



amplitude

**DIAGNOSTICS &
PROGNOSTICS
NEWS**

2024, Issue 4



www.covs.in

COUNCIL OF VIBRATION SPECIALISTS

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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.



The Game-changing Technology: **Motion** Amplification

Quick RCA with Real-Time Vibration Visualisation



VIBRATION MONITORING & MOTION ANALYSIS



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!



Leading Safety and Reliability

For the people who
keep the world running

IRISS Asia Pacific Pvt. Ltd.

3rd Floor, Brigade Tech Park,
Pattandur Agrahara Road,
Whitefield, Bangalore,
Karnataka - 560066



✉ info-india@iriss.com www.iriss.com





Dr Barun Chakrabarti, FCVS

Dear Colleagues,

Greetings from the Editorial Team of *“amplitude”*.

The latest issue of our Newsletter is here. This is the last issue of the Year 2024 (Issue-4 / 2024).

This issue presents the highlights of various activities within the CVS Family during the past quarter, along with our regular features.

Our flagship event, INVEST-25 is just a few months away. The members of the Core Organizing Committee and the Technical Committee have been working round the clock over the past couple of months, shaping various aspects of the conference. Some more members will also join the efforts through different committees closer to the event. With the nation's capital as the location and Brand IIT-Delhi as the key driver, INVEST-25 promises to be even bigger and grander than INVEST-23. But this mega show is not just for those engaged with various committees. INVEST-25 belongs to every CVS Member and each one of us has the responsibility to contribute to the success of this great event. Please do come forward and participate actively in any way you can – as sponsor, exhibitor, speaker, delegate and committee member. No effort is too small. We definitely look forward to seeing each one of you at INVEST-25.

This issue of the Newsletter covers several notable activities during the past quarter. These include an informative seminar on motion amplification systems organized jointly by IRISS and CVS in Navi Mumbai, a productive visit to CSIR – SERC, Chennai by our Secretary & DG, and two successful webinars that promoted learning and knowledge sharing among members.

As we had noted in the last issue, our esteemed Members continue to bring glory to CVS through their professional and personal achievements. Please do read the long list of such accolades featured in this issue. Our heartiest congratulations to all the Members and best wishes for their continued success in the pursuit of excellence.

By the time you read this, we will have been several weeks into the New Year 2025. Start of a new calendar year may be just a point in the limitless axis of Time, but we all look forward to a New Year with hope and aspirations, and for the promise of a new beginning that it brings. New Year Resolution is a much cliched term and it is often said that the only purpose of making such a Resolution is to break it – what matters is how soon. Jokes apart, let us enjoy this new beginning in our professional and personal lives and make the most of it, while committing our best efforts towards taking CVS to greater heights.

Wish you happy reading!



Dr. Tarapada Pyne, FCVS

Secretary and Director General

Dear Diagnostic and Prognostic Engineers,

Happy New Year 2025!

'*amplitude*' is being released a little late this time as we celebrate the fourth CVS Foundation Day on Republic Day. We now have over 230 members, with 25 new members joining in the last two weeks of the previous year.

Resolutions have been made: some have been achieved, some not, and a few are only partially completed. Yet, we must remain optimistic, keeping our targets in sight and putting in the effort to achieve our goals. Our main objective is to achieve Excellence in Vibration Science and Engineering and contribute to the nation's needs by bridging the knowledge gaps in the field of vibration across key sectors—namely, manufacturing, agriculture, and aerospace—which contribute the most to the nation's GDP. This can be accomplished by solving the teething problems of vibrating machinery. Helping the industry with value-adding production assets is, in fact, a contribution toward "Viksit Bharat."

Engineers at CVS can benefit from exchanging professional information and knowledge among peers through conferences, seminars/webinars, and by dedicating ourselves to nation-building by way of enriching the specialized, omnipresent subject of vibration science and its applications through training courses, consulting for industries, and supporting students and faculty in their project/research work. We encourage members to take time out of their busy schedules to help students, faculty, and junior engineers who aspire to pursue careers in vibration.

To make our lives easier in the industry, engineers at all levels must understand and appreciate the interdisciplinary care required when any asset becomes "sick." In academia, we need a dedicated effort to serve the diagnostic community, and this can only be achieved by nurturing the right diagnostic education.

In this new year, with renewed hope, CVS will strive to enhance individual careers, support corporate initiatives, assist in higher studies and research, and develop special skill-building courses for industries. Active participation from our members is crucial for the realization of CVS's objectives. A focused effort from our entire group will help elevate our expertise and make it recognized globally.

Our flagship event, INVEST, held every two years, was a great success the last time in Bengaluru, with the presence of experts from various stakeholders in vibration and allied fields. INVEST25 at IIT Delhi, scheduled for May 29-31, 2025, will be even more dynamic, featuring the latest innovative solutions from global leaders in machinery vibration and allied fields. With Predictive Maintenance and Asset Management as key themes, it is “Destination India” now, and with Delhi being a ‘Mini India’ and IIT Delhi being one of the nation’s top institutes, this conference is set to be extraordinary. We invite all members and their organizations to participate in any capacity in INVEST25 (please refer to social media for details and/or contact our various committees).

We appeal to all members to join forces and focus on scaling up our priority areas: consulting, training, developing course modules, obtaining associations/accreditations, participating in INVEST25, helping students within chapters, and reaching out to more colleges. We need the support of every member and prospective member. The following Resolutions for this year are especially relevant:

- Successfully complete INVEST25 with an emphasis on quality presentations, event management, exhibitions, and attracting more industries.
- Participate in conferences organized by knowledge partners and visit key industries and campuses to enrol more members.
- Establish associations with government bodies/various Skill Councils to deliver structured training courses to industries, preparing syllabi that conform to Government of India norms/ISO standards, with the addition of structural and seismic topics. Explore the possibility of offering accredited certifications through a dedicated team.
- Increase our membership base to 300 members by December 2025.
- Open at least FOUR student chapters across institutions in the country and ONE Regional Chapter (Eastern Zone).
- Conduct free webinars once a month, each lasting one hour.
- Add THREE new corporate members.
- Add value to the CVS newsletter, *amplitude*.
- Prepare for the launch of the CVS journal and/or an MOU with a publisher of indexed journals to feature select papers from INVEST. A dedicated committee will be formed and engaged.
- Strengthen the activities of the ‘Training Chair’ and ‘Students Chair’.
- Encourage CVS members to act as spokespersons to promote CVS training and certifications in the industry, with a prime focus on “Employability and Skills Development.”
- Conduct regular programs and industry visits for students through student chapters.
- As a knowledge-sharing platform, CVS will continue to value each member’s voice for the benefit of this fraternity and to expand the reach of this field.

INVEST 2025

International Conference on Vibration Engineering, Science, and Technology

Date : 29,30, and 31 May 2025



COUNCIL OF VIBRATION SPECIALISTS (CVS)

CVS is a Non-profit, 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)

HIGHLIGHT

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

HURRY UP

Call for Papers

Lecture Hall Complex (LHC)

**IIT Delhi, Hauz Khas - 110 016,
New Delhi, India**

**International conference on
Vibration
Engineering
Science &
Technology**



THEME:
Innovation and Smart Solutions in
Vibration Science and Engineering

<https://investcvs.in>



NEAREST

Metro Stn : 02 km || 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	Director, LPSC and Distinguished Scientist	LPSC, ISRO, Thiruvananthapuram
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. Upadhyaya	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, Bhubaneswar
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 Niranjana 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 Vamshidhar Botha	Group 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/ 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
- Innovation in Power Industries - 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	30 April, 2025
Opening Day of Conference	29 May, 2025

- The papers, accepted and presented in INVEST2025, will be published in SCOPUS indexed 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 30 April 2025. However, they can avail an early bird discount of 5% if they register on or before 28 February 2025. A further discount of 5% is offered to CVS members.

