CMVA ACVM Canadian Machinery Vibration Association / Association Canadienne en Vibration de Machines

CMVA MEMBERS' MAGAZINE

APRIL 2023
VOLUME 10 • NUMBER 1

ViBs

Details inside

ACVM ATC CTA 2023 CMVA

OCT 12 & 13
UNIVERSITY OF VICTORIA BC

ANNUAL TECHNICAL CONFERENCE
Training, Networking & Technology for Industry

CONFÉRENCE TECHNIQUE ANNUELLE
Formation, réseautage & technologie pour l'industrie

Strength in numbers

When our members meet to learn together

CMVA Atlantic Chapter meeting at newly commissioned Pulp Dryer at Irving Pulp and Paper, Saint John NB, on March 9, 2023.

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Collect better data, save time, and learn

By Ken Keith

Tech Tip

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We support our members
in their pursuit of excellence and reliability

ViBs

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To submit a technical paper or a case study, or to buy advertising space in ViBs, or for any comment on ViBs, please contact Ken Keith.

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Group: Canadian Machinery Vibration Association

vibrations.machines.canada

From the Chief Editor's Desk

© Colette Keith

Ken Keith spent 30 years working at Irving Pulp & Paper (Saint John, NB), the last 18 years in the Reliability Department as a Vibration Specialist. In 2017, at the age of 55, Ken retired from IP&P and accepted the position of Executive Director of the CMVA. Since entering the reliability field, he has been passionate about the CMVA. He holds much respect for the members and volunteers who have created and maintained an organization that is driven to improve the skills and abilities of its individual members, and the viability and profitability of the businesses that these members are a part of. Ken holds both CMVA and Vibration Institute CAT III certifications and achieved his CMRP in 2017.

2023 Annual Technical Conference in Victoria, British Columbia

Hello CMVA members,

The planning for the CMVA's 40th Annual Technical Conference in Victoria British Columbia is in full swing. The conference will be held October 12-13, 2023 under the theme ***Training, Networking & Technology for Industry***.

The conference will be held at the University of Victoria and the accommodations will be split between the Inn at Laurel Point and the Days Inn, both located downtown on the waterfront. Blocks of rooms have been set aside, you are encouraged to book soon!

The CMVA will have two Keynote speakers: Mr. Bernie Pringle, P. Eng., with 50 years experience and owner of Primac Reliability Consultants Ltd, and Dr. Keivan Ahmadi BSc, MSc, PhD, Associate Professor of Mechanical Engineering at the University of Victoria. Dr. Ahmadi's areas of expertise include Structural Dynamics, Mechanical Vibrations, Modal Analysis, Dynamics and Vibrations of Machine Tools, Modelling of Machining Processes for Virtual Machining Systems, and Process Optimization for High Performance Machining.

Looking forward to seeing you in Victoria!

KEN KEITH | Executive Director
director@cmva.com

CMVA NEEDS YOUR INPUT!

We plan to offer training on October 10-11 leading into the conference and are looking at a variety of options of some 1 or 2-day courses. Please pick the one you want to see, or make an alternate suggestion.

We are considering:

- **Level 1 Alignment training and certification**
- **Balancing**
- **Rotor dynamics**
- **Frequency response and resonance**
- **Waveform analysis**
- **Modal analysis**
- **Introduction to reliability (a brief review of available reliability-based technologies and appropriate applications)**
- **Another reliability topic... (please submit a topic).**

Please contact me now at director@cmva.com to indicate your preferences.

Word from the President

© Colette Keith

Matthew Holmes is a Senior Reliability Engineer with Acuren since 2006 providing remote & onsite asset management & reliability programs across Canada and the US, including critical equipment diagnostics & monitoring. Matthew joined the CMVA national Board of Directors in 2015 and immediately set to work with the ISO 17024 committee for development of the Quality Management System and business processes.

Matthew also previously held the position of national Vice President from 2017 to 2019 before being elected to the positon of National CMVA President in the fall of 2019. Matthew has been practicing vibration since 2000 starting with the aerospace industry, and currently holds CMVA and VI CAT III certifications, and professional engineering licenses in Nova Scotia and Ontario.

Dear fellow CMVA members and supporters,

Happy Spring to CMVA members, suppliers, certificate holders and supporters! It is early spring where I am at, the temperatures are warmer, the sun is shining and shining for more hours each day. Just a reminder that the CMVA 2023 ATC / AGM has been set for beautiful Victoria, BC, in October. I hope to see many new and old friends presenting vibration or asset maintenance experiences which make the CMVA ATC such as success. Please see cmva.com and committee updates for more information.

CMVA volunteers continue to work hard in the background to provide more benefits to CMVA members and certificate holders. Please see ISO committee and Technical Committee update for current and new initiatives for expanded certification opportunities. These offerings ensure asset management programs (ISO 55000 series) will have qualified and experienced professionals providing a variety of asset health monitoring or condition-based monitoring surveys, analysis and reporting.

Our training partners are busy offering training to support certification exam writers in all areas, so please check our cmva.com course calendar for offerings in your region. If you do not see training that you need for yourself or your organization, please contact Executive Director Ken Keith for facilitation of training options and exams or reach out to the CMVA's approved trainers directly. Approved trainers contact information is located at cmva.com under the certification tab, and on the last page of the current issue.

CMVA is also working hard on providing more resources relevant to the Body of Knowledge (BoK) for our various certifications and for member and certification holder everyday reference. Please make sure your check the cmva.com web store often for resources which you may purchase, like the "Book of Gold."

Finally, I hope everyone learns from the variety of case studies and papers presented in this edition of the ViBs magazine, and all our previous editions. Sharing of information is part of the CMVA's core objective and another way we provide benefits to the members, suppliers, certificate holders and supporters.

Happy spring !

MATTHEW HOLMES
President of the Board of Directors
mholmes@acuren.com

Career Opportunities

Looking for new challenges?

The CMVA website offers now a brand new section in which you will find interesting career opportunities from across Canada, in fields directly related to your industrial maintenance practice.

Whether you are a technician, engineer, mechanic, technologist, reliability engineer, plant manager, specialist or trainer in condition monitoring technologies, etc., sooner or later, you will find the right offer for you! Visit often

cmva.com/career-opportunities/

Looking for competent personnel?

Share your job offers on cmva.com and find candidates whose skills are directly related to your needs! To do this:

1. Become a Corporate Member of the CMVA
2. Send us your offer!

INFORMATION : Ken Keith | 416-622-1170 | director@cmva.com

Technical Committee

Another new year is upon us, and the Technical Committee is looking forward to another successful one for the CMVA. The very first Alignment Certification exams went very well and now we are starting to make improvements to exam questions based on initial feedback. Also, although progress has been slow, work is continuing on Vibration CAT IV certification. A detailed plan has been put together to try to jump start this process and get this completed so CAT IV certification can be offered.

The Ultrasonic Certification Sub-Committee has held its first meeting and laid out a plan to develop this new certification option. The committee will be meeting regularly and working towards this exciting new offering. We would again like to make a call out to anyone with ultrasonic experience that would like to participate in this exciting new project. Interested individuals can reach out to myself, the Executive Director or any of the committee members.

Based on feedback from our annual ISO certification audit, there is now going to be an increased focus on certification renewal form verification. This will include contacting supervisors to verify previous work experience. This will help ensure that certifications are only issued to those who have met CMVA requirements.

Review of exam questions will continue this year. After several updates early last year, we now have enough new exam data to analyze to come up with improvement recommendations. We are also continuing a review on French questions of concern now that we have additional French speakers contributing to the committee.

With this in mind, I would like to welcome Jonathan Dion to the Technical Committee. He will be a great addition and we look forward to his input, especially from a French perspective.

JEFF DOWN | Technical Committee Chairman
downyd@hotmail.com

COMMITTEE MEMBERS

Jeff Down
Chairman

Grant Akitt

Bernard Boueri

Jonathan Dion

John French

Ken Keith

Joe Koncovy

Gilles Lanthier

Ron Newman

Dora Orchard

Janos Pattantyus

CONTRIBUTE TO KNOWLEDGE

For almost 40 years, analysts, technicians, engineers, trainers and reliability managers have presented an impressive number of technical conferences at CMVA events, of which many are available in the knowledge database on the CMVA website.

