

# VIBROSYSTEM

A NEWSLETTER OF ACTIVITIES, PRODUCTS & SERVICES

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YOUR MACHINE CONDITION MONITORING PARTNER

2006



1987 – Hydro-Quebec in-house technology exhibition (from left to right: Messrs. Raymond Pronovost, IREQ, John Butcher and Marc R. Bissonnette, VibroSystem, Paul Ménard, Hydro-Quebec and Jean-Marc Bourgeois, IREQ. Messrs. Bissonnette, Ménard and Bourgeois are still involved with VibroSystem.

## 2006 Marks VibroSystem's 20<sup>th</sup> Anniversary

VibroSystem celebrates 20 years with great pride having earned a worldwide reputation for technological leadership throughout the power generation industry. After two decades of significant achievements, VibroSystem remains focussed on its mandate to create specialized technologies that are unique and precise, offering integrated solutions for the monitoring, diagnostics and protection of large rotating machines. The company believes in a partnership approach placing customer needs and comments at the forefront to better connect with the industry's expectations.

Back in 1986, Hydro-Quebec and a European company founded VibroSystem to commercialize a promising technology. The Air Gap Monitoring System (AGMS®), designed at the Hydro-Quebec's Research Institute (IREQ) by a team of engineers led by Mr. Marius Cloutier, VibroSystem's current President, was the first system ever with the capacitive measuring technology. Over time, VibroSystem developed other applications and products for various industrial fields, including integrated solutions for on-line measurements of stator bar vibration, shaft vibration, displacement, magnetic flux and stator temperature to name a few.

After ten years of mainly serving the hydro power industry, VibroSystem expanded to the turbogeneration industry. The company joined forces with a Swiss partner to develop an optical technology for measuring end-winding vibration. With its current products and promising solutions tailored to turbomachinery, VibroSystem is sure to play a major role in the thermal industry.

VibroSystem's success rests on its personnel who provide a well-rounded expertise to develop technologies, understand market needs, support customers and interpret results. Several employees who joined the company in the early years are still part of the team. VibroSystem personnel will do their utmost to assist with your generator monitoring needs.



1997 – Ground-breaking ceremony of VibroSystem's current Head Office: Messrs. Marius Cloutier<sup>1</sup>, President of VibroSystem, Claude Gladu<sup>2</sup>, Mayor of Longueuil, Serge Jalbert<sup>3</sup>, SDE Longueuil, Bertrand Giguère<sup>4</sup>, National Bank, Sylvain Robitaille<sup>5</sup>, Syscomax Construction, as well as local dignitaries and VibroSystem managers.

*We Thank All  
Our Valued Customers*

20 YEARS • 1986-2006



1986 – Air gap sensor developed at IREQ, shown next to a generator air gap.

## AGMS – The Best Air Gap Measuring Technology for 20 Years

The success of our Air Gap Monitoring System (AGMS®) over the past twenty years is unparalleled. Many other technologies have been used and proved unreliable in the harsh environment found in the air gap. Our stator-mounted capacitive sensor approach stands as the best method to monitor air gap on-line and is often referred to as a standard throughout the Hydro industry. Here is why:

### We Pioneered the Technology and we Master it

Pioneer of the on-line air gap monitoring technology twenty years ago, VibroSystM offers the most precise and reliable system on the market today. The main specialists that created it and developed its capacitive measuring technology continue to work for VibroSystM. As such, we have first hand experience of what works for your machine and what does not.

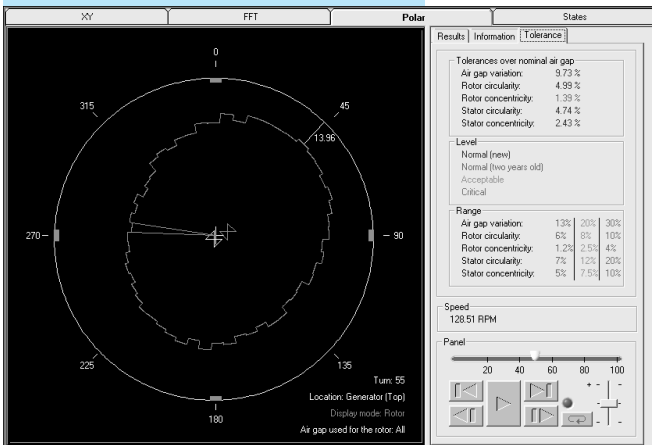
### We are in Touch with the Hydro Industry



