Should I Upgrade My Air Conditioning Unit?

ADVICE FROM AN ENGINEER

- We would like to give you as much information as possible to enable you to make an informed choice.
- We would like to detail why installing an ACES makes sense and what can and can not be achieved.

Air conditioning is a major consumer of electrical power

In many of the warmer countries around the world air conditioning is one of the largest energy consumers in the residential and industrial sector. On a small scale air conditioning accounts for a large part of home and business owners' energy bills. Millions of simple air conditioning units waste unbelievable amounts of energy every day. Not only is the absolute power demand for air conditioning very high, but air conditioning also contributes to extreme peak energy demand on the hottest days of the year which the energy infrastructure has to cope with.

Yesterday's air-con technology will be around for many years

Our advice to any owner of a low efficiency window unit or single split system is "Replace your entire old system today and buy a new ultra-high efficiency system. Make sure it is dimensioned properly, that it is HCFC free and that it uses the most advanced compressor and control technology!"

No matter how desirable this kind of change is, reality is different!

There are millions of older systems in use. In 2001 the Intergovernmental Panel on Climate Change (IPCC) estimated that worldwide a total of over 289 million window/wall mounted units and un-ducted single split systems were in use. In addition, an increasing number of these types of systems is installed every year. In 2001 only for the mentioned types of systems this number was estimated to be almost 38 million, many of them still being low and mid efficiency units. The most efficient new air conditioning systems are simply too expensive for many applications and payback time is still too long. Besides, many countries still have not adopted high-efficiency standards for new systems.

So these simple units will be operating on a large scale for many years to come. They will not just go away. Nor will they be replaced quickly. Average equipment lifetime is typically twelve to fifteen years and in many cases much longer. However, usually these units are not considered for retrofits. Controller manufacturers usually prefer to focus on very large system where even small improvements can be sold for high prices.

Solution: Bridging the gap with a cost effective retrofit

We think that retrofitting these smaller units makes a lot of sense in terms of overall reduced energy usage and reduced operating costs. Retrofitting with the ACES can bridge the gap and lower energy consumption considerably until new high efficiency system become more widespread. The ACES has been designed as an affordable and practical device with short payback times.

Savings mechanism of the ACES

As engineers we do not believe in miracles and we are sure you don't, either. When we began designing a controller specifically for retrofit purposes, we conducted a lot of research and experimented with various principles (more details here). We also came across all sorts of "unique" devices and "black boxes" that claim fantastic energy savings.

Over time we became deeply persuaded that the most effective and practical method to create significant savings with the smallest trade-off's in cooling comfort is to determine the system's current thermodynamic efficiency and switch the compressor off, when it is evidently inefficient. This is logical since the compressor typically accounts for 80% of the system's energy consumption. This, in combination with protecting the compressor against potentially harmful short cycling led to the ACES. We think that out of all retrofit solutions and out of all proposed cycling methods this is the most effective with the smallest costs in cooling comfort.

Limitations of any retrofit

No retrofit will do miracles. With a given system there is always a limit to the possible improvements in energy efficiency. A number of factors are fixed such as the type and efficiency of the refrigerant in the system. Other factors can be optimized such as the runtime of the compressor. A retrofit will not remedy major planning mistakes or technical faults in your system.

Potential trade-off's of installing an ACES

Installing an ACES can slightly alter the cooling characteristics of your system. With an ACES installed, inefficient overcooling is avoided. This is desired, since a lot of energy is wasted in this stage, but it may result in slightly higher average evaporator coil temperatures since the savings algorithm also provides an anti short cycling protection for your system.

In consequence this may have two effects. Firstly, the set point may be reached slightly slower without the wasteful overcooling. However, overshoot of the set temperature is reduced as well. Cooling cycles become more gradual. This is often considered very beneficial in terms of cooling comfort by residents.

Secondly, the dehumidification capacity of your your system may decrease slightly. In extremely wet climates this can potentially be a drawback. On the other hand, many customers have reported that the ACES has increased cooling comfort because a certain degree of humidity contributes to the subjective well-being in a room. There are various simple air conditioning units that by overcooling male the room air excessively dry.

In relation to the benefits, we consider these potential drawbacks as minor for a wide range of applications. Numerous case studies and independent measurement have demonstrated that these changes - although measurable - have very little impact on the overall cooling performance.

What the ACES can achieve

An ACES will improve the overall energy efficiency of your system. Typical energy savings are up to 30%. Generally these savings come at very small, hardly noticeable decreases in cooling comfort. It uses the the circuitry and switches available in (and designed for) your system and does not require replacement of electronic components. The ACES just adds one control dimension (thermodynamic saturation) to your system and compensates your system's deficits.

Overall assessment

Weighing the potential small trade-off's against the significant energy savings, we think that the ACES is the optimum measure for achieving a significant improvement in energy efficiency. Furthermore, these savings come at an affordable and reasonable cost which will result in a short payback period.