**For Corporate Exhibition and Presentation Opportunities,
Please Contact the Organizers**

PAPER AND PUBLICATION COMMITTEE

KEY CONTACTS

Dr Barun Chakrabarti

Editor, '*amplitude*', CVS
Managing Director, Bonitas Consulting, Mumbai
(+91 98200 07199)

Dr Arun Jalan

Professor
Department of Mech. Engineering
BITS, Pilani
(+91 79762 18021)

Dr Suhasini Madhekar

Former Editor, '*amplitude*', CVS
Ex-Prof. COEP, Pune
(+91 98223 25683)

Dr Nilaj Deshmukh

Dean Admin and Faculty,
Department of Mech. Engineering
FCRIT, Navi Mumbai
(+91 98671 67754)

Dr Vasant Matsagar

Professor and Head,
Department of Civil Engineering
IIT Delhi, New Delhi
(+91 98681 81807)

Prof. Sunny Saraf

Asst Prof. of Mech. Engineering
FCRIT, Navi Mumbai
(+91 93089 92780)

Dr Tarapada Pyne

Secretary and DG, CVS
CKO and Director, CRD, Navi Mumbai
(+91 88050 22148)

Email: paperinvest25@gmail.com

<https://investcvs.covs.in>

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:**

Dr Tarapada Pyne, CVS HQ

(+91 88050 22148)

Website: <https://www.covs.in>

Email: cvs.hqs@covs.in





GLIMPSES INVEST 2023



CVS joins hands with IRISS Inc. to host seminar on Motion Amplification Systems

Er. Mukesh Shah, FCVS

Council of Vibration Specialists (CVS) joined hands with CVS Corporate Member, IRISS Inc., to host a very informative seminar of Motion Amplification Systems on the evening of 20th November 2024 at Hotel Marriott in Navi Mumbai.

The collaborative program attracted a distinguished assembly of participants from both the industry and academia, reflecting the significance and broad interest in the topic. Attendees had the unique opportunity to delve into the latest advancements and applications of motion amplification technology.

Event Highlights

Insightful Presentations

Prominent experts from IRISS, Mr. Jyothikumar and Mr. Pariaker, delivered insightful keynote presentations, shedding light on the innovative applications and future potential of motion amplification systems. These presentations provided a comprehensive overview of the technology, addressing both theoretical and practical aspects.

Interactive Demonstrations

The event featured live demonstrations of motion amplification systems and state-of-the-art inspection windows, showcasing their capabilities in real-time. This hands-on session allowed participants to witness the technology's power in enhancing vibration analysis and identifying mechanical issues with unprecedented clarity and precision.

Panel Discussion

The program featured an engaging panel discussion, where industry leaders and academic scholars exchanged ideas and discussed the challenges and opportunities associated with the implementation of motion amplification systems in various sectors. The collaborative dialogue fostered a deeper understanding of the technology's impact on improving equipment reliability and operational efficiency.

Networking Opportunities

The program also provided ample networking opportunities, enabling attendees to connect with peers, share experiences, and explore potential collaborations. The diverse mix of professionals from different backgrounds enriched the conversations and broadened the perspectives on the use of motion amplification technology.

Conclusion

The evening program on Motion Amplification Systems was a resounding success, thanks to the joint efforts of M/s. IRISS Inc. and CVS (Council of Vibration Specialists). The event not only highlighted the innovative applications of motion amplification technology but also fostered valuable connections between industry and academia. We look forward to future such endeavours that will continue the advancements in this field and bring together experts from around the world.

Here are a few glimpses from this educative and enjoyable event.



Visit to CSIR – Structural Engineering Research Centre (SERC), Chennai by Secretary & DG (CVS)

Dr Tarapada Pyne, Secretary & Director General (CVS) visited CSIR – SERC at Chennai on 20th December 2024. Dr Pyne was on his way back from the NSRD2024 event at SRM University, where he had delivered an invited talk. Dr Srinivas Voggu, FCVS and Scientist Ramsh Babu effectively coordinated the visit. During the visit, Dr Pyne met many scientists, scholars, and engineers who were interested in becoming CVS members. It was heartening to see that CVS and its activities were well-known within CSIR-SERC campus. Dr Pyne visited many testing facilities on diverse areas of Vibration and Structural integrity, and had a first-hand exposure to the on-going research activities. Dr Pyne also had the opportunity of meeting the Director, Dr Anandavalli, along with several senior scientists, including CVS Founding Fellow, Dr Srinivas Voggu. During the meeting with the Director, Dr Pyne discussed several topics of common interest, including a membership drive at CSIR – SERC, conduct of joint training programs and active participation from the SERC team in INVEST25. Dr Pyne also proposed that CSIR – SERC could host the next mega event, INVEST27, as the sprawling campus offered excellent facilities for such a conference. Overall, it was a productive visit with fruitful discussion, knowledge sharing and professional networking.





Mr. Jyothikumar Chandran, FCVS

Mr. Jyothikumar Chandran is a distinguished leader in Servitisation, Service Sales, and subscription-based Advanced Technological Services. With over 30 years of expertise he has successfully led P&L for businesses across India, MENA, and the Caspian Region, driving transformative growth in Inspection, Reliability, and Asset Integrity Solutions.

As the Director of Business Development at IRISS, Jyothikumar has spearheaded pioneering initiatives in Vibration Analysis, Motion Amplification, Furnace Thermography, Electrical & Mechanical Maintenance, Thermochromic Solutions, IR Windows, and IIoT solutions for the Oil & Gas sector. His extensive expertise includes product provisions, after-sales condition monitoring, and crafting innovative Service & Contract Sales strategies that enhance customer value and increase revenue streams.

A visionary in his field, Jyothikumar excels at building long-term partnerships, delivering customized solutions, and advancing businesses through strategic leadership. His insights and expertise make him a sought-after speaker and thought leader in the industrial and technological sectors.



Dr. V. Arun Kumar, FCVS

Dr. V. Arun Kumar worked as a Chief Scientist at National Aerospace Laboratories (NAL) and was heading the Propulsion Division at the time of his superannuation. His specialization is mechanical aspects of turbo-machinery in general and rotor dynamics, bearings and vibration control in particular. Currently, he is working as an Adjunct Professor at B.M.S. College of Engineering, an Advisor at Dr. Ambedkar Institute of Technology and as a Chief Technology Mentor with Dheya Technologies, involved in development of small gas turbines.

He has worked as a Consultant to various industries (DUCOM, TVS etc.). He has obtained the National Design Award from NDRF and the Biren Roy Award from Aeronautical Society of India, apart from the Outstanding Performance Award from NAL. He has published over a hundred technical articles and has twelve granted patents to his credit, with three more patents under processing. He has guided the Doctoral research work for five Ph.D. students, four of which have resulted in grant of patents. He has been a Member/Chairman of several technical committees and delivered several invited/plenary talks. Dr. Arun Kumar is currently working on foil bearings, non-contact torque transmission and under-water dynamics, apart from several sponsored research projects.

