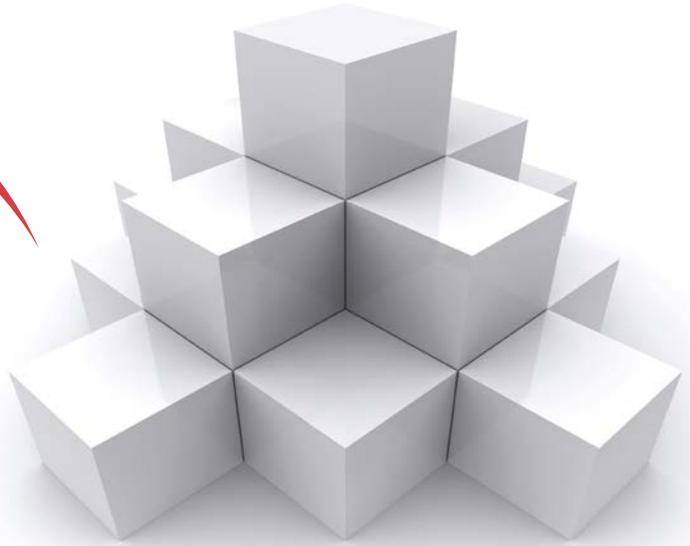


# A HOME INSPECTOR'S GUIDE TO



## OILHEAT



# **BUILD YOUR KNOWLEDGE ABOUT OILHEAT**

## **Advances in Oilheat**

When most of the heating systems you look at are 20–40 years old, it’s easy to conclude that Oilheat is dirty, inefficient and prone to breakdowns. However, there have been some amazing advances in technology that make current Oilheat options substantially more attractive. Examples include innovations such as high-pressure flame retention head burners, advanced solid-state and microprocessor-based electronic controls, and oil condensing technology. Modern fuel blends of low sulfur or ultra-low sulfur heating oil (ULSHO) with clean, renewable biodiesel, known as Bioheat® Fuel, reduce heating oil’s already near-zero emissions even further. Clean, green and made in the U.S.A., Bioheat® fuel has been proven to clean systems of sludge and deposits, in addition to its environmental impact.

This guide explains some of the advances in technology that make today’s Oilheat clean, safe and efficient.



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# HEATING OIL

*Heating oil is produced, transported and priced differently from other fuels.*

## How heating oil is made

Heating oil is refined from crude oil, a complex mix of hydrocarbons plus oxygen, nitrogen and sulfur. The refining process separates crude oil into different “fractions.”

The lighter fractions eventually become propane, butane and petrochemicals; heavier fractions are used to produce gasoline, kerosene, jet fuel, diesel fuel and No. 2 home heating oil. This fuel is blended with renewable biodiesel to create Bioheat® fuel, the next generation of home heating, for cleaner, more efficient home comfort.

After refining, No. 2 heating oil is the color of champagne. For tax purposes, regulations require that heating fuel be dyed red before it is sold, so it cannot be confused with on-road diesel fuel. The dye has no effect on the fuel and how it burns.

## How heating oil gets around

After it is refined, heating oil is transported via ship, barge, truck, train and/or pipeline to major fuel terminals. It is distributed from the terminals to local heating oil companies. Many of these companies have their own storage facilities (such as the facility pictured below), which can hold thousands of gallons of oil. These company storage facilities ensure that an adequate supply of fuel is on hand.

## How heating oil is priced

The price a customer pays for fuel oil is usually determined by the level of service provided by the oil supplier. Companies with service plans, 24-hour emergency service, monthly payment plans and equipment financing typically command a higher price than companies that only deliver oil. Oil companies usually offer several pricing options, allowing customers to choose the services that best meet their needs.

## Heating oil companies and service

Your client will find a wide range of prices and services offered by different companies. Fortunately, Oilheat companies aren't large monopolies. Most oil companies are locally owned and operated and have established deep roots in their communities. They place a high value on the quality of the products and services they provide. In a recent national survey, Oilheat customers gave their oil suppliers an average rating of 94% for friendly, fast service.

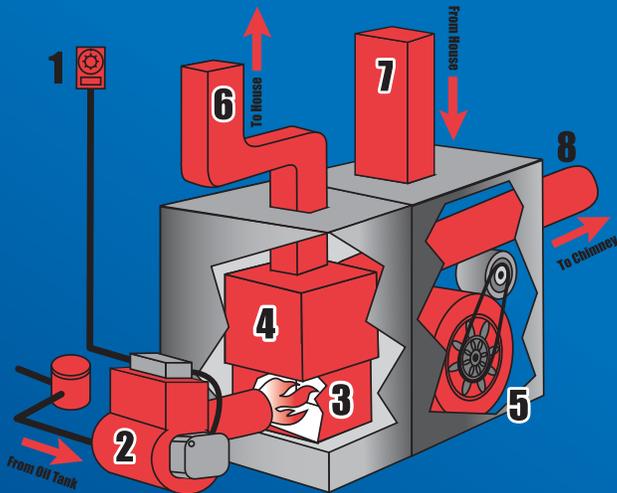


**Common misconception:**  
*Heating oil is a volatile fuel.*

**Truth:** Heating oil is safe. If you dropped a burning match into a barrel of heating oil, the match would go out, just as if you had dropped it in water. Oil must be vaporized before it will ignite or burn.



