Pre-season air-conditioner system inspections are important because they give HVACR professionals the opportunity to check if the unit is properly functioning, troubleshoot any potential issues and discuss any concerns with the homeowner before they become issues. It is advantageous to sell pre-season maintenance packages in order to prevent air-conditioner emergencies in the midst of a summer heat wave. A thorough inspection should cover several elements.

Outdoor unit inspection
Start by checking the overall condition of the outdoor unit. Residential air-conditioners can really take a beating depending on the climate and where the unit is located. First, conduct a physical inspection for dirt, debris and damage. Are mud, leaves, debris or tree limbs blocking the grills and restricting the air flow? Has the homeowner propped or stacked items up against the unit? Has the unit been dented by falling tree limbs? Does the homeowner have male dogs?

If the answer to any of these questions is yes, further action will need to be taken. Start by cleaning away debris and hosing down the unit to improve its air flow and efficiency. If items have dented the unit, explore further to make sure that the fan blades, motor shaft, capacitor or coil were not compromised. By doing this, a potential problem can be identified before the summer season arrives. Advise the homeowner not to stack furniture, firewood or other items next to the A/C unit. Also, talk to the homeowner about keeping male dogs away from the unit, as urine will react with the aluminum in the coil and completely erode it, requiring replacement of the unit.

Inspection of components
After examining the A/C housing and the surrounding area, take a look at the internal components. A thorough inspection of these items will say a lot about the overall condition of the unit.

Fan blade—Are any of the blades bent or dented? Is the hub on the blade still snug and set screw tight? If you find any issues here, the blade should be replaced. An out-of-
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Be sure to check for any loose wire leads. Some installers used wire ties or zip ties to hold wires in place, but these should be checked for sun wear and replaced if needed.

"A bad capacitor can cause reduced motor speed, causing heat, reduced efficiency and, eventually, motor failure."

Balance blade will cause damage to the bearings on the motor. Vibration can also make the mounts come loose, causing catastrophic failure to the unit. The same is true if the blade comes off the motor while running.

**Capacitor**—Test the capacitor’s microfarad (µF) reading. Does it match the stated µF rating within a range of ±6%? If not, the capacitor should be replaced. A bad capacitor can cause reduced motor speed, causing heat, reduced efficiency and, eventually, motor failure.

**Motor**—When inspecting the motor, there are several particular items to look for:

- **Does the motor have an open condensate drain (weep) hole?** OEM motors should have an open condensate hole or open end bracket to let condensation escape from the motor. Check to make sure debris or dust/dirt have not blocked any of this. Most totally enclosed air over, or TEAO, condenser-fan motor aftermarket replacements are equipped with two drain plugs—one in the shaft end and one in the lead (or opposite shaft) end. Because it is a TEAO motor, the external temperature change causes condensation to form inside the motor. One of these plugs must be removed in the bottom position of the mounting in order to allow the moisture to escape. If both plugs are present, there is a high potential for premature failure.
- **Are the wire leads to the motor hanging loose?** Some installers use wire ties or zip ties to hold the wires in place, but exposure to the sun can cause these to break down and fall off. Loose leads can become tangled in the blade while it is running and result in catastrophic failure. These should be replaced, with the leads secured to the motor and unit.
- **Does the wiring harness leading to the motor have a drip loop in it?** The wiring harness location on the condenser-fan motor should have a drip loop installed. Even though there is a condensate drain, a drip loop helps keep additional moisture out of the motor. The less moisture, the better, and the longer the motor should last.
- **Is the motor mounted securely?** Ensure that the motor is still mounted securely in the unit to avoid potential vibration issues. Loose or damaged mounting can also cause premature failure.
- **If there is a legible nameplate, does the motor work within + (plus) 10% or – (minus) 25% of the nameplate amps?** Ideally the motor should operate within ±10% of nameplate full load amps for efficiency. If the motor is more than 10% over amps, it is possibly an overloaded situation.
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This will cause excessive heat and premature failure. If the motor is below amps by more than 25%, then the motor is underloaded. This motor will also eventually overheat as it is not using all of its potential energy, which turns into heat. This takes longer than an overloaded motor but will eventually lead to the motor failing.

FAQs
When doing PM on commercial or residential equipment, are there any guidelines for checking the condenser-fan motors that will predict if the motor is starting to fail? This is a difficult question to answer, as there are many variables that can impact motor life expectancy. One thing a technician can do is perform a quick review of the bearings. On a sleeve-bearing motor, check for excessive end play, any side play and, by a very slow rotation of the shaft, try to feel for any high spots (any sign of binding) during rotation. A ball-bearing motor should not have any end play and no side play at all. A very slow rotation of the shaft could reveal binding or a rough feeling. If these conditions exist in the installed-sleeve or ball-bearing motor, then the bearings are worn and the motor should be replaced.

