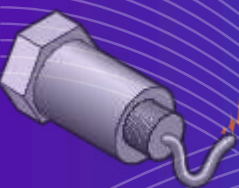




amplitude

DIAGNOSTICS &
PROGNOSTICS
NEWS
2026, ISSUE 2



COUNCIL OF VIBRATION SPECIALISTS

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INDEX

CVS Vision & Mission	03
From the Editor's Desk	04
Events Round-up	
1) CVS Presentation at BIS Meeting 2) CVS MoU with Virgo Communications	05
CVS Chapter News	07
1) Technical Project Competition at FCRIT - Navi Mumbai 2) Workshop on Hypermesh at RVCE - Bengaluru	
CVS Chair Committee Updates	10
1) Inaugural Meeting of Training (Trainers) Committee 2) Inaugural Meeting of Research & Publications Committee	
Know Our Members	12
Members in News	14
CVS Webinar	18
Noise and Vibration Analysis in Product Quality Control – Er. S. K. M. Rao	
Contributed Articles (Short Title):	
1) Book Chapter Preview (Part 9) – “Miscellaneous Response Control Devices” Prof. (Dr.) Suhasini Madhekar & Prof. (Dr.) Vasant Matsagar	19
The CVS Word Puzzle – Dr Arun Jalan	26
CVS Membership Profile	27
Solution for the CVS Word Puzzle – Dr Arun Jalan	28
CVS Membership and Advertisement	29
CVS : Key Officials	30

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.

From the Editor's Desk



DR. BARUN CHAKRABARTI, FCVS

Dear Colleagues,

The Editorial Team of “amplitude” takes pleasure in bringing you the latest issue of our Newsletter (Issue - 02/2026). As done for the previous editions, this time also we have endeavoured to curate the latest updates, news and activities of CVS and its Members to offer you an informative and enjoyable reading experience.

The past few months have seen a marked increase in the level of activities within CVS, as we strive to take various initiatives to the next gear. Notable among these is a presentation by CVS to the Bureau of Indian Standards (BIS), advocating the formulation of an Indian Standard governing training programs in Vibration and allied areas. The ongoing collaborative engagement between CVS and Virgo Communications & Exhibitions took a formal shape with the signing of a Memorandum of Understanding (MoU) between the parties. After the recent re-constitution of CVS Chair Committees, the Committees on Training (Trainers) and Research & Publications organized the inaugural meetings to launch their respective target activities. The CVS Technical Webinar series has also been resumed after a brief period.

Inside this issue you will also find the latest offerings of our regular features, including the Book Chapter Preview (Part 9) and an inspiring collection of news covering various awards, accolades and honours bestowed on some of our esteemed Members. Please also try your hand at the interesting Word Game for some cerebral excitement.

I hope that, by the time you read this issue, the unusually harsh summer months of this year would have relented to the onset of the rains. Enjoy the monsoon magic while flipping through these pages.

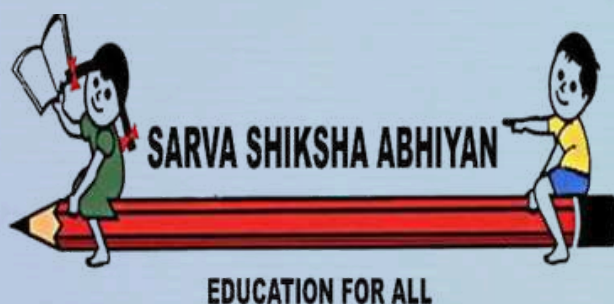
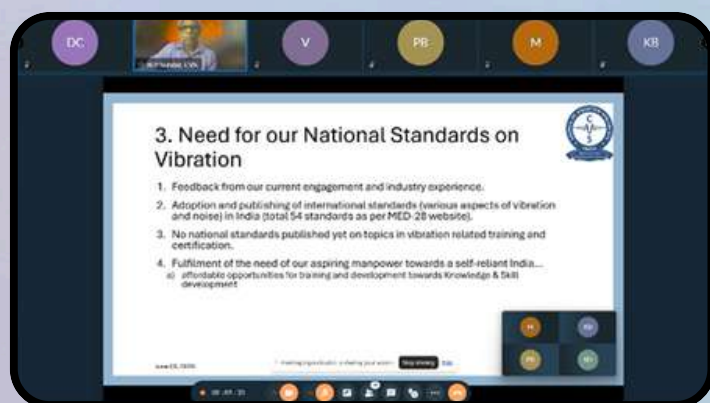
Happy Reading!

Events Round-up

CVS PROPOSES TO BIS SECTIONAL COMMITTEE MED-28 THE DEVELOPMENT OF INDIAN STANDARDS ON VIBRATION: QUALIFICATION, ASSESSMENT, TRAINING AND CERTIFICATION OF PERSONNEL

Council of Vibration Specialists (CVS) is currently engaged with the Bureau of Indian Standards (BIS) Sectional Committee MED-28, which is engaged in the formulation and adoption of Standards in the areas of Vibration, Shock and Condition Monitoring. Currently, Dr Tarapada Pyne and Dr Barun Chakrabarti are the nominated Members from CVS on this Committee.

In the 33rd Meeting of BIS Sectional Committee MED-28 held on 3rd June 2026 in hybrid mode, the CVS team made a strong pitch for the standardization, at national level, on Vibration (Qualification, Assessment, Training and Certification of Personnel). The two CVS Committee Members were also joined by Er N P Sundar FCVS, who participated as a Special Invitee from BIS and anchored the presentation. The proposal was well-received by Members of MED-28, who deliberated on the forward path and decided to circulate the details among all the Members. The proposal would be formalized in the next meeting of MED-28, to route it through the BIS Governance Framework for development of new Standards in this important area.



CVS SIGNS MEMORANDUM OF UNDERSTANDING (MoU) WITH VIRGO COMMUNICATIONS & EXHIBITIONS PVT. LTD.

As an important step in the ongoing collaboration between Virgo Communications & Exhibitions Pvt. Ltd. (Virgo) and the Council of Vibration Specialists, both parties signed a Memorandum of Understanding (MoU) on the 18th of June 2026 at Mumbai. Virgo Communications & Exhibitions is engaged in organizing industry-specific conferences, exhibitions, and publications. The MoU positions CVS as the exclusive Knowledge Partner for Virgo's Expo events on Maintenance, Reliability and Asset Management (MRAM), India's pioneering platform dedicated exclusively to these areas. MRAM Expo 2026, a first-of-its-kind event, aims to bring together practitioners, solution and service providers, industry thought leaders, and innovators to drive industrial efficiency and asset excellence across India.

