The start of a new academic session is one of my favourite times of the year. I look forward to the return of the students each year and the renewed energy they bring to our wonderful campus. As we celebrate the beginning of a fresh school year with the Queen’s community, we at Physical Plant Services have a number of new and exciting initiatives of our own to celebrate.

PPS was a key member of a larger university team that ensured the new Richardson Stadium was opened on September 17 and is a facility we can all be proud of. I’d like to offer my personal thanks to Isabelle Nault, PPS project manager and David Boughton, Director of Design and Construction for ensuring that the project was completed on schedule despite a very challenging timeline. Our engineering, operations, and grounds teams also did a great job supporting the effort … thank you all. Truly a proud moment for PPS and for Queen’s.

Beyond this, we have also launched our new custodial services team under the guidance of Jim MacAdams. I’d like to welcome Tracy Sweet and William Shearing to the custodial management team … we are already hearing good things about the new client service delivery model. Our Town Hall meeting in October focussed on custodial service and how we can all work together to improve our client service and support the Queen’s community.

We also launched our Maintenance Management Software package Archibus in August, a new paperless technology driven system that will allow us to maintain the campus in a more transparent way for our clients and provide more responsive customer service. There have been challenges with the launch, no doubt, but given the magnitude of the change from our previous 20 year old system, it has gone relatively well and I do appreciate your continued support as we navigate the bumps along the way.

Our energy team tells me our Global Adjustment initiatives this past summer, which included running two cogeneration turbines and turning down campus air conditioning on the warmest days, will avoid almost $5M in electrical costs next year … truly a remarkable achievement! Thanks to John Korince and the staff in the CHP, the controls shop, Todd Hartrick and Nathan Splinter and Connor Reed Balen for all your work in ensuring this complex initiative was executed so effectively.

And please join me in welcoming Ginette Denford to PPS as our new Director of Finance. Ginette comes to us from the office of the Dean of Student Affairs at Queen’s and brings a wealth of finance skill and knowledge. I’d also like to wish Greg Orr, Gary Sitoski, and Doris Bell all the best for a healthy and happy retirement … Thank you for all your years of service to Queen’s! And finally my thanks again to all those involved in the very large amount of campus work that happened this past summer … the campus looks beautiful!
Construction Update
BY DAVID BOUGHTON, DIRECTOR, DESIGN AND CONSTRUCTION

Unfortunately summer is over but while you were gone we took the opportunity to fix things up a little for your return. During the summer some important projects took place. The clock on Grant Hall was repaired and has been fitted with a GPS module, which will ensure that it always tells the right time. Part of this work also entailed replacing the hands on the clock. Both Ontario and Grant hall have had extensive repointing done, so they look their best for this year’s 175th celebrations. The grounds crew also did a fabulous job replanting flower beds, replacing sidewalks, and repairing some of the entrance stairs. Work this year did not just concentrate on the exterior of the buildings. The auditorium at Duncan McArthur Hall underwent a major facelift with new seating, flooring and lighting. There is still a little work to finish but this should all be done by Christmas. Some of the Kingston Hall classrooms also had work completed, replacing furniture, flooring, painting and AV installations.

The summer would not have been complete without the opening of the Richardson Stadium for the first game. Work was completed on time, which allowed the first game on the finished project to be played against Western. The day went without a hitch unfortunately, the weather was not as accommodating.

With the stadium project behind us we look to the new projects starting on campus, The Biomedical Research project in Botterell Hall and the Innovation & Wellness Project in the former PEC. Both these project have been partially funded by grants from the Federal & Provincial Government and will be completed by 2018. Connect with the PPS website for regular updates on these and many other projects over the coming months.
Fall 2016 has been an exciting time for Physical Plant Services bringing changes to the structure of the department’s management team. The new model will strengthen the department’s ability to deliver cleaning and maintenance services.

September 1, 2016 marked the launch of the new Custodial Services delivery model. The Custodial Services Team includes Jim MacAdams (Manager), Alberta Thompson (Assistant Manager, Area 1), Leah Neff (Assistant Manager, Area 2), Tracy Sweet (Assistant Manager, Area 3) and Will Shearing (Evening Supervisor).

The transition period was very busy for the new Custodial Services Team as open positions were staffed, a new office was set up in the lower level of Biosciences and a new training and orientation plan was created. The team has also been working to standardize cleaning products and methods across the campus to assist in providing consistent training and support. We are beginning to get positive feedback from clients as this group’s diligent efforts are being noticed.

Our first Custodial Town Hall meeting was held on October 5. New members of the management team were introduced and guest speakers presented material on Teaching and Learning as well as Return to Work and the Thrive programs. There was useful exchange of information and we will be running Town Halls on a regular basis.

