ASHRAE Ottawa Valley Chapter

Chapter Meeting #2 – 15 October 2019

Meeting Date:	15 October 2019					
Location:	Centurion Conference & Event Center, 170 Colonnade Rd, Ottawa, ON					
Attendance:	Total:	45				
	Members:	31	Guests:	6	Students:	8
Theme:	Students					
Tour:	None					
Tech Session:	Hydronic Systems 101 by Joel Primeau					
Table Top:	CEGEP					
Program:	Hydronic System Heat Transfer					
Speakers:	Ryan MacGillivray					
Prepared by:	Ryan Dickinson					

Tech Session (16:30 – 17:30)

Social (17:30 – 18:30)

Business Session (18:30 –18:48)

- President Aaron Dobson called the meeting to order. Aaron introduced the Executive, Board of Governors and Chapter Chairs and Volunteers.
- Secretary Ryan Dickinson introduced the guests for the evening.
- Andrew Brown, the membership promotion chair, welcomed three new members to the Chapter.
- Michael Callaghan, student activity committee, thanked all the students who came out tonight and the ASHRAE members who helped sponsor student meals. Coming up in future events is the student design team which includes members from Algonquin College, University of Ottawa and Carleton University, with mentor Joel Primeau. On December 6th, the student activities committee will be taking a group of Earl of March High School students to Modern Niagara's shop for a tour. Michael also thanked the students from CEGEP for their table top, who brought their project of a heating or cooling system that demonstrates the heat transfer from water to air.
- President Aaron Dobson reminded everyone that this is the second year that the chapter will be awarding a $3,000 Student Scholarship. The deadline is in December, and students can apply through the ashrae.org website. This February, there will be a joint ASHRAE & MCA booth at the OCA Trade Show geared towards high school students entering the industry.
- Adam Moons, President-Elect and Research Promotion Chair, talked about the benefits of contributing to ASHRAE Research and how the money raised within our region stays within our region, funding several projects at Carleton University and the NRC. The Chapter has also started a new Endowment Fund for the continuing support of the YEA leadership program. To date, the chapter has raised over $11,000 out of our goal of $34,600 for the year. Adam thanked everyone for their generous contributions.
- Joe Della Valle talked about the stroke play golf tournament. There were 22 people in

attendance, and the champion from the tournament was Trevor Thomson.
- Upcoming events include the Ottawa 67s game on October 25th with YEA.
- Michael Callaghan talked about the upcoming ASHRAE bowling tournament at Merivale Bowling Lanes on Wednesday November 27th.
- Adrianne Mitani talked about the upcoming Women's in ASHRAE event on Thursday October 24th at the Clocktower Brew Pub in Westboro.
- Trevor Thomson, CTTC Chair, talked about the first seminar of the year on Fundamentals of Air System Design taking place on October 16th.

Business Session Finished at 18:48.

Dinner (18:50 – 19:30)
- Dinner was served at 19:00.
- Dinner was an assorted buffet with cake and coffee served for dessert.

Evening Program (19:30- 20:26)
- Evening program started at 19:30.
- Raffle tickets were sold to win two tickets to the Ottawa Senators vs. the Detroit Red Wings donated by Walmar Ventilation. Clark Campbell from Belimo had also generously donated a Belimo bag. A total of $520 was raised for ASHRAE research. John Naef was the lucky winner of the Senators tickets, and Evans Mutua was the lucky winner of the Belimo bag.
- President Aaron Dobson announced the program topic for the evening, Hydronic System Heat Transfer, and introduced the speaker, Ryan MacGillivray from Saskatoon. Michael works for Daniels-Wingerak Engineering Ltd as a Principal Engineer.
- Ryan started off by talking about heat transfer fundamentals and how it relates to hydronic systems. All matter has internal energy generated by the movement of molecules. The amount of internal energy can be labelled as the objects heat. We measure this by the temperature of the object. All systems try to reach a thermal equilibrium by equalizing the temperature of the components with the surroundings. Heat transfer is therefore dependent on the change in temperature. There are three forms of heat transfer, conduction, radiation and convection.
    - Conduction is only through solids and is dependent on the temperature difference, material property (conductivity), area, and thickness in the direction of heat transfer.
    - Radiation is heat that travels at the speed of light, travels by line of sight and can be reflected. It is dependent on the temperature difference, area, and material property (emissivity).
    - Convection is the third type of heat transfer, and deals with the motion of a liquid or gas, natural convection or forced convection. Natural convection involves buoyancy, while forced convection involves motion created by a pump or fan. Convection is dependent on the temperature difference, area, and fluid properties (density, velocity, specific heat).
- Most heat transfer involves all three modes, conduction, convection and radiation. Energy is conserved between systems according to the First Law of Thermodynamics. The change in internal energy can be measured by the enthalpy of the object. 1BTU/HR is the amount of energy required to heat 1lb of water 1 degree Fahrenheit.
- Hydronic heat transfer can be calculated by Q = 500 x GPM x delta T. This equation only