The MoU formalizes the collaboration between CVS and Virgo to serve the industrial community, by promoting vibration science, predictive maintenance, and asset reliability management through joint participation in technical events, publications, and awareness programs. Both parties recognize the mutual benefit of such collaboration, which can add significant value to events such as the International Conference on Vibration Engineering, Science, and Technology (INVEST) of CVS and the Maintenance, Reliability, and Asset Management Expo & Conference (MRAM) organized by Virgo. For the upcoming MRAM-2026, to be held during 7 - 9 October 2026 in Mumbai, CVS, being the Knowledge Partner to Virgo, is actively contributing to the conceptualization of the event, advising on key areas and aspects, shaping the conference agenda and related technical contents



FCRIT - NAVI MUMBAI AND CVS MUMBAI CHAPTER JOINTLY ORGANIZE TECHNICAL PROJECT COMPETITION FOR STUDENTS

The Department of Mechanical Engineering at Fr. C. Rodrigues Institute of Technology (FCRIT) - Navi Mumbai successfully organized a Technical Project Competition for students on 18th April 2026, in collaboration with CVS Mumbai Chapter. The event, coordinated by Dr. V. G. Salunkhe SMCVS, Treasurer of CVS Mumbai Chapter, saw the participation of 14 teams comprising 56 engineering and diploma students. The primary objectives of the competition were to stimulate student interest in vibration and acoustics, foster innovation, and provide practical exposure to machinery diagnostics and condition monitoring. The event began with a welcome address by the Activity Co-Heads, Siddharth Patil and Anay Bapat, followed by an address from Dr. Nilaj Deshmukh, Dean (Admin and Faculty) and Chairman of CVS Mumbai Chapter, who emphasized the qualities of a good engineer and the importance of systematic project execution. Dr. Tarapada Pyne, Secretary and DG of CVS, provided valuable insights on industrial exposure in condition-based maintenance and highlighted the critical role of vibration analysis in modern industry.

The participants presented innovative projects focused on vibration and acoustics through well-designed posters. These entries were evaluated by Er. N P Sundar FCVS, Liaison Officer for CVS Mumbai Chapter and Dr. Kapilesh Bhargava FCVS, Vice Chairman of CVS Mumbai Chapter, on the basis of technical merit, social relevance, degree of innovation, and the application of state-of-the-art techniques. The event concluded with a Valedictory Session, including a prize distribution ceremony to felicitate the winners. A Vote of Thanks was delivered by Dr. V G Salunke, acknowledging the contributions of organizers, judges, faculty, students, and volunteers. As a result of the competition, students were able to demonstrate an understanding and application of the principles of vibration and acoustics in industry, develop practical skills in measuring and analyzing vibration spectra, and gain awareness of current trends in the field of machinery diagnostics. The competition successfully bridged theoretical knowledge with practical applications, fostered innovation, and enhanced student competence, establishing a strong model for future student engagement and industry-academia collaboration.

Here are a few glimpses from the event.



CVS STUDENTS' CHAPTER AT RVCE – BENGALURU ORGANIZES 3-DAY WORKSHOP ON HYPERMESH & CAE PRE-PROCESSING

The Students' Chapter of CVS at Department of Mechanical Engineering, RV College of Engineering, Bengaluru organized a 3-Day Workshop on Hypermesh and CAE Pre-Processing during 21 - 23 May 2026. The event was held under the aegis of Internal Quality Assurance Cell, in association with TATVA (PG - ME Forum). The Workshop was conducted by Er. Ragunandan U., Senior Project Manager (CAE) at Wipro Technologies. The Workshop provided a unique opportunity to the participants to learn about 3D Modelling and Pre-processing techniques, to be able to efficiently develop Models for engineering simulations.



CVS Chair Committee Updates

INAUGURAL MEETING OF CVS CHAIR COMMITTEE ON TRAINING (TRAINERS)

The inaugural meeting of the CVS Chair Committee on Training (Trainers) was organized on 16th May 2026 in virtual mode, to launch the activities of CVS in this important area. The meeting was attended by ten Committee Members. Dr H S Gambhir, President (CVS) set the context and explained the purpose of setting up this Committee. He highlighted the need to develop quality training modules, create a pool of experienced trainers and launch the CVS training programs as early as possible. He also emphasized the need for accreditation to enhance the brand value of CVS Training. Dr Barun Chakrabarti, Chair of the Committee, reiterated that training, skill-building and knowledge dissemination were core objectives of CVS, to become a globally-recognized professional society. He requested Members for their cooperation and whole-hearted involvement. Dr Tarapada Pyne, Co-Chair for the Committee, elaborated on the work done so far for developing CVS Training Program. He briefly covered the engagement of CVS with Capital Goods & Strategic Sector Skill Council (CGSSC) as well as the BIS Sectional Committee MED-28. He explained the uniqueness of the training program being proposed by CVS, in terms of contents, levels and focus on skill-building for employability in the industry. Er. N P Sundar outlined the engagement with CGSSC so far and presented the draft Proposal on CVS Training Program submitted to CGSSC. Members offered their ideas and suggestions on the way forward. The Committee has decided to hold monthly meetings to accelerate the preparatory activities.



INAUGURAL MEETING OF CVS CHAIR COMMITTEE ON RESEARCH & PUBLICATIONS

The inaugural meeting of CVS Chair Committee on Research & Publications was held on 19 May 2026 in virtual mode. The meeting was attended by 8 Members. Dr Nilaj Deshmukh, Chair of the Committee, welcomed all attendees and highlighted the focus areas of this Committee. He then briefed Members about the status of publication of select papers from INVEST-2023 and INVEST-2025 Conferences. He also shared the feedback received from publishers, such as IET Springer BOOK and Cambridge Scholars Publishing. After deliberation, it was decided to proceed with Cambridge Scholars Publishing to publish the short-listed papers from INVEST-2023 and INVEST-2025. The Members also discussed various options available for publication of top papers from upcoming INVEST-2027 event in research journals or in a book form. The prospects for launching a research journal by CVS were also discussed. Dr Deshmukh expressed the need for having separate websites for the Conference and the Journal, to manage end-to-end activities through online mode. It was decided to prepare a roadmap for the launch of CVS Journal and to assign responsibilities to Members for executing the associated activities.



Know Our Members



ER. VIDYA PRASAD, FCVS

Er. Vidya Prasad, FCVS is a distinguished engineering professional with an M.Tech. in Mechanical Engineering and extensive experience in the integrated steel industry. Throughout his illustrious career, he has served with some of India's leading steel companies, including Bhushan Steel, Tata Steel, and Jindal Steel, where he gained comprehensive expertise in project execution, maintenance, and plant operations.

Renowned for his technical excellence in vibration analysis, condition monitoring, and predictive maintenance, Er. Vidya Prasad has consistently contributed to enhancing industrial reliability, operational efficiency, and asset performance. His analytical skills, innovative mindset, and commitment to continuous learning have earned him the respect of colleagues and industry professionals alike.

Passionate about knowledge sharing and engineering excellence, Er. Prasad continues to inspire students, researchers, and young engineers through his practical insights and professional accomplishments. His professional journey reflects dedication, leadership, and pursuit of excellence, demonstrated through his contributions to the engineering profession and the advancement of the steel industry.



ER. JIGNESH D. JANI, SMCVS

Er. Jignesh D. Jani, SMCVS is an Assistant Professor in the Department of Mechanical Engineering at Marwadi University, Rajkot, Gujarat, and a Ph.D. Scholar specializing in vibration-based diagnostic techniques for biomedical applications. He holds a B.E. in Mechanical Engineering and an M.Tech. in Mechanical Engineering (CAD/CAM) from Nirma University, Ahmedabad, Gujarat.