Changes were also introduced to Facilities Maintenance at Queen’s. On October 1, 2016 Dave Clark assumed the role of Facilities Manager, working with Phil Johnston (Area Manager) and Don Conners (Area Manager) to deliver Preventive and Demand Maintenance for Queen’s buildings. The goal of the Facilities Maintenance team is to provide consistent, professional maintenance service to our clients across the university. This team has also been busy staffing open trades positions. Watch for the announcement of a Facilities Maintenance Town Hall meeting in early winter.

Training for our Facilities Maintenance staff is very important to ensure a high level of technical and safety awareness while performing work on campus. A number of training sessions and seminars have been run this summer and autumn including Siemens Fire Alarm familiarization, Backflow Preventer familiarization, Electrical Code Update, Electrical Safety in the Workplace, “Lock Out Tag Out” and Working at Heights. Additional training and product familiarization sessions will be scheduled as opportunities permit.

I look forward to working with these groups as they develop and innovate to meet the needs of the University.
Keeping it Safe and Keeping it Tidy
BY: LARRY PATTISON, DIRECTOR, ENGINEERING & OPERATIONS

Inadequate housekeeping is one of the most often cited issues in Joint Health and Safety Committee inspections for PPS spaces. The Ontario Electrical Safety Code requires a high standard of housekeeping in electrical rooms and the Ontario Health and Safety Act requires us to keep all of our spaces free of trip hazards and obstructions. Whether in custodial rooms, mechanical rooms, electrical room or shops good storage practices and removal of waste and obsolete equipment are important steps that we need to take. These ensure that parts and supplies are well organized and kept in good condition while reducing the risk of injury by removing potential trip hazards.

As a worker you can:

- Tidy up after your work is complete
- Point out developing housekeeping issues to your manager

As a managers should:

- Allow adequate time in work planning for cleanup
- Arrange for additional storage shelves and cabinets when required
- Ensure housekeeping issues generated by people outside PPS are appropriately addressed

Together we can all work towards a safer workplace.
Demand Response at Queen’s

BY: CONNOR REED BALEN, ENERGY ENGINEER INTERN

As the fall weather begins to settle in we have seen a noticeable drop in the provincial power demand. With the last of the summer heat behind us we have announced the conclusion of the Electricity Demand Response program for this year. We would like to thank everyone who has participated through the summer for their patience and support.

This year was unique in several ways, one of which was the number of activation days that we experienced. Since June we have turned off chillers across campus a total of 21 days. This is a noticeable increase from last year where we responded on only 15 days during the summer. One of the reasons for this uptick has been the unrelenting heat over the course of the summer. Globally, August and July of this year tied for the warmest month ever recorded, according to the monthly temperature analysis conducted by the NASA Goddard Institute for Space Studies. Toronto saw more than 30 days of above 30 °C temperature, where in a typical summer the city would see 18 days.

When temperatures soar across the province the provincial power grid sees higher than usual energy demand which translates into enormous costs for large users such as Queen’s. To reduce costs, Queen’s utilizes the two cogeneration units located at the Central Heating Plant on King Street that generate power for main campus and thereby reduce the quantity of power that Queen’s pulls off the grid. Additionally, Queen’s turns off chillers in 15 buildings across campus to further reduce energy consumption. The measures to reduce power demand on campus this summer will directly result in almost $5 million in avoided costs to the Queen’s electricity budget.

The continued success of the program would be impossible without the commitment of all those who were involved in the daily operation of the demand response program. In particular we would like to recognize Todd Hartrick at Fixit, the controls engineers Steve Graham, Steve Compeau, and Jason McCullough, as well as John Korince and all the operating engineers at the Central Heating Plant. Thank you all for your hard work.
The October 2016 “Tool of the Month” is the Tecnodue Portable Socket Fusion Hand Tool.

Socket fusion welding is a technique for assembling plastic piping systems by simultaneously heating the outside surface of a pipe and the inside surface of a socket fitting. The two components are pressed together and fuse into a single piece as they cool. This is in contrast to other joining methods such as solvent cementing, threaded joints, flanges, or mechanical couplings. The Portable Socket Fusion Hand Tool is easy to transport and allows socket fusion welding to be done on-site.

Proper socket fusion involves measuring the components for insertion depth, heating the pipe and fitting with the hand tool, and then joining them together to cool. The PTFE coated bushes are proportioned to allow enough pressure between the pipe and fitting for proper fusion. Once they have been fused together the pipe and socket fitting become a single piece with no potential leak path. The Socket Fusion Hand Tool has bushes ranging from ½” to 4” in diameter.