Although we have expanded our technologies to other power generation and industrial fields, our ties with the hydropower industry remain strong. For the past two decades, we have been providing tools that heighten the efficiency of hydro machines. In fact, our Air Gap Monitoring System and the other solutions we offer are even more pertinent today to help you streamline maintenance and optimize generator availability.

### We Propose Solutions

Experience has proven that air gap is one of the most valuable indicators of a hydrogenerator condition. VibroSystM believes it should be monitored accordingly. The solutions we propose are based on our expertise from studying air gap results on over 800 hydrogenerators of all sizes, types and makes, and by listening to our valued customers. Therefore, we recommend and install the best system for your machine needs, provide technical support and offer independent results interpretation.



Air gap polar graph showing the tolerance value tab and the "measurement player" that animates the graph. The graph is exclusive to VibroSystM and licenced by Hydro-Quebec.

### We Deliver Performance

Our track record speaks for itself: our AGMS is based on long-term reliability of measurement accuracy and repeatability, as well as our powerful software, which delivers meaningful results that are easy to understand. Our maintenance-free sensors and electronics have been providing highly reliable measurements for two decades.

The AGMS has been directly involved in numerous cases of avoided incidents, enforced warranty, successful problem corrections, optimized maintenance and increased availability. Several of those cases have been published in technical papers and articles.

VibroSystM's Air Gap Monitoring System (AGMS®) is the reference in the hydro industry and your best tool for the future.

20 YEARS • 1986-2006

## Air Gap – 20 Years in Numbers

- 800+ machines equipped with VibroSystM's air gap technology
- 5040+ air gap sensors installed
- Largest AGMS systems installed: 16 channels each on 25 generators at 4 hydro power plants
- 7 MW: Smallest unit monitored
- 805 MW: Largest unit monitored



2005 – VM 5.0 air gap sensor seen between two rotor poles of a hydrogenerator.

## FOA – Generator Curtailment Avoided During Peak Season

This case describes the successful application of FOA-100 fiber optic accelerometers on two problematic turbogenerators during peak season. The 530-MW combined cycle units were commissioned in 2002.

In early June 2003, the generator manufacturer notified the utility that high end-winding vibration had been linked to a catastrophic phase lug failure on similar machines. The manufacturer advised shutting down both units immediately until modifications could be implemented in the fall. A four-month forced outage and loss of power generation during peak season was unacceptable to the utility. Instead, with the manufacturer agreement, it was decided to monitor end-winding vibration with specified alert levels to allow continued operation.

As instructed by the manufacturer, FOA-100 were mounted on the end-windings at the 3:30, 7:30, 11:30 positions of the collector ring end. They were connected to a PCU-100 monitor linked to a network hard drive. This allowed the Head Office engineers to access and analyze the collected data.

Over the summer, the suspected pattern of increasing end-winding vibration emerged. Radial vibration levels on Unit 1 were well below the 10.83 mils (275  $\mu\text{m}$ ) pk-pk alarm level specified by the manufacturer. However, vibration at the 11:30 position was consistently higher than the other two (Figure 1).

Unit 2 was of greater concern (Figure 2). In early August, radial vibration levels were at 10 mils (255  $\mu\text{m}$ ) pk-pk, then decreased slightly towards the end of the month. In late September, radial vibration at the 11:30 position exceeded 12 mils (305  $\mu\text{m}$ ) pk-pk. The unit was load cycled daily to meet demand and a strong correlation of high vibration at half load was observed. End-winding vibration had reached levels at which intervention was imperative. Fortunately, power demand now allowed both units to be removed from service. The manufacturer used the FOA data to develop an end-winding stiffening system to mitigate the problem.