His research interests include vibration analysis, biomechanics, non-invasive bone fracture detection, Frequency Response Function (FRF), Shock Response Spectrum (SRS), modal analysis, signal processing, measurement systems, sensors, and additive manufacturing. He has over 13 years of teaching and research experience in Mechanical Engineering and has contributed to academic, research, and industry-oriented projects in these domains. He is an Associate Member of The Institution of Engineers (India) [AMIE] and actively mentors undergraduate and post-graduate students in research, innovation, and engineering applications.



DR. PALLAVI NIKHIL WAJEKAR, SMCVS

Dr. Pallavi Nikhil Wajekar, SMCVS is an Assistant Professor in the Department of Mechanical Engineering at Fr. Conceicao Rodrigues Institute of Technology (FCRIT), Vashi (Navi Mumbai). She has over 18 years of teaching experience in undergraduate and post-graduate engineering education. She completed her B.E. in Mechanical Engineering and M.E. in Machine Design from the University of Mumbai and earned her Ph.D. in Mechanical Engineering from Veermata Jijabai Technological Institute (VJTI), Mumbai. Her research interests include vibration analysis, condition monitoring, fault diagnosis, machine learning, predictive maintenance, and IoT-based maintenance systems.

Dr Wajekar has successfully completed research projects funded by the University of Mumbai and FCRIT. She has published several research papers in reputed national and international journals and conferences. She has also contributed a book chapter in the field of vibration engineering. She has guided many undergraduate and post-graduate research projects and actively mentors students in advanced mechanical engineering applications. She is a Life Member of the National Society of Fluid Mechanics and Fluid Power and a Senior Life Member of the Council of Vibration Specialists. She has delivered invited expert lectures and participated in several faculty development programs and workshops. Her academic and research contributions continue to strengthen engineering education and industry-oriented research.



ER. KALEL NAVNATH AGNU, MCVS

Er. Kalel Navnath Agnu, MCVS completed his M.Tech. from NIT Surat and is currently pursuing a Ph.D. at COEP Technological University, Pune. He has over six years of teaching experience in Mechanical Engineering. During his M.Tech. program he published a research paper in the International Journal of Heat and Mass Transfer. His current research focuses on condition monitoring of machining centers and the prediction of Remaining Useful Life (RUL) of cutting tools using machine learning techniques. He has also presented a research paper at the ASME Conference 2025, and two additional research papers in this domain are currently under preparation. His research interests include smart manufacturing, predictive maintenance, and data-driven modeling of machining systems.

Members in News

Heartiest Congratulations! We are proud of you.



Dr. Harvinder Singh Gambhir, Founding Fellow and President - CVS, has been bestowed with the prestigious “Lifetime Achievement Award - 2026” by the International Society of Automation (ISA) - Maharashtra Section. This richly deserved accolade comes in recognition of his professional achievements and long-standing contributions towards making ISA a vibrant professional body. The award was presented in a glittering ceremony during the Power, Petroleum & Process Automation (PPPA) Meet on 10 - 11 April 2026 at the CIDCO Exhibition & Convention Center, Vashi, Navi Mumbai.



Dr. Ravindar Goyal, FCVS and CEO & MD of EIP Enviro Level Controls Pvt. Ltd., was felicitated with the “Lifetime Achievement Award” at the ISA Kolkata Symposium - 2026 event, organized at Bokaro Steel City - SAIL during 15 - 16 May 2026. The award recognizes his outstanding achievements in the fields of Instrumentation and Automation, as well as his significant contribution towards the growth of ISA. During his long professional journey over four decades as an Electronics Engineers as well as an Entrepreneur, Dr. Goyal has pioneered the development of world-class solutions in the field of instrumentation and industrial automation, focusing on indigenization and self-reliance in technology



Forbes Marshall - Pune, esteemed Corporate Member of CVS, has been honoured with the “Technical Excellence Award - 2026” by International Society of Automation (ISA), Maharashtra Section. The award was received by **Er. Mukesh Vyas**, FCVS, at a glittering ceremony during the Process, Power, Petroleum Automation Meet (PPPA-2026) during 10 - 11 April 2026 at the CIDCO Exhibition & Convention Center, Vashi, Navi Mumbai. This award is in recognition of the outstanding contributions made by the Company in automation, instrumentation, and control engineering field for over two decades, by bringing in the latest technologies and asset monitoring solutions in the management of critical industrial assets.



Er. Dilip Patil, MCVS, conducted a 3-Day Training Program at Keetronics (India) Pvt. Ltd., Kothrud, Pune during 7th - 9th May 2026. The Company is engaged in manufacturing of advanced input devices, functional printed electronics and touch electrical switches. The first day of the training covered various aspects of Pneumatics. The second day was devoted to key topics under Hydraulics. The third day consisted of practical sessions conducted directly on the shop floor. The sessions were conducted in English and Marathi. Main objectives of the program were to identify ways to enhance energy efficiency and boost productivity within the factory.



Er. Debadatta Mishra, FCVS and **Dr. Prakash C. Patnaik**, FCVS participated as esteemed invited speakers at the TRANSIT-2026 event held at the Pune International Centre during 10th - 12th June 2026. This was organized jointly by COEP University - Pune and CANEUS - Canada, in association with the Government of Maharashtra. TRANSIT-2026 was the maiden edition of a Mid-TRL Technology Transition Workshop, focused on bridging the gap between research, industry needs and real-world deployment, covering Aerospace, Energy, Defence and Dual-use systems



Er. Rao Mannepilli, FCVS from Raytheon Technologies, USA has been elected as a Fellow of the Astronautical Society of India (ASI) in recognition of his professional contributions and achievements. Established in 1990, ASI fosters the development of astronautics in the country through dissemination of technical and other information related to astronautics, by conducting technical meetings, bringing out technical publications and organizing exhibitions. ASI is affiliated to the International Astronautical Federation, Paris as a voting member.



Er. Jignesh D. Jani, SMCVS, from Marwadi University, Rajkot, together with Dr. Nikunj V. Rachchh, have been granted a Utility Patent entitled “Wearable Device for Detection of Bone Cracks Using Vibration Analysis” (Indian Patent No. 593742 Dated 30/06/2026). The patented wearable device utilizes vibration analysis and advanced signal processing techniques for the non-invasive detection of bone cracks and fractures, offering a portable, cost-effective, and radiation-free alternative to conventional diagnostic methods. This innovation has significant potential in orthopaedic diagnostics, sports medicine, emergency healthcare, and rural medical applications.



Er. N P Sundar, FCVS, from Stellar Innostrat Consulting attended the ISO TC/251 Asset Management Plenary at Kyoto, Japan, during 29 June - 03 July, 2026. He represented the Bureau of Indian Standards (BIS) at the meeting. Er. Sundar also led and conducted a 90-minute Workshop for all delegates, as a part of the Plenary Session.

