VIBES = SERIOUS SERVICE™

Is not just our trademark or meaningless words but only the beginning of the commitment to our clients for the last 50 years in business. We dedicate our experience and resources so you don’t have to worry about machinery vibrations and get back to what really matters.

“PEACE OF MIND AT WORK, MORE TIME WITH YOUR FAMILY, FRIENDS AND NATURE”

Garrett Sandwell, CEO
Certified Vibration Analyst, ASNT 3

“Accurate Analysis, Diagnostic Evaluations, Corrections on All Types of Machinery” Vibrations, Noise, Dynamic Balance, Performance, Laser Shaft & Drive Alignment, Electro-Mechanical Repairs, VIBES-GUARD PoM Program™ Monitoring Contracts, Due Diligence Verification Studies, Agents / Specialists Industrial & Commercial Fans, Pumps, Rotors, Blowers, Cooling Towers, Motors & Drives, 24/7 PROFESSIONAL SERVICES • TECHNICAL SALES • ALIGNMENT & VIBRATION TRAINING COURSES
Introduction to VIBES Corp.

Formerly: Industrial Balancing Ltd. (Est. 1967 Calgary, AB) & Fan Doctor Canada Inc. (Est. 1982 Calgary, AB).

Why work with us? Serving Canadians for over 50 Years.

VIBES Corp's reputation was built and established on thousands of promises fulfilled over 50 years in business across Canada. Superior quality service, sales and training courses provided on the intelligent specialist level has been the standard and always will be since our vibration and balancing business was formed in Calgary, AB, in 1982. (Formerly Industrial Balancing Ltd. Est. 1967) In the final real-time analysis VIBES Corp will deliver more value and peace of mind.

What do we do?

What do we sell, supply, install & service?
- WEG motors
- COOLBLUE - Inductive Absorbers & Chokes = VFD any motor shaft current bearing damage protection
- EASY LASER - Shaft Alignment Systems
- METALON synthetic grease
- CTM - Cooling Tower Maintenance Parts & Services for all makes & types
- Vibration isolation & control, measurement, recording, alarm & shutdown. We represent: BALMAC, LO-REZ, MEGGITT, MURPHY, SPECTRUM-INSTRUMENTS, WILCOXON, Misc.
- Factory replacement fans, blowers, pumps & motors, customized rotors - new or re-manufacture
- SPANCO Gantry Cranes, KITO Chain Hoists and Trolleys
- Drive systems and parts: bearings, sheaves, couplings, belts, misc.
- Please visit www.vibescorp.ca to view more information and purchase products

The machinery under our professional health care programs = VIBES-GUARD PdM Programs™ are treated as if our own. We use proven technologies and methodologies along with our multi-technical and electro-mechanical (VIV, ASD, PVM, CPM, VFD, EIBD, EDM, Shaft Currents, etc.) training, skills, and experiences for total overall analysis and evaluations. When the total analyzed facts about a machine, motor or engine are known we formulate a true condition report and recommend the best possible solutions. We work with clients to organize necessary actions in order of urgency or budgets.

Who have we worked with?
VIBES Corp service capabilities have been used and accepted by high-ranking officials in:
- other service companies
- manufacturing and processing
- engineering firms
- universities
- colleges
- hospitals
- cold storage
- power plants and dams
- sewage and water treatment plants
- government infrastructure facilities
- oil and gas
- biogas energy systems
- transportation and construction
- commercial towers
- agricultural
- mining
- ski hills
- marine-terminals & ships
- asphalt and cement
- saw mills
- pulp and paper
- research and development
- machining / fabrication
- chemical plants
- restaurants
- skytrain tunnels

We take due diligence to the highest level on all projects regardless of size or budget.


24/7 PROFESSIONAL SERVICES • TECHNICAL SALES • ALIGNMENT & VIBRATION TRAINING COURSES
Do we offer training?

VIBES Corp represents and offers training courses in technologies and quality products that we use, are industry-trusted and relate to improved machinery, engine, electric motors health and performance, energy savings and preventative maintenance. Examples:

- Laser Shaft Alignment
- Fan & Motor Maintenance Training
- Update International (Vibration Analyst Certification ASNT Level 1, 2 & 3) On Site & On line Courses
- Bearing Maintenance & Precision Installation
- VIBES-GUARD PdM PROGRAM™
- Dynamic Balancing Agricultural Machinery ON-SITE

Learn more

You can download all catalogues and educational articles from our home page at www.vibescorp.ca. Here are four recent articles:

- Learn About Vibration, Volume 1 & 2: Basics & Advanced Vibration Analysis
- Electrically Induced Bearing Damage, aka Electrical Discharge Machining (EDM), Shaft Currents
- Failure Prevention of Variable Pitch in Motion Axial Fans

The photos below show typical projects that we have resolved. Fig. 1. The failure was due to moisture contamination. Fig 2 The stainless steel guard solved the original problem with no issues for the last 13 years. Fig 3 A new fan was installed due to a complete failure of the original. Fig. 4 Shows a 200HP motor and fan repair/replacement.
For more information & quote please visit our website www.vibescorp.ca

|-----------------------------------------------------------|-------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------|

**SPANCO GANTRY CRANES**

Spanco’s Gantry Cranes are portable, lightweight, low-cost lifting solutions with adjustable heights.