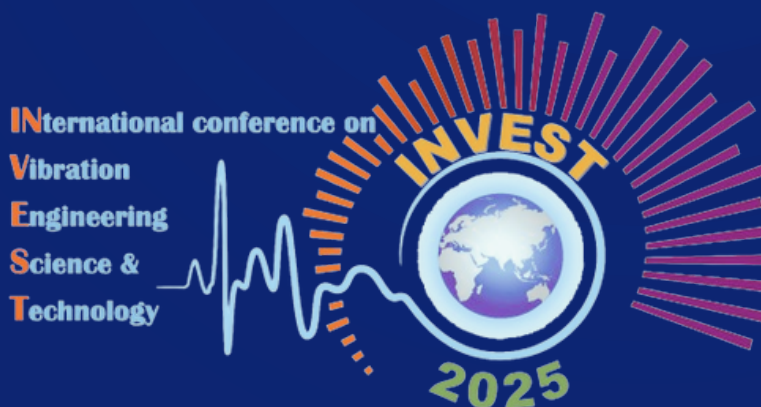


Dr S. Seetharamu, FCVS

Dr S. Seetharamu received his Ph.D. in Mechanical Engineering from the Indian Institute of Science (IISc) in 1982, after completing his M.E. in Mechanical Engineering from IISc in 1976 and B.E. in Mechanical Engineering from Bangalore University in 1974. He began his career in the industry, working with Larsen & Toubro (L&T) and Best and Crompton Engineering. In 1985, he joined the Central Power Research Institute (CPRI), where he rose to the position of Director and served for thirty years until his retirement in June 2015. He also served as a faculty member at Toyohashi University of Technology in Japan. After retiring from CPRI, he took up various assignments, including AICTE and INAE Distinguished Professor, and Visiting Professor at leading colleges. He also serves as the Director at the National Design and Research Forum (IEI).

As a leading Scientist of Central Power Research Institute, he has worked towards applied R&D with the Power Utilities, which involved condition assessment and diagnostics, asset integrity management, RIA and LE of plant components, and materials technology advances. His present interest includes, IIoT, GH2 Technologies and Energy & Environment (ESG). Throughout his career, he has guided and mentored undergraduate, postgraduate, and doctoral students.

Dr. Seetharamu has published over 160 reviewed journal papers, received numerous awards and has several patents to his credit. Apart from being a Fellow of CVS, he is associated with many professional bodies, including IEEE, IIE, IIPE, ISNT, ASM, ICS, IAEMP, ISSE, InSIS, TSI, and SFA.



CVS is a Non-profit, 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)

Date : 29,30, and 31 May 2025

THEME:

Innovation and Smart Solutions in
Vibration Science and Engineering

Members in News

Heartiest Congratulations! We are proud of you.



Dr H S Gambhir, Founding President of CVS, has been elevated to the esteemed position of Fellow of the International Society of Automation (ISA). This honour is in recognition of his outstanding contributions and achievements in the field of Automation and in the activities of ISA. The CVS Family feels proud of his accomplishments and wishes him many such laurels in the years to come.



Prof. Dattatray Sawant, FCVS, has been bestowed with the prestigious award for Excellence in Technical Achievement 2024 by the International Society of Automation (ISA). The Award recognizes his technical contributions in the area of robotics and automation. Prof. Sawant has been elected as the Budget Committee Chairman in the Geographic Assembly of the ISA, USA.



Prof. V. Matsagar, Founding Fellow of CVS and Head – Dept. of Civil Engineering, IIT – Delhi, has been conferred the prestigious Fellowship of the Indian National Academy of Sciences. The Fellowship Certificate was presented by Dr. Balram Bhargava, President – Academy. Prof. Matsagar has also been elected as a Fellow of the Maharashtra Academy of Sciences in the year 2024. The Fellowship was awarded during the induction ceremony at the MIT – WPU Campus in Pune.



The 7th National Symposium on Rotor Dynamics (NSRD-2024) held at SRMIST, Chennai during 18 – 20 December 2024, saw senior CVS Experts present in strength to add value to the event. **Dr. Tarapada Pyne**, Founding Secretary & DG – CVS, **Dr V. Arun Kumar**, FCVS and Consultant (Dheya Engineering Technologies) and **Er. SKM Rao**, FCVS and Technical Director (Envicon Vibrotech Pvt. Ltd.) made technical presentations at the Symposium. Dr Pyne spoke on rotating machinery diagnostics and plant reliability, Dr V. Arun Kumar spoke about futuristic research aspects in turbo-machinery while Er. Rao presented case studies on modal analysis and ODS.



Er. N P Sundar, FCVS, from Stellar Innostrat Consulting, participated in the Asset Integrity Management Summit – 2024 at Mumbai and presented a talk on “Integrated Asset Strategy Cycle – The Opportunities for (Asset Intensive) Organizations”. The presentation attracted much attention and was appreciated by the audience.



Dr Suhasini Madhekar, FCVS and Chairperson of the Pune Chapter of Indian Society of Earthquake Technology (ISET), was recently felicitated in recognition of outstanding performance of ISET – Pune Chapter as the best-performing ISET Local Chapter. In the felicitation ceremony held on 12 December 2024 at IIT Guwahati during the 8th International Conference on Advances in Research and Development of Geotechnical Earthquake Engineering (8ICARGE), Dr Madhekar was presented with a memento and certificate of appreciation by Prof. B. K. Maheshwari, President ISET.



Er. Gourav Vivek Kulkarni, CVS Life Member, was awarded the Gold Medal for his M. Tech. (Machine Design) course and the Best Outgoing Student (PG Non-Circuit Programs) Award during the Graduation Day Ceremony at RV College of Engineering, Bengaluru on 17 December 2024. He was an active Student Chapter Member of CVS at RVCE. Currently, he is an Assistant Professor at KLS Gogte Institute of Technology, Belagavi.



Dr Kartik Fojdar, FCVS has published a book on Reliability, which was launched in a glittering ceremony in Mumbai. The book provides valuable insights to instrumentation system designers with respect to the user's perspective of Reliability. It lucidly explains Availability and Safety as core Reliability values and also explains their interaction. The book talks about how to optimise Availability and Safety. It emphasizes that core Reliability should not be compromised while evaluating new technologies.

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.)
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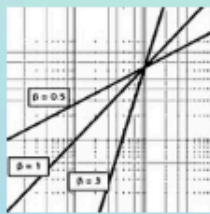
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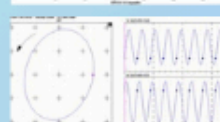
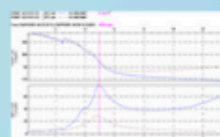
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Mobile: +91 8805022148



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Machine Learning Approach for Condition Monitoring (10 November 2024)

Dr. Abhishek D. Patange, MCVS

Data Science & AI Specialist, ABB Global Industries and Services (P) Ltd., Bengaluru

Dr Abhishek Patange presented an overview of the Machine Learning based approach towards condition monitoring. In a lucid and crisp presentation covering the key concepts in Machine Learning and Data Analytics techniques, he demonstrated how such concepts can be effectively deployed in the critical task of monitoring asset health and diagnosing faults. With simple examples from everyday life, Dr Patange delivered a highly enjoyable talk that not only captivated the audience but also presented a unique learning opportunity for all who participated. The presentation was followed by an engaging session of Q&A. It goes to the credit of Dr Patange that he communicated the complex concepts of Machine Learning to those uninitiated in this field and made them knowledgeable about this important, emerging area of asset monitoring and diagnostics.

Tune to the Concept that Glitters! FREE!

WEBINAR
SUNDAY, 10 November 2024
Time: 11:00AM-12:30PM

Dr. Abhishek D. Patange, MCVS
Data Science and AI Specialist
ABB Global Industries and Services (P) Ltd.
Bengaluru

SPEAKER

Dr. Abhishek is a Data Science and AI Specialist at ABB's Center of Excellence in Process Automation Digital, Bengaluru. He is PhD in Mechanical Engineering from VIT Chennai with 7 years of experience as an Assistant Professor in Mechanical Engineering at COEP, Pune. He has cultivated proficiency in machine learning, condition monitoring, mechatronics, and mechanical design engineering. He has number of research works with Govt grants more than a crore in Prognostics & Health Monitoring, Digital Twin and Agricultural Revitalization in Higher Education Institutions. He has published 50 research papers in SCI journals, obtained 2 Indian patent, and with citations 785+. Keeping self-engaged in research and teaching (his passion), he transitioned from academia to industry a year back.