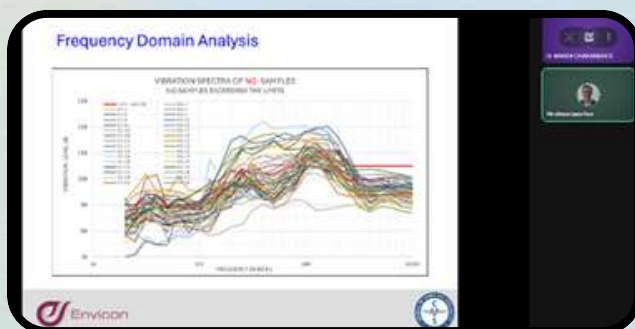
NOISE AND VIBRATION ANALYSIS IN PRODUCT QUALITY CONTROL

(28 JUNE 2026)

Er. S. K. M. Rao, FCVS

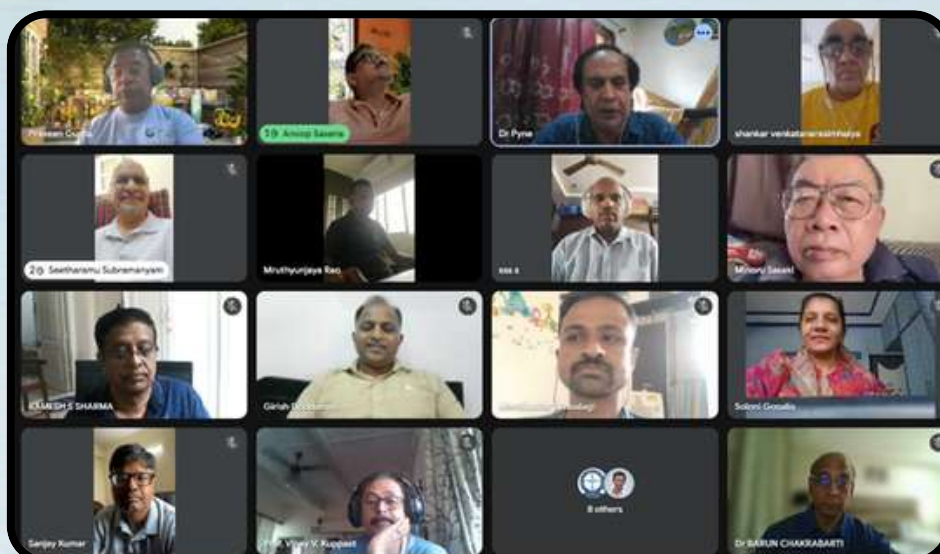
Managing Director - Envicon Vibrotech Pvt. Ltd

Er. S K M Rao FCVS, Managing Director of Envicon Vibrotech Pvt. Ltd. and Vice Chairman of CVS Bengaluru Chapter, delivered a technical talk on “Noise and Vibration Analysis in Product Quality Control” on 28th June 2026. The highly informative talk was attended by 28 members. Er. Rao briefly covered the concept of using noise and vibration levels as indicators of product quality. He illustrated the concept in depth through two case studies pertaining to the automotive sector. The examples showed how noise and vibration measurements had been used to segregate “OK” and “Not OK” samples in the manufacturing of Alternators and Wiper Motors. Er. Rao emphasized three critical aspects of such quality control philosophy, namely, selection of the appropriate technique, the parameter(s) and the GO/NO-GO Limits to be set. The presentation was followed by a lively Q&A session.



Salient features of test software

1. Creation of project—adding new types
2. Creating and modifying templates (Defining the noise acceptance limits)
3. Microphone calibration and calibration log
4. Automatic selection of template for a particular type of starter tested (Exchange of control signal from existing FSC)
5. Storage of results data with date and time stamp as file name
6. Automatic Microphone error detection
7. No requirement of Noise Chamber if vibration is used



MISCELLANEOUS RESPONSE CONTROL DEVICES

(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. Wire Rope Isolators

Underground structures, such as hydrological project control rooms, oil and natural gas storage facilities, and large ammunition dumps, are significant contributors to the nation's economy. Their failure or any interruption in their operation leads to significant losses. It is important to protect these structures from external vibrations caused by seismic activity, blast-induced ground motion (BIGM), and transmitted shocks. Depending on the loading intensity and geological conditions, the damage may range from minimal to catastrophic. Even if the structure survives without complete damage, the explosion's effects may render it operationally unserviceable.

As with earthquake response reduction, BIGM control can also be achieved using the three common vibration-suppression approaches: isolation, energy dissipation, and tuned vibration absorption. Traditional isolators and dampers used for seismic hazard mitigation may not meet the requirement to reduce response to the desired level in specific situations, i.e., when applied against BIGM characterized by very high peak accelerations.

A wire rope isolator (WRI), also known as a wire rope spring or metal cable spring, is one of the most effective devices for such applications. Due to their omnidirectional nature and ruggedness, WRIs have found wide-ranging applications in protecting sensitive military equipment and heavy industrial machinery. In the event of a blast or explosion, a significant amount of energy is transmitted to the ground as shock and vibration. WRIs are widely used for shock and vibration isolation because they can absorb impact energy very efficiently. They have also been found useful for seismic protection of sensitive equipment in buildings.

Salient Features of Wire Rope Isolators

WRIs are essentially spring dampers consisting of stranded stainless-steel wire ropes held between rugged metal retainer bars. The spring action arises from the elasticity inherent in the cable's flexure when the cable is formed into a loop. Damping results from friction between the cables, individual wires, and strands. Additionally, these isolators exhibit high resistance to ageing and creep and are unaffected by harsh environmental conditions, chemical agents, and temperature variations.

The distinguishing feature and effectiveness of WRIs over conventional isolation devices lie in their ability to provide isolation in all three planes and in all directions, making them unique. The behaviour of WRIS is strongly affected by their configuration and design and depends on various characteristics, such as the wire rope diameter, the coil diameter, the cable length, the direction of the applied force, and the number of wire strands. The performance of a WRI depends on its stiffness, which in turn depends on the material and geometric properties. WRIs are available in various shapes and sizes, some of which are shown in Figure 1.