<table>
<thead>
<tr>
<th>Murphy Shutdown Vibration Switches and Monitors</th>
<th>Murphy VS 2 Shock and Vibration Control Switch</th>
<th>Murphy VS 94 Shock and Vibration Control Switch</th>
<th>CTM = Cooling Tower Replacement Parts For All Types</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>MAC200 MachineryMate Handheld Vibration Meter</th>
<th>MAC800 MachineryMate Handheld Vibration Meter</th>
<th>MAC MachineryMate High Performance Sensing</th>
<th>MAC MachineryMate Strobe Attachment</th>
</tr>
</thead>
</table>

MAC MachineryMate DataMate Software and USB Docking Cradle

VIBES Corp accepts: EFT, VISA, Mastercard, Discovery, Debit & SWIFT

![Payment Icons]
Projects completed at these locations

- **New Westminster, BC.** Dynamic Balancing a Large Fan on site
- **EIBD/Shaft Current Diverters**
- **2 x 125 HP Kiln-Exhaust Fan**
- **150 HP Wood Hog**
- **2 x 125 HP Kiln-Exhaust Fan**
- **Hospital Lab Hood Fans**
- **Waste Water Treatment Plant Squamish, BC. **
- **Abbotsford Pet Nutrition 450 HP Hammermill**
- **Geo Thermal Pump Station**

VIBES Corp

FAN DOCTOR™

Vibration Industrial Balancing & Equipment Services, Corporation

720 - 999 W. Broadway, Vancouver, BC V5Z 1K5

www.vibescorp.ca  email: info@vibescorp.ca  Phone: 604 - 619 - 9381 (24/7)
Projects completed at these locations

Teck Highland Valley Copper - Processing Plant
800 HP Blower - Logan Lake

Abbotsford Waste Water Treatment Plant

Naval Ship Generator

600 HP Bio-Gas Compressor
Projects completed at these locations

400 HP Motor & Compressor
Food Processing Plant
Vancouver

Complete Fan Assembly Replacement

Pleasure Cruise Ship Engines
Vancouver

900 HP Drill Rig Compressor

100 HP Woods Fan

60 HP Joy Fan

For more information & quote please visit our website www.vibescorp.ca
Protect your rotating machinery assets 24/7

No more misalignment due to large air gap between drive and driven machines.

SOFT-START & VIBRATION REDUCTION

BEST BREAKTHROUGH IN COUPLING TECHNOLOGY IN 50 YEARS!

FLUXDRIVE Magnetic SmartCOUPLING E420

EIBD/Shaft Current Diverters

AEGIS-SGR Shaft Grounding Rings Absorb the energy caused by the VFD’s at the source before getting to the motor bearings.

Large motor shaft current bearing damage protection.

Rogowski Coil (VFD) - Common Mode Testing Service

For more information & quote please visit our website www.vibescorp.ca

400 HP RS Compressor

125 HP Pump

350 HP Motors & Gearbox

Laser Alignment of Overhead Cranes
BC Hydro Burrard Thermal Plant
VIBRATION SEVERITY GRAPH FOR GENERAL ROTATING MACHINERY

This Chart is based on ISO 10816-3

Displacement
1 mil = 25 microns

AMPLITUDE

DISPLACEMENT Mils (x.001”) peak to peak

VERY ROUGH DANGER

VELOCITY (ips in/sec) peak

ROUGH

SLIGHTLY ROUGH

FAIR

GOOD

EXCELLENT

VERY ROUGH DANGER

VELOCITY (ips in/sec) peak

INTERNATIONAL STANDARDS ZONES

UNACCEPTABLE

BEST CONDITION

VIBRATION ANALYSIS
VELOCITY, DISPLACEMENT, ACCELERATION
VELOCITY FOR ACCEPTABILITY - DISPLACEMENT FOR BALANCING
ACCELERATION FOR BEARING HEALTH CONDITION MONITORING