The Tecnodue Model PF 63 R is equipped with a bi-metallic thermostat to allow accurate monitoring of the temperature of the bushes. This eliminates any guess work from the procedure and results in a more consistent and safer welding process.

An example where this tool might be used is the reverse osmosis water line in Chernoff Hall. This water line was installed with fusion welded piping when the facility was built. Any repairs or changes to the system can easily be completed using this tool.

The Tecnodue Portable Socket Fusion Hand Tool is kept in the Area 1 shop and is available for sign out to all PPS staff.
Behind The Wall’s
BY DAVE CLARK, FACILITIES MANAGER

Spring time can be an incredibly busy time of year for our Physical Plant Services skilled trades, it is the start of switching over our HVAC – Heating Ventilation Air Conditioning from heating mode to cooling mode. This task falls depending on the system to our refrigeration trades with support of others. Upon start-up of Leonard Hall this year due to Life Cycle “age” the main component a 60 ton compressor failed with no backup to support the cooling process.

A review was conducted and as a result the determination was to replace the failed compressor and install a backup to ensure season cooling would not be interrupted. A project of this size would in many circumstances be conducted by Queen’s project group/contractor. One thing I discovered upon joining PPS is the incredible level of highly trained skilled trades within our organization so the decision was made to keep this in-house and make repairs ourselves. By instituting a team of Millwrights, Electricians, Refrigeration and grounds crew along with CA Peters Crane services supported by PPS engineering, a complete removal and installation of two new 60 Ton compressors and rebuild was successfully completed within one week.

Once we had moved on to other projects, our Refrigeration Mechanic Scott Ferguson took it upon himself to document the complete project for our client, Residence Administration and training purposes. There have been and will be many more projects moving forward and knowing we have the capability to keep in-house where ever possible ensures quick response and preventive maintenance measures moving forward. Enjoy the read.
Leonard Hall A/C repairs
BY SCOTT FERGUSON, REFRIGERATION MECHANIC

Mc Quay 120 ton system
M#ARC120AS37
S# STNU020700126

In early May the second of two 60 ton compressors failed. The first compressor had failed some time ago. We already had one replacement compressor on site and at this time it was decided to replace both compressors as well as make necessary changes to correct the cause of compressor failures.

Ultimately our primary function is to not only supply comfort cooling to the required space but to protect the equipment for a long and economical operation.

Therefore several changes were required to bring the system to proper and protected operation.

The system as it was originally installed consisted of the condensing unit with, as mentioned, 60 ton compressors staged on through temperature with (3) stages each and (3) condenser fans controlled by pressure and temperature to maintain head pressure in a range from 190 psig-225psig.

The protection for each compressor consisted of a high pressure, a low pressure and an oil pressure safety as well as phase protection and thermal overload built into the compressors.

This outdoor section is connected through (3) refrigerant lines per circuit, 2 5/8” suction, 1 5/8” liquid and 1 1/8” hot gas roughly 100’ of vertical pipe and 30’- 40’ of horizontal pipe, to an evaporator section, consisting of (2) coils fed by (2) 30 ton thermostatic expansion valves each.

The cooling operates by compressing high pressure vapor then condensing it to a liquid. Then the liquid travels through the liquid line to the thermostatic expansion valve. As the high pressure liquid passes
through the valve it begins to expand because of the drop in pressure across the valve. When it expands it absorbs heat (this is the cooling effect) this heat transfer is then drawn back to the compressor through the suction line as a low pressure vapor it then starts the cycle again.

The purpose of the hot gas line is to inject hot gas from the discharge line into the suction line to maintain velocity for oil return from the evaporator back to the compressor in low load conditions.

All of this is proper practice when the condenser and evaporator sections are within specific distances both vertically and horizontally.

This was not the case with this installation.

Our vertical drop for the liquid line creates a situation called liquid head. As you stack a solid column higher the force becomes greater at the bottom. In the ideal situation we design based on a 100 psig drop across the txv (thermostatic expansion valve).

What was actually created was a 150psig drop across the txv.

This is calculated at 1/2psig/ ft. so at 100’ we have a gain of 50 psig. This equation also requires correction factors for temperature of the refrigerant and pressure drop across the txv.

So in reality the 30 ton txv’s we giving us 41.12 tons of cooling.

With 2 of these valves per circuit the total becomes 82.2 tons which is too much load for a 60ton compressor.

For this reason the txv’s were resized to 20 ton valves which with the same correction give us 28.6 tons per valve thus 57.2 tons per circuit.

Now we address 2 other issues that remain. Oil return and protection from liquid return from the evaporator section to the compressor.

