EVERYTHING YOU NEED TO KNOW ABOUT

AIR SOURCE HEAT PUMPS

MICHAEL CAPPUCCIO

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INTRODUCTION

A heat pump, also known as a ductless HVAC system, warms your home by moving warm air from the outside to the inside of your home.

In the winter, the heat pump takes refrigerant and moves it through an expansion valve. At that point, the gas becomes much colder than the outside air, and as a result, any heat that is in the outside air gets absorbed by the refrigerant.

Then, the warmed refrigerant travels into your home. When it gets to your air handling units, the units blow air over the warm refrigerant and that warm air is released into your home.

Cooling with a heat pump is basically the reverse process. The refrigerant absorbs warm air from your home. Then, it carries that air outside and releases it. When the refrigerant returns inside to your indoor air handling units, it is cold.

When air runs over the coils holding the refrigerant, the air cools down and in turn makes your home cooler.

On average, families save 30% to 40% on their heating and cooling bills when they switch to ductless systems. In this book, we'll explain more about what an air source heat pump is, how it works, how to choose one, and more.

FROM THE DESK OF MICHAEL CAPPUCCIO

Air source heat pumps are the future of heating and cooling technology, especially as climate change continues to worsen and people are looking for greener, more energy-efficient heating and air conditioning options.

Not only is an air source heat pump a more affordable way to heat and cool your home both during the winter and summer, it also creates a smaller carbon footprint. A single system does the work of both a separate heater and air conditioner, keeping your home comfortable without any hot or cold spots.

Deciding to upgrade your home's HVAC system to an air source heat pump is an important decision that requires thought, research, and care.

I hope you enjoy reading and get the information you need to make smart decisions about heating and cooling your home with heat pumps.

Sincerely,

Michael Cappuccio

Michael Cappuccio

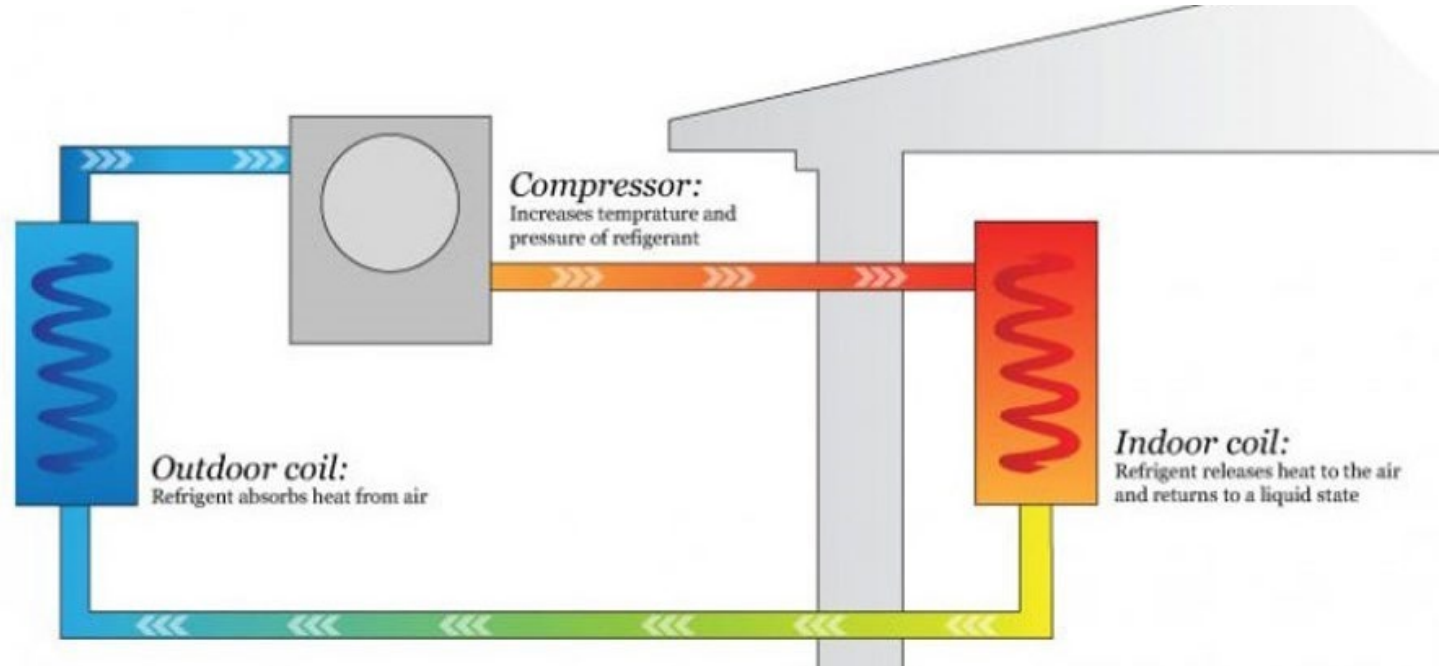
CHAPTER 1: WHAT IS A HEAT PUMP AND HOW DOES IT WORK?

An air source heat pump is a kind of heating and cooling system that uses the same external heat exchange and vapor-compression refrigeration process as traditional air conditioners to remove heat from a colder location and discharge it into a warmer location.

In the summer, an air source heat pump acts as an air conditioner, pumping warm air outside. Then in the winter, the same system uses the reversing valve to pump warm air inside.

Instead of using separate heating and air conditioning sources, like baseboard heating and window unit air conditioners, air source heat pumps allow you to use the same efficient system for both.

Basic Refrigeration 101

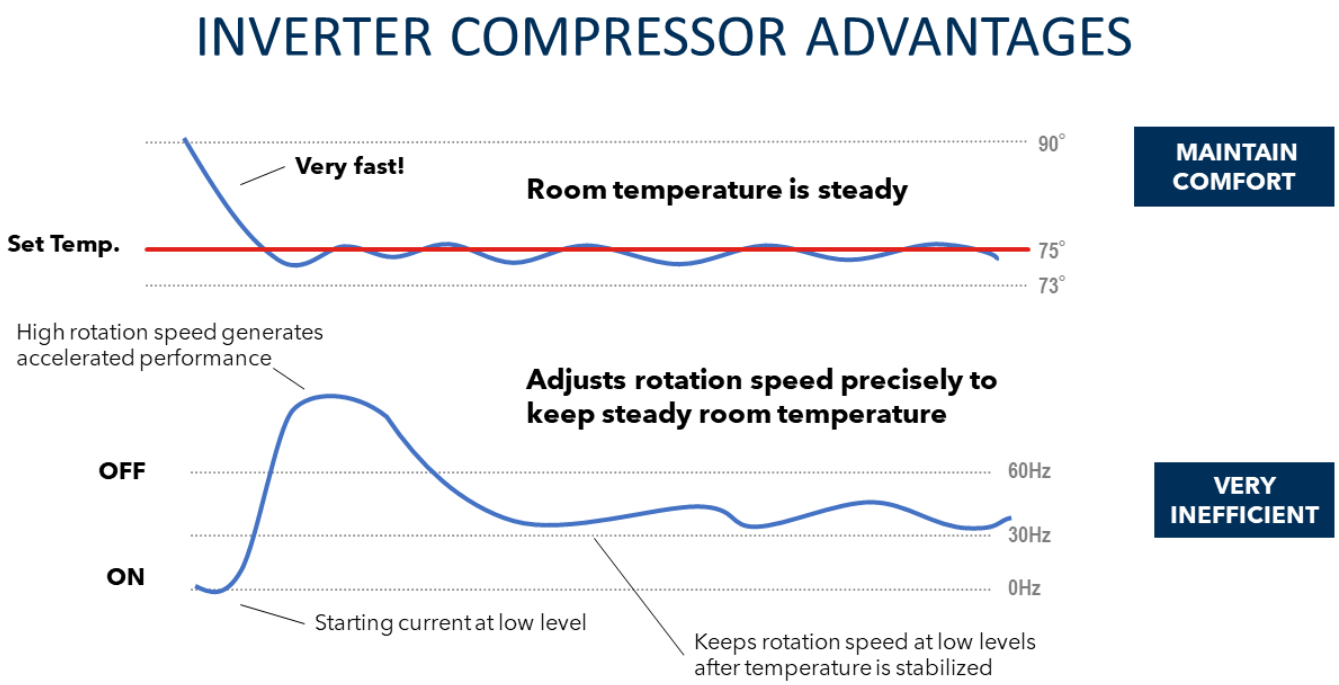


The process of air-conditioning is dictated by simple physics.