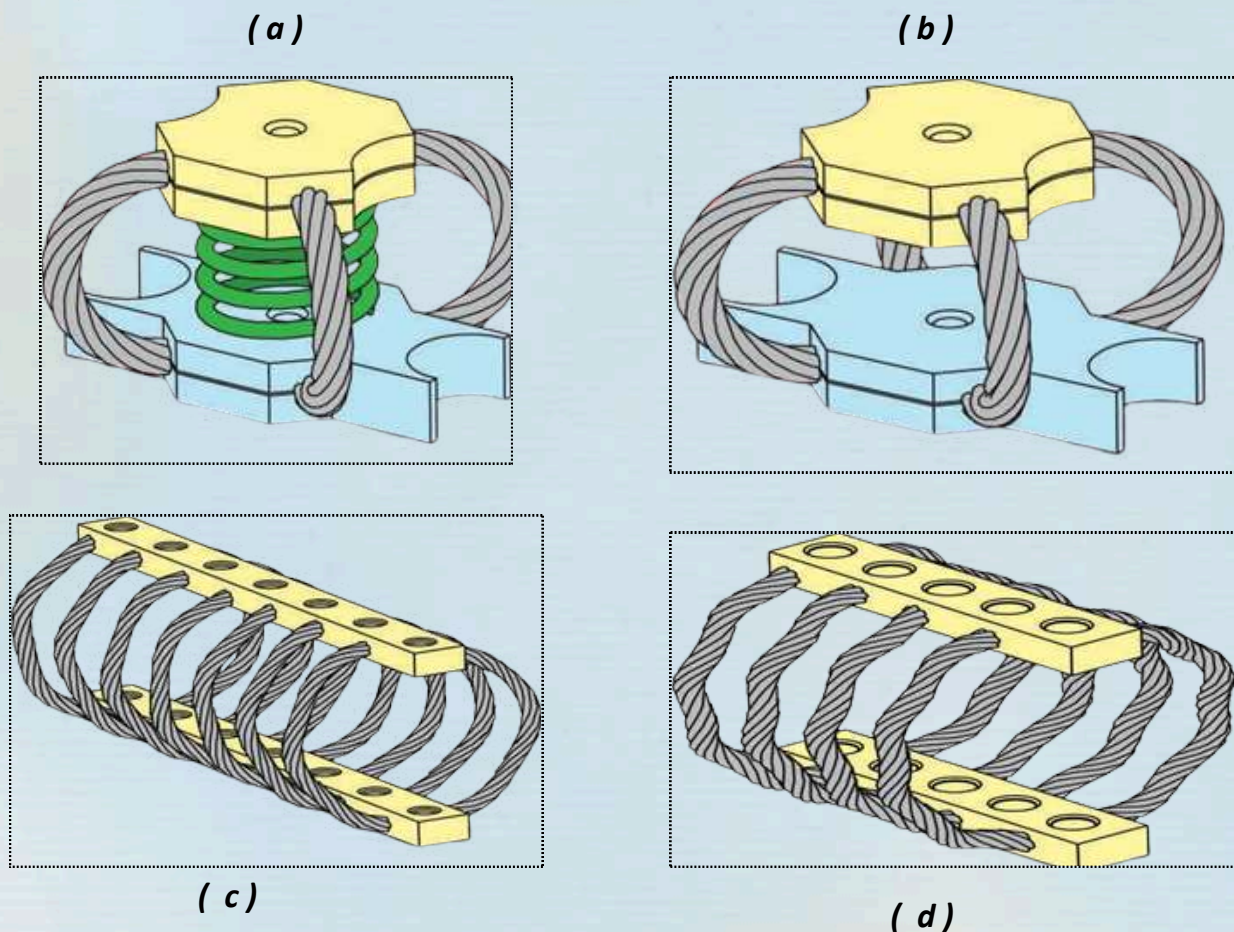


Fig. 1. Typologies of wire rope isolators: (a) helical, (b) half-helical, (c) polycal, and (d) spring polycal

Energy Dissipation Capability of Wire Rope Isolators

The various geometrical characteristics, such as wire rope diameter, number of turns, cable orientation, and strand loosening and tightening, govern the hysteresis behaviour and affect the shape of the hysteresis curve of WRI. However, the behaviour is independent of the loading frequency. The components of the restoring force are a nonhysteretic elastic force and a hysteretic damping force. The cyclic behaviour of WRI under tension-compression and shear-roll loading differs. The amplitude of displacement significantly affects the shape of the hysteresis curves. Rubbing and sliding friction between the individual strands provides inherent damping due to flexural hysteresis. The wires and cables possess an inherent capability to dampen vibration due to static hysteresis arising from sliding friction between cable strands. The damping in WRI is maximum when loaded at smaller vertical displacement amplitudes.

As shown in Figure 2(a), the hysteresis curves under vertical loading (i.e., tension-compression) are asymmetric, indicating variable stiffness in tension and compression. This asymmetry can be attributed to nonlinear contact between the steel-stranded wires at higher loads. It arises from different numbers of strands tightening and relaxing under tension and compression, due to different arrangements, and from hardening in tension and softening in compression. Initially, for smaller displacements, the curves are symmetric in both directions; however, at larger amplitudes, the asymmetry becomes evident due to nonlinear contact between the stranded wires. Since the hysteresis force-deformation curves in tension-compression modes are asymmetric, they cannot be accurately represented by the classical Bouc-Wen model.

Furthermore, the hardening behaviour in tension arises from a significant increase in the number of contact points as the wire strands come closer together, thereby increasing frictional resistance. This eventually leads to a stiffer isolator. In compression mode, as the strands tend to move apart, the number of contact points decreases, reducing friction and, hence, producing softening behaviour. Hardening behaviour is observed in tension, and softening under compression. As amplitude increases, this effect becomes more prominent.

As shown in Figure 2(b), tests in the horizontal direction (shear-roll) exhibit symmetric hysteresis behaviour due to the coil's circular section and an equal number of coil turns from the centre of the isolator. The dissipated energy increases progressively with deformation.

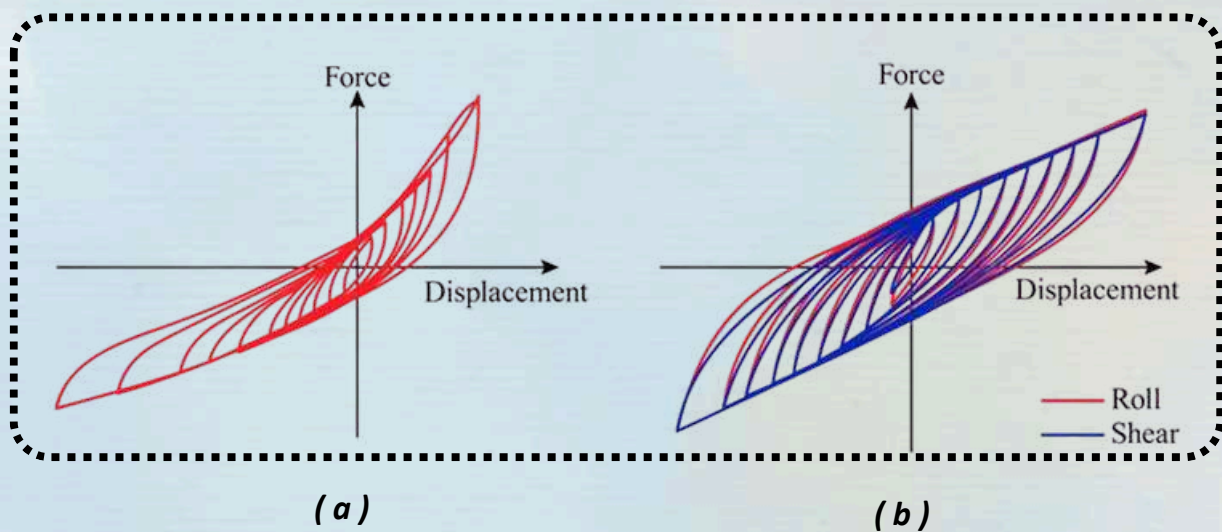


Fig. 2. Hysteresis curves of wire rope isolators: (a) tension-compression and (b) shear-roll.