applies for water at 20 degrees. Density and specific heat change as the fluid and temperatures change. For air, the density and specific heat is a lot less, so the heat transfer is a lot less. Sensible heat transfer can be calculated as Q = 1.08 x CFM x delta T. A lot of systems are designed around a temperature change of 20 degree Fahrenheit.

- There is a limit to the change in temperature that can be reached by increasing the flow. As the flow rate increases, the temperature does not change proportionally. There is a limit to how much heat transfer is available for a system. As the flow rate is increased, noise and pressure drop become a concern. Typical maximum flows for noise is 4ft/sec, and for pressure drop is 4ft/100ft.
- Ryan asked why choose a hydronic system? Water is a very good heat transfer medium. It has much greater heat transfer capability than air, it is easier to install smaller pipes in a system than larger ducts to get the same heat transfer, water is safe to use and is readily available, and it's easy to make piping changes to the system for zoning.
- Typical heating supply temperatures are 210F, 180F, 160F, and 110F; typical chilled water temperatures are 45F, 60F, maybe even 25F. Domestic hot water production needs over 160F.
- Originally, 210F was based on wood fired boilers with no temperature control. With the transition to natural gas, controlling the burning process allowed the water temperature to be controlled to 180F. More recently, there's been a shift away from high temperature boilers to low temperature boilers, which offer better control and efficiency when the return water is below 130-134F. The 130-134F threshold is when condensation begins to occur in the flue gases depending on the amount of oxygen in the burner. Condensing boilers provide the system with extra efficiency. This can be achieved with a supply temperature of 160F and a 30F temperature drop.
- Europe has been designing around a 20C (36F) temperature drop for some time. The higher temperature drop allows for lower flow rates, smaller pipe sizes, and smaller pump requirements. Just as there is an upper limit to flow rates, there is a limit to the minimum flow that is practical. To slow of a flow and it may no longer be in turbulent flow, so the heat transfer will change.
- Older hydronic systems can be upgraded to make use of newer technologies and lower temperatures. Heat loss calculations should be confirmed to determine whether a lower average water temperature would achieve the output capacities required with the existing terminal units. Additional terminal units, such as more wall fin piping, may be needed to meet the load with the lower temperatures, or the terminal units may need to be replaced with higher output units, such as fan coils.
- Ryan concluded his presentation by discussing heat exchanger fundamentals. Heat exchangers transfer heat between mediums. Examples include a boiler which transfers heat from gas to water, or a steam to water heat exchanger.
- The three main types of heat exchangers are:
    - Shell and tube: straight tube, u-tube, horizontal, vertical.
    - Coiled: typically used for domestic hot water production using boiler water flowing through a coil and domestic water in the main tank.
    - Flat plate: plate and frame, brazed plate.
- Heat exchangers can either operate in Parallel flow or counter flow; however, most heat exchangers are designed for counter flow because of the better heat transfer performance. Heat exchanger performance is dependent on the heat transfer coefficient, area, and log mean temperature difference. Fouling inside the heat

exchanger occurs over time and will reduce the heat transfer capabilities.

- President Aaron Dobson thanked Ryan MacGillivray and reminded attendees of the survey which will be emailed. The next meeting is scheduled for November 19th at the Centurion Conference and Event Center.

Meeting adjourned 20:26.