We are always looking for technical articles, whether for our events, our online library or our ViBs magazine. **Submit articles and case studies** for the benefit of the vibration community to director@cmva.com and earn points toward certification renewal.

© Jordan Burns

Lloyd Appelt is President of Vibratech Solutions in Alberta. Vibratech Solutions does regular machine predictive monitoring and specialized analysis, along with dynamic balancing and impact testing. Born and raised in Alberta, with all his work experience there as well, Lloyd started his career as a machinist, then moved into millwrighting and shortly after into vibration work for the last 20 years. He is currently a CMVA CAT III certified vibration analyst.

Lloyd first joined CMVA in 2005 as a member, and is part of the national Board of Directors since 2015. In 2019, he became the chair of the ISO Accreditation Committee.

ISO Accreditation Committee

Things are moving along steadily with the ISO committee.

The committee is comprised of 4 main people with the CMVA and 1 external contractor (plus a little extra assistance from a few others). Thanks to everyone for helping move things along.

It was a lot of work for CMVA to become ISO 17024 accredited and it remains to be a lot of work to maintain this level of excellence.

The CMVA has just finished an internal audit in January which was performed by our external contractor. This ensures we are on track with our certifications and helps find opportunities to improve the association. We will be having an external audit performed by the SCC (Standards Council of Canada) in Mid-April. This has all the benefits of the internal audit as well as verifying that we still meet all accreditation requirements.

Currently the CMVA has Vibration Specialist Category I, II, & III accredited under ISO 17024 and are now working toward adding our Alignment certification. In the future, we will hopefully be adding Vibration Specialist Category IV, Ultrasound, and other technologies to our program.

As we move along in our industrial world, more and more companies require certifications to conform with standards that they operate under. The ISO accredited certifications that the CMVA are providing to those who have passed its exams, are the gold standard so to speak. It is a small worldwide club right now of ISO 17024 accredited certification bodies for vibration specialists which is comprised of CMVA, Mobius Institute and Vibration Institute. You, as a CMVA member, are in high standing. The CMVA will continue to work toward adding to our accredited technologies and maintain our accreditation through the SCC.

LLOYD APPELT | ISO Accreditation Committee Chairman
lloyd@vibratechsolutions.ca

COMMITTEE MEMBERS

Lloyd Appelt
Chairman

Matthew Holmes

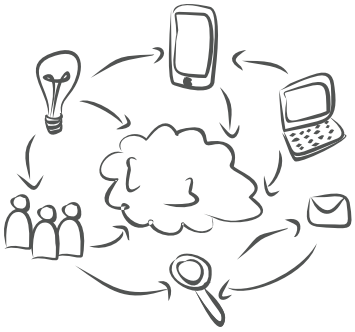
Ken Keith

Joe Koncovy

BE PART OF THE ACTION

Do you have skills & interests you wish to put at the service of CMVA? Several working groups are looking for wise and motivated members to bring solutions, projects and new ideas. Contact us to learn more at **director@cmva.com**. Our workgroups include :

ISO Accreditation Committee, Technical Committee, Communications Committee, Membership Committee, National Board of Directors, Chapter Executive Committees & Annual Technical Conference Host Committee.



Communications Committee

The year 2023 has started with many requests to write exams from candidates from all Canadian provinces. These applications are not just simple forms to complete and approve. These requests generate conversations, by email or telephone, before the big day.

While some students who attend courses in class have their exam session generally proctored by their instructor, others, for various reasons, will take their exam from their home or office, and will be monitored online, by a human.

As a remote proctor, and I believe my colleague Ken Keith would agree with me, I have a privileged meeting with each of these candidates for 2, 3 or even 4 hours. Of course, I am silent and invisible during the exam, but the exam is preceded by a preamble that follows a strict protocol in terms of the rules surrounding the proctoring and writing of a certification exam.

Sometimes candidates are stressed before their exam, and that is understandable. We must, as invigilators, ensure that the premises are adequate, that the candidate is comfortably installed, that he/she has in his/her possession all the tools to which he/she is entitled, that his/her telephone and computer are connected to the mains and that the Internet is stable.

The clarity of the explanations is essential, because the invigilator does not answer any more questions as soon as the exam has started. All must be done with patience and kindness, in order to smooth out the irritants as much as possible for the candidates, so that they can focus on the essential, their success.

I have great joy in making beautiful and enriching encounters with people who are sometimes far away. Technology has this good thing, because it makes distance disappear. There are only two humans left, each in front of their screen. The quality of inter-relational communications makes each experience unique.

In fact, nothing pleases me more than meeting candidates and CMVA members, regardless of the media.

ANNE-MARIE SAMSON | Coordinator & Co-chair
acvm@cmva.com

Follow us! Participate! And share!

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vibrations.machines.canada

COMMITTEE MEMBERS

Ken Keith
Co-chair

Anne-Marie Samson
Co-chair

Gurwinder Bhambra

Derek Prinsloo
On consultation

John French

Gregory Zurbriggen

DEVELOP NEW WAYS TO REACH OUT

The Communications Committee supports the CMVA in developing its internal & external communications, with its members, personnel, committee members, chapter executives, partners, certified analysts and the general public on the various platforms used by the association: social media, website, ConnecT newsletter, ViBs magazine. The committee also sees to the protection and development of the CMVA brand image in the production of derivative products and communication tools and supports the chapters in the dissemination of local information.

© Colette Keith

Jesse LaPaire is the current Vice President of CMVA National and holds the Mentor position on the executive of the CMVA Atlantic Chapter. Jesse is a certified CMVA CAT III analyst, and a registered Professional Engineer in the province of New Brunswick. He works currently with NB Power (Corporate) to improve predictive maintenance programs and overall plant reliability in the generation division, while additionally supporting machinery diagnostics acquisition and analysis.

Membership Committee

The year 2023 is well underway and the CMVA has tallied a total of 400 members so far. I, and the CMVA executive, would like to extend our sincere gratitude to the membership committee and others who participated in our membership retention efforts, sending home the true community aspect you receive with the CMVA. Naturally, this total membership number will increase throughout the year with newly certified analysts seeking community and continuous learning opportunities, as well as chapter events and the annual technical conference driving the message home that there is a technical community available in Canada, and it pays to be a part of it! It is these types of efforts that keep us on track to meet our 2023 end of year goal to increase total membership by 10% to 449 valued members.

This issue of ViBs grants the opportunity to welcome new representation to the membership committee, as Brent Gattoni of PDM Technologies Inc., takes a seat at the table. Hailing from the Ontario chapter, we are excited to hear Brent's fresh ideas at our next meeting taking place on April 24, 2023.

JESSE LAPAIRE | Membership Committee Chairman & National VP
JeLaPaire@nbpower.com

COMMITTEE MEMBERS

Jesse LaPaire
Chairman

Brent Gattoni

Ken Keith

Ted Pater

Charles Scott

Mark Shoup

Get involved!

We have a few vacant seats.

BRING NEW INTERACTION

Each new member joining CMVA adds a wealth of new knowledge, because we come from diverse backgrounds and encounter equally diverse technical situations.

As a member, you are our best ambassador and no promotion on our part can match your efforts to recruit new members. Let your colleagues, customers and suppliers know what the CMVA can do for them. Encourage them to create a user profile and become a member on **cmva.com**. After all, we are all looking for the same goal: excellence and reliability.

News from the Chapters

British Columbia


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The organization of the 2023 ATC being held on 12-13 October in Victoria BC is well underway and we are going through the final steps to finalise the hotels and rooms including training courses the two days prior to the conference. The conference will be held at the University of Victoria in the Student Union building. The venue includes a large room for the exhibitors and two rooms for the technical presentations. Victoria is a great city with a lot of museums and tourist attractions so you should also plan for a little extra time and take advantage of the great BC weather in October and all the tourist attractions in the area.