Unlike in tension-compression, the hysteresis plots in shear-roll are symmetric in the positive and negative directions because the restoring force mechanism is the same and the WRI's stiffness remains equal for positive and negative shear.

2. Bretelle Damper

Bretelle dampers are used as clamps for installation with conductor loops. They not only provide damping but also help prevent conductor rupture and are designed to carry high-slipping loads. The conductor channel of the Bretelle damper is grooved, whereas the conductor channel is serrated to protect the conductor without affecting the clamp function. Bretelle dampers are typically installed on most suspension clamps in 225- and 400-kV lines. They consist of a short length of the same conductor as the line, attached to the conductor by special fixing blocks. The positioning of dampers is the same at each suspension tower along the line. The tension in the cables does not affect the performance of the dampers

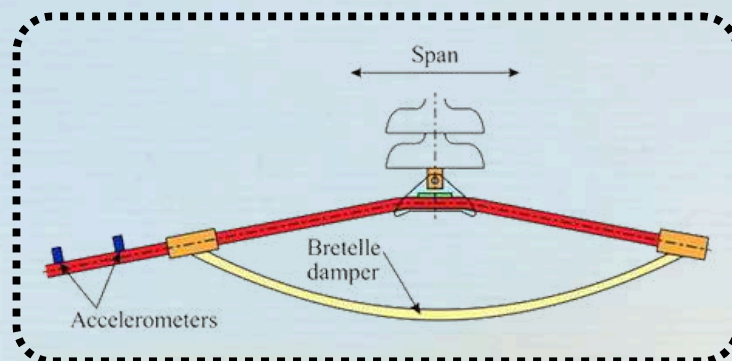


Fig. 3. Bretelle damper.

Figure 3 shows a typical Bretelle damper. There are two types of Bretelle clamps: (i) open type, with a continuous channel for the conductor (multiple loops), and (ii) closed type, in which the closed end is intended to provide optimal corona protection. All internal spaces are designed to accommodate damper clamping, and dampers are installed as per the specific requirements.

3. Spacer Damper

Transmission lines are laid over long distances to transmit signals from one place to another. When transmission line cables are required to span very long distances, they are supported by pylons at adjacent spans. In such cases, wind may cause significant vibration in the cables. Several forms of vibration, i.e., aeolian vibration, sub-conductor oscillations, galloping, and wind-sway, occur. The most dominant is the aeolian vibration. Aeolian vibration, shown in Figure 4, is characterized by low amplitude and high frequency, generally ranging from 20 to 150 Hz.

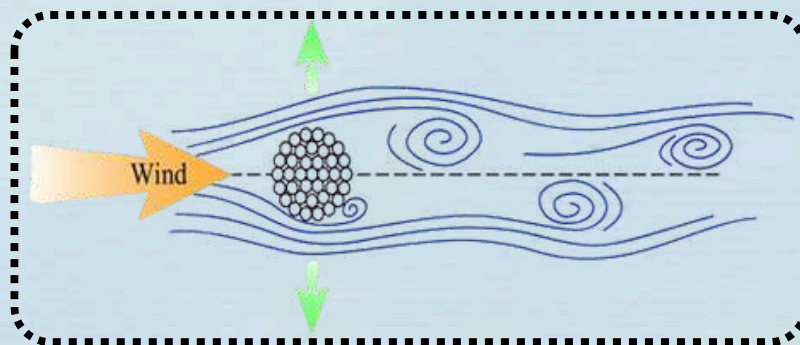


Fig. 4. Aeolian vibration.

Aeolian vibration is the most important type of vibration because it causes fatigue failure of conductor strands or of the system used to protect conductors. It can occur in relatively light winds at velocities of 2 to 24 km/h, resulting in the formation of eddies at the cable end. When the frequency of eddies generated in the cable equals the cable's natural frequency, the resulting forces cause fatigue failure. Nowadays, a transmission line consists of several sub-conductors per pole, grouped in bundles at each position. However, such transmission lines are subject to aeolian vibration. Due to the flow of wind over the windward conductors, eddies and vortices are formed between the sub-conductors, which are placed adjacent to each other. To prevent conductor failure and protect transmission line cables from wind effects, spacer dampers are widely used.



Photo 1. Dampers used to prevent aeolian vibration.

Photo 1 shows the spacer dampers, used to prevent aeolian vibration. For effective operation, the exact number of spacer dampers is installed along each span. The spacer dampers protect the conductors from high-speed winds and galloping by preventing sub-conductors from clashing along the span. Such spacers are flexible, enabling them to withstand high short-circuit current loads in both compression and tension, thereby protecting the conductors and cables from damage. For a double-conductor system, flexible spacers with high energy capabilities are required.

General Information About Spacer Damper

A spacer damper essentially consists of conductor clamps and a connecting frame with damping elements made of highly elastic macromolecular elastomers. These elements are characterized by high energy-absorbing capacity to dampen harmful wind vibrations, and by the required flexibility and stiffness in all directions. The damping elements also resist UV radiation and ozone exposure. Generally, the clamps for the dampers are made of high-grade cast aluminium, and the screws are high-strength. There are two types of spacer dampers: rigid and flexible. Rigid spacers are used where conductor connections are very short and flexible spacers are not feasible. Rigid spacers are readily available in the market for double, triple, and quadruple bundles; however, other designs can be manufactured to meet specific requirements. Rigid spacers equipped with counterweights to create tower clearance are used for jumpers. Figure 5 shows such a type of spacer damper.

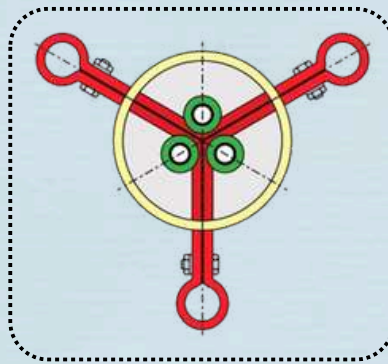


Fig. 5. Rigid spacer dampers for jumpers with counterweights.

Flexible dampers are used as twin bundles, horizontal and vertical, made of aluminium. To impart flexibility, these dampers are provided with movable clamp bodies connected by a spacing piece, as shown in Figure 6.

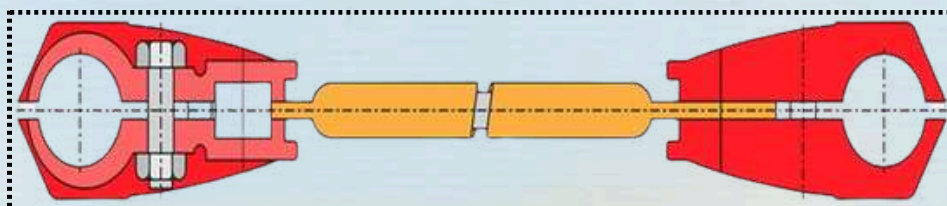


Fig. 6. Flexible spacer dampers.

