

Higher SEER Replacement Air Conditioning Systems...

What savvy property managers, building engineers and building owners will want to know when older package or split system air conditioners and heat pump systems need to be replaced.

By Mark Strahan



It is not unusual to find package and split system air conditioning units in the Phoenix market that have been in use since the 1970's or 1980's. Because the average life expectancy of this type of HVAC equipment is around twelve to fifteen years, it is high time to retire some of these tired old workhorses.

An added bonus when you replace older air conditioning systems can be a significant increase in energy efficiency with an accompanying decrease in energy costs. With the amount of discussion we have been hearing in the news lately urging all of us to be green and save energy that is probably not going to be an unwelcome consequence.

Along with the good news of energy savings there are also some considerations that the competent air conditioning contractor will make you aware of when it is time to replace older equipment. I would like to share a few of them with you. First let's discuss split system heat pumps and then briefly cover things that are common to both package units and split systems.

As SEER (Seasonal Energy Efficiency Ratio) ratings for new air conditioning equipment have increased, HVAC industry practices that have been marginal in the past will no longer be acceptable. One of those unacceptable practices occurred whenever split system heat pump condensing units were replaced. The common practice in the past was to replace the heat pump condensing unit without first verifying that the new condensing unit was compatible with the old air handler. Several problems may arise whenever there is a mismatch between the condenser and the indoor air handler.

The first problem is the reduced efficiency that will result from replacing an older condensing unit without replacing the air handler at the same time. The reason for this is that air conditioning manufacturers do not rate current model heat pump condensing units with "antique" air handlers that are twenty years old. To achieve the published SEER, a heat pump condensing unit must be matched with an indoor air handler or fan coil unit that it has been rated with. In other words, if you install a new 13 SEER condensing unit with an old 8 or 9 SEER air handler, the actual efficiency achieved will be less than 13 SEER.

A second concern is there can be a mismatch of the internal coil volumes between an older air handler and a newer condensing unit. As minimum SEER mandates have required increased efficiencies over the years, manufacturers have made enhancements to both the indoor and outdoor coils in order to increase heat transfer efficiencies. Newer condensing units may have a different internal coil volume than some of their antique counterparts. If a new heat pump condensing unit is installed on an old air handler it may result in improper operation in either the heating or the cooling mode that will require seasonal refrigerant charge adjustments and unnecessarily increase service costs. It can also contribute to system reliability issues.

A third issue we are all facing is the difference in the characteristics of the refrigerants and compressor lubricants that are being used in the new systems. Since new air conditioning equipment using R22 refrigerant cannot be manufactured after 2010, the leading manufacturers have already started making newer high efficiency models utilizing R410a refrigerant and polyolester (POE) oils. The new refrigerant has properties that are very different than the R22 that has been the primary refrigerant for split system and package air conditioning systems for decades. In short, R410a is not compatible with the refrigerant flow control devices in the older air handlers that were designed for R22. Even if the flow control device could be changed, there may also be

issues that could develop over time if the original mineral oils are not adequately cleaned from the system.

A fourth consideration is the refrigerant line size. The new high efficiency R22 condensing units often require larger diameter vapor lines than those that were originally installed with the old system. It may not be economically feasible to replace the vapor lines, so there will be losses in efficiency as a result of the increased refrigerant pressure drop in the smaller than recommended vapor line. One possible solution to resolve this issue would be to install a new R410a split system condensing unit and a new R410a air handler. Since R410a generally requires smaller vapor lines than R22, it would allow the use of the existing smaller vapor lines. Recommended procedures for removing residual mineral oil from the existing lines would have to be observed if the conversion to R410a was implemented.

When all of the above factors are taken into consideration, it becomes clearer that the very best course of action is to replace the indoor unit along with the heat pump condensing unit. While this is more expensive up front, it can help avoid significant downstream issues later.

Now that we have discussed issues unique to split system replacements, let's consider some factors that are common to both package units and split systems.

One issue that is common to both package units and split systems in higher SEER products is reduced cooling capacity at higher outdoor temperatures. This can be verified by checking manufacturer's ratings for the old air conditioning system and the new air conditioning system at outdoor temperatures above 100 degrees. The newer high efficiency systems generally tend to lose sensible cooling capacity more quickly than the lower efficiency units that were manufactured in the past. This is an important factor when evaluating an existing system that is doing only a marginal job of cooling the space it serves. A new system may have to be larger in capacity to produce the desired cooling effect at the higher outdoor temperatures we see in Arizona. There is a caveat with this also. You don't want the replacement system to be grossly oversized either or it will not perform as intended.

Another thing you will notice is that many of the newer systems have larger cabinets than the older style units. The larger cabinet size can become an issue in confined areas. Since minimum clearances must be maintained, a new system may not fit where the old system was installed. This consideration will be unique to each specific application, but you should be aware of it so you don't get an unpleasant surprise.

One last item to be aware of regarding both package or split system replacements is the significant difference in equipment costs. Higher efficiency comes with a higher price tag. Based on one leading manufacturer's pricing for a 5 ton package heat pump, the jump from 10 SEER to 13 SEER comes with more than a 30% differential in price. If it has been a while since you have replaced an air conditioning system, you may have "sticker shock". Material price increases along with the use of advanced technologies like variable speed compressors, dual compressors or unloading scroll compressors along with variable speed fan motors and enhanced control systems all contribute to higher equipment costs. Keeping this in mind when you are projecting future costs for HVAC equipment replacement can help you develop more accurate replacement budgets.

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