Facilities Planning & Management
UNIVERSITY OF WISCONSIN-MADISON

PHYSICAL PLANT
September 2020 Operations Report

Most of us wouldn't dream of skipping oil changes for our vehicles. However, when it comes to building mechanical systems, we often forget that the same principles apply. A good maintenance plan has many benefits, including reduced ownership costs and improved reliability. These values are good for home as well as the workplace.

We recognize the operational impact when our aging infrastructure fails and unplanned outages occur. The Physical Plant preventive maintenance program, highlighted in this month's report, is expanding as part of an effort to develop and implement comprehensive strategies to manage UW-Madison's assets (e.g., life cycles and total cost of ownership) to foster resiliency and financial stewardship. Properly resourced, proactive maintenance is a key strategy for improving reliability and better supporting campus operations and programs.

Have you had your home furnace inspected and serviced yet, in preparation for winter? Don't forget to show some love to that mechanical system at your house—it works hard to keep you comfortable—a little TLC from a qualified mechanic goes a long way.

A technician performs preventative maintenance on a pump with the help of our Integrated Work Management System (IWMS).

IMPROVING EFFICIENCY AND EFFECTIVENESS THROUGH PREVENTIVE MAINTENANCE

A strong preventative maintenance program increases resiliency and reduces the risk of breakdowns that could affect UW-Madison's operations and programs.

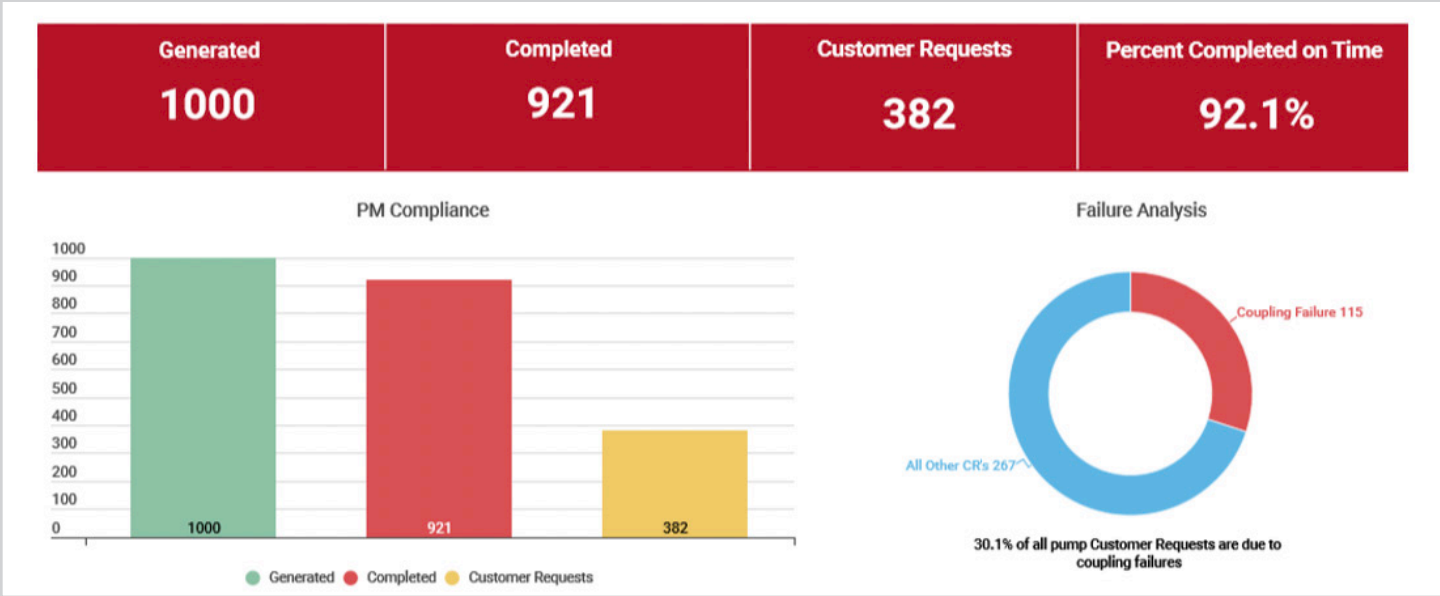
Pumps in building ventilation, domestic water, and other critical facility systems were recently added to a comprehensive preventive maintenance program. In this program, each pump receives a thorough inspection, both to identify the need for critical repairs prior to a pump experiencing failure, and to perform preventative maintenance. This is increasingly important with UW-Madison's aging infrastructure.

So far, 921 pumps have received maintenance and 382 corrective actions were identified and completed (*see page 2*). These proactive repairs help prevent emergency breakdowns, reduce emergency service costs, and reduce the risk of disruption to university operations and programs.

This program is being expanded to include other types of critical facility equipment using FP&M's Integrated Work Management System (AssetWorks) and the addition of maintenance schedulers. Data accumulated in AssetWorks will also set the stage for predictive maintenance. For example, the data analysis allowed Physical Plant staff to identify coupling failures as a major issue with pump operations. As a result we are evaluating different coupling technologies to address these failures.