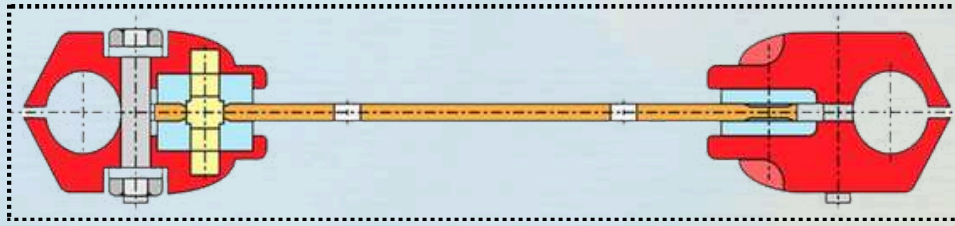


Fig. 7. Flexible spacer damper with neoprene washers.

However, the clamp bodies are guided over steel bodies and can move only in one direction. Stainless sleeves are provided with a bore in the link to ensure an optimal bolt connection. Flexible spacer dampers with neoprene washers are shown in Figure 7. They are used in horizontal and vertical twin bundles.

EDITOR'S NOTE

This article is a preview of Chapter-9 of the Authors' book entitled "Passive Vibration Control of Structures" (CRC Press). The earlier Chapters were covered in the previous issues of "amplitude". We plan to present the previews of subsequent Chapters of the book in future issues of this Newsletter.

Passive Vibration Control of Structures

Suhasini Madhekar Vasant Matsagar



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- 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 Trebuchet MS 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.

The CVS Word Puzzle

Contributed by Dr Arun Jalan, FCVS

It is time to get cerebral!

C	V	S	C	O	U	N	C	I	L	I	S	H	I	G	H	L	Y	I	N
H	O	M	E	X	A	N	M	I	T	I	G	A	T	I	O	N	C	R	O
A	A	V	V	E	R	A	G	E	I	N	T	R	O	D	U	E	D	V	I
R	F	U	T	I	L	I	Z	A	T	I	O	N	A	M	E	T	O	N	S
R	S	O	M	E	B	A	N	D	O	O	Y	E	S	R	O	S	I	N	E
I	D	A	M	P	E	R	P	A	E	R	I	S	T	O	E	N	S	I	R
O	R	P	A	T	Y	O	A	P	O	L	L	S	O	R	B	U	I	T	E
T	E	N	P	E	O	P	L	T	L	I	G	H	U	M	G	Y	G	O	D
A	S	P	E	R	I	N	S	O	I	I	O	T	A	C	V	I	N	A	U
S	E	A	D	U	R	I	M	N	A	O	C	T	A	M	A	R	A	B	C
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B	H	N	D	E	V	I	S	A	M	O	N	D	U	C	O	N	T	O	N
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Fill in the blanks below with right words and then find these hidden words in the above grid

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The science of _____ carries a rich _____ for centuries from the time of the concept of _____ frequency by Pythagoreans in _____ instruments, followed by the use of the _____ in later centuries. However, the proper _____ of this field has prevailed from the middle of the 20th century with the emergence of ever-growing _____ of high-tech instruments for data capturing, _____ processing and analysis. Further, vibration in _____ due to a variety of reasons, such as different environmental loading and in _____ machinery, is highly undesirable and necessitates the _____ of vibration _____ technologies. The Council of Vibration Specialists (CVS) is committed to _____ this potential through _____ and training in vibration as a fundamental physical science with an _____ -focused application-approach, as built-in-design of vibration in assets, as risk mitigation of structural and _____ infrastructure, and as related development of _____ techniques.

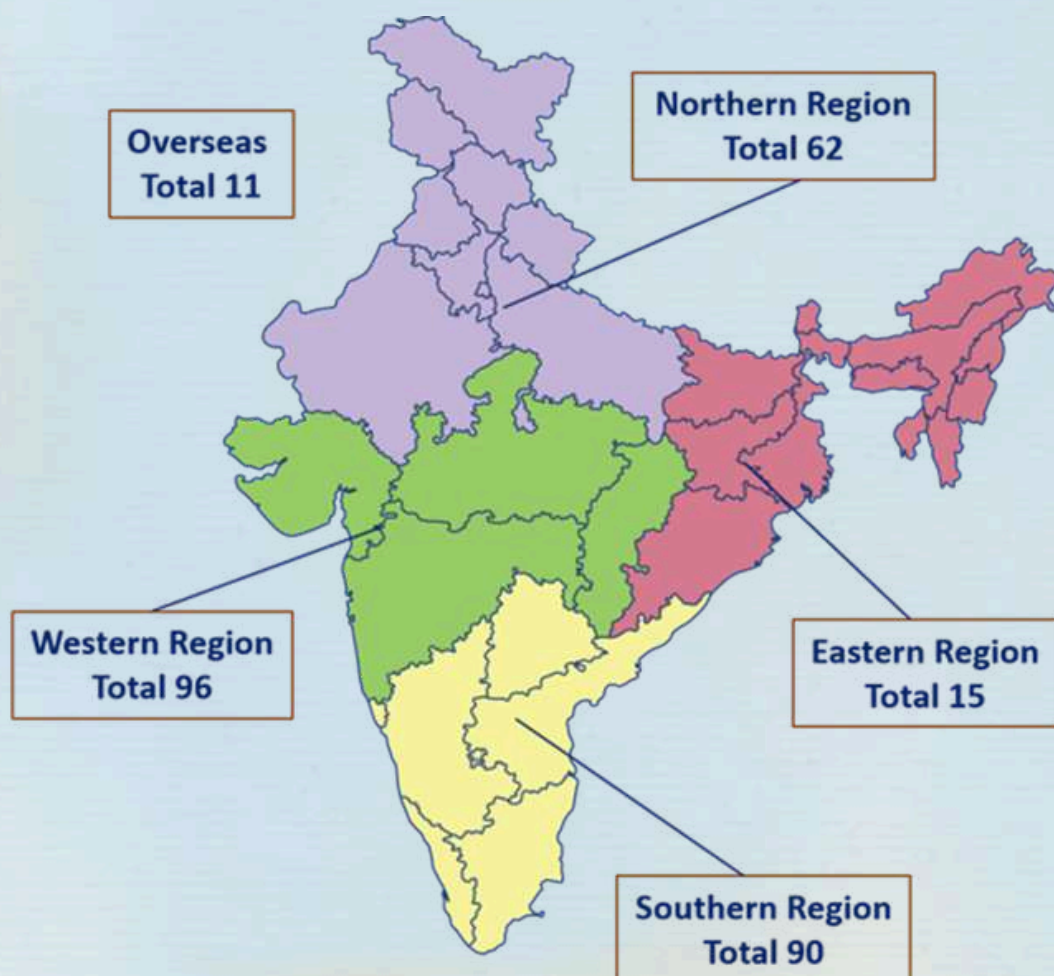
(A visit to the CVS Website might help!)