TOPIC:
Machine Learning Approach for Condition Monitoring

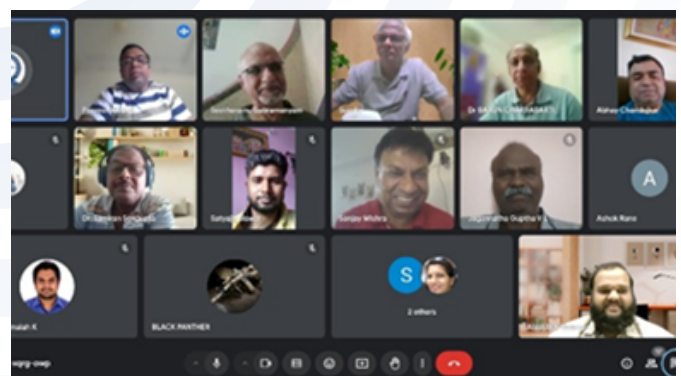
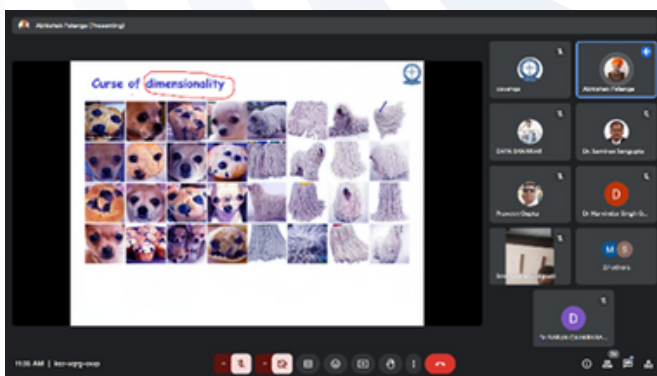
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Smart Sensing and Fibre Optic Based Accelerometers for Asset Health Monitoring (15 December 2024)

Er. Prakash J B Stephen, Director, Hottinger Bruel & Kjaer (HBK) - India Operations

Er. Vijayaraghavan J, Lead Engineer – nCODE Software, HBK

Er. Prakash J B Stephen presented an overview of Smart Sensing techniques with reference to asset health monitoring, mainly structural health monitoring and prescriptive maintenance. This was followed by a detailed coverage of fibre optic-based sensors for various applications and brief discussion on HBK Toolbox for monitoring. Er Vijayaraghavan made a presentation on nCODE VibeSys software for acoustic and vibration analysis applications, covering structural dynamics, rotating machinery, modal analysis etc. He also covered a few case examples. The talks generated much interest among the audience and there was a lively Q&A session where many queries pertaining to smart sensing, use of fibre optic sensors and various features of nCODE VibeSys software were addressed by the speakers.

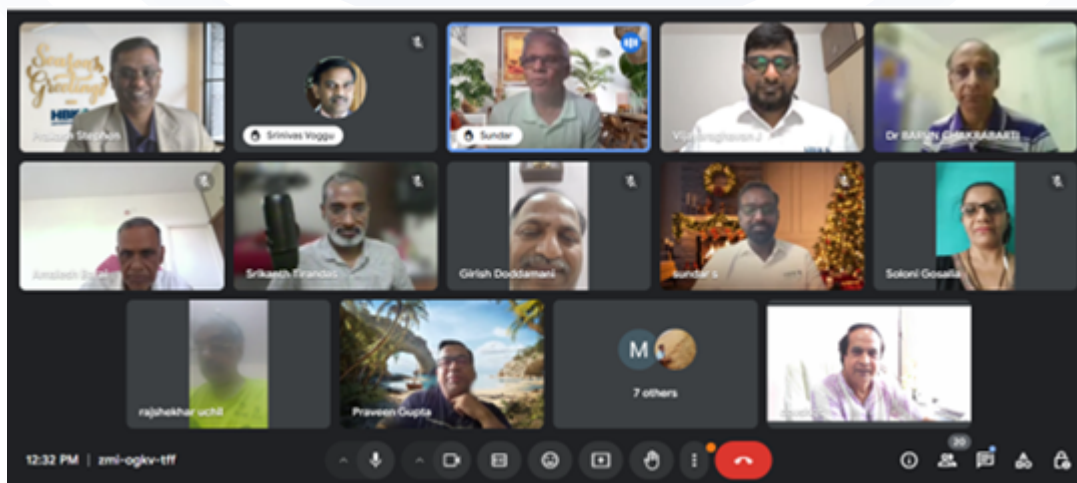
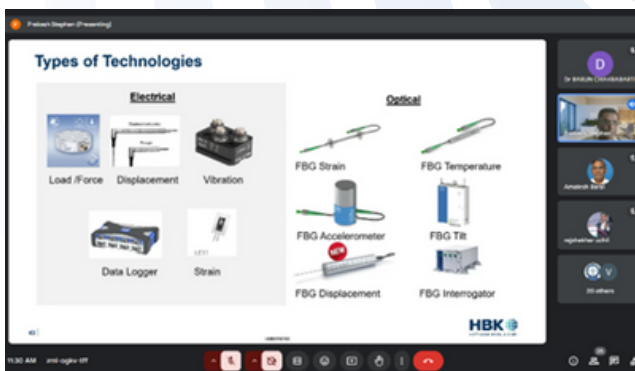
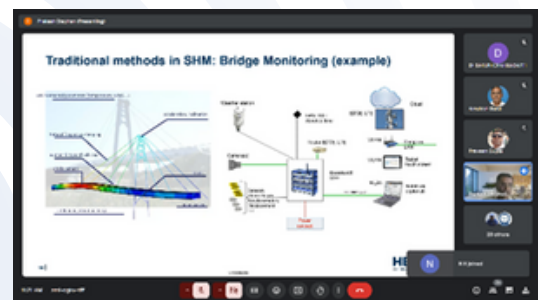
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Jointly organizes webinar on

Smart Sensing, and Fiber-Optic Based Accelerometers for Asset Health Monitoring
Sunday, 15 December 2024, 11 AM to 12:30 PM

SESSIONS	SPEAKERS
<ul style="list-style-type: none"> Fiber Optics in Asset Health Monitoring Smart Sensing Data processing and analysis in acoustics and vibration 	<p>Er. Prakash J B Stephen Director - Hottinger, Bruel & Kjaer (HBK), India Operations Degree in ECE Engineering, Specialty Business System Leadership, with 20 years of Experience in Test and Measurement</p> <p>Vijaya Raghavan J Lead Engineer, nCODE Software - Hottinger Bruel & Kjaer Degree in Mechanical Engineering, M.Tech in Structural Engineering, with 25 years of Experience in Analysis, Research, Product Development</p>

The Event is coordinated by CVS HQ
Contact: Dr. T. Pyke, 8864021468

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Viscous and Viscoelastic 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

1. Introduction

Among various energy dissipation devices, fluid viscous dampers (FVDs) have been widely used in vibration control of several structural and mechanical systems, for dynamic response mitigation, where their performance has been very promising and satisfactory. The performance of structures can be greatly enhanced by using the right type and right configuration of FVDs. The dampers have been used in shock and vibration isolation of military and aerospace hardware, wind vibration control of missile launching platforms, and several other projects. Fluid dampers are now widely used in applications for seismic energy dissipation in buildings, bridges, water tanks, and other structures because of their characteristics, such as linear viscous behavior, lower sensitivity to temperature changes, small size in comparison to stroke and output force, and their reliability and longevity.