Oil return as you can imagine is critical to the compressor. This is no different than a car engine, no oil goodbye engine.

In a system the oil travels with the refrigerant through the system and returns to the compressor.

In order for this to take place a minimum refrigerant velocity is required otherwise the oil separates from refrigerant and remains trapped in the system.

The bigger the system or longer the lines we compensate by adding more oil until we see oil come back.
There is one other way to assist with velocity in low load situations called hot gas bypass which we will discuss later as it was installed in this system and there are reasons it would not work.

So since the system was unable to maintain proper oil return we installed oil separators. These remove the oil from the refrigerant just after it leaves the discharge of the compressor as a high pressure high temperature vapor. It is separated by centrifugal force and a float system in the base of the separator opens allowing the oil to return to the compressor.

This eliminates oil logging in the system and constant lubrication for the compressor.

There was a situation created by the oversized txv’s in which the valves allowed more refrigerant into the evaporator coils than they were capable of handling therefore the liquid would still exists when exiting the coils. It then travelled back to the compressor which would wash out the oil and also cause damage because liquid is not compressible. This had the capability to bend valves break rods and wear out parts where there was lack of lubrication. Also a liquid issue was created in the off cycle. Refrigerant likes to migrate to the coldest spot which in this case is the evaporator section, in the basement.

When the system calls for cooling all the liquid is pulled back to the compressor with the same results.

For this reason we have installed a suction accumulators. It is installed prior to the inlet of the compressor. It works by allowing any liquid to accumulate in the bottom of the cylinder and the compressor pulls the vapor off the top, this protects our compressor.

Finally we have hot gas. As explained previously its purpose is to maintain velocity for oil return in low load situations strictly for oil return.

Again this is proper piping practice but the length in this case is too long. What was happening is the high pressure vapor was condensing as it traveled down to the evaporator section this of course was adding more liquid to the coils. Now that we have installed oil separators hot gas is no longer required.
We have also installed pressure controlled unloaders. These were previously controlled by building automation based on temperature. This did not work because the unloading of the compressor occurs as the txv’s closes up the suction pressure drops. Because the unloaders were based on temperature they did not work and the compressors would continue to run fully loaded. Now being based on pressure they unload when the pressure drops which allows the refrigerant cycle to remain stable and constant.

So now we have a system that can stage from as low as 20 tons of cooling up to 120 tons through (6) stages.

We have also installed new electronic oil pressure safeties, oil filters and liquid line driers.

This system should perform at less cost and problem free for many years to come.
Announcements

**New Hires**
Ginette Denford, Director, Finance (Facilities), October 3, 2016
Adam Griffin, Steamfitter, October 3, 2016
Trevor Homer, Millwright, October 3, 2016
William Shearing, Custodial Supervisor, October 3, 2016
Chris Sleeth, Trades Helper, October 6, 2016
Tracy Sweet, Assistant Manager, August 25, 2016

**Retiring**
Greg Orr, Electrician, November 30, 2016
Gary Sitoski, Carpenter, December 31, 2016
Doris Bell, Parking Attendant, December 31, 2016

**Thinking of Retirement?**
Queen’s Human Resources offers a Series of Pre-Retirement planning courses designed to encourage Queen’s employees to begin planning earlier in their lives so that they can live the way they want to when they retire. For more information, check the online catalogue located at [http://www.queensu.ca/humanresources/apps/training/](http://www.queensu.ca/humanresources/apps/training/)

**Thank You, Thank You, Thank You**
I just wanted to send a quick note of thanks to John and Paul from the “Fridge Shop” – They came in today and helped me with my wall unit and where flexible enough to coordinate it while I went to a meeting and did a great job for me fixing my problem. I wanted to send my token of appreciation and hope this can be forwarded to the appropriate unit supervisor.

Thanks in advance,
Martin Galczynski, Faculty of Health Sciences

*John Simmons and Paul Carter are Refrigeration Mechanics in Area 5.*
Tell Us What You Think

Do you have a news story or an announcement you would like to make, or a cartoon or photograph you’d like to share? We’re looking for submissions to add to the next publication that will come out in December 2016.

All ideas and suggestions on the newsletter’s name, design and content are welcome. Submission deadline for the next edition is November 15, 2016.

You can submit your ideas to any of the newsletter committee members:

Tracy Elliott, tracy.elliott@queensu.ca
Llynwen Osborne, lrao@queensu.ca
Larry Pattison, pattison@queensu.ca

If you would like to start receiving an electronic version of the PPS Newsletter send an email to one of the newsletter committee members and you will be added to the email distribution list.