REFERENCE POINT ○ = 1800 rpm machine/motor excellent condition

ACCELERATION or FORCE OF GRAVITY "G" (ips² in/sec for simplicity)
ACTUAL G = 32 fps/s = 9.8 m/s²

www.vibescorp.ca  email: info@vibescorp.ca  Cell: 604 - 619 - 9381

Rev 1 / Date Issued: 01/20/2016
<table>
<thead>
<tr>
<th>CAUSE</th>
<th>FREQUENCY</th>
<th>AMPLITUDE</th>
<th>PHASE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unbalance</td>
<td>1 x RPM</td>
<td>Highest in Radial Direction-</td>
<td>Single Mark (Steady)</td>
<td>A common cause of vibration.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Proportional to Unbalance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defective Anti-Friction</td>
<td>Very High-</td>
<td>Use Velocity</td>
<td>Unstable</td>
<td>Velocity readings are highest at defective bearing. As failure approaches, the amplitude of the velocity signal will increase and its frequency will decrease. Cage frequency is 40% +/- 4% of RPM.</td>
</tr>
<tr>
<td>Bearings</td>
<td>Often From 10 to 100 x RPM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Misalignment of Coupling or</td>
<td>1, 2 or 3 x RPM</td>
<td>High Axial Axial 50% or more of Radial</td>
<td>Often 2, Sometimes 1 or 3</td>
<td>Use phase analysis to determine relative movement of machine or bearings. Use a dial indicator if possible. Often diagnosed as a bent shaft. Can be caused by misalignment of V belts.</td>
</tr>
<tr>
<td>Bearing</td>
<td></td>
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</tr>
<tr>
<td>Sleeve Bearing</td>
<td>1 x RPM</td>
<td>Not Large Use Displacement Mode Up to 6000 CPM</td>
<td>Single Reference Mark</td>
<td>May appear to be unbalanced. Shaft and bearing amplitude should be taken. If shaft vibration is larger than the bearing, vibration amplitude indicates clearance.</td>
</tr>
<tr>
<td>Bent Shaft</td>
<td>1 or 2 x RPM</td>
<td>High Axial</td>
<td>1 or 2</td>
<td>Similar to misalignment. Use phase analysis.</td>
</tr>
<tr>
<td>Defective Gears</td>
<td>High No. Gear Teeth x RPM</td>
<td>Radial</td>
<td>Unsteady</td>
<td>Use velocity measurement. Often affected by misalignment. Generally accompanied by side band frequency. Pitting, scuffing and fractures are often caused by torsional vibrations. Frequency sometimes as high as 1 million CPM or more.</td>
</tr>
<tr>
<td>Mechanical Looseness</td>
<td>2 x RPM</td>
<td>Proportional to Looseness</td>
<td>1 or 2</td>
<td>Check movement of mounting bolts in relation to the machine base. Difference between base and machine indicates amount of looseness.</td>
</tr>
<tr>
<td></td>
<td>Sometimes 1 x RPM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defective Drive Belts</td>
<td>1 or 2 x Belt Speed</td>
<td>Erratic</td>
<td>Use Strobe to Freeze Belt</td>
<td>Calculate the belt RPM using:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>in OSC Mode</td>
<td>Belt RPM = Pulley Diameter x 3.141 - Belt Length x Pulley RPM</td>
</tr>
<tr>
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<td></td>
<td>Look for cracks, hard spots, soft spots or lumps. Loose belt. Changes with belt tension.</td>
</tr>
<tr>
<td>Electrical</td>
<td>1 or 2 x Line Frequency (3600 or 7200 CPM for 60Hz Power) May appear at 1 x RPM</td>
<td>Usually Low</td>
<td>1 or 2 Marks Sometimes Slipping</td>
<td>Looks like mechanical unbalance until power is removed. Then drops dramatically.</td>
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<tr>
<td>Oil Whip</td>
<td>45 - 55% RPM</td>
<td>Radial Unsteady</td>
<td>Unstable</td>
<td>Caused by excessive clearance in sleeve bearings or by underloaded bearings. Will change with viscosity of oil (temperature).</td>
</tr>
<tr>
<td>Hydraulic-Aerodynamic</td>
<td>No. Blades or Vanes x RPM</td>
<td>Erratic</td>
<td>Unsteady</td>
<td>May excite resonance problems.</td>
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<tr>
<td>Beat Frequency</td>
<td>Near 1 x RPM</td>
<td>Variable at Beat Rate</td>
<td>Rotates at Beat Frequency</td>
<td>Caused by two machines, mounted on same base, running at close to same RPM.</td>
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</tr>
<tr>
<td>Resonance</td>
<td>Specific Criticals</td>
<td>High</td>
<td>Single Reference Mark</td>
<td>Phase will shift 180° going through resonance (90° at resonance). Amplitude will peak at resonance. Resonance in frame can be removed by changing rotor operating speed or by changing the stiffness of the structure.</td>
</tr>
</tbody>
</table>

Rev 2 / Date Issued: 02/08/2017

NOTE: There are several additional detailed articles that identify more complicated vibration sources at the Vibes Corp website titled:

1) LEARN ABOUT VIBRATION VOLUME 1: BASIC UNDERSTANDING OF MACHINERY VIBRATION
2) LEARN ABOUT VIBRATION VOLUME 2: ADVANCED VIBRATION ANALYSIS
3) LEARN ABOUT ELECTRICALLY INDUCED BEARING DAMAGE & SHAFT CURRENTS