Fluid dampers have the following intrinsic and noteworthy advantages, compared to hysteretic, viscoelastic, tuned mass, and elastoplastic energy dissipators:

- (i) They are self-reliant; no supplementary equipment or external power is required for their operation.
- (ii) The contemporary fluid dampers operate at significantly high fluid pressure level. Due to ease of installation, adaptability, good coordination with other structural members, compactness and diversity in their sizes, viscous dampers have found many applications in new structures and in retrofitting works.
- (iii) Fluid dampers have a low initial cost and almost negligible maintenance cost. They are economical and can reduce the overall cost of the project, when used at high damping ratios in the range of 15%–40%.
- (iv) Fluid dampers are especially attractive for enhancing the performance of structures because they reduce the deformation demand and also the force transferred to the structure. Because of their significant energy dissipation capability, fluid dampers can effectively reduce both internal shear forces and bending moments (usually governing limit state of collapse); and story drift and displacement (usually governing limit state of serviceability).

2. Fluid Viscous Dampers

In 1980, FVDs were effectively employed for applications in civil engineering projects for seismic energy dissipation. Based on the laws of fluid mechanics, various types of fluid viscous devices have been researched, tested, and brought in use. Viscous damping walls

(VDWs) were proposed in Japan in 1986, in which three steel plates were used to sandwich the viscous fluid inside them. These walls proved their effectiveness in minimizing the earthquake-induced forces, and also in reducing base shear, story drift, and structural displacements, by shearing action of viscous fluid sandwiched between the plates. Other classes of FVDs are linear and nonlinear fluid devices, where velocity is linear and nonlinear function of the force of the damper, respectively. In order to mitigate the effect of temperature rise in piping system in nuclear power plants, a pipework (GERB) damper is used. In an orifice fluid damper, a cylindrical tube consisting of piston head with orifices is attached to the damper and is filled with highly viscous fluid. Orifice fluid dampers are used for effectively reducing the earthquake effects on structures. The common mechanism behind energy dissipation in all fluid viscous devices is the smooth transfer of mechanical energy to the surrounding environment in the form of heat. FVDs can also be used in combination with seismic isolation systems for enhancing the energy dissipation capacity, and for controlling the excessive displacements at the isolator level, during earthquakes. Figure 1 shows the schematic diagram, free body diagram and the mathematical model of fluid viscous damper.

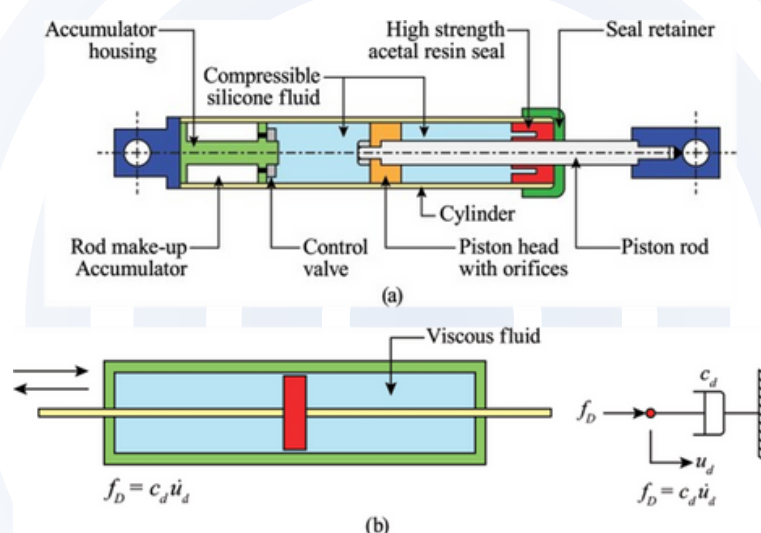


Fig. 1. Fluid viscous damper: (a) Schematic diagram and (b) Free body diagram

Linear viscous damping is a property of the computational model and is not a property of a real structure. Viscous dampers are normally mounted in structural locations where some elastic recentering forces are provided by the structural frame itself. Nonlinear FVDs have the apparent advantage of limiting the peak damper force at large velocities while still providing sufficient supplemental damping.

Nonlinear damping system provides higher damping, compared to the linear damping system; therefore, such system is quite effective in absorbing and mitigating the high-velocity shocks. The resisting force of a nonlinear FVD is proportional to a fractional power law of the velocity, with velocity exponent α ranging between 0.1 and 1.0, i.e., the damping force is nonlinear function of the velocity of fluid.

The supplemental damping ratio can be obtained by evaluating the equivalence between a nonlinear and a linear FVD. The criteria for evaluating the supplemental damping ratio for a nonlinear FVD presented in literature are expressed in terms of energy dissipated. One of the most common methods for defining equivalent viscous damping is to equate the energy dissipated in a vibration cycle of the actual nonlinear system to that of equivalent viscous system.

3. GERB Fluid Viscous Damper

The pipework damper shown in Figure 2 is a unique FVD, which is first manufactured in 1970 by GERB in Germany. Pipe work damper is used to reduce the dynamic response in piping system in nuclear power plants, where the piping system in operation may get excited by undesirable dynamic loads caused by earthquake and vibrations caused by regular operations. The working principle of pipework damper is similar to that of the FVD, where the to and fro movement of piston through highly viscous fluid causes dissipation of vibration energy in the form of heat. GERB viscous damper reacts in no-time delay and requires almost no maintenance.

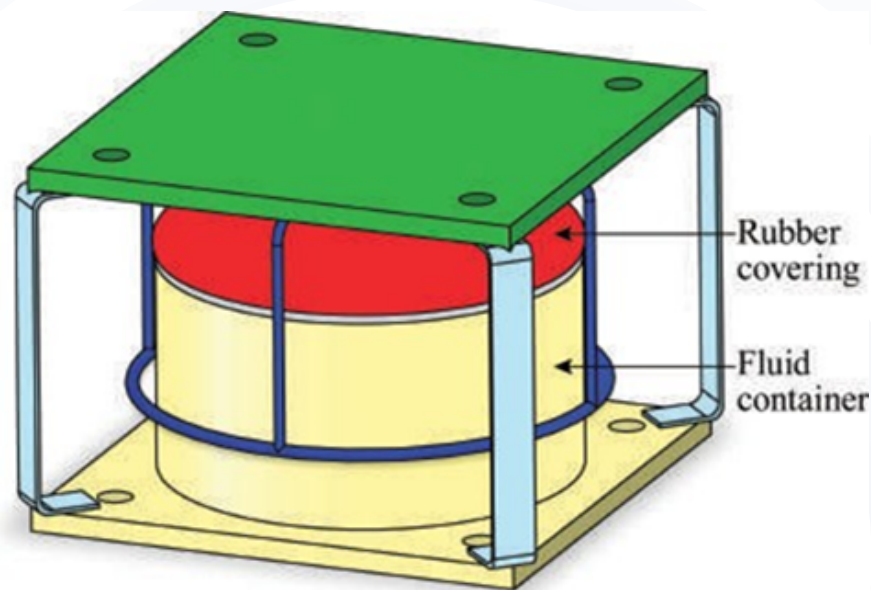


Fig. 2. GERB fluid viscous damper

Assembly of GERB pipework damper includes outer box, highly viscous fluid, piston, protective sleeve, and a simple indicator of piston position. The viscous fluid should be nontoxic, resistant to moisture, vapor, and steam, should not react with oxygen, and should not corrode the material with which it is in contact. There are no adjusting components such as seals and guides. The movement of the piston is multidirectional; the volume and shape of the damper can be varied as per the application requirements. The pipework damper reacts to loads in any direction, i.e., it can be operated in all translational and rotational degrees of freedom. GERB dampers are available for specified operating temperatures and they can remain operative even if there are fluctuations in the temperature of the contained viscous fluid. It is recommended that the temperature of the fluid should never drop by more than 20% below that of the operating temperature. Higher damping is observed at lower temperature, whereas damping efficiency is considerably reduced at higher temperature. As the temperature of viscous fluid returns to the operating temperature, the GERB damper regains its original characteristics.