More information on the tourist attractions, museums and other venues will be posted on the CMVA website. Anyone in the BC chapter who would like to volunteer to help with the organization of the ATC can contact me directly.

The next BC chapter meeting will be held in June (date to be determined) and will be a virtual meeting. The chapter executive is looking for a case history presentation or short technical presentation for this meeting. Please contact me or John French jfrench86@hotmail.com if you would like to submit a presentation. See you in Victoria in October.

COLIN OSTERGARD | President
costergard@acuren.com

Atlantic

2023 is off to a great start for the Atlantic Chapter. Our first general meeting of the year was a huge success with 35 members attending (see picture on cover). The meeting included a tour of the Newly Commissioned Pulp Dryer at Irving Pulp and Paper, Saint John, NB. Also featured at the meeting was a Technical Presentation by John MacKenzie from Sable Engineering on TMP Refiner Plate Online Protection. Big thanks to John for presenting and Irving Pulp and Paper for hosting the meeting.


© Courtesy

On April 5th, Joel Hicks presented to a class of 3rd year Mechanical Technicians at NBCC. The purpose of this presentation is to provide awareness of the CMVA to the next generation of Predictive Maintenance Practitioners. The presentation was the first in-person presentation at the collage in recent years with two being held online in 2022. The presentation was well received with lots of engagement and questions for the presenter. The chapter plans to continue with this initiative. Thank you, Joel, for putting in the time on this. The Chapter voted to award 2-$1000 student bursaries in 2023. There will be communication from the National on this in the coming days. You can also view the application form at www.cmva.com under chapters/ Atlantic. Applications can be submitted to joel.hicks@irvingoil.com and myself.

The Chapter plans to hold two more meetings in 2023 with a Technical Conference to be held in December. Technical Day will consist of 3-4 technical presentations. If you wish to present, please reach out to Kyle Arsenault at kyle.arsenault@irvingoil.com. The proposed date for the next General Meeting is early September, with the hopes of a plant tour of Coleson Cove Generating Station during an overhaul of a Main Steam Turbine. The Atlantic Chapter is looking forward to these exciting events coming up and hopes to see a good turn out of members and associates at all events!

MATT FIRTH | President | mfirth@nbpower.com

Prairie

© Colette Keith

The Prairie Chapter held an in-person meeting last March 16, at Northpoint Technical Services in Calgary. The purpose of the meeting was to cover technical presentations and promote networking and sharing of ideas, solutions, and experiences in the chosen field while relaxing over a nice meal. The meeting included :

- Technical presentation by Alexandre Gauthier titled *Advanced Analytic Tool to Detect Early Mechanical Failure Modes and How to leverage other condition monitoring applications to Conduct dept Analysis*;
- *Highlights of Vibration Analysis cases studies*, by Alexandre Gauthier;
- A post-meeting dinner at Brewster's Brewing Co., Foothills.

Members were encouraged to meet at Sunshine to sky on Friday, March 17.

Prairie Chapter executive is: Gurwinder Bhambra (President); Ryan Goddard (Vice-President); Mark Shoup (Secretary and Membership Chair); Jacob Wiebenga (Treasurer); Alexandre Gauthier (Technical Director) and Greg Poirier (Mentor).

Upcoming meeting will be held on September 14, 2023, from 1 to 4:30 pm, at Spartan Centre, 8403, 51th Ave NW, Edmonton, AB, T6J 6Y8. Join us for a post meeting dinner at Earls, 4250 Calgary Trail NW, Edmonton, AB.

GURWINDER BHAMBRA | President | gbhambra@wajax.com

Quebec

© Cindy Doucet

The Quebec chapter Executive committee met on March 14 to plan the chapter's annual technical day, as well as the members AGM with elections. The scheduled date is June 15 in Ville Saint-Laurent. The suggested theme, Electric motors, will be confirmed in future communications to members. Again, we will be presenting the event in the hybrid formula (face-to-face/virtual) following last year's success. The Chapter Executive has also agreed to host the 2024 National Technical Conference, and will form the organizing team for the event shortly.

PATRICE HUARD | President | Huard.Patrice2@hydro.qc.ca

Ontario

© Courtesy

The Ontario chapter held its 2023 Annual Technical Conference and General Meeting in person on Thursday March 30, 2023. This was the first ATC (and AGM) held since June 29, 2021, by the Ontario Chapter. During the AGM, the election took place for the new chapter executive. Your new Ontario executive is Andrew Ali (President); Theresa Girard (Vice President); Mohamed Ali (Technical Chair); Brent Gattoni (Membership Chair). There are two vacant positions (Treasurer & Secretary) that we are still looking for volunteers to fill.

The Annual Technical Conference included three excellent technical presentations and a keynote speaker, Roy Zarieh (CMVA Ontario Chapter President). One was presented by John Lambert titled *The Accumulated Effects of Machine Casing Stress and Shaft Deflection*, and the other ones presented by Mohamed Ali titled *Measuring Shaft Vibration Using Inductive Proximity Probes* and Dr. Morteza Zohrabi titled *ROI & Engineering Calculations*.

The next Ontario Chapter meeting is tentatively planned for August.

ANDREW ALI | President
andrew.ali@opg.com

Ontario Chapter meeting. © Ontario Chapter

MEMS accelerometers: Ushering in a new era in machine health

By **Jacob Loverich**, Chief Product Officer, KCF Technologies | loverich@kcftech.com

ABOUT THE AUTHOR

© Courtesy

Jacob Loverich is the Chief Product Officer at KCF Technologies, a company providing predictive machinery health monitoring solutions. He has spent the last 20 years developing core technologies that are foundational to the Industry 4.0 including AI software, sensors, wireless communication, and energy harvesting technologies.

He is currently leading KCF Technologies in efficiently capitalizing on the information embedded in the trillions of data sets that their sensors acquired in the last few years. This work has resulting in a strong portfolio of enterprise software, IOT platform, and advanced analytics solutions. The work is represented in a dozen patents and hundreds of trade secrets proprietary to KCF. Jacob's understanding of the Industry 4.0 is grounded by his practical background as a former machinist, his Doctoral work in smart materials and non-linear optimization, software development at IBM, and MEMS sensor innovation at Kyoto University, Japan.

The field of vibration analysis largely was spawned by the advent of the modern piezoelectric accelerometer. Innovation in piezoelectric ceramics during WWII enabled piezoelectric accelerometers to be cost-effective, reliable, and practical for many applications, including measuring vibration.

Several decades later, the handheld vibration analyzer emerged out of the computer revolution and, paired with piezoelectric accelerometers, enabled route-based monitoring at scale. The field of vibration analysis and machine reliability quickly progressed to the present day, where vibration analysts are essential in most large manufacturing plants and a good vibration analyst can identify early-stage inner race cracks in large low speed bearings.

We are at another interesting point in history, much like the period after WWII, where a new sensor technology—MEMS accelerometers—is being combined with high energy density lithium batteries, low power wireless communication, cloud computing, and AI. This new wave of technology is ushering in an exciting era in machine reliability that is expanding the reach of the field of vibration analysis and its impact on manufacturing.

While there is an ongoing debate about how far these technologies will go in terms of automating machine health analysis, what is apparent already is wireless vibration sensors and AI are being deployed widely and are proving to be valuable new tools in the field of machine reliability. Rather than displace vibration analysts, this technology is freeing up analysts to spend more time working on complex and persistent problems. AI is helping the analyst by curating a subset of machines that require detailed analysis and wireless vibration sensors—enabled by MEMS accelerometers—are allowing analyst to spend less time walking around plants taking measurements and more time reviewing machine vibration. These technologies are also allowing some analysis to be done remotely and rudimentary diagnosis like unbalanced caused by debris accumulation on fans to be automated with AI.

