ASHRAE Ottawa Valley Chapter

Chapter Meeting #3 – 26 Nov 2013

Meeting Date:	26 Nov 2013
Location:	Restaurant International, Algonquin College
Attendance:	Total: 61 Members: 49 Guests:8 Students: 4
Theme:	Student
Tour:	None
Tech Session:	None
Table Top:	Vortisand, presented by Trane Evapco and Lagos Filtration Systems, presented by HTS
Program:	**HVAC Noise and Vibration Control: Compliance Strategies and Tactical Resources**
Speaker:	Bruce Majer
Prepared by:	Abbey Saunders

Social (17:30 – 18:25)

Business Session (18:25 –18:45)

- President Rod Potter introduced the Board of Governors and Executive.
- Abbey Saunders introduced the guests for the evening.
- Adam Moons welcomed new members.
- Rod Lancefield introduced the HTS table top (Evapco and Lagos Filtration Systems), and Stephane Laurin introduced the Trane table top (Vortisand).
- Steve Moons provided a wrap-up summary for recent Bowling Social event. Direct Energy was crowned the champions again for the third consecutive year.
- Senators tickets donated by Trane were raffled off raising $360 for ASHRAE Research with Don Weekes of In Air Environmental being the lucky winner of the Sens tickets, who graciously donated the tickets to a student attending the evening's festivities.
- Rod Potter discussed the upcoming Christmas Social and the lack of registrants to date, he also explained that if more attendees were not registered by Thursday this week, unfortunately the party will be cancelled.
- Don Weekes and Steve Moons then recognized the various chapter members for their donations to ASHRAE Research during last year's campaign.

Dinner (18:45 – 20:00)

Evening Program (19:45 – 20:55)

- Following dinner, the main program event took place. Speaker Bruce Majer's presentation topic was HVAC noise and vibration Control: Compliance Strategies and Tactical Resources.
- Presentation commenced with Acoustics 101 where the speaker basically introduced various terms and definitions important to understanding sound. We reviewed that

sounds is described by the amplitude and frequency of the sound wave. Frequency basically measures air pulsations and is expressed in octave bands, and amplitude measures the linear distance between the air pulsations.

- We were then reminded that based on the characteristic properties of sound waves, attenuation of low frequency noise is much more difficult when compared to attenuation of mid and high frequency noises.
- Next we reviewed the important difference between sound power and sound pressure. Understanding of these different terms is critical in understanding noise control. Sound power is defined as the acoustic energy emitted by a sound source that has an absolute value and in unaffected by environmental conditions or distance from the sound source. Sound pressure on the other hand is the local pressure deviation from the ambient (average, or equilibrium) atmospheric pressure, caused by a sound wave that is greatly affected by environmental conditions, and distance from the source.
- Converting between sound power and sound pressure allows environmental factors, such as distance and obstacles adjacent a source to be factored in. Adding sound levels isn't straight forward arithmetic but rather must be done following logarithmic rules.
- Next we reviewed that A-weightings of sound measurements provide the best approximation of the human hearing response across the various octave bands.
- ARI-370, Sound Rating Standard for Large Outdoor Refrigerating & Air Conditioning Equipment requires that manufacturer's express data in un-weighted sound power octave bands, with the overall sound level expressed as an A-weighted value. Mr. Majer cautioned us that not all manufacturers represent their data in similar manners, so it is important that we understand the difference between sound power and sound pressure when comparing equipment.
- Next we went on to discuss sound engineering, and basic options to help with noise reduction. Typical sound reduction options include both source and path control. Source controls incorporate strategies such as acoustic lagging, silencers, etc.. Path transmission controls include the erection of barriers and sound absorptive materials between the source and the observer. Typical acoustic materials include: absorbers, barriers, composites (which combine absorbers and barriers), dampening, electronic (noise cancelling), and flow control (silencers).
- Common acceptance criteria for noise include: NC, RC, PNC, ANSI, project specifications, OSHA, regulatory mandates, company policies, and good neighbor concerns. Documentation is available in guidelines and standards that publish recommended NC levels for various activities and miscellaneous room uses. The published NC curves also allow us to determine actual required attenuation for a space, and a given sound source at each given octave band.
- Next we reviewed a case study of a chiller with and without the sound kits against a 65dBA day and 50dBA night standard compliance v. non-compliance. Outcome of the case study: non-compliance noise levels can result in unwanted publicity or worse.
- General Noise Suppression Best Practices and Strategies were then discussed by Mr. Majer. Typically a 3 – 5 dBA safety factor should be utilized and a cursory review of noise for a site should be conducted to determine if a more detailed in-depth review is necessary. If a more detailed review is required, the generally accepted three step problem identification model is a good place to start.
    - Step 1: Where Are We Now?
        - Obtain a baseline for the particular application. This can include review of published data and sound ratings for new equipment proposed for installation, or review of existing sound measurements obtained from an existing installation.
    - Step 2: Where Do We Need to Be?
        - Determine the acceptance criteria for the particular application. Whether it be NC for indoor applications or ordinance for outdoor applications, understand what these criteria are and meet or exceed any regulatory requirements.

    - Step 3: How Do We Get There?
        - Evaluate the project specific treatment options to determine the best solution to mitigate the noise concerns. Remember that overall system noise should be targeted, and that by simply reducing the noise from a single component of a system may not have a very large impact on overall system noise reduction. Similarly, consider that equal isn't always equal and the proposed mitigation measures should be designed so that they allow easy maintenance and re-instatement. For example, acoustic blankets held on with tie straps are likely to be just left hanging over the component after the first service is required, whereas acoustic blankets held in place with Velcro and D-rings are easily manipulated and more likely to be installed properly following maintenance.
- Next, a quick summary of Indoor Equipment Best Practices were reviewed. Examples of the strategies discussed include, but are not limited to the following:
    - Use of a combination of source and path mitigation such as thickened walls, slabs and roof structures, silencers, barriers, etc.
    - Vibration Isolation: following guidelines for static deflection. Isolate miscellaneous mechanical / electrical elements such as ducts, conduits, etc., avoid cantilevered loads, avoid suspension mounting in mechanical rooms if spaces above room are noise sensitive, similarly avoid floor mounting if spaces below are noise sensitive. Diligence to ensure vibration isolation systems are installed correctly is critical. Otherwise short circuiting with structural elements can eliminate or significantly reduce the effectiveness of vibration isolation measures.
- An even shorter summary of Outdoor Equipment Best Practices were reviewed. Examples of the strategies discussed include, but are not limited to the following:
    - Thickened structural elements, such as roof slabs, floors and walls.
    - Elastomeric mounts.
    - Special consideration for remote evaporator piping systems.
    - Optimized aerodynamic performance to ensure laminar flow and total system loss is within the manufacturers' allowable limits is crucial.
    - Consideration of allowable building and property line noise levels.
    - Barriers or enclosures.
    - Splitter baffles or silencer banks.
- During the question and answer period it was addressed how manufacturers react to the various attenuation strategies. Mr. Majer indicated that based on a proposed strategy for a particular application the equipment manufacturer's sometimes have concerns, however in general if the noise consultant works with the manufacturer generally a mutually agreed upon strategy can be developed.
- President Rod Potter thanked Mr. Bruce Majer.
- Meeting adjourned 20:55.