Commonly, GERB dampers are manufactured to operate at 20°C. If they are not able to operate at the specified temperature, then temperature-dependent viscous fluids are used. However, such types of viscous fluids are costly and they reduce the damping efficiency.

4. Viscous Damping Wall

A viscous damping wall (VDW) is a passive structural control system. Like other passive devices, it does not require any external source of power supply for seismic energy dissipation. It utilizes the motion of the structure for effectively controlling its dynamic response. Broadly, it is one of the types of FVD, where viscous fluid plays an important role in dissipating seismic energy. VDWs are found to be very effective and cost-efficient energy dissipaters. Lots of research works have been done on VDW in the last three decades. The concept of VDW was first proposed by a Japanese researcher Miyazaki et al. (1986). A large number of numerical and experimental studies have proved the effectiveness of VDWs for alleviating the dynamic response of structures. Dynamic structural response measurements of scaled-down and full-scale models of multistory reinforced concrete (RC) and steel buildings, installed with VDW, have established their effectiveness in reducing base shear and story drift, as well as providing additional damping and stiffness to the structure. VDW also proved effective in controlling wind-induced vibrations. Sumitomo construction company first manufactured VDWs in 1992. Furthermore, parameter optimization techniques for VDW are proposed recently in order to reduce the overall cost of the project, including material and installation costs. Figure 3 shows the schematic of the viscous damping wall.

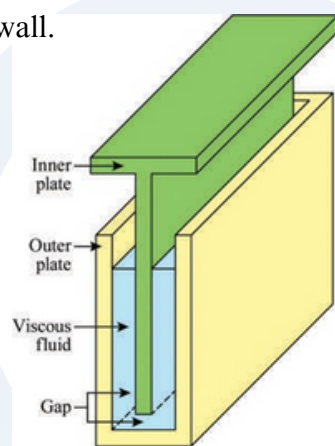


Fig. 3. Schematic diagram of viscous damping wall.

The merits of VDWs are:

- (i) VDWs are inexpensive, reliable, and do not require any digitally managed computerized system for their operation.
- (ii) VDWs can sustain a temperature rise up to 200°C. Their outer surfaces are protected with fireproof material. Therefore, the temperature changes in the structure do not affect the functioning of VDW. The fireproofing material also serves as a thermal insulator under normal working conditions.
- (iii) VDWs substantially reduce the dynamic response of structures subjected to earthquake excitations and wind loading, such that the structure always remains elastic. Hence, the possibility of formation of plastic hinges in the structure is reduced substantially.
- (iv) VDWs constructed with two inner plates offer twice the damping force with a very small increase in wall thickness.
- (v) VDWs are almost maintenance-free because they do not require any high-maintenance components, such as sealing system.

(vi)VDWs provide the designer with a greater architectural flexibility. They can be manufactured so as to get accommodated easily, as structural walls of building.

(vii)Because of their compact rectangular shape, they can be installed easily, compared to the diagonal bracing systems or dampers.

(viii)VDWs reduce the seismically induced inertial forces and inter-story drift in buildings substantially

In the United States, the first project employing VDWs was completed in 2012. The installation of 113 walls was completed by Dynamic Isolation System (DIS), US, in Gery Van-Ness Medical Centre, located in San Francisco, California.

5. Viscoelastic Damper

A purely elastic material regains its original shape and size on the removal of the stress acting over it. Thus, all the energy stored in the elastic body during loading is recovered rapidly on the removal of the externally applied load. Most of the elastic materials clearly show linear elastic behavior and are well represented by Hooke's Law. The material that exhibits property exactly opposite to the elastic material, i.e., the material that does not obey Hooke's Law, is known as a purely viscous material. Viscous material does not recover any energy lost during loading, after removing the load acting over it. Once the load is removed, all the energy is lost or absorbed by material as pure damping. In this case, stress is proportional to the rate of change of strain.

The material that does not fall under the category of either elastic material or viscous material is known as viscoelastic material. Such material features both properties; elasticity and viscosity. Upon removal of the applied load, some amount of energy gets recovered, while the remaining energy is dissipated in the form of heat. Dynamic modulus, also referred to as complex modulus, is used to represent modulus of visco-elastic material.

It is the ratio of cyclic stress to cyclic strain under vibratory conditions. Dynamic modulus is calculated from the experimental data obtained from either free or forced vibration tests, in shear and compression.

Practically, the concept of using properties of elastic material and viscous material together is widely used for stiffness enhancement and energy dissipation. Furthermore, the energy is dissipated either by using solid or fluid action of damper. Hence, viscoelastic dampers are further classified as viscoelastic solid damper and viscoelastic fluid damper.

6.Viscoelastic Solid Damper

Viscoelastic solid dampers generally employ copolymers or glassy substances that dissipate energy, when subjected to shear deformation. Viscoelastic solid damper consists of layers of viscoelastic material, bonded with steel plates, as shown in Figure 4. The two outer steel flanges are connected to center steel plate with solid elastomeric pads of viscoelastic material. This is done in order to obtain large tensile and compressive strains in viscoelastic material. Viscoelastic solid damper possesses the ability not only to dissipate energy but also to store it.

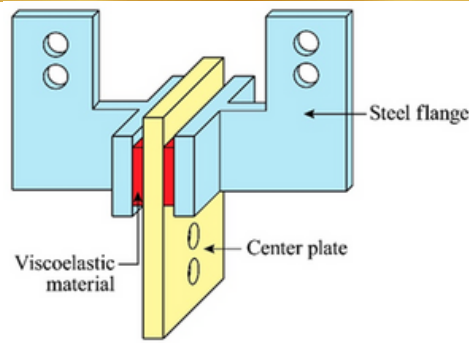


Fig. 4. Typical configuration of viscoelastic solid damper.

The dynamic response of a viscoelastic solid damper depends upon parameters such as frequency of motion, the level of strain, and the ambient temperature. Temperature has an inverse effect on energy dissipation; as temperature tends to increase, the energy dissipated per cycle tends to decrease. A lot of research has been conducted in the past for employing high damping rubber as a viscoelastic material, because of its properties depending on both temperature and time. Under constant stress, rubber shows an increase in deformation with time and under the condition of constant strain, there is a decrease in stress with time. Rubber possesses the property of both creep and relaxation, which results in increased energy dissipation.

The main advantages of viscoelastic solid dampers are :

- (i) A viscoelastic solid damper is effective in reducing wind vibrations and is also capable of providing the structure with increased damping for frequent low-level ground shaking as well as for severe earthquake ground motions.
- (ii) Viscoelastic solid dampers are inexpensive as compared to viscoelastic fluid dampers
- (iii) Viscoelastic behavior of damper is linear and it gets easily activated at very low displacements, thus reducing the displacement demand on the structure.
- (iv) A viscoelastic solid damper is capable of dissipating energy in early stages of cracking of concrete elements, thus preventing further damage.

The primary disadvantages of viscoelastic solid dampers are:

- (i) Viscoelastic solid damper has a very limited deformation capacity.
- (ii) Properties of damper are frequency and temperature dependence. As ambient temperature tends to increase, the energy dissipated per cycle tends to decrease.
- (iii) There is a possibility of debonding and tearing of viscoelastic material.