Through the evaporation process heat is absorbed by the aluminum fan coil in the indoor evaporator unit and is removed from the room by the gaseous refrigerant. The heated refrigerant (pressured by the compressor) flows into the outdoor unit's aluminum coils.

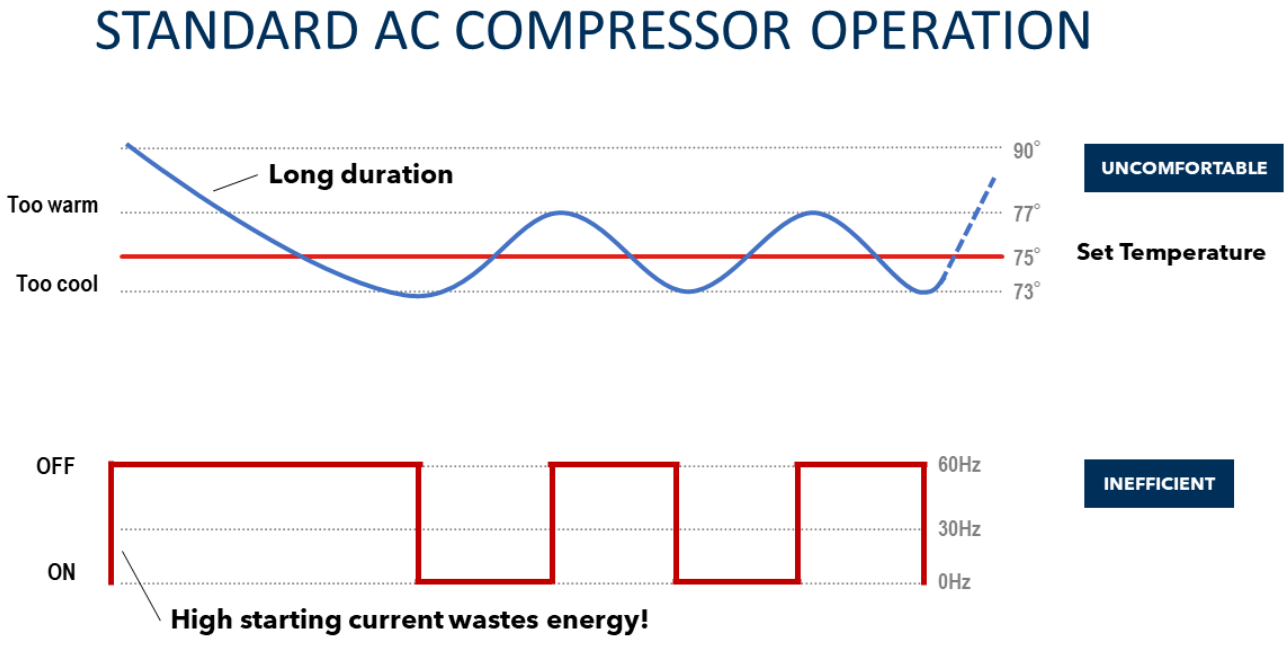
Here, a large fan blows across this coil to discharge the heat energy. The liquid refrigerant is cooled by this process and is cycled back to the indoor unit, where a fan blows across it and distributes the cool air into the room.

Standard AC Compressors vs. Inverter Compressors



Standard air conditioning compressors operate by turning on when the thermostat says it's too warm in the house. Then, when the temperature gets down to the set point of the thermostat, the compressor shuts off.

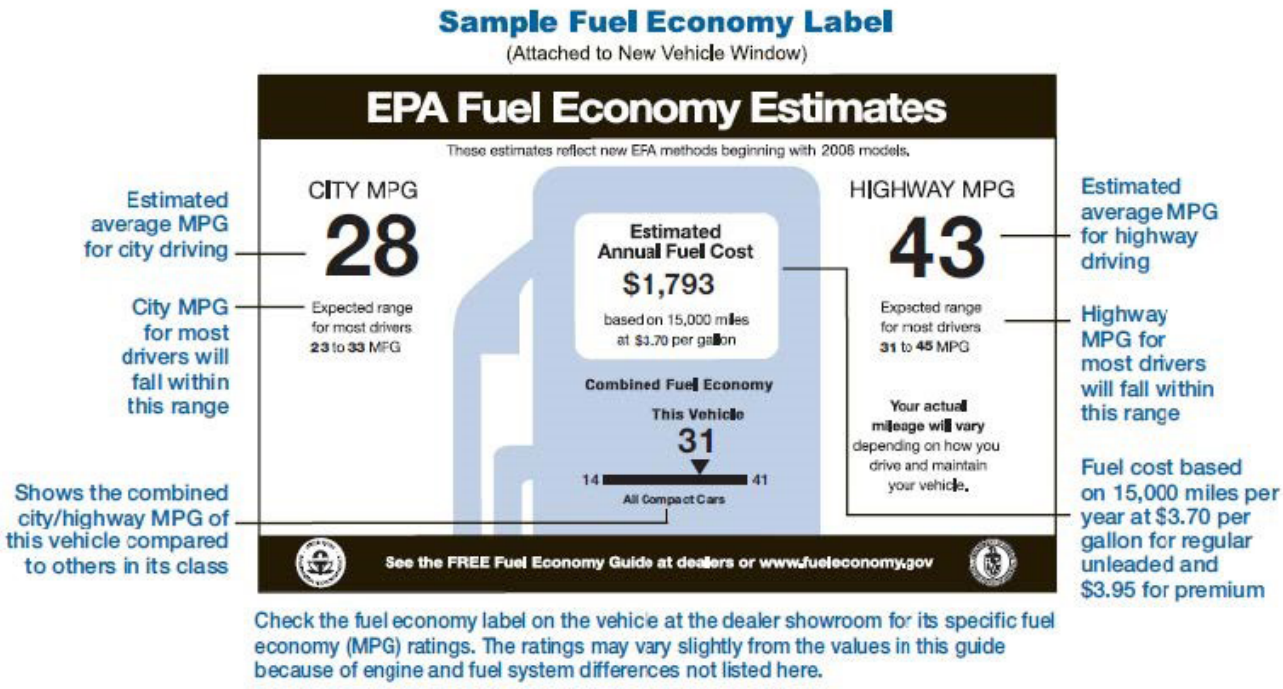
Again, the temperature rises, so the compressor comes on. When it dips once again, the compressor shuts off, creating an inefficient on/off cycle.



A window unit air conditioner that you'd have in your home does the same thing. You might be watching TV and the unit running quietly with just the fan. Then, all of a sudden, the compressor comes on and starts to cycle on and off.

Not only is this highly inefficient, but it also typically doesn't maintain comfort well either. For example, you might have a lot of hot and cold spots throughout the areas of your home.

It's very similar to highway versus city driving in your vehicle. When you're driving in the city and you're hitting stoplights and accelerating and decelerating, it's highly inefficient and you end up using a lot of gas that way.



Check the fuel economy label on the vehicle at the dealer showroom for its specific fuel economy (MPG) ratings. The ratings may vary slightly from the values in this guide because of engine and fuel system differences not listed here.

This is similar to older types of air conditioners that cycle on and off, using a lot of electricity in the process.

When you get out onto the freeway and are able to drive at a nice, smooth, smooth speed, you tend to get the best gas mileage. You're not starting and stopping like with city driving. If you're able to set your cruise control and keep your vehicle at a steady pace, you get better gas mileage.