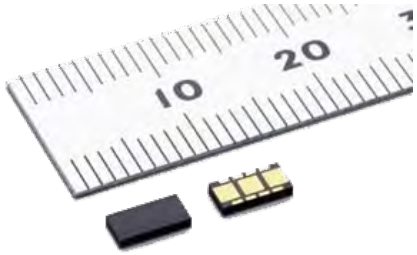
Perhaps the most exciting and impactful new capability offered by this technology is much more frequent and persistent machine measurements. Rather than seeing a snapshot of vibration once per month, vibration analysts are now able to see measurements as frequently as once per minute. This enables them to quickly identify damaging operational conditions like pumps cavitating during washdown cycles or startup. These types of conditions are often the root cause of premature seal failure and bearing wear but are left unaddressed because it is unclear why it is happening and what could be changed to avoid the damaging condition.

The MEMS accelerometer is a foundational and critical technology on which this new capability is based. If the input signals from online wireless sensors don't have an appropriate level of fidelity, the result from the AI may be incomplete. While MEMS accelerometers offer impressive characteristics in terms of low power operating, small size, and low cost, they also have some characteristics that can limit their performance and the output of wireless online vibration monitoring programs in general. Although there are some premium wireless sensors that use a piezoelectric accelerometer, they typically can only be sampled once per day to maintain a reasonable battery life, whereas MEMS transducers can be sampled much more frequently. For these reasons and cost, the vast majority of wireless vibration sensors use MEMS transducers.

The key to understanding the trade-offs in MEMS vs. piezoelectric accelerometers is to understand how they are made. Piezoelectric accelerometers are fabricated in a single batch process where each ceramic element is carefully placed, preloaded, wires soldered, and the enclosure laser welded over the ceramic element. The ceramic material composition, shape, and inertial mass all determine performance characteristics of the accelerometer such as sensitivity, amplitude range, and noise floor. Because piezoelectric accelerometers are made in small batch processes, adjustments to the construction can be made at little cost, which enables a wide range of different sensor characteristics. This is important because different types of applications require different sensor characteristics like sensitivity, and frequency range. (Continued on next page)

MEMS accelerometers
Ushering in a new era in machine health

By **Jacob Loverich**, Chief Product Officer, KCF Technologies | loverich@kcftech.com

PIEZOELECTRIC VS MEMS ACCELEROMETER		
FEATURES	**MEMS**	**PIEZOELECTRIC**
		
COST	Low cost ~$3-10	High cost ~ $100-500 (fully packaged)
BATTERY OPERATION	Yes	Not recommended
FREQUENCY RANGE	Medium range	Highly flexible (high and low frequency)
NOISE FLOOR	Medium	Low (this is better)
CALIBRATION	Not required	Every 5 years
ORIENTATION	Yes	No
ROUTE-BASED MONITORING	Not recommended	Yes
ONLINE MONITORING APPLICATIONS	Wireless online vibration sensors	Hardwired vibration sensors
EQUIPMENT TYPES	Pumps, fans, motors	Turbines, large slow speed bearings

On the other hand, MEMS accelerometers are made in large batch processes where thick silicon wafers are selectively eroded until miniature beam structures remain. These structures look different than those of piezoelectric accelerometers, but the basic principle of operation is similar. Signal condition amps and filters can be added to the silicon to form complete sensor devices on miniature chips.

Owing to the complicated fabrication process, fabrication of MEMS accelerometers is cost effective in high volume production, much higher than what the machine vibration analysis market is demanding at present. For this reason, MEMS accelerometers are not specifically designed for machine vibration monitoring, but rather for applications like automobile airbags and cell phones. Coincidentally, these accelerometers tend to have performance that is acceptable, but not ideal for some types of machine vibration monitoring.

MEMS accelerometers tend to have a relatively modest noise floor, low frequency range from roughly 0 to 1-5khz, and amplitude range that is generally less than 20 g. These MEMS sensor characteristics are sufficient to analyze most common faults like unbalance, misalignment, bearing faults, and even some high frequency faults like cracked rotor bars in small to medium (25-200Hp) size pumps, fans, motors, and gearboxes. An interesting characteristic of MEMs accelerometers is that they can measure static orientation (0 Hz). This is useful for knowing if a wireless sensor has fallen off a machine or was moved to a different location. Unlike piezoelectric accelerometers, their sensitivity is very stable over time and they don't require recalibration every few years.

The most significant limitation of MEMS sensors is that they typically have a built-in low pass filter that cannot be bypassed. This means that much of the high frequency (10-100kHz signals) content useful for envelope analysis is filtered out of the signal. MEMS accelerometers will have limited capability for slow speed bearing analysis and high criticality assets where more premium sensors are justified. Finally, they generally are limited to <125°C operation. For these reasons, piezoelectric accelerometers are likely to continue to be the best choice for handheld, route-based monitoring.

While someday the vibration analysis market may be large enough to enable chip manufacturers to invest in building a specific MEMS accelerometer that offers optimized characteristics for machine vibration, we are likely to be limited to sensors designed for consumer and light industrial applications.

An interesting and exciting reality is that MEMS accelerometers are emerging at a critical point in time where there is increasing awareness that vibration analyst only monitor a fraction of the machines in the world that warrant health analysis. At the same time a skills gap has emerged owing to the large number of analysts retiring. MEMS accelerometers are abating this conundrum by both increasing the scope of value that each analyst can deliver and their over business impact. With this new technology we are seeing a resurgence in the vibration analysis field and increasing demand for analysis as machine health underpins the ROI of many Industry 4.0 and Digital Transformation projects. ◀

Ball Mill Motor Magnetic Center

By **Jim MacIvor**, CBM Technician, Acuren | jmacivor@acuren.com

ABOUT THE AUTHOR

© Courtesy

Jim MacIvor is a CBM Technician (Industrial Red Seal Electrician/Technician) with Acuren East, based in Pictou County, Nova Scotia, with 44 years of industrial electrical experience. Jim provides electrical motor circuit analysis (MCA), ultrasonic emissions (UE), electrical scans and infrared (IR) and electric scans (high and medium voltage) for Acuren customer reliability programs.

CONTEXT

Motor Circuit Analysis (MCA) online testing was requested for a ball mill motor (1,250 HP, 4,160 VAC) due to increased axial vibration (Figure 1). MCA online testing, as the name indicates, means the motor remains operational and there is no impact to production.

COMMENTS

MCA online testing indicates a possible magnetic center issue at the 5th harmonic of the rotor evaluation spectrum (Figure 1). Magnetic center issue is denoted by the double peaks at 300 Hz.

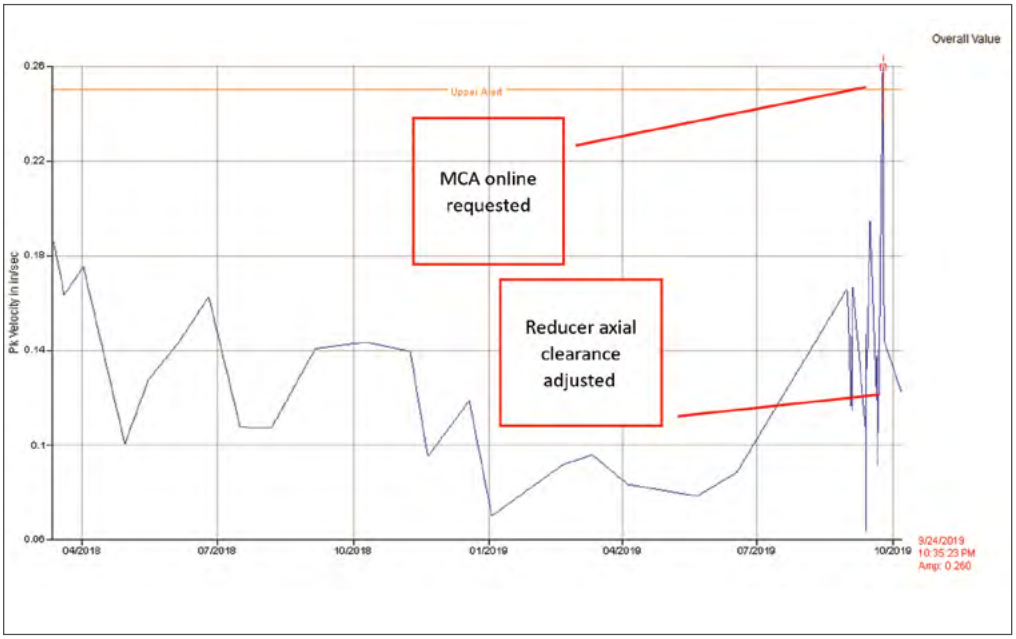


Figure 1 – Ball mill motor, vibration, drive-end, axial, trend 2019

RECOMMENDATION

At next scheduled opportunity, check output shaft of motor for magnetic center.

