Delivered Efficiency of the Unico Small-Duct High-Velocity Heating and Cooling System

What good is your high-efficiency air-conditioner or heat-pump if the energy is lost before it reaches its destination?

All air-conditioners and heat pumps have an energy label and rating based on laboratory simulations. For air conditioners this rating is called the S.E.E.R. (Seasonal Energy Efficiency Rating) and for heat pumps it is called the H.S.P.F. (Heating Seasonal Performance Factor) These ratings are great for comparing similar systems but should not be used to estimate your energy usage or to compare different types of systems. To do this, you need to determine the "delivered" efficiency of the entire system connected to your air conditioner or heat pump. When you do that you will find that the Unico small-duct high-velocity (SDHV) system is the best choice for not only delivered efficiency but also for comfort.

Delivered Efficiency

HVAC equipment is like the engine of the car. It uses energy to create something useful. In the case of an air-conditioner or heat pump it "conditions" the air. Likewise, the entire car is like your home and taking this analogy one step further, the delivered efficiency is like miles per gallon. It doesn't make much sense to put a highly efficient 4-cylinder engine inside of a mid-sized car. The same thing applies with an air-conditioner. To get the most out of your air-conditioner, i.e. energy efficiency, you must consider the following:

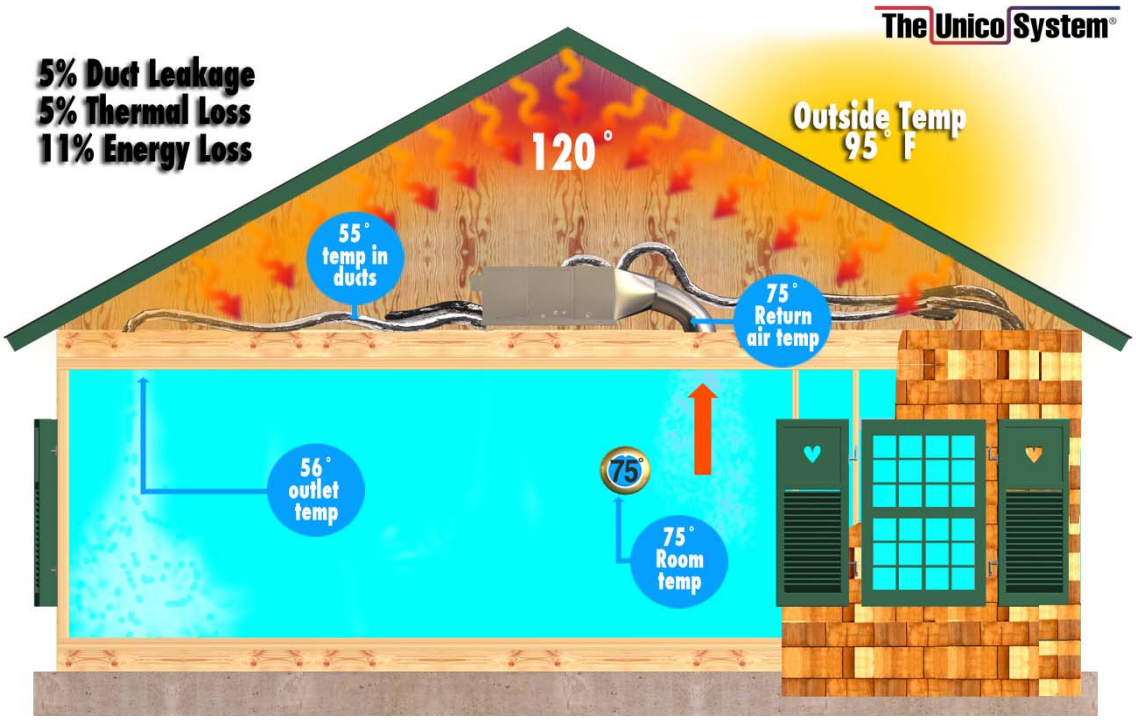
- **Equipment location.** It is always best to locate the air-conditioner and ducting inside the insulated portion of house. This isn't always possible so you need to make sure the duct system is as efficient as possible, as with the Unico system, which boasts less than 5% duct leakage.
- **Equipment efficiency.** Like the engine this is where it starts. Choose the highest efficiency equipment that does the job – heats and cools effectively, dehumidifies effectively, and is sized properly for your house. Because Unico has superior delivered efficiency, the Unico System has a separate rating and standard compared to conventional systems.
- **Duct location.** Just like the equipment, it is best to install the duct inside the house. Hands down, the Unico SDHV makes this much more likely - because the Unico SDHV duct work takes up 1/3 the space of a conventional duct system.
- **Duct efficiency.** Like equipment, duct work has its own efficiency. Heat can leak through the walls of the duct and air can leak through its seams. In either case, the Unico SDHV system is far superior to a conventional system. Insulation and size determine the "heat leakage". Workmanship and design determine the "air leakage". There is no getting around this fact. The Unico SDHV ductwork has 1/3 the surface area of conventional ducting so right from the beginning before it is even installed it has 1/3 less heat leakage. In the case of air leakage, the Unico SDHV system is engineered for simplicity and air tightness. There are only three basic duct sizes which are factory insulated and use custom made easily installed gasket connectors. You have to work hard to make a mistake.
- **Usage.** It needs to be stated that the delivered efficiency of an air conditioning and heat pump system depends on the application. First, it must provide comfort. The Unico SDHV air distribution is superior in that it minimizes drafts and provides even air temperatures throughout the living space. For hot humid climates it has the added bonus of superior humidity removal. This alone can make your system more efficient by allowing you to operate the cooling system at a higher temperature because it delivers a lower humidity.