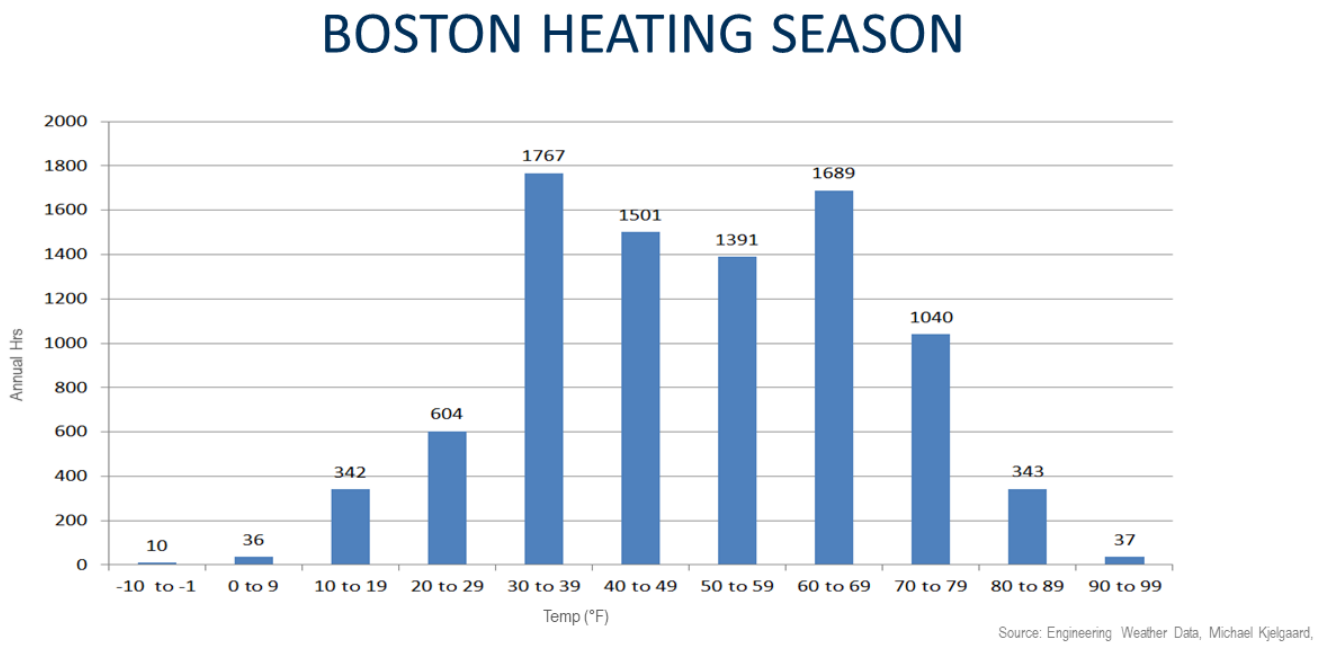
In the case of air source heat pumps with inverter compressors, you maximize the amount heating and cooling you get out of the electricity you're using.

Boston Heating Season

Air source heat pumps are incredibly efficient, particularly for the Boston heating season. For example, there are thousands of hours above 20 degrees Fahrenheit. The number of days that reach 19 degrees and below for a whole entire heating season, however, is actually less than 400 hours annually.

Alternatively, the number of days over 90 degrees Fahrenheit during the Boston cooling season is just a few days. This means it's important to have a heating and cooling system capable of doing both effectively and can work most efficiently in mid-range temperatures.

During the heating season, the "sweet spot" for maximum heating efficiency is an outdoor temperature of between 20- and 50-degrees Fahrenheit. During the cooling season, heat pumps operate at max efficiency when the outdoor temperature is 80 to 90 degrees with 70 to 80% humidity.



Cost of Air Source Heat Pumps vs. Fossil Fuels

Before deciding on an air source heat pump, you should compare the cost of heating your home with a pump or using fossil fuels like oil heat.

To do this, you need to make sure that the system is sized properly. This includes doing things like obtaining an accurate load calculation on the home, knowing what kind of windows are in the home, and what type of insulation is being used. If you are planning on upgrades, this is a significant factor when sizing the heat pump for BTUs.

For example, an older home might use 20 BTUs of energy per square foot of heating in the space. Newer homes, however, that have been built with spray foam and triple pane windows, might only use 4 to 5 BTUs per square foot.

When you start to evaluate the cost of energy use, you should be looking at the cost of an air source heat pump versus the cost of oil heating, gas heating, and electric resistance heat. For example, the average for electric resistance heat is approximately $50 to $55 per cost per million BTUs.

Oil heat, in comparison, is $30 per cost per million BTUs and propane is around $40 per cost per million BTUs. Gas heat is cheaper at around $15 to $16 per cost per million BTU.

With an air source heat pump, the cost per million BTUs is calculated a little differently. This is necessary because the compressor speeds up and slows down as the temperatures change.

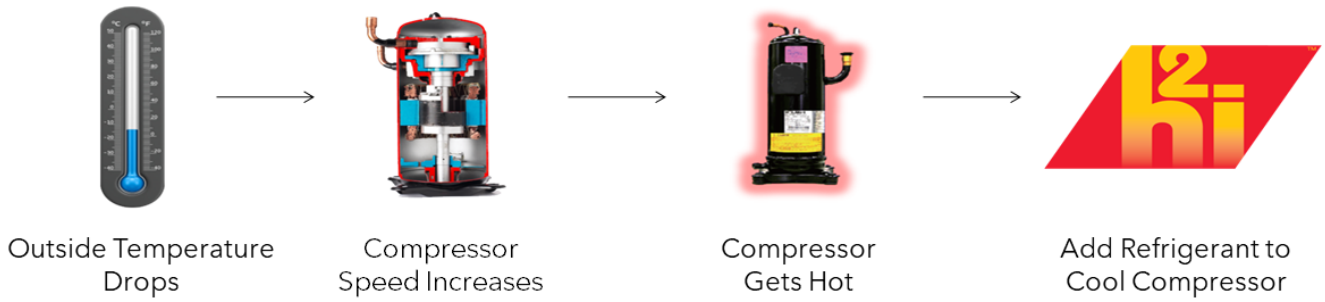
The per cost per million BTUs of an air source heat pump is just $13 at a 45-degree temperature outside and roughly $26 to $27 on a zero-degree day. On average, it's just as efficient to heat your home with an air source heat pump as it is to heat with gas.

Many people prefer natural gas heating, but it's important to remember what you're putting in the air when you're running a gas furnace too. Gas heating puts a lot of carbon into the air, which impacts climate change and is something we're trying to move away from globally.

Currently, air source heat pumps are the most planet-friendly way to heat and cool your home.

H2i Hyper Heat

Hyper Heat by Mitsubishi Electric has been on the market for about 6-7 years. This technology allows the compressor to speed up when the outdoor temperature drops, raising the temperature of the refrigerant. Then, it adds the refrigerant to cool the compressor down.



This superheated refrigerant is being added into the system's evaporator coil inside the home. This allows the air source heat pump to maintain consistent indoor temperatures despite brutal outdoor temperatures.

In the past, heat pumps were seen as inferior because the old technology meant that they were unable to heat as efficiently when the temperatures outside got too cold. For example, a unit may be 100% efficient at 5 degrees Fahrenheit.

This means that at 5 degrees outdoor ambient temperature, an 18,000-BTU heat pump could produce 18,000 BTUs of heat.

However, in the above example, if the outdoor temperature were to drop down to say -5 degrees, that heat pump might only give you 12,000 BTUs of heat.

Newer air source heat pumps with Hyper Heat technology allows these units to maintain 100% efficiency, even at below zero temperatures. The best way to think of this is to compare it to an ice cream scoop with a heat exchange liquid built in.

The scoop can remain warm enough to easily go through rock-hard ice cream, due to the phase-changing liquid in the handle- a kind of "anti-freeze." The same principle allows Mitsubishi Electric's Hyper Heat system to still extract heat out of the air and warm your home, even when temperatures drop well below the range where most heat pumps simply give up.

Hyper Heat kicks in when the compressor motor is signaled that a burst of heat is required. The motor revs up to max speed and the system funnels the additional heat thrown off the compressor magnets back to your blower, super charging your heat output and quickly responding to the dropping temperature outside.

These Hyper Heat systems can cool your home in the summer as well, by reversing the heating process, that is, removing heat and humidity from your indoor environment and piping that excess heat outside.

The other benefit of systems like Hyper Heat is that they can be installed either to work with an existing heating duct system, boosting efficiency, or as a “space heater” in areas that do not have or have room for traditional ductwork.

If you live in a home with hard to heat spaces, like finished basements, garage workshops, additions, bonus rooms over a garage, or anywhere where you might consider a space heater, an air source heat pump might be just the solution you are looking for.

It can even turn your “three season porch” into a full year-round space for the whole family.

Understanding Important Acronyms

Here's a breakdown of some of the important acronyms you might hear in reference to air source heat pumps:

SEER (Seasonal Energy Efficiency Ratio)

The SEER rating is the cooling output during a typical cooling season, and it's the energy output of what the machine operates at.

