



**2010  
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## Troubleshooting VFD Issues

By: Thomas DeMusis

One of the greatest advances in technology affecting the efficiency of HVAC systems has been the introduction of variable frequency drives, commonly referred to as VFDs. As TAB technicians and supervisors, we see these devices used to control the speed on electric motors driving fans, pumps, and chillers. Although they've been around for quite some time, the state of the art for VFD design has continuously improved, as it has for the motors typically controlled by these devices. There is no doubt that as the need for increased energy efficiency grows, we will see more applications utilizing this technology.

There are several issues that we in the TAB community need to be aware of when evaluating systems

using VFD controllers. Some, like harmonic distortion introduced into the building's electrical power and control systems may not be our concern. We do however, need to be aware of the possibility of premature bearing failure in VFD driven motors. As VFD technology evolves, and the software used to control the VFD changes, some unexpected results have occurred. Certain types of drives, particularly those employing IGBTs (isolated gate bipolar transistors) to switch the power in VFDs, when programmed to turn on and off at very high frequencies, can cause an electrical potential between the rotor (rotating component) of the electric motor, and ground. The only available path to ground is through the shaft and bear-

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## 2010 MAEBA Educational Seminar

By: Trish Casey

MAEBA held its annual Recertification and Educational Seminar at Bally's Hotel and Casino in Atlantic City, New Jersey on September 19th and 20th. The annual event began with a dinner reception sponsored by AiRNAB.

On Monday, September 20th, Safety Professional, John Connolly began the morning with a presentation on "NFPA 70 Electrical Safety". NFPA 70 requires workers to be "qualified" and use safe work practices when working with electricity. The standard describes how to do 'energized work', the hazards encountered, and the per-

sonal protective equipment you need to protect yourself. Karen Groppe, PCM, NEBB Director of Marketing and Communications, followed with a presentation on "Marketing: The Ultimate Fertilizer for Your Business".

Next, Terrance K. Resnick of Resnick Associates spoke on "Keeping the Doors Open: Ensuring the



MAEBA President Matthew Sano opens the MAEBA Annual Meeting .

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## 2010 Educational Seminar

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Successful Succession of Your Business”.

The technical session began with Mark Hegberg and “Variable Speed Pumping”. Mark is a leader in the industry and received the 2009 Exceptional Service Award from the American Society of Heating, Refrigeration and Air-Conditioning Engineers-ASHRAE. Mark spoke on “A Balancers Guide To Variable Speed Pumping Systems”.

Variable speed pumping has over twenty years of application history in the U.S. now, and has become so accepted that the model building codes require it for systems greater than 300,000 BTUH, the equivalent of about a 1 HP pump! The topic of variable speed pumping still bears the burden of an industrial debate as to how to design, control, commission and operate these systems. 2009’s July ASHRAE Journal article “The case against balancing valves” and the subsequent issues “Letters” renewed this debate, and pointed out just how misunderstood the principles of hydronic system design, control and commissioning are especially in variable speed pumping systems. It is the balancing technicians that suffer the results of this because they ultimately see and measure how “the rubber hits the road”, and when the system is not understood by all who play a part in its coming into being, disastrous results with exceptional financial impacts can be the result.

We looked at the implementation of variable speed pumping. The seminar was based on the fundamentals of hydronics, pumps and controls, and then, the pros and cons of the industry, debating points were examined in detail, using techniques that can be applied by anyone with a little spreadsheet experience.

Last but not least, we used the concepts and examples to form some guidance on how these important systems should be approached from a field implementation perspective so that the energy saving potential of variable speed pumping can be achieved. We also looked at some of the pitfalls and discussed practical solutions to solving or communicating the problems that occur in systems.

Properly implementing variable speed pumping with good temperature control can reduce pumping system energy costs by a factor of ten or more, without causing any discomfort to the occupants of a system. Making that happen requires good balancing and commissioning technique and analysis.

As in past years, there were numerous vendors that

displayed their latest products including AiRNAB, LLC, DP2 LLC, Brown Transmission & Bearing Co. and TSI during the extended lunch program.



Pictured, Tim Eder of AiRNAB, this years sponsor.



2009 Recipient of the ASHRAE Exceptional Service Award, Mark Hegberg speaking on Variable speed pumping.



Terrance Resnick of Resnick Associates



Vincent Del Vacchio, MAEBA Past President and long time NEBB Professional, presents the NEBB 25 Year Pin to Raymond Burger of Independent Balancing Co. Ray not only has 25 Years as a NEBB Professional but has also served on the MAEBA Technical Committee and as a NEBB Exam Proctor for many years.

# VFD Issues

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ings, to the motor housing, which is grounded. When the potential rises to a level above three volts, it can cause arcing between the ball bearings and the bearing race, effectively removing metal with each instance of arc. This leads to pitting of the race and ball bearings, rough running, and eventually the premature failure of the motor bearings.

There are several options to minimize the possibility of this occurring:

- Wiring of the power, control, and VFD feed to the motor must be properly installed. Separate metallic conduits must be used for these circuits.
- VFD switching frequency should be programmed below 10 kHz, whenever possible.
- Silicone based grease can be used to minimize arcing, when the bearing manufacturer permits it.

Shaft grounding rings, which provide a path to ground directly from the shaft to the housing, should be installed on VFD driven motors. These can be factory or field installed, and requires little or no maintenance.

Although these items may not be the responsibility of the TAB contractor, we need to be aware of the potential problem, and the issues that may cause it. For more information, contact your VFD or electric motor supplier.