The FOAs served their intended purpose and proved to be an invaluable tool. They confirmed a trend of increasing end-winding vibration, allowed plant operation through the 2003 summer, and provided useful information to the manufacturer. The savings from avoiding the purchase of replacement energy and the means to enforce warranty terms made the FOA a very affordable investment to the utility.

The utility continues to monitor trends of end-winding vibration to detect early signs of recurrence and notify the manufacturer thereof.

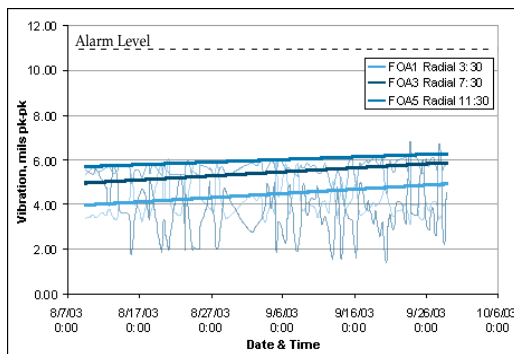


Fig. 1 – Trend graph of end-winding vibration (radial) on Unit 1 during the Summer of 2003.

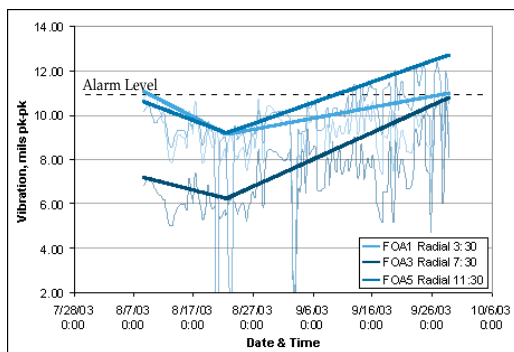


Fig. 2 – Trend graph on Unit 2 over the same period. In late August, vibration began to trend upward and exceeded the alarm level by the end of September.

20 YEARS • 1986-2006



1993 – Employees' tour of a hydroelectric plant where one of our system is installed.



Ms. Carolyne Rochon is one of VibroSystM's skilled technicians performing assembly and calibration.



Mr. Jacques Boulé and our field technicians combine 30 years of experience in servicing customers and installing our systems worldwide.



Our senior technician, Mr. Richard Marshall, conducting software training at a plant in India.

20 ANS • 1986-2006

## VibroSystM – 20 Years in Numbers

- Equipment in 56 countries
- 115,000+ MW of hydro power and 20,000+ MW of turbo power monitored
- 735+ FOA-100 accelerometers installed
- 40+ Papers and Articles Published on VSM Technologies
- Employees:
  - 40% with 10 years experience or more at VibroSystM,
  - from 13 countries,
  - speaking 10 languages

## “Electrical Runout-Free” Probe for Reliable Vibration Measurements



VibroSystM’s PCS-300 series proximity probes offer a *better performance* and *ease of installation* than eddy-current proximity probes at a *lower cost*.

The PCS-302 and PCS-304 probes are direct-to-instrumentation devices – embedded electronics – with 2 and 4 mm / 79 and 158 mils ranges. No field probe driver or on-site calibration required. This means less equipment to buy and hassle-free implementation.

With their capacitive measuring technology, target characteristics – material, surface finish, residual magnetism – have no effect on the readout. This ensures more accurate and reliable results for alarm monitoring and vibration analysis.

Test the performance of the PCS-300 yourself and see the difference.

## 5<sup>th</sup> Workshop Machine Condition Monitoring

Monday, July 31, 2006

HydroVision 2006 – Portland, Oregon USA

For details and on-line registration, visit: [www.hcipub.com/hydrovision](http://www.hcipub.com/hydrovision)



1986 – First generation AGMS commercialized: 4-ch acquisition unit, air gap sensors designed at IREQ, and PC running on HP-DOS.



1986 – Early collaborators to the development and commercialization of the AGMS at the site of its first installation: Messrs. Paul Ménard, Hydro-Québec, François Lalonde, IREQ, John Butcher, VibroSystM, Marius Cloutier, IREQ (now President of VibroSystM), and Jean-Marie Houle, IREQ.



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