In the United States, the lowest number you can possibly get on the market right now is 13, or essentially the bare minimum. Thirteen is the least inefficient piece of equipment you can buy.

In the past, window unit air conditioners could be as low as 8 or 10, but the Department of Energy has placed a regulatory minimum on SEER ratings, requiring them to be at least 13. The SEER rating on a window unit is so low for several reasons:

- Window units lack inverter-driven compressors
- They turn on and off.
- They often run on a 115-volt plug, taking up an entire outlet and window
- They consume a lot of electricity

In regard to SEER ratings, the higher the better. Ductless air source heat pumps with inverter-driven systems have excellent energy efficiency and can have SEER ratings as high as 50.

EER (Energy Efficiency Ratio)

The efficiency of a room air conditioner is also measured by EER, or the Energy Efficiency Ratio.

According to the Department of Energy, the EER is the ratio of the cooling capacity in BTUs to the power input, which is measured in watts. The higher the EER rating, the more efficient the air conditioner.

HSPF (Heating Seasonal Performance Factor)

The SEER and EER ratings of an air source heat pump have more to do with the unit's cooling efficiency. Another important acronym to understand is HSPF, or the Heating Seasonal Performance Factor.

HSPF is the ratio of heat energy delivered, versus the energy supplied and is a critical number to consider when using a heat pump as your primary source of home heat. Again, the higher the rating, the better the unit is able to utilize the energy supplied to put out maximum heat.

In regard to Mass Save rebates, the HSP is an important rating. Heat pumps with ratings as low as 7 or 8 are simply not energy efficient. They will cost more to operate to heat your home and are harder on the environment.

COP (Co-Efficiency Performance)

COP, or Co-Efficiency of Performance, is the relationship between the amount of energy put out by the heat pump, measured in kilowatts, compared to the amount of power that is supplied to it.

It's similar to HSPF but is an indicator of the efficiency of both the heating and cooling capabilities of a particular unit.

Comparing Decibel Levels

Another issue to consider is how loud different heating and cooling options are. For example, a window air conditioning unit is extremely loud.

It's often one of the biggest complaints from customers switching to an air source heat pump; they hate how loud the unit is when it's on and how they have to turn up the volume on the television to hear, only to turn it back down again when the unit cycles off.

In regard to sound, everything is measured in decibels, or dB. The sound of using a push lawnmower to mow grass is roughly 90 dB. A blow dryer for hair is only slightly quieter, at 80 dB.

Normal conversation with another person is approximately 50 dB and a human whisper is around 30 dB.

In comparison, the indoor air handling units on an air source heat pump system that are mounted inside the home run anywhere from 19 dB to around 45 dB at max capacity with the high-speed fan on.

A regular window air conditioner runs at about 63 to 65 dB.

Even at its loudest, an air source heat pump has a less volume level than a normal conversation. Most of the time, they're normally not even running at 100%. So, the majority of the time, the unit operates at the volume of human whisper or lower.

Lawn Mower – 90db
Blow Dryer – 80db
Vacuum Cleaner – 75db
Noisy Restaurant – 70db
Normal Conversation - 50db
Whisper – 30db
GL12NA-U1 – 19, 22,30,37, 45db
KJ12 – 21, 27, 34, 41, 46db
Frigidaire Window Unit – 63db

CHAPTER 2: BENEFITS OF AIR SOURCE HEAT PUMPS

By switching to air source heat pumps, people in the Northeast and Mid-Atlantic regions save an average of $459 to $958 per year.

Running an air source heat pump also costs 30% to 40% less than using a forced-air system. Why are air source heat pumps so energy efficient? Here are a few reasons.

They Don't Generate Heat

While most traditional heating systems generate heat, an air source heat pump simply moves heat.

It extracts heat from outside your home and brings it inside. Even in cold temperatures, this process requires less energy than generating heat. Air source heat pumps produce 1.5 to 3 times more heat energy than they consume in electric energy.

For comparison, an electric furnace or boiler turns 95% to 100% of the electric energy it consumes into heat. These systems are considered relatively efficient but are still significantly less efficient than air source heat pumps.

Most Units Don't Use Ductwork

Ducted heating systems can lose up to 35% or more of their energy through ductwork. As air travels through the ducts, it seeps out of holes or the sides of the ductwork due to poor insulation.

This air is wasted in attics, crawlspaces, or other unused areas. Air source heat pumps are ductless, so you don't have to worry about this inefficiency.

Refrigerant Flow Is Ultra-Precise

Air source heat pumps use refrigerant to move heat. This process is reversed when cooling.

The refrigerant changes from a liquid to a gas as it moves through the system, and thermostatic expansion valves control the amount of refrigerant. To boost efficiency, air source heat pumps use high-quality expansion valves that allow for precise control.

They Contain Energy Efficient Variable Speed Blowers

The indoor air-handling unit of your air source heat pump features a fan that blows air into your home. Older systems had single-speed fans that consumed the same amount of energy in all circumstances.

Today's energy-efficient heat pumps use variable-speed fans that adjust their speed depending on room temperature.

This adaptation helps to ensure the fan doesn't run more than necessary. It also keeps the space at a more consistent temperature.

Additionally, variable speeds mean that the unit doesn't have to cycle on and off as much, saving energy.

The Coil Design Has Been Improved

The refrigerant in an air source heat pump moves through copper coils. These coils hold the refrigerant within both the indoor and outdoor units of your mini split.

As the outer coil absorbs heat from the air, the refrigerant changes from liquid to gas. The gas then moves to the inside coil. As air moves over the coil, it picks up the heat and blows it into your space.

As the coil cools down, the refrigerant changes back into a liquid. It then moves back outside, and the process repeats.

Heat pump manufacturers like Mitsubishi Electric have continued to improve coil design over the years to make this process as efficient as possible.

Copper coils now have grooves that increase their surface area to maximize heat absorption and release.

Some Have Two-Speed Compressors

Compressors help to move refrigerant between the indoor and outdoor units of air source heat pumps.

When a compressor has two speeds, it can automatically adjust based on heating and cooling needs.

This makes indoor temperatures more consistent. It also allows your compressor to run at lower speeds and prevents excessive on-and-off.

Over the years, air-source heat pumps have improved substantially in energy efficiency. Early generations didn't work as well in cold climates, but technological advances have changed that.

Now, air source heat pumps are very efficient, even in below-freezing temperatures.

CHAPTER 3: HEAT PUMP PRODUCTS AND OPTIONS

The number of options available with today's air source heat pumps are significantly more sophisticated compared to early versions of ductless HVAC systems.

It used to be that only wall-hung indoor units were available.

Now, there are floor mount units that can be recessed into walls, ceiling units that are recessed into the ceiling, and even ducted units, just like a conventional air conditioning system that uses ductwork in your attic.

For example, the latter setup might be the upstairs of a home with a ducted unit and one thermostat upstairs, serving three bedrooms with the ductwork.

Such a setup can even be combined with heat pumps used for the first floor of the home and the basement, where ductwork cannot be built.

Single-Zone Units

Basic, one-on-one systems that utilize a single unit with one indoor and one outdoor unit and create a single zone of heating and cooling are still available.

However, it's becoming the least popular product installed in Boston homes today.

Multiport Systems

Now, many homes use multiport systems with branch boxes that allow up to eight indoor units.

It can be used with wall units, floor mount units, ceiling units, and ducted units to mix and match the system to meet your family's unique needs.

Air Source Heat Pump Control Options

To maintain consistent temperatures, each indoor unit has a variety of ways it can be controlled. In the past, the standard for an indoor unit was a handheld remote control.

Each unit had its own remote and there was no way to control the entire system from a single place.

MHK2 Controllers

Mitsubishi Electric's MHK2 controls are essentially square, wireless thermostats that can be set up to work with Alexa, Google Home, and your other smart devices.

This gives you even more flexibility with where you place your indoor air handling units, since no wires are required for the thermostat to communicate with the air handlers.