**MAEBA wishes to thank the 2010 Recertification Seminar  
Vendor Displays**

**AiRNAB, LLC      DP2 LLC      TSI**

**Brown Transmission & Bearing Co.**





## Presidents Column

Matthew Sano, MAEBA President



The current economic climate is a challenge to all of us from both a personal and business standpoint. While it is always to our advantage to participate in our support organizations, I think it is of particular importance to get more involved in times like these.

We have seen many recent changes in the national organization this year and the year is only half over at this point. It would be easy to point out performance issues and complain. I would ask, however, that we all take a supportive position and do what we can as individuals and as a local chapter to move things in a positive direction. The MAEBA staff as well as the National NEBB staff needs all the positive support we can give in order to get through these challenging times.

In the near future, you will see programs coming to our local area that highlight a forward-thinking mindset on the part of our national organization to make programs more affordable for all of us. I want to take this opportunity to thank all of you for your continued support.

## Delivering Sustainability

From Testing, Adjusting, Balancing to Commissioning to Sound & Vibration to Retro-Commissioning to Cleanroom and Fume Hood Testing, NEBB Certified Professionals deliver sustainability.

When your building needs to perform, you have assurances that the work will be done right, the first time with a NEBB Certified Professional.

For more information, please visit [www.nebb.org](http://www.nebb.org).



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## MAEBA Welcomes new NEBB Executive Vice President

MAEBA would like to welcome Steven Johnson, P.E., the new NEBB Executive Vice President.



Johnson is a registered Professional Engineer and former career Navy Civil Engineer Corps Officer. He graduated from the US Naval Academy and earned a Master of Science Degree in Engineering Science from UC Berkeley. In the Navy, Johnson attained the rank of Captain and his career highlights included major shore command, Pentagon duty, White House duty, Seabees, extensive, worldwide deployments, and assignments in Japan and Italy.

Johnson's major shore command comprised 2,800 personnel who provided \$500 million in built environment operation, maintenance, repair and support services and \$1 billion in construction support to eleven major bases in three states. After leaving the Navy, Johnson enhanced his leadership and executive management skills with select opportunities in the private and public sectors, gaining engineering and construction experience in the healthcare, public safety, and defense built environments.

## Attention Engineers — NEBB Quality Assured

For many years NEBB has had a program to help ensure their high standards; this program is called the Quality Assurance Program. The Quality Assurance Program is a single source for prompt, professional project support.

NEBB's credibility is built by maintaining integrity through high standards, quality programs and the demonstrated capabilities of its certified firms. This is achieved through NEBB's Quality Assurance Program (QAP). The program ensures swift, single-source mediation and resolution of disputes between NEBB Certified Professionals and their customers. ***NEBB's QAP applies to all projects that have been specified for completion in accordance with NEBB's applicable Procedural Standards and delivered by a NEBB Certified Firm.***



NEBB will issue Conformance Certification Certificates when called for in specifications and applied for by a NEBB Certified Firm. A unique certificate is issued for each project covered by a Conformance Certification. *A certificate is not a requirement to seek assistance under NEBB's QAP.*

### **Request for Assistance**

A request for assistance may be initiated by a project's owner or his/her representative either in writing or via a telephone call to NEBB or to a local NEBB chapter.

### **Resolving the Issue**

NEBB will select a qualified, third party professional to evaluate and address all issues within seven (7) calendar days of receiving an initial complaint. NEBB's qualified third party professional will promptly contact the NEBB Certified Firm and the person who initiated the complaint.

During an initial review the NEBB third party professional may:

- Review applicable plans and specifications.
- Review job specific procedures and submittals.
- Review applicable reports and field conditions.
- Review the accuracy of field data.
- Attempt to mediate a solution with the two parties.

### **Taking Corrective Action**

If NEBB determines that corrective action is required, NEBB will perform one or more of the following actions to resolve the issue:

- Prepare a scope of work document that outlines the corrective actions that are necessary.
- Secure a letter of credit, certified check or payment and performance bond from the original NEBB firm to assure successful completion of the required work.
- Supervise the required remedial work by the original contractor, if the original contractor agrees to perform the work.
- Select an alternate NEBB Certified Firm to redo the defective work at no cost to the owner, if the original firm refuses to do the work.

***So specify NEBB on all your jobs and be assured!***

## MAEBA Technical Committee

Thomas DeMuis - Chairman	Matthew Sano - Ex-Officio MAEBA President	Jeff Schools - Vice Chair
Vincent Del Vacchio	Raymond Burger	David Gatewood
Angel Rivera	Brian Matyola	David Wood
Robert Ulis	Fredrick Scafidi	Patrick Edmonds
Mary Coffey	Ted Salkin, P.E	Frank DeGaetano



Mid-Atlantic Environmental Balancing Association

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## Calendar of Events

March 19, 2011 NEBB Supervisors Written Exam  
Given Locally in MAEBA Chapter

March 19, 2011 Supervisors Practical Exam  
Given Locally in MAEBA Chapter

March 19, 2011 NEBB Technicians Exams  
Given Locally in MAEBA Chapter

April 6, 2011 MAEBA Semi-Annual Meeting  
MAEBA Auditorium Spring Mill Bldg.

September 2011 MAEBA Annual Recertification  
and Educational Seminar—to be announced.

Mid-October 2011 NEBB Annual Meeting  
Location to be announced  
East Coast Location

## MID-ATLANTIC ENVIRONMENTAL BALANCING ASSOCIATION

Chapter of the  
National Environmental Balancing Bureau

MATTHEW SANO - PRESIDENT  
LEO FOSTER - VICE PRESIDENT  
THOMAS DEMUSIS - T.C.C.  
TRISH CASEY - CHAPTER COORDINATOR

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