Initially, viscoelastic solid dampers were used for mitigation of wind-induced vibrations. As the research progressed, the solid dampers proved their effectiveness in reduction of earthquake-induced vibrations. Some of the notable applications of viscoelastic solid dampers in the world are presented subsequently.

The first application of viscoelastic solid dampers for mitigating earthquake-induced vibrations was in 1993, for the 13-story Santa Clara building in San Jose, California (CA), United States. The building was constructed in 1976 and the seismic upgradation plan was developed for installing viscoelastic solid dampers. Two dampers on each face of the building, for each floor, were installed, which provided substantial reduction to building response under all levels of ground vibrations.

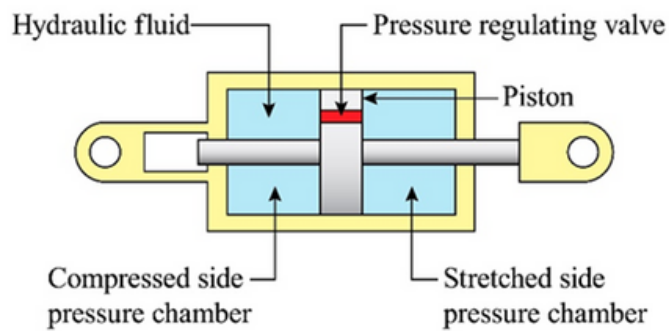


Fig. 5. Structure of linear-type oil damper.

7. Orifice Fluid Damper

Orifice fluid damper consists of a tight cylinder with a piston rod, which is allowed to move backward and forward through the cylinder. Generally, the stainless-steel piston rod is provided with a bronze head. The cylinder has two chambers for storage of highly viscous fluid (silicone) and a self-contained piston displacement accumulator. The fluid is placed in a closed container, where it is allowed to deform and is forced to pass through small orifices, as shown in Figure 6. With this arrangement, it is possible to achieve a higher level of energy dissipation. High-strength resin seal is placed at one end of the cylinder so as to prevent any leakage of viscous fluid through cylinder and thus the liquid remains within the closed container for the design period of the damper.

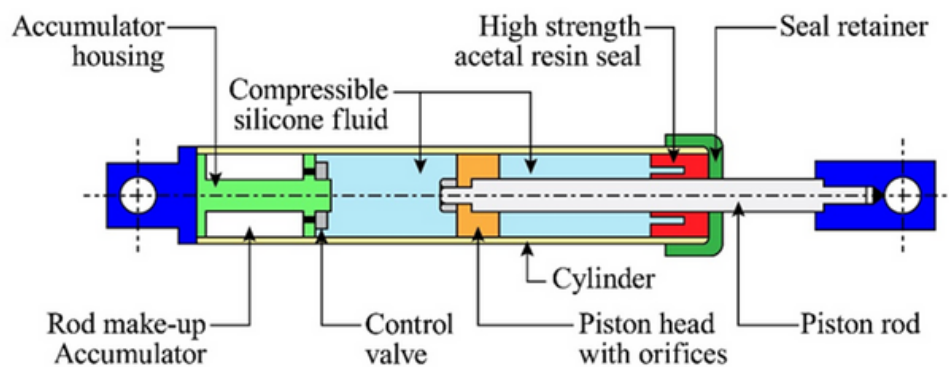


Fig. 6. Orifice fluid damper.

8. Lead Extrusion Damper

Extrusion is a process in which metal is pushed through a die opening placed in a closed container to mold it in a desired shape. When a polycrystalline metal deforms, its grains are dislocated. Elongation of such grains with large gaps is seen in metal deformation. Further, such metals try to regain their original configurations by the three inter-linked processes, i.e., recovery, recrystallization, and grain growth. Recrystallization is the process of replacing the displaced grains with a fresh set of defect-free grains, until growth of new grains takes place.

The temperature at which half of the total recrystallization of grains happens for a period of one hour, is known as recrystallization temperature. Recrystallization temperature differs for various metals; for example, lead has recrystallization temperature well below 20°C. As the recrystallization temperature of lead is very less, compared to other metals, any deformation of lead is simultaneous with the processes of recovery, recrystallization, and grain growth. This property of lead makes it suitable than all other metals as an energy absorber. Figure 7 shows the particulars of lead extrusion damper.

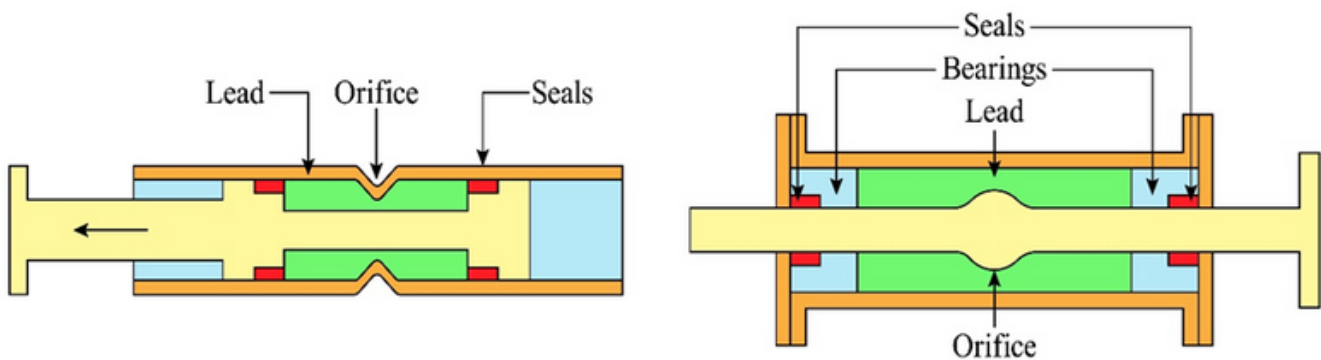
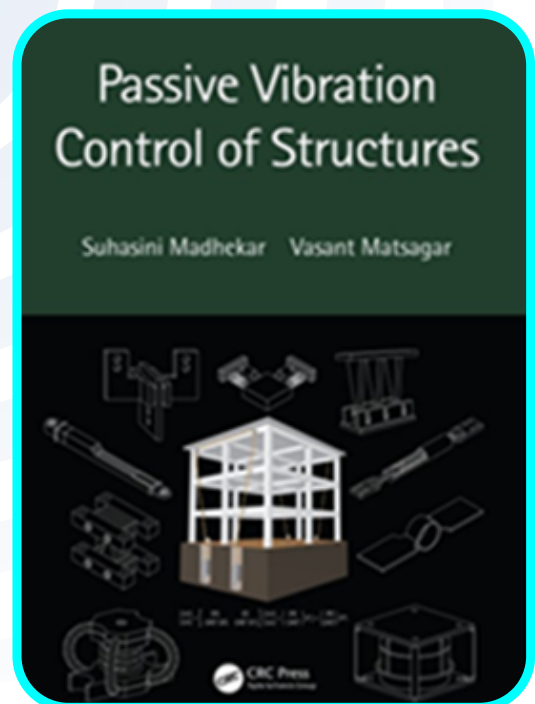


Fig. 7. Longitudinal section of lead extrusion damper:
(a) tube-type lead extrusion damper and (b) bulged shaft-type lead extrusion damper.

Editor's Note : This article is a preview of Chapter-4 of the Authors' book entitled "Passive Vibration Control of Structures" (CRC Press). Chapter-1 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.