Kumo Cloud Device

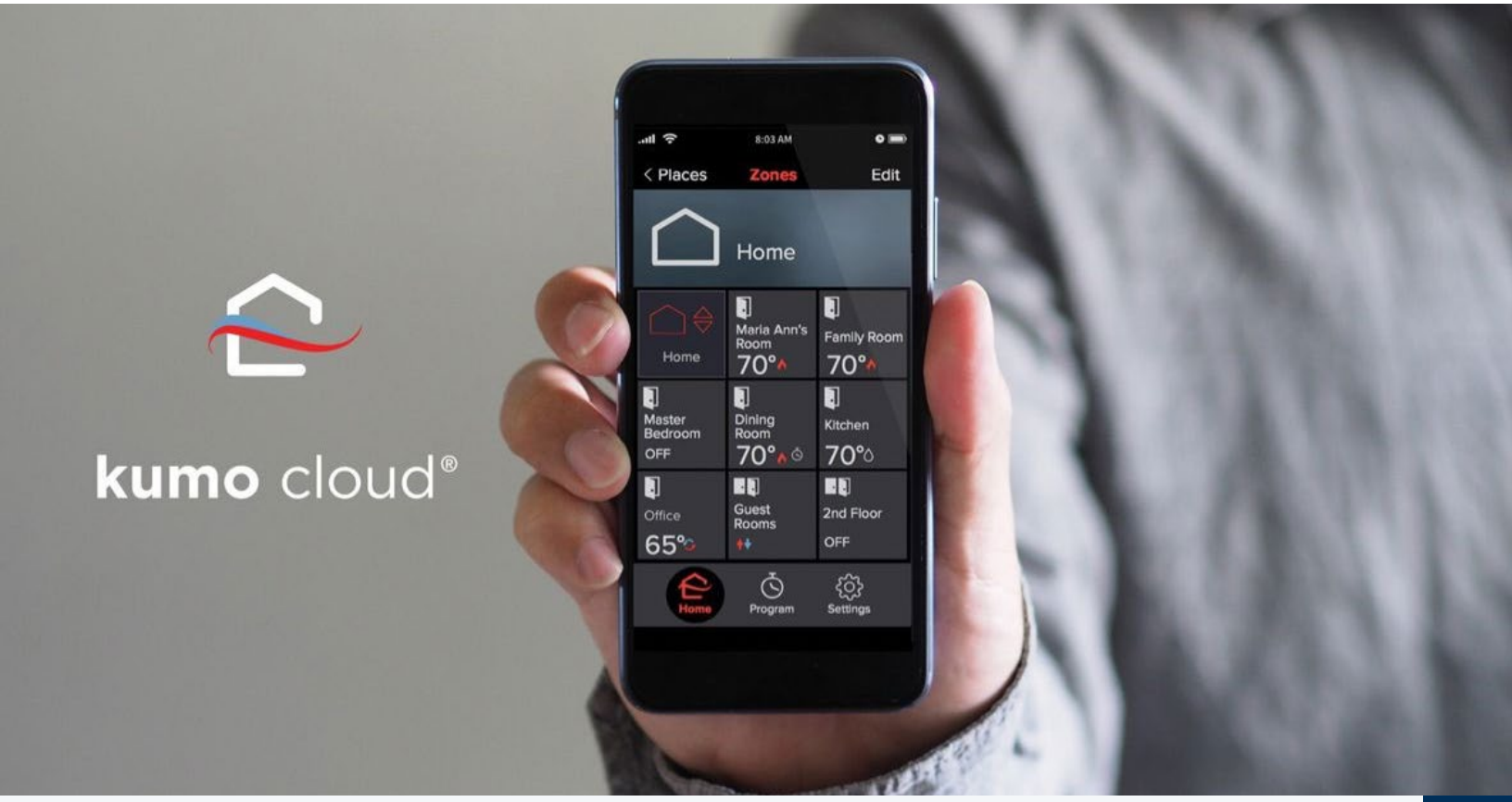
Along with the above, you can also use the Kumo Cloud device.

This is a patented Mitsubishi Electric device that will go into the indoor units and allows you to control your home's entire heating and cooling system on your smartphone.

It also works with voice command devices, making it easier than ever to program your home's temperatures to your exact specifications.

You can also control your home's temperature when you're away from the house.

For example, if you forgot to turn down the temperature of your home when you went away on vacation, you can simply use your smartphone from wherever you are to dial down the thermostat.



Integrated Controls

Integrated controls are something new that has been introduced to the market over the last three to four years, and they're typically used in whole-home solutions.

Generally, these are being installed with an existing heating system, such as a boiler that runs on natural gas or oil. It's often too costly and inefficient to remove an established heating system.

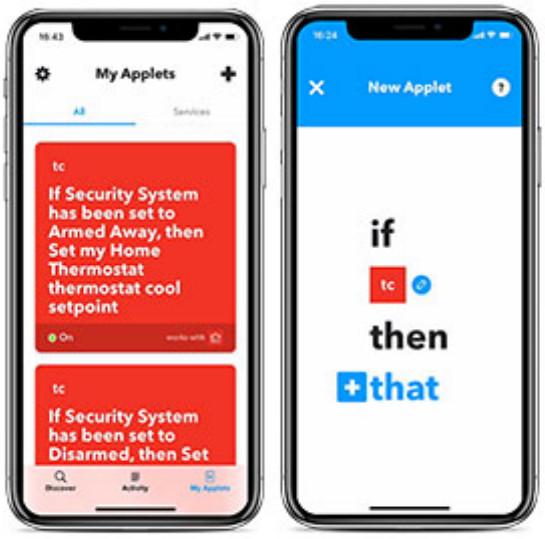
Integrated controls allow homeowners to add an air source heat pump and program both systems to operate in a certain way.

For example, say you wanted to heat your home using the heat pump until the temperature gets down to 30 degrees Fahrenheit or less.

If the temperature were to drop below this, then the backup heating system would kick in.

In situations where the home has a boiler that also heats the water, it's more efficient to use integrated controls to add more heating capabilities to the house without removing the boiler and having to install a separate water heater.

The idea with the integrated controls is that you're using the air source heat pump at the temperatures where it's the most efficient, and getting the best of both worlds without having to purchase a large, high-BTU heat pump capable of heating to sub-zero temps.



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CHAPTER 4: ZONING AND WHOLE HOME SOLUTIONS

Zoned heating and cooling is essentially taking the overall livable space of a home and sectioning it off, e.g., bedrooms, living rooms, dining rooms, kitchens, sunrooms, and basements. Zones are parts of the home where you might want to have different temperatures.

Benefits of Zoning

There are many benefits to zoned heating and cooling, however, the most attractive is arguably having the ability to independently control the temperature in each zone.

For example, if you have three bedrooms and you have three different kinds of people that want different temperatures, you can easily change the temperatures in those rooms separately from one another.

Another benefit of zoning is the ability to turn a single zone off while leaving the remaining zones functional.

Using the above example, say one of the three people was leaving for vacation for a week. You could turn that zone off since there is no need to spend money heating or cooling an empty room.

With central heating and air-conditioning, usually a home would get zoned with one thermostat. Depending on the season, you would likely have hot and cold spots at the center of the home and at either end. It's like having one light switch in your home that controls every light, which would be extremely inefficient.

Can You Zone a House with a Traditional Ducted System?

While it is possible to zone a home with a ducted HVAC system, it's not nearly as efficient.

To do so, you need to use dampers in the ductwork that are manually opened and closed to stop or allow airflow to a particular zone. In some instances, there are systems that use motorized dampers that open and close with a separate thermostat controlling that zone damper.

When a damper is closed, air now can't come out of that duct, so it needs to go somewhere else. This means it's going to blow hotter and faster in another room.

How Do Air Source Heat Pumps Offer Zoned Heating and Cooling?

During the installation process of an air source heat pump, an HVAC contractor will look at the layout of your home and determine how many zones you have.

Then, one or more air handling units with their own thermostats are placed in each zone depending on how large the zone is.

It's important to know how many BTUs each unit has and how many are needed to heat and cool the entire home.

By dividing the total amount of energy needed for the home by the number of air handlers or zones you will have in the home, you can determine the size that each unit needs to be.

For example, say your home requires 48,000 BTUs to heat or cool and you have 4 total zones. This means the heat pump setup would require 4 x 12,000 BTU units, one in each zone.

Zoned heating and cooling allows you to constantly adjust the temperature of different spaces in your home, which is exactly what's happening outside in the environment as well. This creates an energy-efficient and comfortable space for you to live.