FOLLOW-UP

The motor output shaft magnetic center check did not conclude magnetic center was at issue (rotor did not move in-out when run uncoupled). However, the motor was connected to a reducer and the the reducer axial play was adjusted to OEM specification.

Magnetic center indication in the 5th of the rotor evaluation spectrum (Figure 2) improved (no double peak at 300 Hz) and the vibration improved as well (Figure 3). This avoided early removal of the motor due to excessive end bell / bearing forces.

This motor remains in operation to this day.

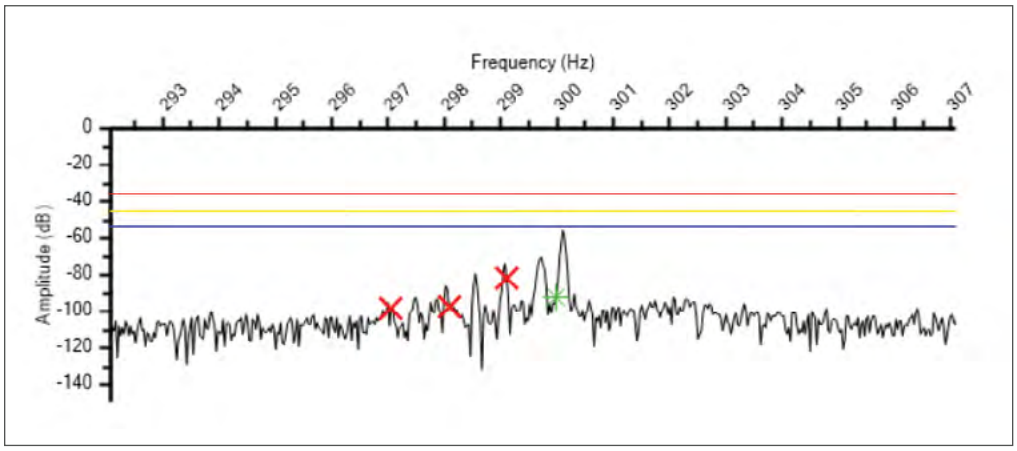


Figure 2 – Ball mill motor, MCA online, spectrum 2019

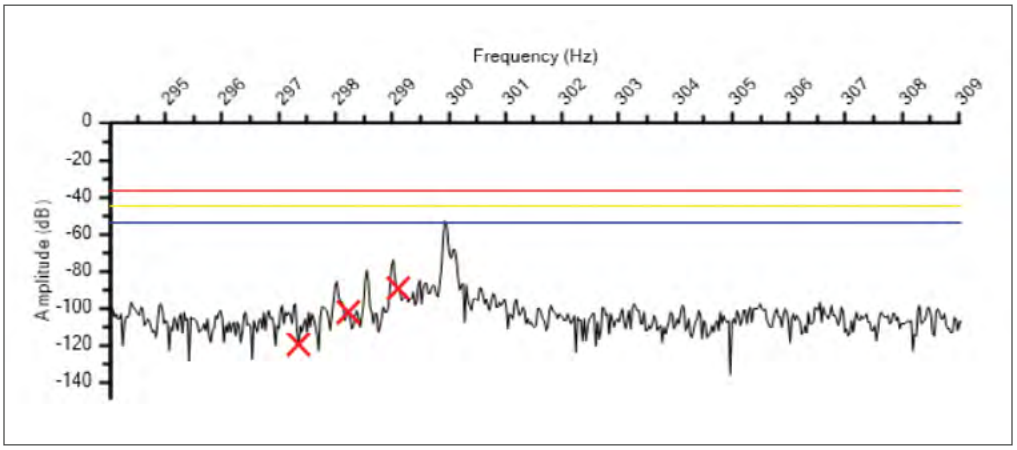


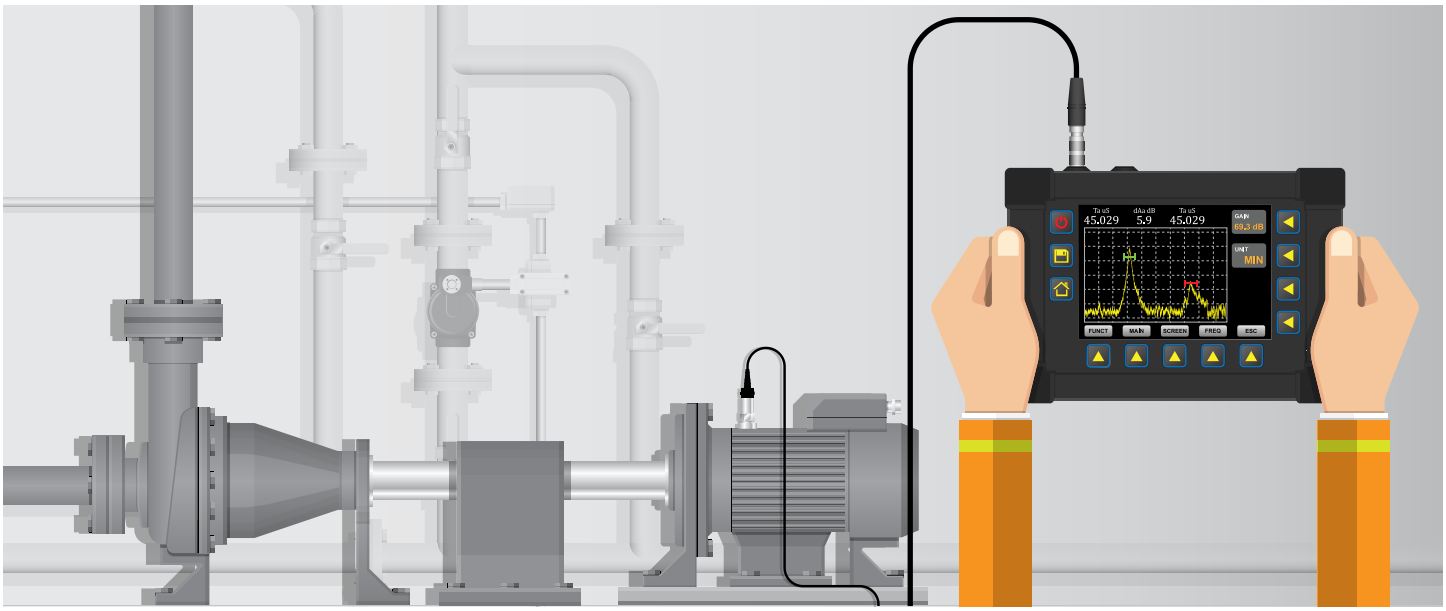
Figure 3 - Ball mill motor, MCA online, spectrum 2022

Collect better data, save time, and learn

By **Ken Keith**, Senior Reliability Analyst | k.keith48@yahoo.com

Tech Tip

When collecting route data, you should carefully monitor the display on your data collector. Many vibration specialists go from point to point when collecting route data, focused on getting the data quickly, and in their haste, do not look at what they are collecting. This can lead to poor data being stored and may require multiple return trips back to the field. Such trips could be to verify anomalous readings, or to take further readings with different parameters, to confirm a diagnosis.



What to watch for as you collect your data

Compare the previous overall reading to the current reading - a sudden change could indicate a process change or machine fault, but it could also indicate:

- Poor data collection technique, for example not allowing enough settling time for the transducer, or a poor mount;
- Faulty or loose cable;
- Wrong transducer being used for a special point or reading;
- Reading being taken at the wrong point or orientation.