Will testing the resistance of the windings and taking a reading indicate how long the motor might last? This is a question I am asked a lot by technicians trying to eliminate some calls during the heat of the summer. Testing the resistance in the winding is also known as an insulation resistance test (IRT). This process involves record keeping over an extended period of time and it is not often practical in residential applications. An IRT is more suited to use in commercial applications. However, due to the amount of time involved in the process, it may not deliver a “cost vs. return” in terms of time and record keeping compared to just replacing the motor when it fails.

In order to perform an IRT, the technician will need a good megohmeter with a time-test feature. Every motor has different resistance parameters, but if the tech is servicing a unit, a resistance test can be performed. Test the motor before starting (cold) and record that measurement, then take a reading after five minutes of running (hot) and record that measurement. Repeat this process the same way each time PM is performed. Compare the results, paying attention to the rate of decline in the resistance—also known as “current leakage rate.” This basically shows how the insulation is holding up within the motor. A slow degradation in current leakage is natural and happens over time with the operation.
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of the motor in the elements. However, any large changes in current leakage may indicate that the breakdown of insulation in the windings will lead to an increase in temperature within the motor. This can be helpful in indicating that the motor is heading to failure, but still is not an absolute predictor.

A preventive maintenance schedule can help improve the efficient operation of the equipment and help prolong life. However, predicting component failure is still an “educated guess.” Many other factors, such as voltage spikes, can take out several of the mentioned components. Using the observation, testing techniques and homeowner discussions described in this article can help reduce the chances of component failure in the hot summer months. (More)

Darryl Roberson is a Regional Sales Manager with Regal Beloit Corp. He has more than 20 years experience in the motor industry, including work for both wholesalers and manufacturers. He was a guest instructor/speaker at the 2013 HVACR & Mechanical Conference for Education Professionals in Colorado Springs, CO. For more information, e-mail darryl.roberson@regalbeloit.com or visit www.thedealertoolbox.com.

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**The Summer’s Highest Rated Air Conditioners**

**Compiled by Jordan Brandes**

As an HVACR technician, one has to be there to not only service but also give advice. With summer almost here, customers will want to know about some of the top-rated air-conditioning units on the market.

**Consumer Reports**—According to Consumer Reports, these air-conditioning units were made to be both reliable and economical for the consumer. Though they vary in size from small to heavy duty none of them will put a strain on finances.

- Frigidaire LRA067AT7/Frigidaire FRA054XT7
- Sharp AF-S85RX
- LG LW8010ER/LG LW1210ER
- Frigidaire FRA106CV1

To read the full report visit: http://news.consumerreports.org/home/2013/05/best-air-conditioner-buys-for-the-hot-summer-ahead.html.

**Energy Star**—The EPA’s Energy Star program prides itself on finding the most efficient products on the market today. The units below represent the organization’s 2013 Most Efficient cooling products.

- Broan FS4BI/FT4BI Series with iQ Drive Control
- Bryant 280ANV Evolution Extreme Series with Evolution Connex Control
- Carrier 25VNA Infinity Series with Infinity Touch Control
- Coleman Echelon Series with Touch Screen Communicating Control
- Dave Lennox Signature® Collection with iComfort Touch Control
- Fraser-Johnston Premium Series with Touch Screen Communicating Control
- Frigidaire FS4BI/FT4BI Series with iQ Drive Control
- Fujitsu RLFCC/RLFW/RLS2Series with Inverter Control
- LG LSU/LSN Series with Comfort Alert Control
- Luxaire Acclimate Series with Touch Screen Communicating Control
- Maytag PSA4BI/PSH4BI Series with iQ Drive Control
- Mitsubishi Electric Heating and Cooling M-Series
- Nutone FS4BI/FT4BI Series with iQ Drive Control
- Rheem Prestige Series with Comfort Control2 System
- Rudd UASL Series with Comfort Control2 System
- Tappan FS4BI/FT4BI Series with iQ Drive Control
- Westinghouse FS4BI/FT4BI Series with iQ Drive Control
- York Affinity Series with Touch Screen Communicating Control

To read the full article visit: http://www.energystar.gov/index.cfm?c=most_efficient.me_cac_ashp.

Being prepared for any situation that may arise is one of the best tools in an HVAC technician’s toolbox. Always cater to the customer’s economical and efficiency needs before the need for troubleshooting arises.
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