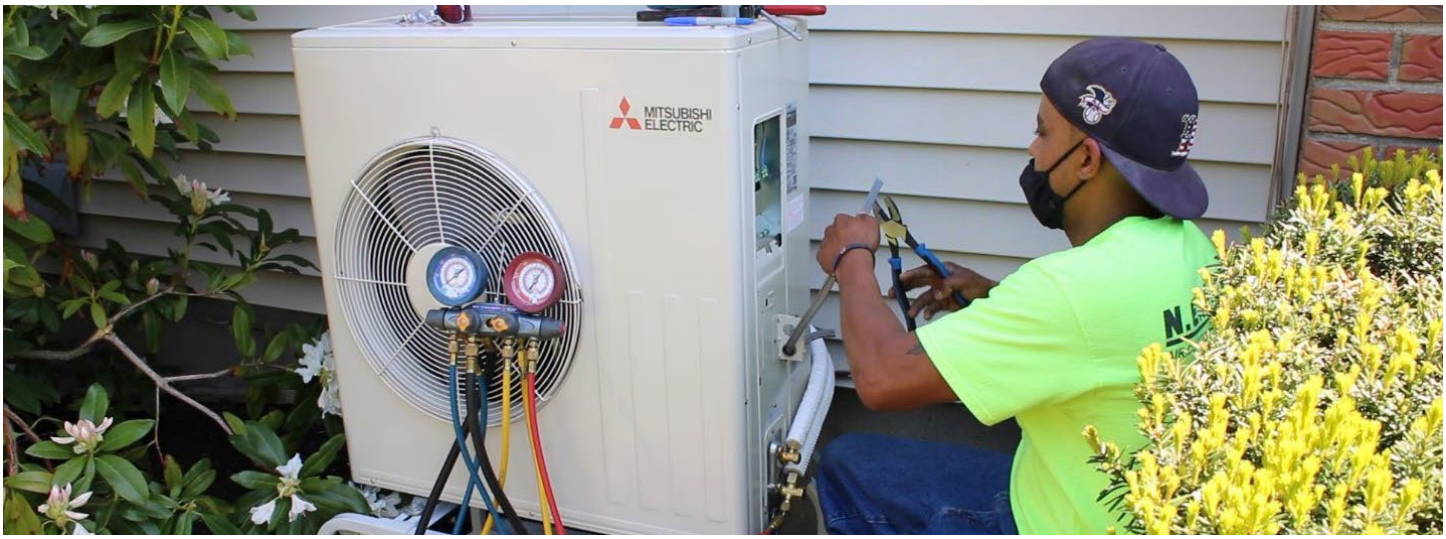
CHAPTER 5: AIR SOURCE HEAT PUMP INSTALLATION

When your home needs a repair or a new appliance, you have two choices. You can do it yourself or call a professional.

Small jobs such as unclogging a toilet, repairing a minor plumbing issue, or painting a wall are usually straightforward to address on your own, and there are all kinds of DIY videos and books that can guide you through the process.

But when you're facing a major issue, such as putting in a new heating and cooling system, you should stop the videos, put down the tools, and call in the pros.

Here's a look at the main reasons you should choose professional installation for heating and cooling systems.



1. Eliminates Costs for Tools and Materials

Unless you're a seasoned handyman or an HVAC professional yourself, you probably don't have the tools required to install an air source heat pump.

You need torque wrenches, vacuum pumps with lines and adapters, gauges, clamps, levels, drills, and a variety of other tools. You also need conduit, insulating tape, anchors, and other supplies that most DIY people don't have access to.

Many of these tools and materials are not cheap, and since most people only get a new heating and cooling system every 10 to 20 years, you may never use those tools again.

If you have to buy them, that drives up the total cost of your new system. In contrast, installation professionals have all the tools to complete this type of project.

2. Saves Time

In addition to saving you money on supplies, professional installation can also help you save time. When embarking on a DIY project, you have to invest a lot of time into research.

Then, you have to shop for supplies and materials. Once you get started, you may find that you have questions, and at that point, you need to stop and revisit the instructional books or materials. Additionally, with an air source heat pump, the process can take a lot longer if you don't have two people involved.

When you hire a professional, you don't have to spend any time on the project. Professional installers have handled countless similar jobs in the past. They can usually give you an accurate estimate about how long the process should take.

They also know which tools and supplies are required for the job, and they come prepared.

Additionally, before any work commences, these experts take the right measurements and assess any potential issues, and that helps to ensure the process goes as quickly and smoothly as possible.

3. Offers You Cheaper Prices

When you buy an air source heat pump on your own, you pay retail rates. In contrast, when you buy one from a professional, they purchase the equipment at wholesale prices.

They also tend to get better rates because they buy so much equipment. Often, these professionals pass on savings to their clients.

4. Avoids Costly Mistakes

Unfortunately, when you take a DIY approach, things can and often will go wrong. But, with professional installation, the chances of errors are much lower.

HVAC professionals go through extensive training to earn their licenses, and they also must do continuing education to stay updated on new equipment and trends in the industry.

If you invest in a Mitsubishi Electric heating and cooling system and you hire a Mitsubishi Electric Elite Diamond Contractor, you get an expert who has had more training than almost anyone else in the industry.

To achieve this elite status, these HVAC professionals have to complete in-person and online training modules.

They also have to gain a lot of experience in the field and meet numerous other criteria.

5. Protection from Danger

Hiring a professional to install your heat pump can also protect you from physical danger.

When installing a heat pump, you must work with electricity as well as refrigerant. Both of those elements can be dangerous, and if you make a mistake during the install, you may put your entire home in danger.

6. Keeps Your Warranty Intact

Some air source heat pumps lose their warranty if they are not installed correctly. Then, if something goes wrong, which is usually covered by the warranty, you may end up being stuck paying for the repair on your own.

Keep in mind that when you work with a Mitsubishi Electric Elite Diamond Contractor, you actually get an extended warranty when you buy a Mitsubishi Electric system.

7. Helps You Avoid Property Damage

When you're doing an installation on your own, you could accidentally crack a wall or make a hole that's too large.

You could wire the system incorrectly, causing electrical damage to the unit itself or miscommunications between the unit and the thermostat.

You may not set the unit flush with the wall, leading to long-term inefficiencies and increased energy bills. These are just some of the errors and a selection of the potential property damage that can occur.

Typically, the point of DIY projects is to save a little money, but when you factor in the cost of tools, the physical risk to your body, potential damage to your home, and the possible loss of your warranty, DIY becomes more expensive in the long run.

If you are getting an air source heat pump for your home or commercial space, don't install it on your own. Instead, turn the job over to the pros.

CHAPTER 6: HEAT PUMP MAINTENANCE

If you change the filters of your heat pumps regularly, you probably think your units are clean. Unfortunately, they're probably not as clean as you'd like.

Over time, ductless HVAC systems build up dirt, bacteria, dust, allergens, and other pollutants deep inside, where you can't reach. Even if you're diligent about DIY cleaning, heat pumps can build up dirt, dust, mold, and grime in both the indoor and outdoor units.

To safeguard your equipment and its efficiency, you should consider professional cleaning for your ductless system.

Dangers of a Dirty Heat Pump

A dirty ductless unit can be hazardous, causing:

- **Mold buildup.** If mold is growing in your ductless equipment, the spores are carried throughout your home every time you turn on your unit. Mold can cause irritated eyes, headaches, runny noses, sore throats, allergic reactions, and other respiratory issues.
- **Health problems.** Even if you don't have mold in your unit, you may encounter health issues due to dust, dander, and bacteria hidden in the unit. Children, elderly individuals, and those with respiratory conditions are at a higher risk.
- **Dust accumulation.** Dust that blows out of a dirty ductless unit lands on the surfaces of your home, exacerbating allergies and adding to your list of chores.
- **Poor indoor air quality.** When your ductless unit is dirty, everything inside is being pumped out into the air that you breathe every day, reducing the overall quality of your indoor air.
- **Reduced efficiency.** A clogged ductless unit cannot operate as efficiently as a clean one, wasting energy and driving up your electricity bills.
- **Debris from a clogged unit can migrate to the drain pan.** When it overflows, this can cause water to build up in your unit and lead to costly leaks.
- **Expensive repairs.** Dirt and grime causes your unit to work harder, decreasing its lifespan and increasing the cost of ownership.

Filtration

Cleaning your filters is essential to safeguard your ductless equipment and your indoor air quality.

