

# Seasonal start-ups

It's not just the flip of a switch



Performing a thorough start-up positions you for maximize benefits.

Believe it or not, the cooling season is right around the corner. Is your HVAC equipment up to the task? Now's the time to conduct a seasonal start-up, to make sure you're able to provide reliable, efficient cooling throughout the warmest months of the year.

## Seasonal Start-ups

Seasonal start-ups take many forms. Some may simply flip a power switch and hope for the best. Others may compare operational parameters to the previous cooling season and call it a day. But when you take the time to conduct a thorough seasonal start-up, you'll be positioned to:

- Increase uptime and reliability
- Maximize energy efficiency
- Detect system problems before they cause catastrophic failure
- Extend equipment life

Make the most of your seasonal start-up. It requires time and expertise to take full advantage of the opportunity, but the benefits are limitless. Here's a roadmap to get you started.

### General tasks for all types of equipment

Start with a visual inspection of the unit, which can reveal several potential problems. Inspect outside units for loose or missing covers or panels. Inspect and clean control panels and internal compartments; they make ideal havens for animals and insects during the winter months. Also look for evidence of refrigerant leaks. Often, the leaking refrigerant will carry oil with it, so the presence of oil around fittings and connections should be cause for concern.

Next up, electrical and control systems. The majority of HVAC units will require similar tasking for these systems. Check power and control electrical connections for tightness and signs of overheating or other damage. On units with mechanical contactors, have the contactors disassembled and the contacts inspected for arcing and wear. And whether the unit has mechanical or electronic safety controls, safety cutouts should be confirmed and properly set.

Finally, review last season's operating logs and/or service history. That information will help the service provider make recommendations for additional follow-up after the seasonal start-up is completed.

### Rooftop units

Today's rooftop units (RTUs) come in many configurations and sizes, and the seasonal start-up tasks cover both the airside of the unit and the refrigeration. On units with outside air dampers and economizers, check linkages and damper operation for mechanical looseness or binding that would prevent smooth operation. Clean or replace air filters to ensure proper airflow to the building. And if required, lubricate fan motor bearings and check for smooth rotation. Always inspect the fan belt and pulley for alignment, tension and excessive wear.

The refrigeration system is the heart of the RTU and it requires attention in several places. First, inspect both the evaporator and condenser coils and clean them, if necessary, with appropriate commercial cleaners. If the condenser coil has fin damage, repair it using the appropriate fin comb. Second, confirm that the unit has the proper refrigerant charge. These two actions are the key to ensuring unit operation at the highest efficiency.

When inspecting the evaporator coil, always remember to clean the condensate drain, as mold and other organic material may have accumulated during unit downtime. Most RTUs will utilize thermostatic expansion valves (TXVs). If the TXVs are adjustable, run the unit and check for proper superheat. On all units, check to make certain the TXV sensing bulb is properly placed and insulated. Larger RTUs, utilizing semi-hermetic compressors, require energizing the crankcase heater several hours before start-up to drive the refrigerant out of the oil and, where sight glasses are provided, confirm proper oil level.



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## Water chillers

When bringing water chillers back online, the seasonal start-up tasks will vary depending on the type of chiller. Air cooled chillers are, in some ways, similar to rooftop units and require the same attention to condenser coil cleanliness, refrigerant charge, and TXV operation. During a visual inspection, be attuned to the clearances around the unit(s), as landscaping, while visually appealing, may be blocking air flow onto or off of the condenser coil.

These relatively routine tasks, however, are only the first step in a comprehensive seasonal start-up of air cooled chillers. While these systems were, at one time, fairly simple reciprocating compressor systems, they are much more complex today. Air cooled chillers can be provided with high speed screw compressors and sophisticated capacity control systems utilizing variable speed drives. Traditional predictive analysis tasks, like oil and refrigerant analysis, are still required and vibration analysis should always be considered. On these sophisticated units, only a highly trained technician, such as one trained by the Original Equipment Manufacturer (OEM), has the necessary skills to collect data, interpret predictive analysis reporting and evaluate chiller variable speed drives.

