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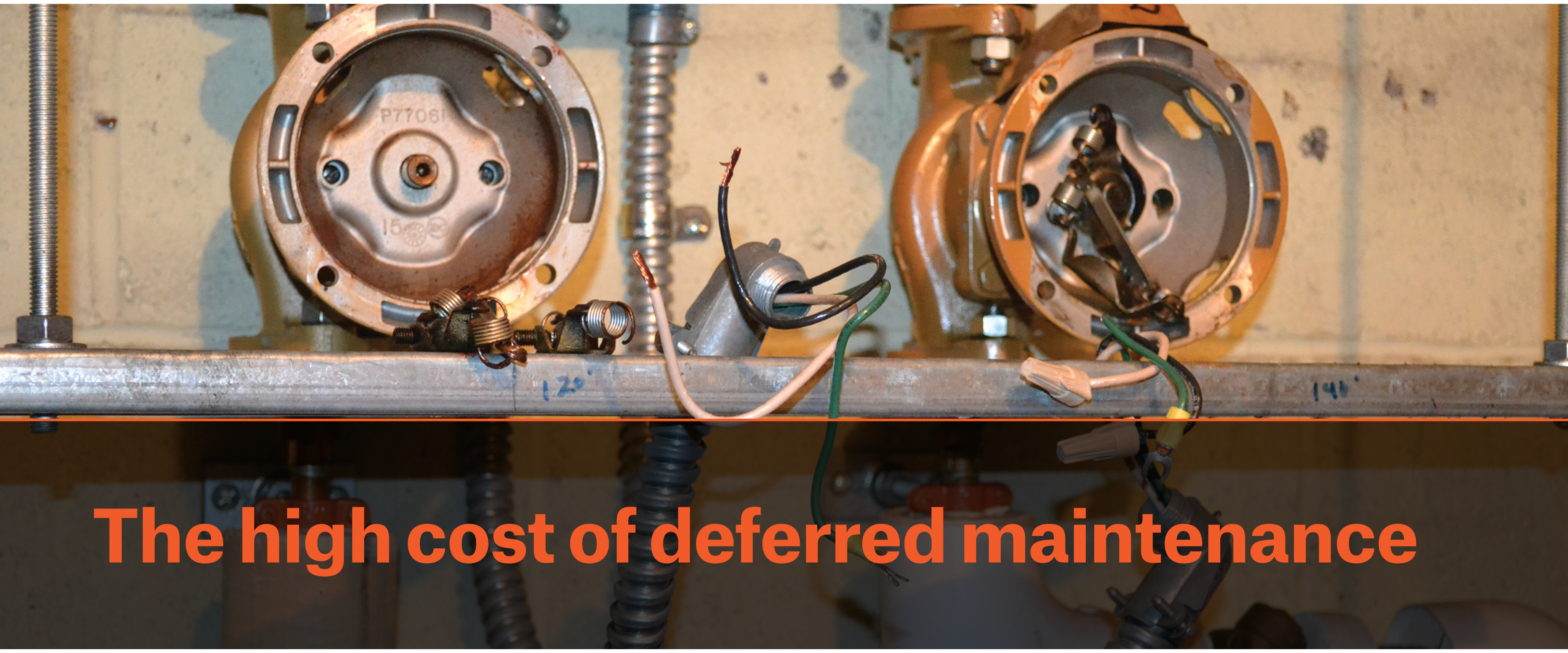

The high cost of deferred maintenance

HSB, a Munich Re company, is a technology-driven company built on a foundation of specialty insurance, engineering, and technology, all working together to drive innovation in a modern world.

"Deferred maintenance cost-savings" myth

Large commercial buildings and campuses require maintenance for mechanical, electrical, plumbing, HVAC, safety, and security systems. This is in addition to the maintenance required for the physical buildings and grounds. Equipment manufacturers and standards organizations publish the required maintenance for safe operation and maximum life-expectancy of their equipment and installations. There is an annual cost to perform this collective recommended maintenance. It can be tempting at times, to reduce, postpone, or eliminate some or all of this maintenance in the interest of apparent cost savings. But eliminating recommended maintenance can have significant costs that far outweigh the apparent short-term cost savings.

The purpose of equipment maintenance

The purpose of performing recommended maintenance is to achieve the greatest performance, safety, and life-expectancy from the original installations. When maintenance is deferred, it directly follows that performance, safety, or life-expectancy will suffer over the immediate or extended life-cycle of the building. In many cases, deferred maintenance results in inefficient operation of the systems and increased fuel and energy costs. The cost to correct the system problems will still need to be spent. But now additional costs are incurred for the period of time the systems run in an inefficient, unsafe, or degrading manner. Deferred maintenance sometimes results in missed opportunities to discover unsafe operating conditions. Guards may be missing, or heating equipment may be producing dangerous levels of carbon monoxide. Failure to detect and correct these conditions can result in severe injury or death to the building occupants.

