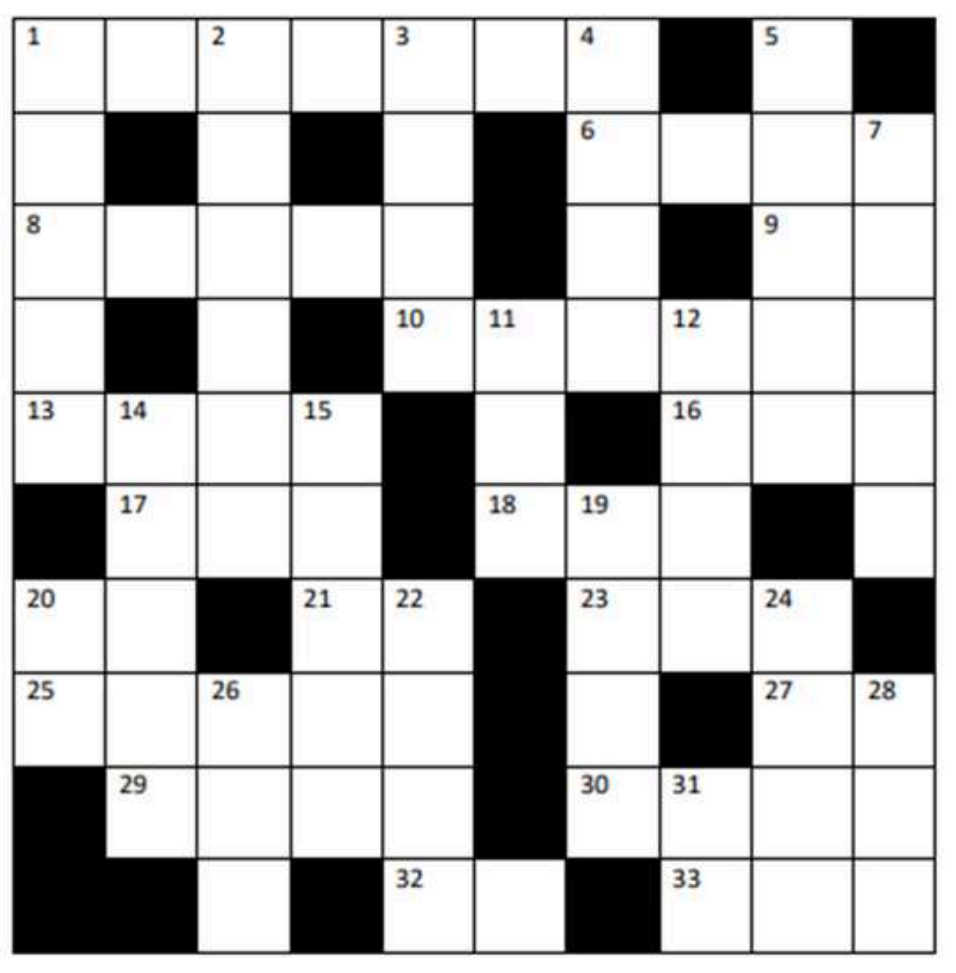
The CVS Crossword

Contributed by Dr Arun Jalan, FCVS

Let's put on our thinking caps!



Across	Down
1. Sound measurement unit 6. The smallest unit of an element that retains the element's properties 8. A woody climbing usually tropical plant 9. A type of water treatment process 10. A Type of bone 13. A strong metal 16. A type of file, which can directly execute to perform a specific task. 17. A curved line and part of conic sections 18. A critical component of steering system, _____rod. 20. A removable storage device 21. A type of vehicle 23. An instrument used for surface study. 25. To represent something large or broad 27. A type of radiation energy 29. A unit of weight used in countries near the Mediterranean 30. One of the thermodynamic cycle 32. A communication protocol that ensures data reaches its destination safely 33. An Indian city	1. The upcoming INVEST'25 will be held at 2. A loud noise 3. To strike directly, forcefully and repeatedly 4. A type of guided ultrasonic wave, used for non-destructive testing 5. A chemical, primarily used as a cleaner 7. Walk or move in a leisurely manner 11. A network of physical objects, or "things," embedded with sensors, software 12. One of the international technical professional organization 14. A system that uses radio waves to detect, locate, and track objects. 15. A national council for education 19. Space agency of India 20. A trademark used specifically with services. 22. SI unit of electric potential 24. Silent; No sound 26. the ratio of the friction force to the normal force 28. Represents the high-level output voltage. 31. The diminishment of signal strength as it travels through a medium or system