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North (Delhi)	53	9	0	62
West (Mumbai)	59	33	4	96
Overseas	9	2	0	11
Total	182	84	8	274

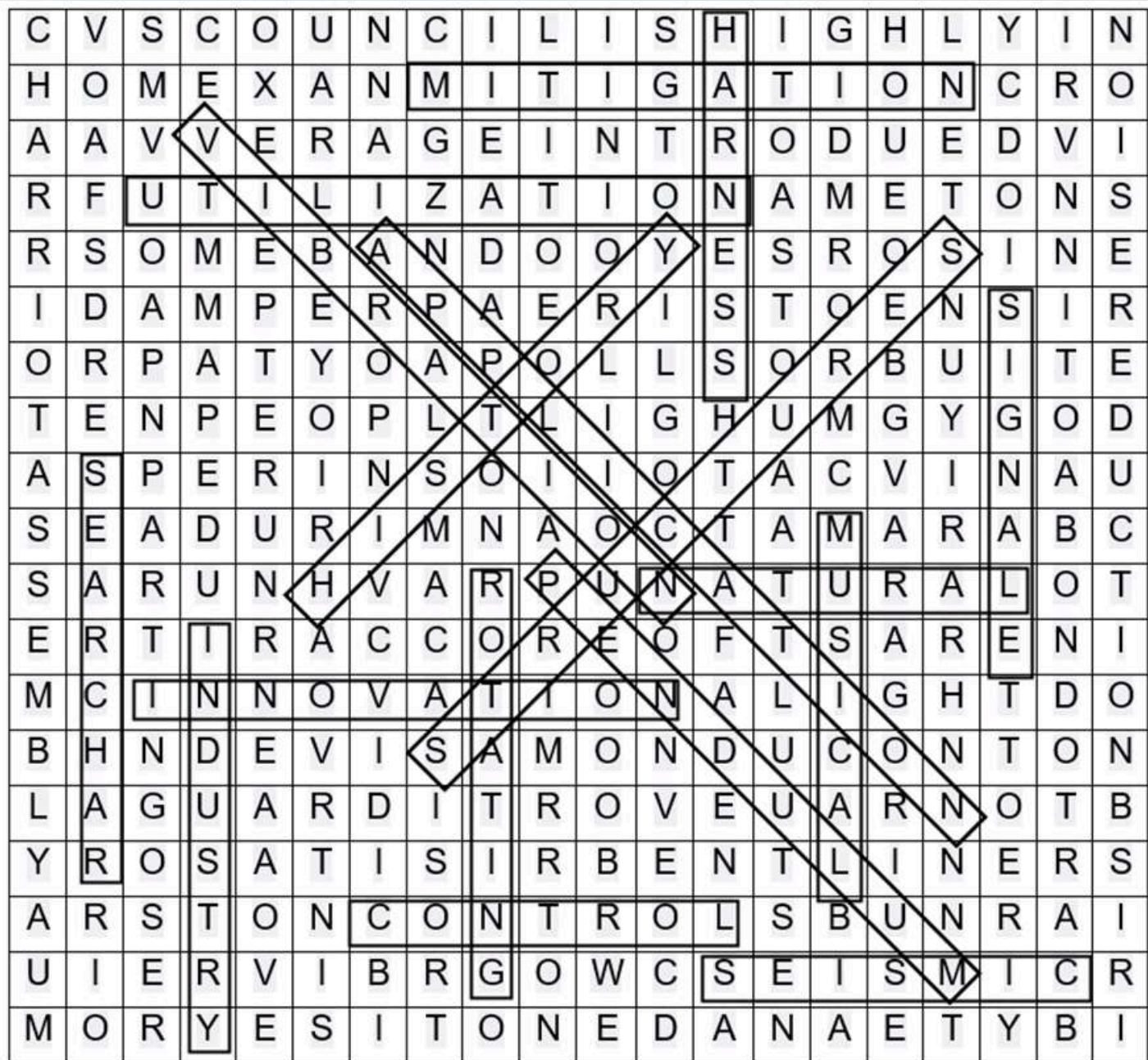
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AS ON 30 JUNE 2026



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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

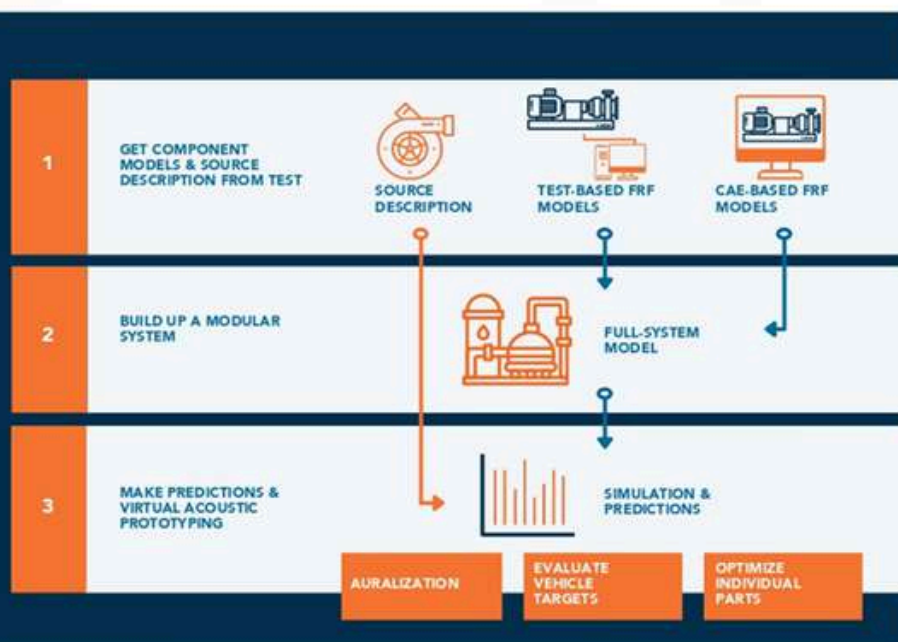
SOURCE is a software tool for Blocked Force Source Characterization (SC) and component Transfer Path Analysis (TPA). It combines all SC and TPA methods in one clear workflow with quality checks. Results are then integrated into CAE simulations, helping engineers address NVH issues early in product development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

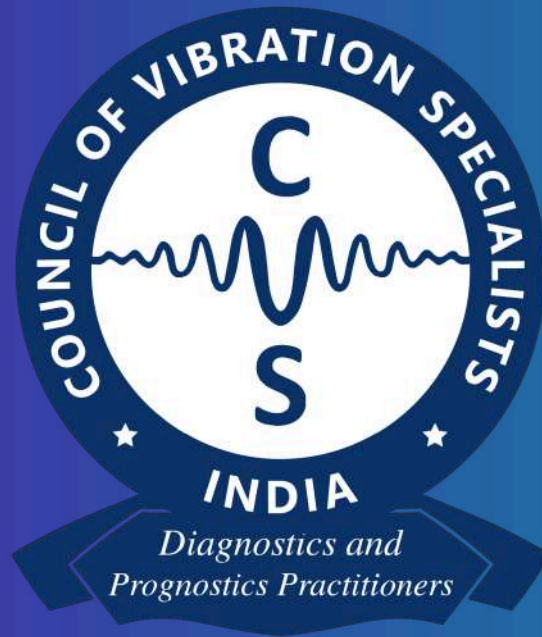
COUPLE

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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