Loose mechanical parts such as sheaves, belts, and motor mounts may not be found in a timely manner resulting in major replacement costs for entire units or sub-assemblies. Small problems that continue unnoticed typically advance into major problems that severely reduce the equipment life-expectancy. Premature equipment replacement costs are much greater than the small, incremental costs to perform the recommended maintenance.

Recovering from deferred maintenance is difficult and expensive

Deferring maintenance is a somewhat insidious cycle. After the first year of deferred maintenance, everything seems like it is working just as well as when the recommended maintenance was performed. This leads to the second year of deferred maintenance. And then the third year, and on and on. Each year goes by with those small, unnoticed problems developing or getting worse. Year after year, less efficient, worse performing, potentially unsafe installations continue to operate. The collective damages result in significantly reduced life-expectancy for the equipment. Once again, much greater costs are incurred due to the elimination of small, incremental costs associated with recommended preventive maintenance tasks. These consequential costs are typically not factored into the apparent saving from deferred maintenance strategies.

Deferring maintenance erodes "high-standards" trade mindset

One of the greatest negative effects of deferred maintenance is on the mindset of the maintenance and trades staff who service the buildings and equipment. When service staff are instructed to stop performing recommended maintenance, they can become desensitized to looking for, finding, and correcting problems while they are small and insignificant. The mindset can become, "We just let everything run until it fails now." It may be difficult to reestablish the high-quality mindset that it is important to catch problems while they are minor to maintain safety, efficiency, and maximum life-expectancy of the equipment.

Long-term versus short-term perspectives

There is a disproportionate expense and penalty for deferred maintenance strategies. In the short term, there appears to be a working strategy that is saving money. Yes, the maintenance costs are reduced, but the safety, efficiency, and life-expectancy costs are not being quantified in this analysis. Each year of deferred maintenance accrues unaccounted for costs related to higher energy bills, poor performing HVAC equipment, unsatisfied occupants, avoidable accidents or injuries that occurred, and increased future capital spending for short-lived equipment. The sum of these costs greatly exceeds the periodic, smaller recommended maintenance costs that were eliminated with a deferred maintenance strategy.

An illustrative example

A school, operating on a multi-year deferred maintenance strategy, recently had complaints from the teachers that the classrooms were too hot during the cold weather season. In fact, the teachers resorted to opening most of the windows during the classes to reduce the heat in the rooms. Although this practice reduced the excess heat, it did not keep the classroom at a controlled room temperature. The classrooms would get so hot at times, that the teachers would ask the maintenance person to shut off the boiler manually. Investigation of the initial complaint about the rooms being too hot revealed:

Problem Found	Consequence	Cost to Repair	Annual Loss/Result
Classroom exhaust fans were not functioning due to control issues and broken belts or tripped motors	The classrooms did not exhaust air of 20 CFM per student as required	Average cost per classroom = $300	Complete loss of classroom exhaust systems; unhealthy air in classrooms

Problem Found	Consequence	Cost to Repair	Annual Loss/Result
Classroom unit ventilators/heaters were not functioning due to failed motors or being manually switched to off	Tempered fresh air did not enter the classroom at the required 20 CFM per student; since the room thermostat controlled the unit ventilator heat output, no temperature control occurred	Cost per classroom = $50 - $400	Complete loss of tempered fresh air supply to each classroom; loss of room temperature control since the thermostat controls the unit ventilator modulating water valve for setpoint control
The gas-fired boiler warm-weather shutdown control was not working	On warm outside days when the building did not need heat, the boiler continued to overheat the building	Repair cost = $250	Large natural gas fuel usage due to boiler operating at full temperature when it could have been shut down due to warm outside conditions; $$$$ natural gas fuel bills
The hydronic water loop reset-control for the classroom perimeter heaters was not functioning	The perimeter hydronic heating operated at full boiler output temperature of 180°F instead of modulating as a function of the outside temperature	Repair cost = $350	Boiler operated at full 180°F when it could have ramped down due to low boiler load requirements based on outside air controller; $$$$ natural gas fuel bills
Classroom thermostats were not calibrated	For working classrooms, the thermostats did not control the room temperature to the setpoint of the thermostat	Average cost per classroom = $200	Loss of classroom comfort control; classrooms would overheat or underheat based on lack of calibration; $$ natural gas fuel bills
Classroom unit ventilator filters completely blocked airflow due to dirt	Where unit ventilators still operated, blowers could not force any air through the plugged filter media	Average cost per classroom = $50	Lack of airflow and filtering of the classroom air; electric motor running for blower but producing no airflow; $$ electricity to run motors but achieve no airflow
The boiler night-setback control was not functioning	The boiler and hydronic loops ran at full temperature output, even when the building was unoccupied	Repair cost = $200	Daytime pumps ran throughout the night consuming additional electricity; $$$$ required for extra natural gas consumption

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