However, this step is not enough on its own.

When you operate your ductless HVAC system, small particulates squeeze through the filter and get lodged in the coil and other hard-to-reach parts of the ductless unit. If you don't clean your filters regularly, the problem becomes even worse.

The N.E.T.R., Inc. Maintenance Plus Program

To help you avoid the dangers of a dirty ductless HVAC system, N.E.T.R., Inc. is excited to offer state-of-the-art deep cleaning technology.

What Is Maintenance Plus?

Maintenance Plus is a comprehensive cleaning system for ductless HVAC units, mini splits, and window air conditioners.

It relies on pressurized water and non-toxic cleaners to sanitize your system and remove mold, mildew, fungus, bacteria, skin cells, and other contaminants from every component of your ductless HVAC unit.

This includes the barrel fan, chassis, drain pan, covers, and louvres of the indoor air handling unit, and the outdoor condenser.

How Does Maintenance Plus Work?

Before deep cleaning your ductless HVAC system, the technician turns on the unit to check the air velocity and make sure it's operating properly.

Then, they attach a catchment bag to the unit to catch the water and debris that will be generated by the cleaning process.

The technician removes the cover and louvre to access the inside of the unit. Then, they spray on non-toxic AerisGuard cleaners onto the unit and use a pressure washer wand to push water through the components of the system.

Typically, they start by cleaning the fins and the back of the chassis, followed by the back of the unit, the top drain, and the coil.

To ensure the entire barrel fan gets clean, they spin the fan while cleaning this part, and then, they complete the process by cleaning any other interior parts and flushing out the debris that fell from the coil into the main drain.

Finally, they clean the covers and louvres that were removed at the beginning of the process, and they replace everything and check air velocity and operation again.

After repeating this process on all indoor air handling units, the technician cleans the outside condenser unit using a very similar set of steps.

Ultimately, this technology returns your ductless unit to the same level of cleanliness it had when you first purchased the equipment.

What Makes Maintenance Plus Superior to Other Ductless HVAC Cleaning Methods?

Maintenance Plus is the only equipment designed specifically for cleaning ductless HVAC systems.

This cleaning system gives your unit a deep and comprehensive clean that you cannot get with any other products.

The process ensures that all contaminants are completely removed for your system to safeguard your home's air and your equipment.

Clean

AerisGuard cleaners use patented, non-hazardous multi-enzyme technology, to break down and digest the organic debris and other dirt. This is easily removed using a pressure cleaner.

Protect

AerisGuard Treatment is then applied to your unit to create a biostatic protective coating on the surface.

This provides up to 12 months protection and is ideal as part of an annual ductless maintenance program.

Optimize

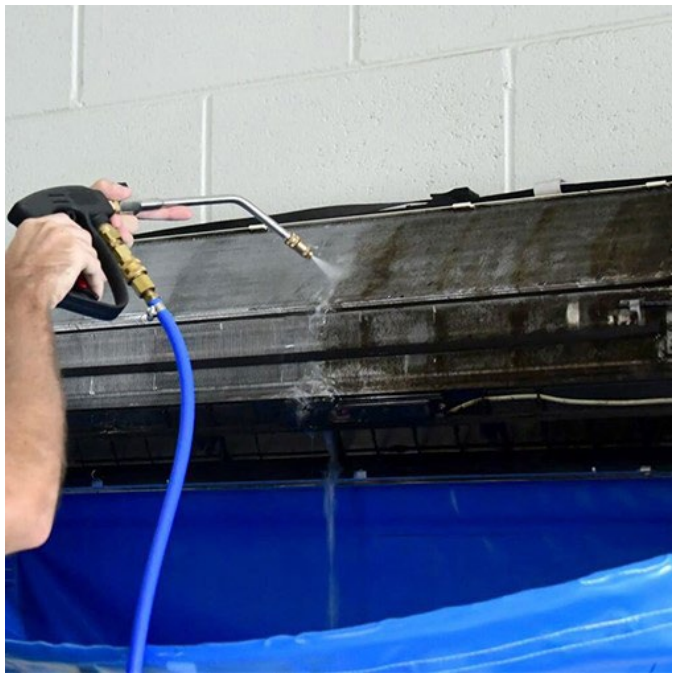
Cleaner coils and surfaces result in improved airflow and more efficient heat exchange during the heating and cooling cycle.

Not only does this mean lower running costs, it also delivers cleaner air and improved comfort.

Cost of N.E.T.R. Inc.'s Maintenance Plus Program

At N.E.T.R., Inc., we strive to ensure keeping your air source heat pump clean and in excellent working condition affordable.

Here's our pricing structure*:



Off-Season Pricing

November – February

- $139 for one indoor and one outdoor unit
- $59 for each additional indoor unit on a multi-zone system

In-Season Pricing

March – October

- $199 for one indoor and one outdoor unit
- $99 for each additional indoor unit on a multi-zone system

*2021 rates, prices subject to change without notice

CHAPTER 7: WHY YOU SHOULD CONSIDER A HEAT PUMP

There are many reasons to consider either replacing your existing heating and cooling system with an air source heat pump or adding a heat pump to your home's established ductwork or heating source.

Here are just a few:

They're a Greener Way to Heat and Cool Your Home

Oil, gas, coal, and other types of fossil fuels are a non-renewable energy source. The earth has a finite supply of fossil fuels, meaning that at some point, the world will run out.

Based on current consumption rates, estimates claim the earth will run out of oil and natural gas in 50 years, and coal in 100 years.

To avoid getting to this point, businesses and consumers should reduce their reliance on fossil fuels and use energy efficient appliances that make the most out of each BTU.

Additionally, burning fossil fuels harm the environment, contributing heavily to climate change. Using fossil fuels creates carbon dioxide, a byproduct that in excess gets trapped in the atmosphere, causing the earth to retain heat.

Ultimately, this contributes to global warming.

Improved Air Quality

The quality of your indoor air — especially when you're staying at home for extended periods of time — is an important consideration.

Many people don't think twice before lighting a scented candle or using commercial cleaning products, however, even with fair to good ventilation, the chemicals from these items linger inside your home and clog up the air you're breathing.

Opening your windows and letting fresh air into your home when the weather allows is a good way to quickly ventilate your home.

However, this doesn't always cut it, and if you have allergies, bringing in pollinated outdoor air isn't likely an option.

The U.S. Centers for Disease Control (CDC) reports that the improper operation of HVAC systems are responsible for poor indoor air quality.

Both heat pumps are designed not only to heat and cool a space, but also to remove harmful pollutants and contaminants from the air. This includes but is not limited to:

- Carbon dioxide
- Carbon monoxide
- Bacteria
- Mold
- Mildew
- Cleaning product residue
- Pesticides

A well-maintained air source heat pump can keep your home at a steady, comfortable temperature and free of harmful particulates.

It can also help control indoor humidity, which has a significant impact on the overall quality of the air you're breathing. Cold, dry air makes it easier for bacteria and viruses to spread.

CHAPTER 8: REBATES & FINANCING

To encourage consumers to heat and cool their homes as efficiently as possible, MassSave offers a number of rebates on heating and cooling equipment.

Check out these programs:

Electric Heating and Cooling

If you invest in qualifying electric heating and cooling equipment in Massachusetts, you may be able to claim the following rebates*:

- $50 per ton for central air conditioning.
- $250 per ton for a central heat pump.
- $250 per ton for a mini split heat pump.
- $1250 per ton for central or mini split gas or oil heat pumps (integrated controls required if not removing your central heating system) or for switching to an electric resistance heat pump that has at least a 900 kWh difference between the sum of your three winter usage and three lowest usage months.
- $500 per indoor unit, up to $1500 total for adding integrated controls to an existing central or mini split heat pump.

*Rebates based on equipment installed between January 1, 2021 and December 31, 2021 and are subject to change without notice.

Gas Heating Equipment

MassSave offers rebates between $950 and $2,750 for eligible natural gas heating equipment including warm air furnaces, forced hot water boilers, and condensing boilers with on-demand hot water.

The rebates vary based on the Annual Fuel Utilization Efficiency (AFUE) rating of the equipment, and as a general rule of thumb, your rebate increases when you buy more efficient equipment.

Oil Heating Equipment

If you buy an oil-powered furnace with an electronic commutated motor (ECM) and a minimum AFUE of 86%, you can earn a $650 rebate from MassSave.