PREVENTATIVE MAINTENANCE, CONTINUED...

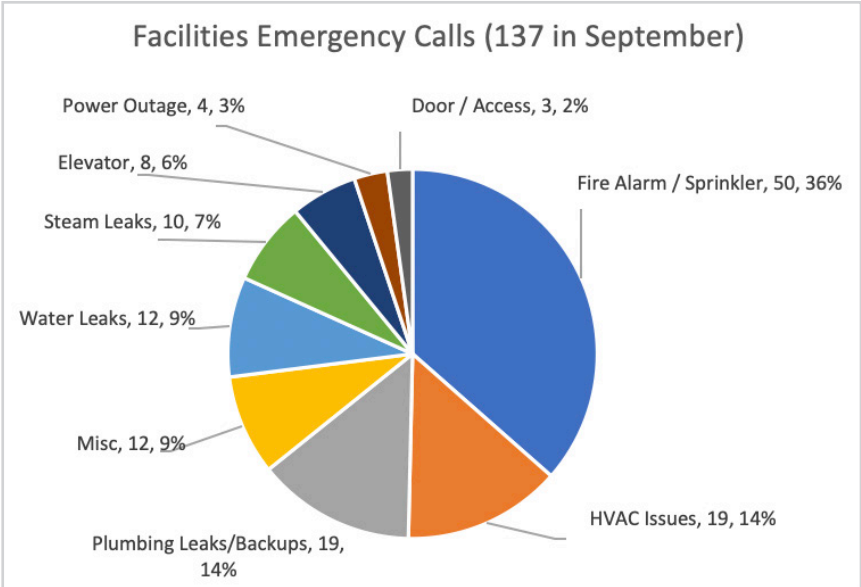
Physical Plant Machine Shop Preventative Maintenance Metrics (Year to Date)



BREAKDOWNS AND FAILING FACILITY CONDITIONS

Here are a few examples of major equipment failures from September 2020, all of which demanded significant unplanned efforts and increased the risk to UW-Madison's operations and programs.

Primate Center Temporary Chiller. The temporary chiller servicing a previous failure itself experienced a mechanical failure. Physical Plant staff rapidly responded to this outage, and then quickly designed and implemented mitigations for the facility and research programs until the temporary chiller could be restored to normal operation.



Steam Line Failure. An expansion joint in the steam tunnel near Computer Science failed, resulting in tunnel temperatures in excess of 150°F. Physical Plant technicians worked with facilities contracting to make repairs with minimal disruption to steam service.

- Age of the steam line: Over 60 years.
- Expected life: 40–50 years.

Loss of Cooling at EHS. The Environmental Health and Safety Building experienced several HVAC issues this summer. Physical Plant staff designed a solution that uses campus chilled water to bypass the failing facility equipment. A temporary chilled water line was installed, ensuring continued operations until a larger project can be executed. The temporary line was completed in September.

ZEBRA MUSSEL INVASION ADDRESSED WITH FILTERING AND UV LIGHT

UW-Madison's heating and cooling plants provide critical utilities to the campus, including steam and chilled water.

The university's location on Lake Mendota provides an opportunity to use low-cost water for process cooling, boiler make-up, and cooling tower make-up. However, lake water presents challenges because it carries biological organisms that can accumulate inside pipes and other pieces of machinery.

In the past decade, zebra mussels have spread throughout Lake Mendota. Forming dense colonies on surfaces, they are a significant concern for plant operations as they are also being discovered in the lake-water piping system, in cooling towers, and in heat exchangers in the heating and cooling plants. This causes clogs that have required emergency equipment outages for cleaning.

With support from the State of Wisconsin, the Physical Plant Utilities Energy & Management team developed a water treatment strategy to protect operational equipment from zebra mussels and recently completed the installation of this equipment.

The first line of defense is a self-cleaning filter in the intake piping that collects loose zebra mussel shells. As lake water passes through the filter, particles are trapped on an inner screen that causes a differential pressure. When the pressure reaches a setpoint, an exhaust valve opens, and two stainless steel brushes sweep the inner surface of the screen. The shell particles trapped on the screen are dislodged by the brushes and flushed to a backwash tank and then into the storm sewer.

A series of UV lights form the next line of defense. The technology employed features a unique reflection technology that recycles UV light energy, ensuring both homogenous UV dose distribution and power efficiency. Power is continuously monitored and adjusted as the UV bulbs age to ensure delivery of the effective UV dose at all times.

The one-two punch of filtration and UV light technology helps minimize operational issues caused by zebra mussels, increasing efficiency and reducing the need for emergency maintenance.

Submerged pump from the Lake Water Pumphouse covered with zebra mussels, showing how pervasive they are.

Self-cleaning filter full of zebra mussel shells.

Microfiltration equipment at the Charter Street Heating & Cooling Plant

Ultraviolet (UV) technology.

PROJECTS SUBSTANTIALLY COMPLETED AND CLOSED OUT—SEPTEMBER 2020

Eleven projects (worth $345K) reached substantial completion during the past month.