Seasonal start-up for water cooled chillers will vary based on the type of chiller. Larger water cooled chillers (>200 tons) will typically employ oil return systems to keep the evaporators free of oil. Oil in the evaporator impedes heat transfer and negatively impacts efficiency. So, start by changing the filter drier and inspecting the oil educator on the oil return system. And when the system utilizes screw or centrifugal compressors, be sure to change the oil filter. Energize sump oil heaters for several hours prior to operation. And, since water cooled chillers rely on cooling water from an external source (a cooling tower or river, for example) evaluate the condenser tubes for fouling - both organic and mineral. Remove organic and minor levels of mineral fouling via tube brushing. In more severe cases of mineral scaling, you'll need to acid clean the tubes. Eddy current tube testing is a valuable predictive maintenance tool and should be performed every three-to-five years (depending upon water treatment and operational considerations). Other important predictive maintenance tasks are refrigerant, oil analysis and motor/compressor vibration analysis.

Some water cooled chillers, by the nature of their design, require special start-up consideration. Absorption chillers operate below atmospheric pressure and must be



extremely leak tight. Similarly, so do low-pressure (R11, R123) centrifugal chillers, so it's critical to check for leaks and maintain the purge unit components to ensure reliable operation and long equipment life. Over the past 10-15 years, variable speed drives have become prevalent on centrifugal chillers. These drive and control components are complex and, as discussed earlier, are best addressed during seasonal start-up by highly trained technicians, such as those trained by OEMs.

## Cooling towers and ancillary equipment

Whether you're a building owner, property management company or facility manager, don't ignore cooling towers and other ancillary equipment as you plan your seasonal start-up. Visually inspect the cooling tower fill material, clean the sump and check the distribution spray nozzles to make sure they aren't clogged. And don't forget to ensure tight shut-off of the fill valve, clean the strainers, and adjust the sump "blowdown" frequency and amount to reduce the total dissolved solids in the water. Coordinate these activities with the water treatment vendor to prepare the system for the addition of required biocides and corrosion inhibitors. Condenser and chilled water pumps are our final point of focus; they require lubrication, coupling inspection, and balancing of the flow through the individual systems.

### Evaluate retrofit and energy enhancement opportunities

One additional aspect of a thorough seasonal start-up that should never be ignored is evaluation of energy enhancements and updates or retrofits to increase reliability and uptime. The Spring season still leaves time for variable speed drive retrofits and/or building automation system upgrades like chiller plant automation, condenser water reset, or optimal start/stop that will increase the energy efficiency of your chiller and HVAC system. Qualified contractors will also be able to inform you of software updates and component-obsolescence issues that could negatively impact uptime if an unforeseen failure were to occur during the height of the cooling season.

To fully prepare for the worst-case scenario, Spring is also a great time to make cooling contingency plans. In the wake of an emergency, it might cost as much as \$5,000 to \$20,000 to run piping for a 500-ton back-up system. By pre-installing those same pipes during seasonal start-up, you could save as much as 90 percent of the installation. With stub-outs in place, you'll have the confidence in knowing you can respond to any emergency situation, quickly, any time of year.

**For more information on how Johnson Controls can assist you with your seasonal start-up or any other building technology need, contact your local branch office. Use the branch locator tool at [www.johnsoncontrols.com](http://www.johnsoncontrols.com).**

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### Connect with your chiller equipment

Technological advances now allow for some service providers to have a 24/7 line of sight into the operations of your chiller. Using a secure connection, monitoring can be conducted for alarms, faults and the overall health of your chiller, 24/7/365. If something of concern is discovered, a local technician can be notified, log-in via smartphone, PC or tablet –using a secure connection, and evaluate the situation. This immediate access to trend data allows for better decisions to be made regarding what corrective actions should be taken and when. Catastrophic failures and the resulting costs can be avoided by the ability to detect deteriorating conditions and implement corrective actions sooner.

### Select a skilled seasonal start-up provider

When choosing a partner to provide seasonal start-up or any kind of services to your equipment, take the time to identify vendors who are OEM trained, have national reach and have demonstrated expertise in energy and operational efficiency as well as the latest technological enhancement. By partnering with a top-tier provider, you can reduce risk, increase efficiency, extend the life of your equipment and rest assured during the warmest months of the year.

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