Similarly, a hot water boiler with a minimum 86% AFUE earns you an $800 rebate.

Propane Heating Equipment

For a propane furnace with an ECM motor and a minimum 95% AFUE rating, the rebate is $1,000.

You can earn a $1,500 rebate for a hot water boiler with a 90% AFUE or bump the rebate up to $2,300 by upgrading to a boiler with at least a 95% AFUE.

Finally, a condensing boiler with an on-demand water heater and at least a 95% AFUE rating brings in a $2,000 rebate.

Smart and Programmable Thermostats

Smart thermostats let you preset your thermostat and control your home's temperature remotely, helping to save energy and reduce your utility bills.

For 7-day programmable thermostats, you can earn $25 per thermostat on up to four thermostats. The rebate for an Energy Star certified smart thermostat is $100 each for up to four thermostats.

CHAPTER 9: HEAT PUMP MYTHS

Heat pumps are an excellent solution to Boston's frigid, unpredictable winters. They can provide even, energy-efficient heating throughout your home or business without the hot and cold spots that other types of heating systems are known for.

However, heat pumps are not well understood, and many home and business owners have misconceptions about how they work.

Here are the most common heat pump myths, debunked.

Heat Pumps Create Heat

Unlike other types of heating solutions, heat pumps don't create heat — they simply move it from one place to another.

Even in very cold temperatures, there is some amount of heat that still exists in the air.

In fact, outdoor air that is 0 degrees Fahrenheit only loses 18% of the total amount of heat the air holds at 100 degrees Fahrenheit.

Heat pumps remove this heat and transfer it into your home; during the summer, the process is reversed and heat inside your home is pumped out instead.

Heat Pumps Don't Work in Cold Temperatures

Many people believe that a heat pump won't work well in weather that is too cold, based on similar performance from older, more outdated equipment.

Fortunately, New England residents who are familiar with frigid winters don't have to worry about this with quality equipment from trusted brands.

Mitsubishi Electric uses patented "flash injection" and Hyper-Heating INVERTER® (H2i®) technology that allows their heat pumps to produce efficient, superior heating in temperatures as low as -13 degrees Fahrenheit.

Even in subzero temps, these units can heat up quickly and provide even, comfortable heating without cold spots throughout your home without the need for supplemental heat.

Gas Furnaces Are More Energy Efficient

Since a heat pump uses cooler air to maintain a consistent temperature within a space, the system runs longer.

Instead of shutting off when the ambient temperature is reached and turning back on again when the temperature gets out of range, a heat pump simply brings in the amount of heat needed to achieve the desired temperature.

This leads people to assume that the longer run-time of a heat pump means it's less efficient, but quite the opposite is true.

A gas furnace produces less than a single unit of heat for every unit of energy it uses, while a heat pump produces two to three units of heat for every unit of energy used.

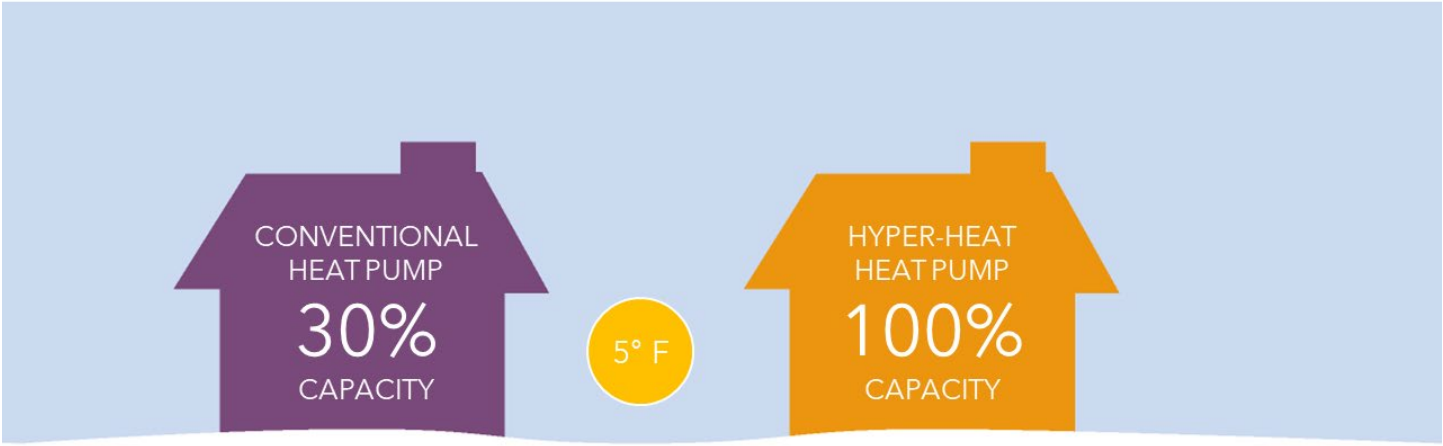
Additionally, many people mistakenly think that a heat pump won't keep you as warm in the winter as a gas furnace or wood stove.

The truth is ductless heating systems are designed to keep the air in your home consistently comfortable instead of providing "bursts" of heat to warm up cold air. Thus, hot and cold spots are eliminated.

You Can't Use Other Heat Sources with a Heat Pump

Some home and business owners don't want to upgrade to a heat pump because they're unsure if a heat pump will keep their space warm enough and they won't be able to use their existing heating system after they make the switch.

However, heat pumps work well as a supplemental heating system, meaning they can be easily used in conjunction with central heat, baseboard heat, wood stoves, and other forms of heating.



CONCLUSION

At N.E.T.R., Inc., we have been installing heating and cooling equipment in Boston and the surrounding areas since 1989.

We have an A+ rating from the Better Business Bureau (BBB) and hundreds of five-star ratings from satisfied clients across multiple online platforms and review sites.

We are also a Mitsubishi Electric Elite Diamond Contractor, ensuring you get the highest quality of service.

Air source heat pumps offer numerous benefits. They are easy to install, operate quietly, and offer an attractive design. They're reliable, able to heat and cool with the same system, and are controlled wirelessly.

A heat pump is ideal for new additions, renovated spaces, and garage or basement rooms, and it's an effective solution for any property that can't accommodate ductwork.

With heat pump from Mitsubishi Electric, you can actively cool the rooms you want to cool while dialing back energy costs in the rooms that are not in use.

Plus, Mitsubishi Electric's inverter-driven compressors automatically adjust to changing conditions to deliver an ideal level of comfort while only using a minimal amount of energy.

You also get these benefits:

- Cooling is up to 40% more efficient than standard systems
- Single and multi-zone systems available to fit any room or your entire property
- Options include more than 25 ENERGY STAR® qualified models and 9 ENERGY STAR® Most Efficient models

N.E.T.R., Inc. is dedicated to giving our clients the fast, efficient, reliable, and affordable cooling solutions that they deserve.

As the largest ductless contractor in New England with thousands of ductless system installations in the region, we are incredibly experienced and know our heat pump technology inside and out.

ABOUT N.E.T.R., INC.

New England's Leading Residential & Commercial Heating & Cooling Company

N.E.T.R., Inc. is here to help home and business owners install the best heating and air conditioning systems that fits their needs.

Since 1989, we've installed heating and air conditioning systems in Boston and its surrounding areas, tackling tough problems that our clients face.

Our goal is to ensure our clients have energy efficient, quiet, reliable systems so they can live their lives to the fullest both at home and at work.

We are the largest ductless contractor in New England with hundreds and hundreds of ductless system installations in the region. We have a dedicated residential installation staff that only installs ductless heating and air conditioning solutions.

Our commitment to our customers' needs is what drives us each and every day.

Our approach to temperature control and comfort has helped us become one of the most respected names in heating, cooling, and refrigeration in New England.

MEET MICHAEL CAPPUCCIO

Meet Mike, the founder of N.E.T.R., Inc., and the driver of our continued success.

Mike is passionate about heating, cooling, and refrigeration because he understands that his clients' lives depend on comfortable temperatures. Mike tours the country speaking to groups about ductless HVAC systems and is a leading expert on creating unique solutions for high-end commercial HVAC projects.

N.E.T.R. Inc. has reached the highest level of accreditation from Mitsubishi Electric's HVAC Division. We have successfully completed factory training in the areas of applications, sales, and service for ductless air products.

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