Artificial Intelligence vs. Human Intelligence in Plant Condition Monitoring Application & Diagnostics for Successful Defects Prediction of Equipment (Maintenance 4.0 AI – Smart Sensors/ IIoT Application)

Anoop Saxena

Director (Consultancy & Training), Asset Management Consultant (P) Ltd.

E-mail: anoopsaxena19@gmail.com

Technological Advancement is making Industries to adopt Maintenance 4.0 (Integration of AI / Smart Sensors, use of IIoT and Cloud Computing), for better Asset Performance & Reliability. Present digital era emphasizes on large usage of AI (Artificial Intelligence) for quick problem resolution and accurate decision-making regarding Equipment Health Assessment.

About three decades ago, the Entek IRD Amethyst System (Expert Fuzzy Logic System - form of Artificial Intelligence) was applied & integrated with IRD Mechanalysis 7090 Software and Vibration Analyzer Model 890 Data Collector. The Amethyst software was used for synthesis of vibration overall data & FFT (Fast Fourier Transform signatures) with input of basic details of the machine as per type (RPM, Bearing No., Gear details, No. of Blades etc.). If any machine had abnormal vibration pattern, then the Amethyst software provided 4-5 options of possible defects in the system, but who takes final decision best? It is Human Intelligence based on knowledge gained about the Equipment – understanding its O&M behavior in physical mode, under live situations, previous historical experience with the machine behavior and variance of parameters as per type of Plant – Process / Engineering.

Most signals and automated decision matrix are always available to Aircraft Pilot during Take-off, Landing and in air-borne condition. During any turbulence or defects in the system, final call is that of the Pilot, as per his expertise / experience, to safeguard the flight through his decision-making at that moment. Similarly, missile technology, satellite launching, air defense system etc. still continue to be based on Human Operator Intelligence, to rightly apply it. About 95% assistance can be given by AI, Smart Sensors and Technology in any operation, but success/failure will depend on its execution on 5 %, which is in hand of Human Intelligence.

For accurate system health analysis, one needs the integration of multi-parameter trends with inputs from:

- In plant operation, many decisions are taken based on Cost, Plant Availability, Outage, Shutdown Plan and other Risk Criticality Factors, before taking decision on stopping or running of machines as per their key parameters and overall health assessment (how much life can be utilized, till it can be used, after coming in Warning/Critical zone). The timing of such decision by Plant Management / HOD is crucial for ROI of any forced or planned interruption in plant operation. For example, in a Power Plant operation, the Turbo-Generator (TG) stoppage may have severe financial impact on other integrated plant units.

EQUIPMENT ASSESSMENT FACTORS CONTRIBUTION %

Factor	Contribution %
CBM - CONDITION MONITORING	45%
PI/OPERATION PARAMETERS/JH, 5S	20%
EQUIPMENT SOP TRAINING	10%
SD CHECKS	10%
PM CHECKS	10%

- CBM - CONDITION MONITORING
- PI/OPERATION PARAMETERS/JH, 5S
- PM CHECKS
- SD CHECKS
- EQUIPMENT SOP TRAINING

Time to stimulate our grey cells!

Unscramble these six jumbles,
one letter to each square,
to form six technical words

1. ETSUNDAY

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2. CANNAMENITE

--	--	--	--	--	--	--	--	--	--

3. GIVENSIRH

--	--	--	--	--	--	--	--

4. GUNCBILK

--	--	--	--	--	--	--	--

5. EOSNI

--	--	--	--	--

6. ROTASOIL

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Now arrange the circled letters to
form the surprised answer, take help
suggested by the above image

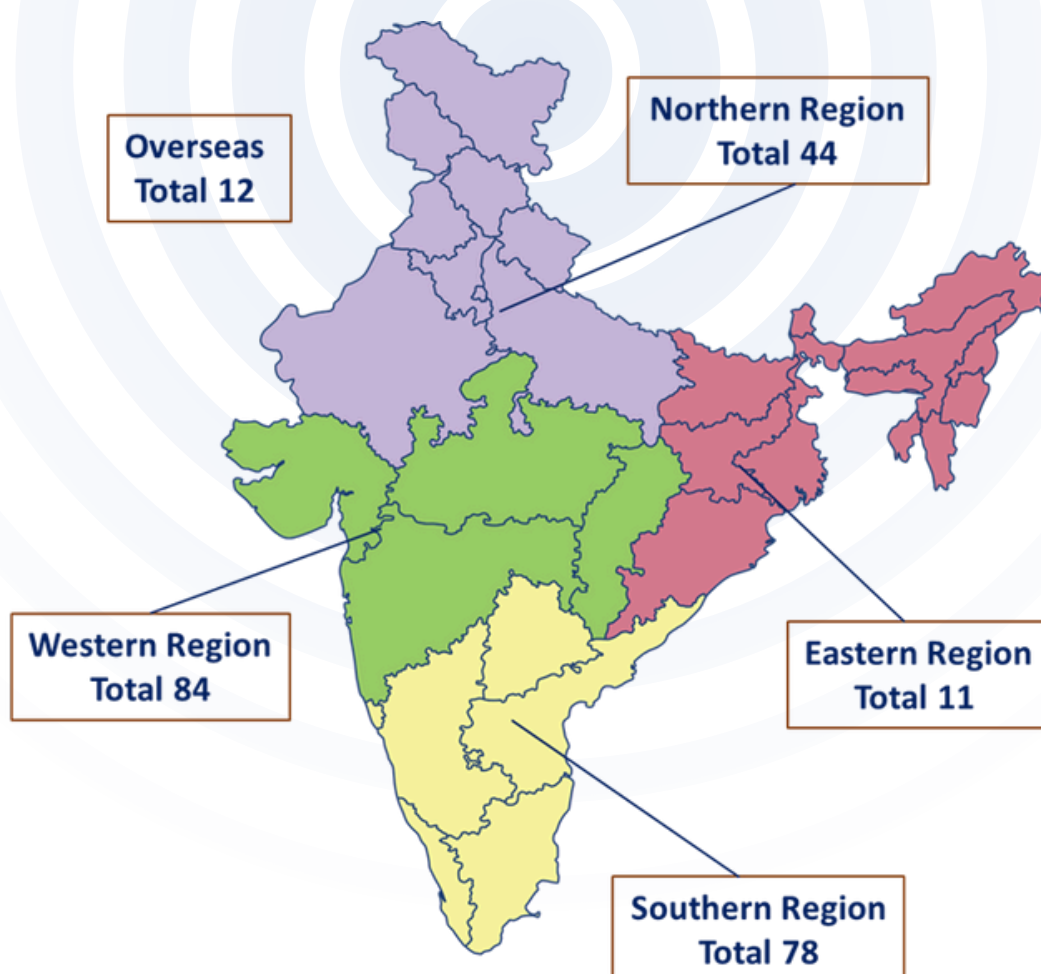
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North (Delhi)	38	6	0	44
West (Mumbai)	50	31	3	84
Overseas	9	2	1	12
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Category of Membership	Mumbai & West	Bengaluru & South	Kolkata & East	Delhi & North	Overseas
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Member	8	2	2	24	0
Student Member	3	11	0	0	0
Corporate Member	3	3	0	0	1
Total	84	78	11	44	12



Solution for The CVS Word Game

Unscramble these six jumbles, one letter to each square, to form six technical words

1. ETSUNDAY

U N **S** T E **A** D **Y**

2. CANNAMENITE

M **A** I N **T** E **N** A N C E

3. GIVENSIRH

S H I **V** E R **I** N G

4. GUNCBILK

B U C K **L** **I** N G

5. EOSNI

N O **I** S E

6. ROTASOIL

I S **O** L **A** T O **R**

FINAL ANSWER

V I B R A T I O N

A N A L Y S I S

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Premise 'Center for Reliability and Diagnostics'

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