Look at your waveforms

When you see a different pattern in a waveform, question it. In some cases, you may want to take a few different readings on the point to confirm a diagnosis, or just to satisfy your curiosity:

- Do you see an indication of a bearing fault?
- Do you see a beat?
- Is there unexpected truncation?
- Are there unexpected transient indications?

Look at your spectra

- Is there a "ski slope"?
- Do you see any indication of a bearing fault?
- Are there strange or unusual harmonics?

Seeing an anomaly during data collection encourages you to take a closer look at the equipment and the surrounding area. There are many environmental situations that could contribute to, and explain a change in a vibration signature, such as a loose base bolt, maintenance activity, new equipment installation, construction, broken pipe hangers, and much more.

The conclusion is that if you pay more attention to your data and your environment while collecting it, you will save time in the long run and learn more about vibration analysis.

Branding for Certified Analysts

The certification signature boxes are emailed to every CMVA certified analyst. These PNG files come to you in two versions:

One is in **colour** to be used in places where it is unlikely to be photocopied in black & white, so is good for emails, websites, and quality print.

The **black & white** version is intended for items that are likely to be photocopied, such as reports. Your signature will always looks good.

If you have not received yours yet, please contact CMVA's Executive Director.

OCT 12 & 13

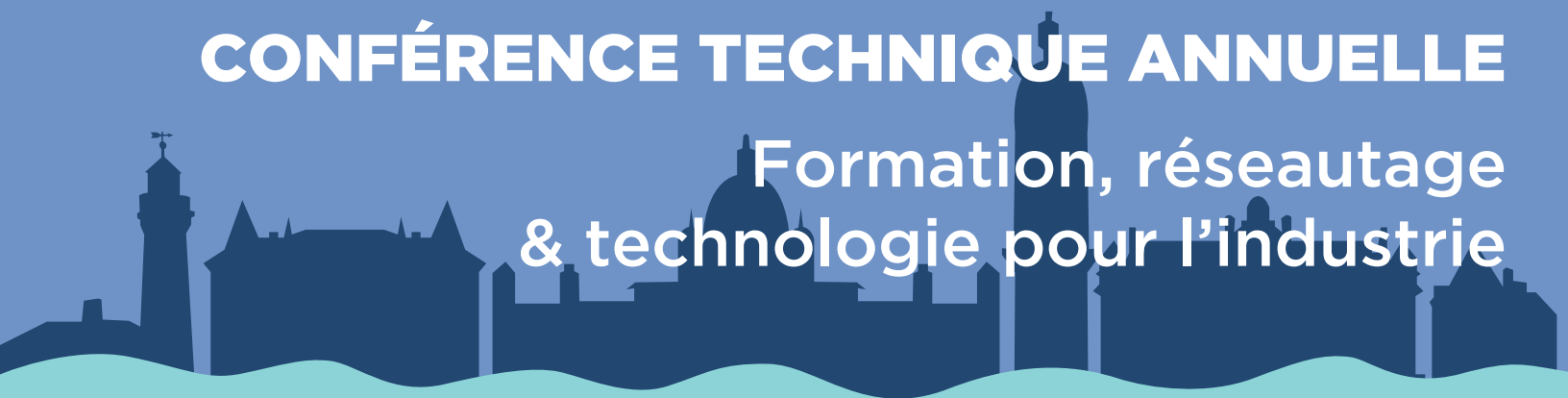
UNIVERSITY OF VICTORIA BC

ANNUAL TECHNICAL CONFERENCE

Training, Networking
& Technology for Industry

CONFÉRENCE TECHNIQUE ANNUELLE

Formation, réseautage
& technologie pour l'industrie



REGISTRATION | INSCRIPTION

www.cmva.com

2-DAY

PRE-CONFERENCE TRAINING

On October 10 & 11, courses will be held at the Inn at Laurel Point, one of our two suggested hotels. Contact CMVA to suggest topics!

2-DAY

TRADESHOW

On October 12 & 13, during the conference, more then **15** exhibitors will hold a booth with their most recent products and services offering!

CALL FOR PRESENTATIONS

Dear Colleagues and Friends of the CMVA,

The organizing committee of the CMVA ANNUAL TECHNICAL CONFERENCE is delighted to announce this highly anticipated event!

We will be receiving proposals for technical presentations, workshops and short training sessions at this Technical Conference to be held October 12&13, 2023 at University of Victoria, in the Student Union Building.

Student presentations

A low student registration fee has been set in order to encourage as many students as possible to attend this meeting. Two (2) Student Awards of 350$ each will be awarded for the best presentation (judged by a Peer Panel), as well as a CMVA student membership for the year 2024. Only articles written and presented by students as first author will be eligible for ***Student Awards***, which will be granted during the Happy Hour on Thursday.

Submit conference, a short training or a workshop

Please go to www.cmva.com under ***Annual Technical Conference*** **tab** to download the Call for presentations registration form containing useful information.

Suggested themes

This communication is an invitation to seize the opportunity to present your ideas, expertise and case studies to your peers across Canada. We look forward to your proposal, and here we suggest some themes:

- Vibration monitoring and analysis (basic to advanced)
- Precision maintenance
- Motion amplification
- Acoustic and ultrasonic monitoring
- Infrared thermography
- Lubrication and oil analysis
- Motor current and power analysis
- Data-driven predictive maintenance (e.g. advanced pattern recognition, artificial intelligence, Internet of things, etc.)
- Reliability, uptime & cost efficiency
- Innovation: techniques & tools

FOR ADDITIONAL INFORMATION
Contact Anne-Marie Samson
at **acvm@cmva.com** or **438 821-5912**.

OUR KEYNOTE SPEAKERS

Mr. Bernie Pringle

P. Eng.
President at Primac Reliability Consultants

Bachelor of Applied Science,
Bachelor Mechanical Engineering,
University of British Columbia

Mr. Pringle has over 50 years of hands-on experience in the field of vibration analysis and balancing, covering a wide range of industries. Work positions included companies like Cominco Mining and Smelting, Kadon Electro Mechanical, Dynamic Signal Analysis Corporation, and his present company Primac Reliability Consultants Ltd which was started in 1993. He is equally driven by giving technical input to the development of new technologies and applications, being a trusted advisor in the field of Condition Monitoring, acting as a mentor and teacher to many bright young minds.

Dr. Keivan Ahmadi

Associate Professor
Mechanical Engineering
University of Victoria

BSc (Tehran Polytechnic), MSc (IUST),
PhD (Waterloo)

Dr. Ahmadi's area of expertise includes Structural dynamics, Mechanical vibrations, Modal analysis, Dynamics and vibrations of machine tools, modelling of machining processes for Virtual Machining Systems and Process optimization for high performance machining.

His research areas are Dynamics and vibrations, Dynamics of machining processes and Advanced Manufacturing

REGISTRATION FEES

	CMVA MEMBERS		NON MEMBERS	
	Until August 21	**After August 21**	**Until August 21**	**After August 21**
Booth including 1 attendant	$ 1210	$ 1520	$ 1520	$ 1895
Supplementary booth attendant	$ 310	$ 390	$ 310	$ 390
Guest one-day Trade Show pass *	$ 250	$ 310	$ 250	$ 310
Networking event to be determined	TBD	TBD	TBD	TBD
Presenter	$ 280	$ 280	$ 280	$ 280
Participant - Standard fee	$ 655	$ 825	$ 825	$ 1030
Participant - Retired CMVA Member	$ 140	$ 180	—	—
Participant - Student	$ 140	$ 180	$ 140	$ 180

*** One-day trade show pass for Trade Show Exhibitors guests** : includes breakfast, coffee breaks and lunch at Trade Show Hall. Must be paid prior to event by the exhibitor. Pass holder must be identified with CMVA prior to event. Not interchangeable with another person on site. This pass does not give access to presentations.