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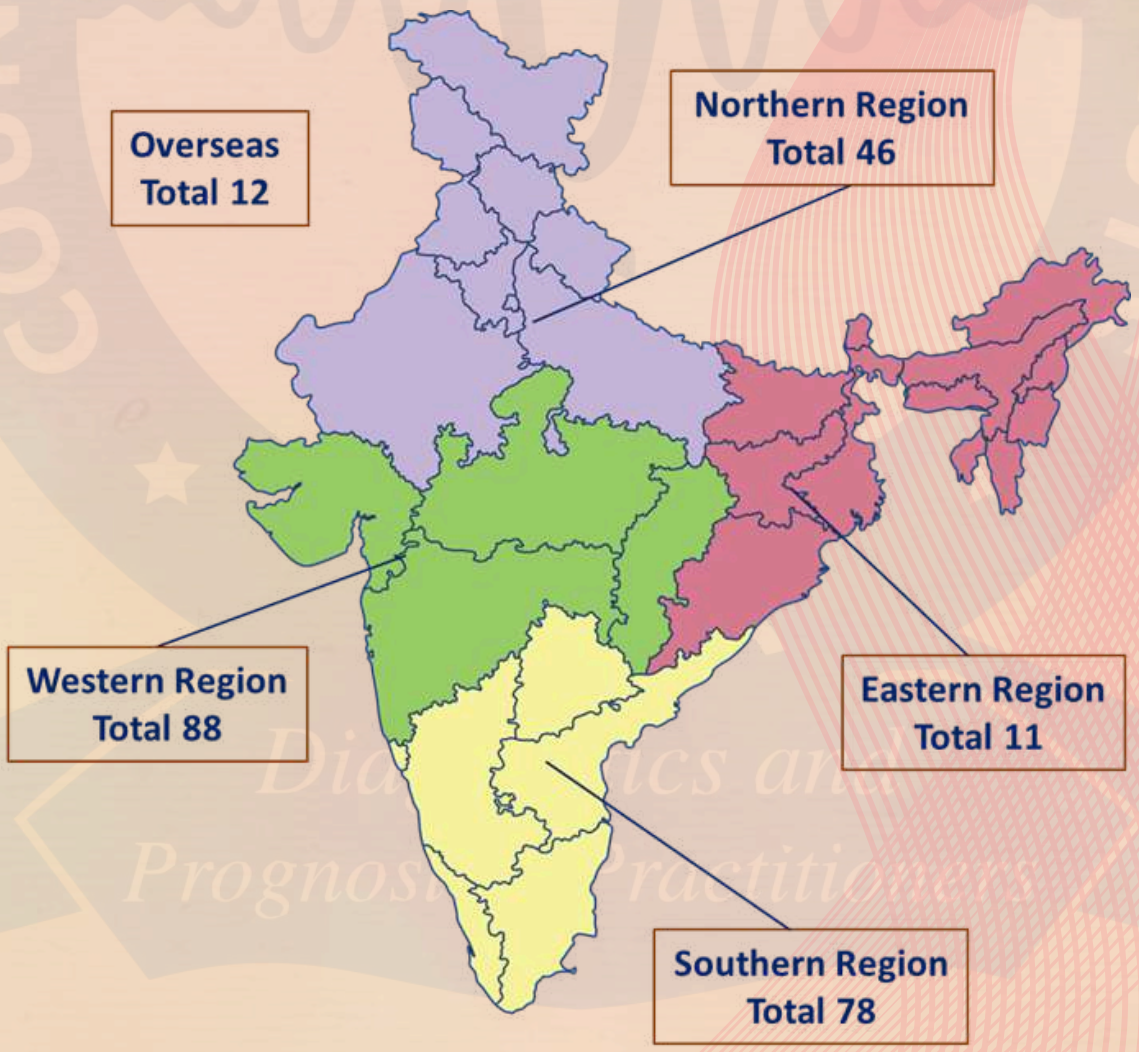