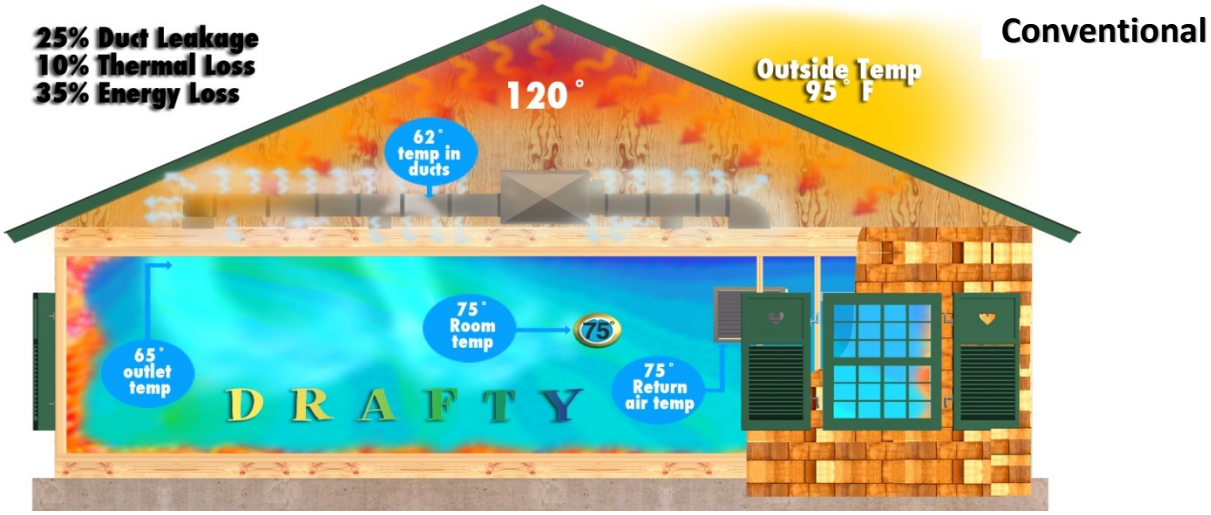
Equipment Efficiency of Small Duct Systems

The Unico Small Duct High Velocity HVAC system operates differently from conventional systems. The Unico SDHV system is a pressurized, sealed system which minimizes duct leakage. Recognizing this fact, the U.S. Department of Energy has created a separate test standard and efficiency rating for this product

Comfort

The Unico System has a greater temperature reduction effect as air passes more slowly over a larger coil than with a conventional unit, resulting in 30% greater moisture removal than conventional systems, allowing for greater comfort at higher thermostat settings. When cooling the average home, for every degree higher you set your thermostat the result is a 2% energy savings. For example, with Unico, you can keep your thermostat setting at 75, which will feel like 72, and give you 6% energy savings.





Accessories Matter: Another aspect is the effect that high efficiency filters, UV lights, and electric heaters have on the efficiency of air conditioning systems. These are all very popular options but they all have one thing in common, they add friction and force the fans to consume more energy. This is very similar to an undersized duct except this occurs even if the duct system is perfect. When these devices are added to a system the effect is more strongly felt by a conventional system because the relative increase is substantial. A high efficiency filter can easily double the blower pressure for a conventional duct system; whereas, the same filter in a small duct system might only increase the relative blower pressure by 10%, hardly a noticeable effect.

Real world comparison between Unico and conventional system efficiencies

Remember, The Unico Small Duct, High Velocity HVAC system operates differently from conventional systems. Recognizing this, the U.S. Department of Energy has created a separate test standard and efficiency rating for this product.

The SEER rating is based on equipment-only not connected to a ductwork distribution system. It is a simple formula; **BTU divided by Watts equals SEER**

Here is a look at what the actual efficiencies are of a conventional versus Unico systems if you take actual jobsite conditions into effect (duct air leakage into the building and thermal losses from duct work run in hot attics)

If we put a 13 SEER on both systems, how efficient are they? How much energy is actually delivered to the building? What did the customer actually get?

Let us compare a conventional system to a Unico SDHV matched to the same outdoor condensing unit. In this example, the outdoor unit is a nominal 5-ton condenser and the duct work is installed in an attic. The building load is 40,000 Btu/hr.

Unico SDHV System

The system is rated at 49,000 Btu/hr at 11 SEER.

Unico SDHV duct efficiency is 0.85[2].

The equipment load is 47,000 Btu/hr (= 40,000 ÷ 0.85). Again, this is smaller than the equipment capacity so the run time would only be 96% of the time (= 47000 ÷ 49000).

The Unico system power usage is 4276 Watts per hour (= 49000 ÷ 11 × 0.96).

The Unico SDHV system is more efficient.

And if the Unico SDHV ducts are inside the conditioned space, you can downsize the condenser and save even more, up to **20% more!**

Conventional System

The equipment is rated at 57,000 Btu/hr and 13 SEER.

The duct efficiency is 0.70[1].

The required equipment load is actually higher because of the duct leakage and thermal losses. It is 57,150 Btu/hr (= 40,000 divided by 0.70). This is close enough to the actual equipment capacity.

The power usage is 4385 Watts per hour (= 57,000 divided by 13.00).

[2] Unico systems have a duct efficiency of 85% (* Oak Ridge Labs/ASHRAE)

[1] Conventional systems have a duct efficiency of 60-70% (* Oak Ridge Labs/ASHRAE)