ACCOMMODATION

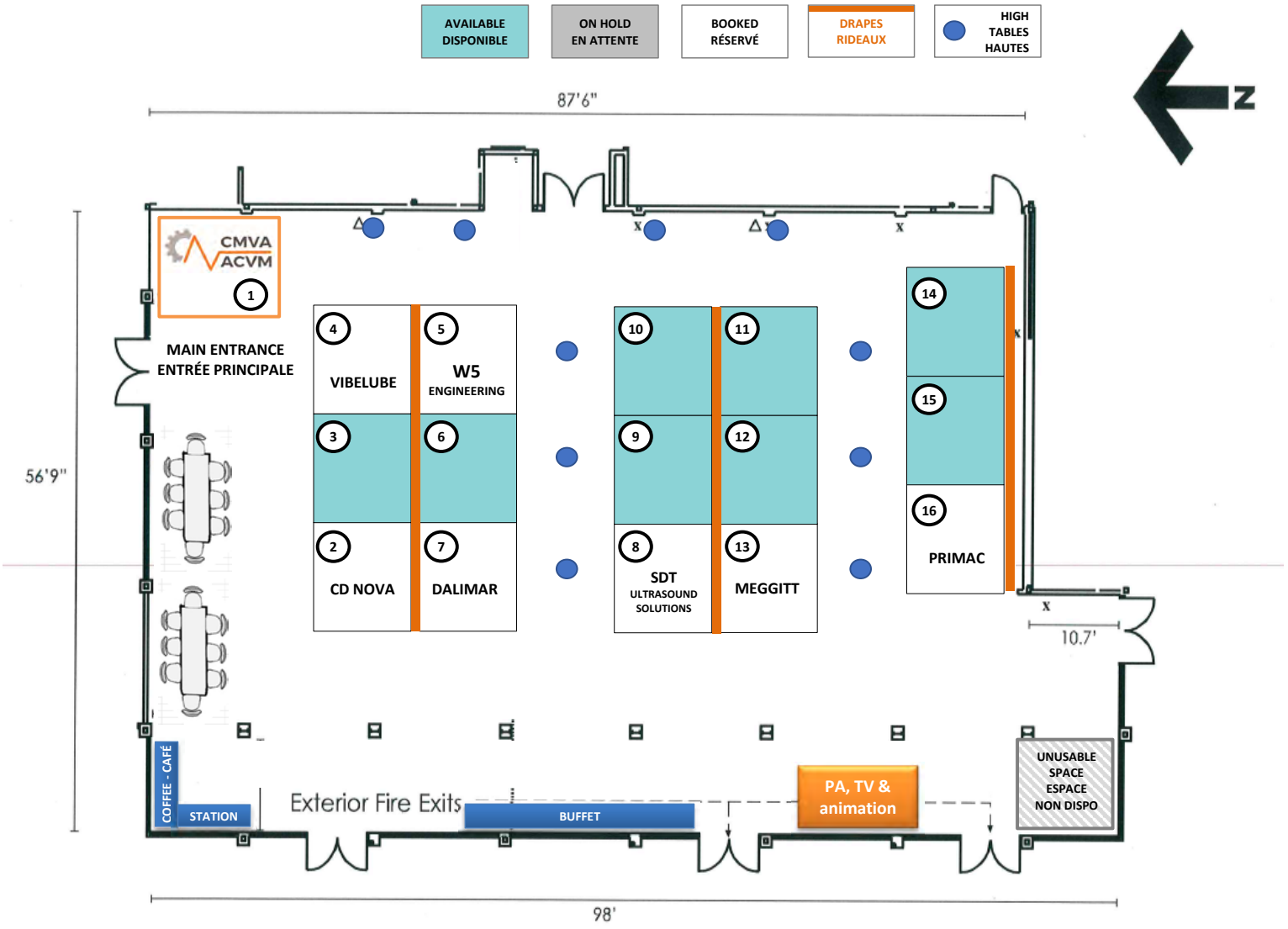
To obtain event's group rates

Book before August 24 using following link:
https://bit.ly/book-hotel-Victoria
or call and quote CMVA.

Inn at Laurel Point

680 Montreal Street, Victoria, BC V8V 1Z8
1 800-663-7667 (Toll Free)
www.laurelpoint.com

TRADE SHOW



Book a both at the Tradeshow

We will soon forward our **Exhibitor Guide** to all product & service providers we know my be interested. If you are interested already, don't wait to act (limited number, and they go fast).

FOR BOOKING OR INFORMATION,
contact Ken Keith at **director@cmva.com** or **416 622-1170.**

About Membership

Benefits

- Free certification renewals if a member for entire period of certification ($450 value);
- Through CMVA membership, corporations and individuals are able to communicate and network with workers in the field of machinery vibration, especially at local and annual meetings;
- Chapter and National meetings focus on relevant case studies and training sessions;
- Consult with colleagues on projects;
- Get referrals from people who have experience;
- Annual National Conference presentations;
- Technical presentations available our website in the Members section;
- Quarterly ViBs Magazine;
- Certification Exams following ISO 18436 Guidelines;
- Recognition as major contributor to the technology if your company is registered as a Corporate Member;
- The CMVA works with industry and users to establish a Canadian position in the formulation of both national and international standards;
- The CMVA may recommend the adoption of ISO standards as national standards, where appropriate.

Duration of membership

Most important of all, CMVA enhances the visibility and importance of the technologies, and therefore contributes to machinery reliability throughout Canada.

- Membership year is January 1st to December 31st;
- Memberships purchased between October 1st and December 31st are valid for the remainder of that calendar year and the following year;
- Multiple year memberships are available. A discount applies, but mostly, they allow you to reduce your paperwork and avoid potential price increases.

Individual membership

Individual benefits includes an access to the Members Section of CMVA's website where you can find a knowledge center, lists of members, trainers, financial reports and technical information.

Corporate membership

Sooner or later, you will need condition monitoring and the personnel capable of using it effectively. Corporate membership is for those forward thinking companies who recognize that fact, and are proud to support the only association in Canada that fosters machinery condition monitoring technologies and certifies the people who use them.

Your corporate membership includes:

- Individual benefits for up to five people;
- Your company name and website address listed in Corporate members under www.cmva.com;
- Annual Technical Conference mentions;
- List your organization as a trainer, on CMVA's website;
- Option of placing a "help wanted" ad on the Members Section of the website – at no extra charge;
- Advertising in the ViBs magazine at a reduced charge.

In one click

Application and renewals are easily done

Sign in and make sure your personal information is correct so we can join you and you don't miss anything. We also list certification and membership details in your user's profile. If you are not already listed, please create an account. Once you are logged in, click **Join CMVA** and follow the prompts.