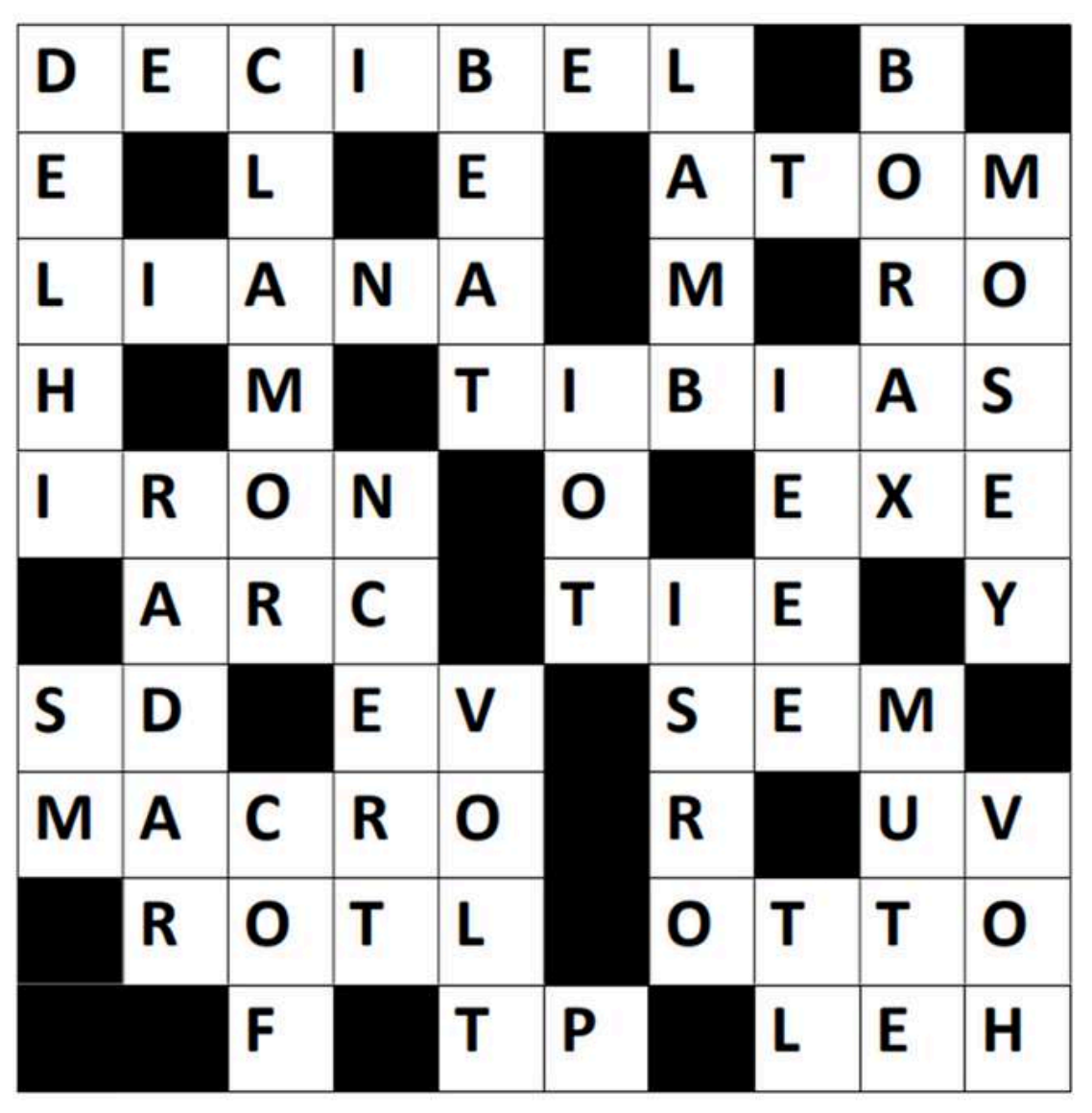


Solution to the CVS Crossword



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