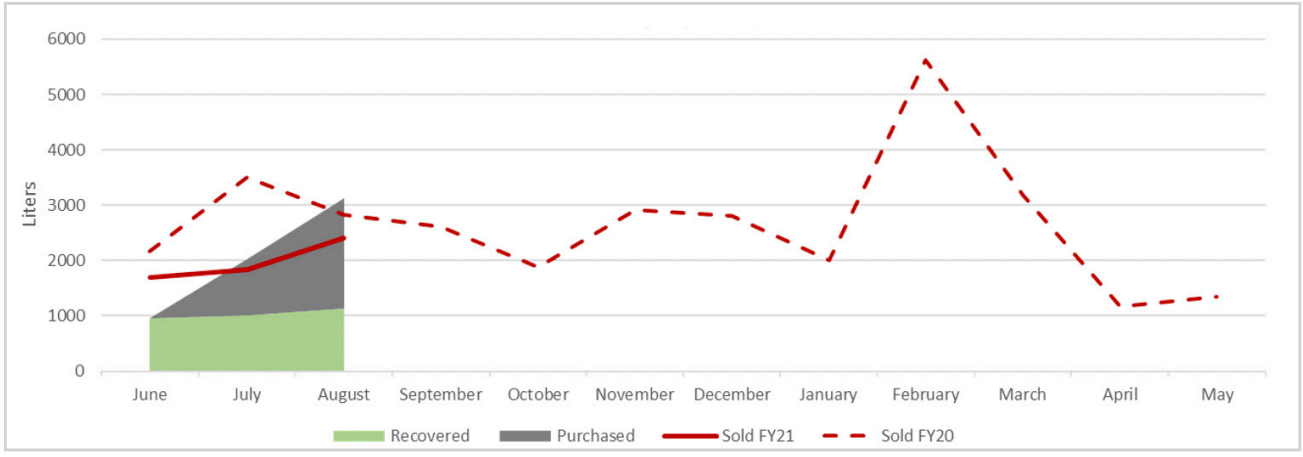
Project Number	Building	Description	Value
04591901	Waisman Center	Relocate Clinic & Renovate Room	$169K
PRJ-20-001893	Veterinary Medicine	Renovate Rooms 2530 and 2360	$81K
PRJ-20-002136	Art Lofts	Renovate Photography Lab	$15K
PRJ-20-001716	Van Hise Hall	VCFA Classroom Renovation	$69K
05451807	Vilas Hall	Renovate Room 2000R	$128K
PRJ-20-001128	Engineering Hall	Remove Wall Room 3009	$30K
00151802	Memorial Library	Install Gates at Main Entrance	$72K
00561901	Ingraham Hall	Remodel Offices and Reception Area	$136K
PRJ-20-001541	Van Vleck Hall	Restroom Upgrade: Rooms B136 and B138	$95K
PRJ-20-001543	Van Hise Hall	Restroom Upgrade: Rooms 164 and 168	$95K
PRJ-20-001884	Social Science	Workspace Partitions: Rooms 6239 and 4223A	$15K
		Total Approved Construction Service Agreement (Final Amount TBD)	**$345K**

HELIUM PLANT DEMAND RETURNING TO NORMAL

Physical Plant provides helium services, including recovery, to the campus research community. After dropping off in April and May, helium demand has increased each month since, corresponding to increased research activities on campus. This September's demand of nearly 2,800 liters outpaced last September's sales of 2,600 liters.

- Significant resources were expended in August to troubleshoot and clean the helium liquefier due to contamination caused by an accidental release of nitrogen into the helium recovery system.
- Airgas recently increased the cost of helium from $11.38 to $14.69 per liter. The current cost charged to internal UW-Madison customers remains at $9.50 per liter. This deficit is due for review, but no internal price increase is planned at this time.
- The liquefier was taken out of service on September 21 for a week to perform planned warranty maintenance repairs on the oil coalescer. The liquefier was restarted on September 29.
- Arrangements are in-place to support NMRFAM's new 750WB magnet with 2,000 liters the first week of October and another 2,500 liters the third week of October.

FY21 Helium Plant Operations



WEST CAMPUS ROUNDABOUT RESTORATION

Working with a reduced staff this summer due to COVID-19, Physical Plant—Grounds still kept the university looking its best. A notable improvement was the redesign and renovation the campus roundabout at the intersection of Walnut Street and Observatory Drive. This iconic gateway to the west campus is frequently used for photographs and was greatly in need of improvement.

Becuase major sections of wall were failing, the entire wall was taken down and rebuilt to address drainage and and safety concerns. The lower portion was also regraded for a more aesthetically pleasing winter view, adding stone edging and a maintenance staircase for safe access.

As part of this renovation, plantings were redesigned in-house, focusing on:

- Year-round interest that can be a backdrop for this popular photo spot
- Symmetry when approaching the roundabout from all four directions
- Badger colors of red and white using foliage, flowers, and fruit

We hope you have enjoyed the beautiful colors and manicured grounds across campus this summer and into fall. It has been the result of a lot of hard work from the entire Grounds staff.

Before: old grading and plastic edging.

After: new grading and stone edging.

Before: failing wall.

After: The restored roundabout provides a beautiful welcome to the UW-Madison campus.