www.cmva.com

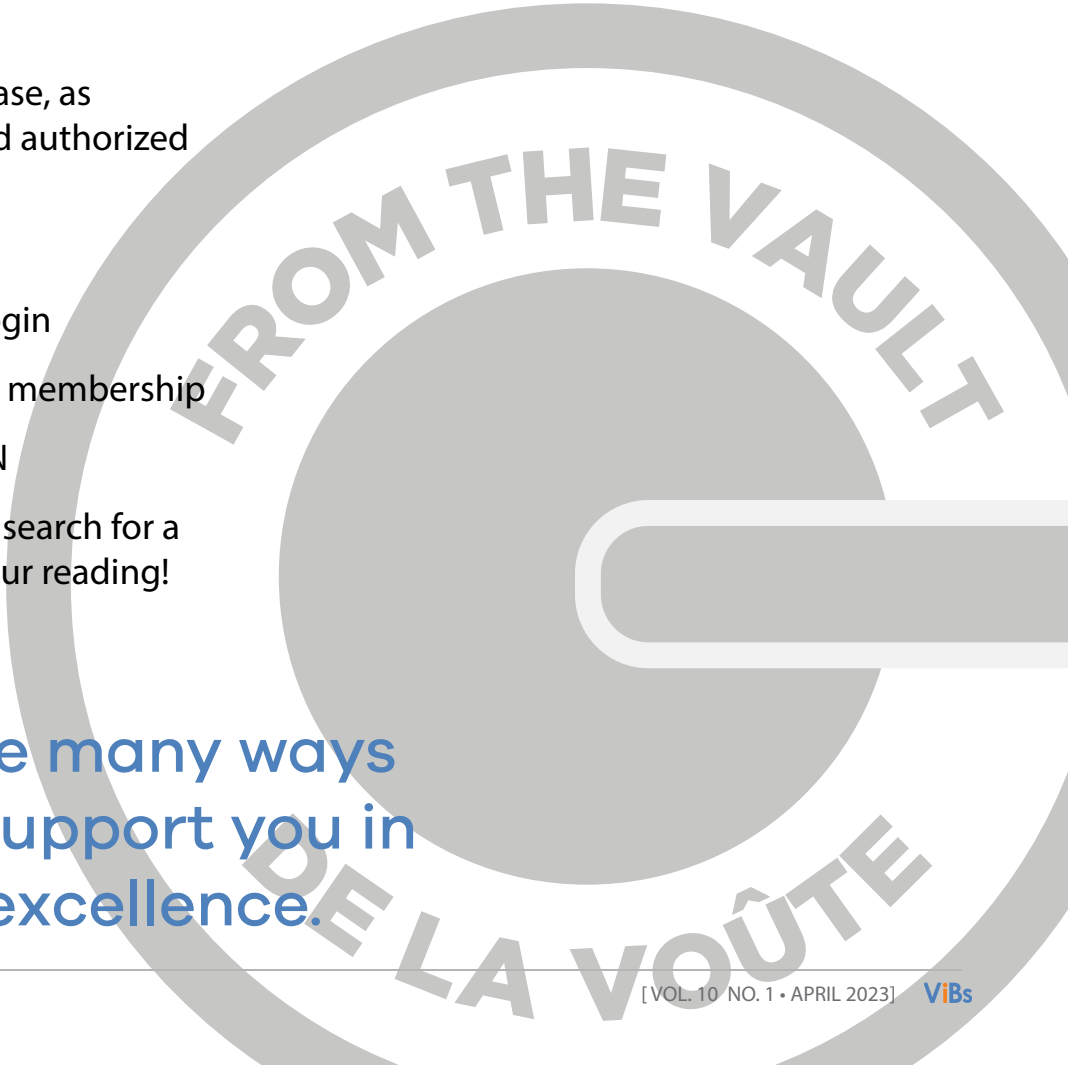
Did you know that...

- CMVA has collected articles and presentations by qualified speakers and authors for years?
- This knowledge database covers a multitude of topics in vibration analysis and predictive maintenance?
- Many case studies are also published there?
- Only CMVA members in good standing have privileged access to these documents of a technical and scientific nature?

The CMVA populates this database, as presentations are submitted and authorized for publication by their authors.

CONNECT! IT'S THAT SIMPLE!

1. Go to www.cmva.com and login
2. If not done already, buy your membership
3. Go to the MEMBERS SECTION
4. Browse through the titles, or search for a specific subject and enjoy your reading!



This is one of the many ways the CMVA can support you in your pursuit of excellence.

Become Certified

CMVA is a Certification Body accredited by SCC according to ISO 17024 and ISO 18436-1

Benefits For The Employee

- Better job opportunities;
- Possibility of advancement and recognition of your skills;
- Possibility of obtaining additional and relevant training in order to be accredited to the required categories;
- Present in detail what is required to properly perform the duties of your position;
- Increased levels of trust and pride.

Benefits for the employer

- Define the tasks of the main stakeholders according to clearly defined and uniform criteria:
  - » Promote the training of existing staff;
  - » Define hiring criteria;
  - » Establish salary scales according to skills.
- Show increased confidence in the skill level of employees;
- Have tools to demonstrate that their department has the qualities and skills required to perform quality work;
- Have a way to motivate employees who are interested in improving their skills by having the opportunity to encourage and reward their efforts.

Conditions to certify

For each level:

- Demonstrate that you have completed the minimum number of hours of appropriate training required by ISO 18436-2;
- Demonstrate that you have the minimum number of months of machine vibration experience required by ISO 18436-2*;
- Pass the certification exam with a mark of 70% or higher.

*If you do not have this experience, you can take your course, write the exam, and if you are successful, CMVA will issue your certificate when you can demonstrate that you have the required experience.

Apply for exam

To apply for a certification exam, please go to this page and complete the registration form:

https://cmva.com/online-exams/

Due to COVID-19, you may decide to take an online course. Chances are you will need the service of remote exam proctoring. To know more about this service:

https://cmva.com/remote-proctoring-of-online-examinations/

Certification renewal comes in two steps

1. The analyst must provide verifiable evidence of continued satisfactory work activity without significant interruption. For this CMVA uses a point system, awarding points for different activities. There are multiple ways to earn the points needed to renew your certificate. You have 5 years to gather the necessary points (20 points for CAT I and 30 points for CAT II-III-IV). Otherwise, you will have to rewrite an exam. A successful review in a higher category also prolongs your certificate for another five years.
2. Pay the $450 certification renewal fee. If a certified analyst has been a CMVA member for the full 5 year term of certification, the renewal fee will be waived.

Many people wait until the last minute to remember all the activities in which they participated and which account for the renewal of their certificate. It is easy to forget activities that would have qualified. The best way to avoid search time, that could be long and complex after 5 years, is to use the form provided for that purpose and to fill it gradually over time.

Download and complete the certification renewal form:

https://cmva.com/certification/re-certification/.

Once completed, submit to director@cmva.com.

Training leading to certification

Are you considering registering for a course leading to certification?

Because we support our members in their pursuit of excellence and reliability, CMVA provides ***ISO 17024 accredited certification for vibration analysts*** and approves trainers upon their engagement to provide ISO 18436-2 & ISO 18436-3 compliant training courses.

CMVA also provides ***ANSI/ASA S2.75-2017/ Part 1 - Shaft Alignment certification Level I*** and approve trainers upon their engagement to provide training courses compliant to this standard.

CMVA has prepared documentation entitled ***Performance objectives*** for each level. These performance objectives define what an individual certified in a specific category should be able to do, on the job. They are based directly on the standards concerned and were prepared by members of CMVA's Training and Certification Committee.

The full text of the standards is available to CMVA members under license by clicking on the Members Only tab.

Learn about the ISO and ANSI based performance objectives on cmva.com.

CMVA approved vibration analysis trainers

CONTRÔLES LAURENTIDE
training@laurentide.com
514-697-9225 ext. 521
www.laurentide.com

FLOWSTAR
wally@flowstarind.ca
902-896-0041
flowstarind.ca

NAVAJO TECHNICAL
ron@navajotechnical.com
604-787-2366
navajotechnical.com

PDM TECHNOLOGIES
granta@pdmtechinc.com
905-648-5353
www.pdmtechinc.com

SDT ULTRASOUND SOLUTIONS
training@sdtultrasound.com
905 377-1313
sdtultrasound.com

VIBELUBE
roy@vibelube.com
416-816-0030
www.vibelube.com

VIBRATECH
formation@vibratech.ca
514-259-6173
vibratech.ca

WAJAX
gbhambra@wajax.com
403-813-1287
www.wajax.com

Become a CMVA approved trainer

To become a CMVA approved vibration analysis trainer, complete the vibration analysis trainer agreement form and submit it for approval. **https://cmva.com/training-bodies/**

Once approved as a CMVA approved trainer, you are eligible to have your course schedule added to our certification course calendar using the course registration form.

For more information. contact Ken Keith at director@cmva.com.

COURSE CALENDAR 2023

VIBRATION ANALYSIS

CATEGORY I

PDM Technologies (English)
Live class, Burlington ON
May 1 to 4

Vibratech (French)
Live class, Montreal QC
May 1 to 4

Vibelube (English)
Live class, Toronto ON
June 19 to 22

CATEGORY II

Vibratech (French)
Live class, Montreal QC
May 15 to 19

PDM Technologies (English)
Live class, Edmonton AB
May 29 to June 2

Vibelube (English)
Live class, Toronto ON
May 29 to June 2

CATEGORY III

Vibelube (English)
Live class, Toronto ON
April 24 to 28

More courses & course details:

cmva.com/calendar/