## How an Oil Furnace Works



- 1** The thermostat senses that the room's temperature has fallen below the designated setting. In response, it sends a signal to the controls on the oil burner.
- 2** Oil is then sent to the burner through a fuel pump. A filter on the pump converts the oil into a fine mist, which is then sent to the combustion chamber.
- 3, 4** Inside the combustion chamber, the fine mist is mixed with air and then ignited, which causes the chamber to get extremely hot.
- 5, 6, 7** The furnace's heat exchanger allows air to absorb the generated heat. Warm air is then propelled by a blower throughout the home's ducts.
- 8** Combustion emissions from the system are sent through the flue pipe and out the chimney, leaving the home altogether.

## FURNACES

Oil furnaces provide homeowners with many options for increased comfort. In addition to heat, the ductwork that connects with the furnace can deliver other kinds of conditioned air. For example, homeowners can use the same ductwork to:

- Stay cool with a central air system.
- Eliminate dry air by attaching a whole-house humidifier.
- Filter out household dust and pollen that can cause allergic reactions, by adding an air cleaner.

### Types of Furnaces You May See

The oldest kind of oil furnace you are likely to encounter will probably be connected to a gravity, warm air system that was designed to burn coal and has been converted to oil. Although few of these systems are still in use, they have contributed to the negative impression some people have about Oilheat.

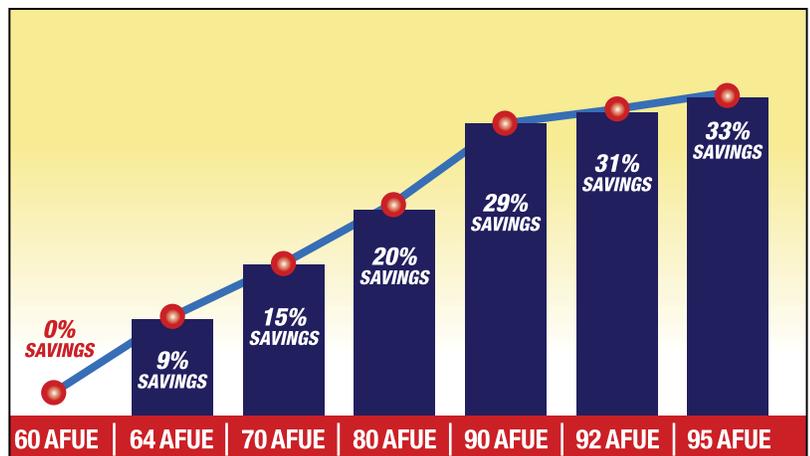
### Efficiency Levels

In many cases, a coal-to-oil converted system is extremely inefficient by today's standards.

A typical oil furnace of this kind operates at 50%–60% efficiency, well below the efficiency levels of modern oil furnaces. The low efficiency of older furnaces is due to design flaws, which result in a great deal of heat loss.

A second factor is the burner found in older Oilheat systems. It cannot cleanly convert the fuel into heat and thus does not perform as efficiently as a modern oil burner.

### Upgrading to a New Oilheat System Pays





At left is a typical furnace "jacket." Pictured at right is a direct-drive blower, used in some oil furnaces. A direct-drive blower can be set to automatically deliver the correct amount of air flow for both heating and cooling a home.



### Tip for your client:

Explain to your client the importance of changing/cleaning the furnace filter. Since indoor air continues to circulate whenever the blower runs, household dust, pollen, animal hair and lint will get trapped in the filter. If the filter becomes clogged, the furnace will overheat and the limit control will shut the system down.

Conversion of these coal systems, which started around the 1940s, involved removal of coal grates and installation of a combustion chamber and oil burner. The system may also have been retrofitted with a blower assembly and turned into a forced air system.

The coal-to-oil conversion also included the addition of three basic controls: a thermostat, a high limit control and a stack switch, also known as a primary control or stack relay.

Recommendation: Replacing one of these inefficient systems with a modern Oilheat system can reduce heating bills by approximately 40%. At a minimum, the conventional burner could be replaced with a new flame retention head burner, saving the homeowner as much as 15% on annual fuel bills. (See p. 7 for more about burners.)

## Today's Oil Furnaces

Modern oil furnaces range in efficiency from 83% to 96%. Some of the innovations found in today's oil furnaces include:

- Low-mass combustion chambers and sophisticated heat exchangers, which together improve heat transfer.
- Solid-state or microprocessor-based controls, which result in more reliable operation.
- High-pressure flame retention burners, which result in clean, efficient comfort.

*Note: These technological advances also apply to modern Oilheat boilers.*

## The Condensing Furnace

One of the newer technologies in Oilheat is the condensing, oil-fired warm air furnace, which features two heat exchangers. Efficiency ratings of 96% have been achieved, so operating costs can be much lower. The ultra-high efficiency of the condensing furnace is achieved by lowering the stack temperature to the point where the steam in the flue gases turns back into water.

***In 1980, it took an average of 1,400 gallons of oil to heat the average home. Today, it takes about 700 gallons - that's 50% less fuel!***

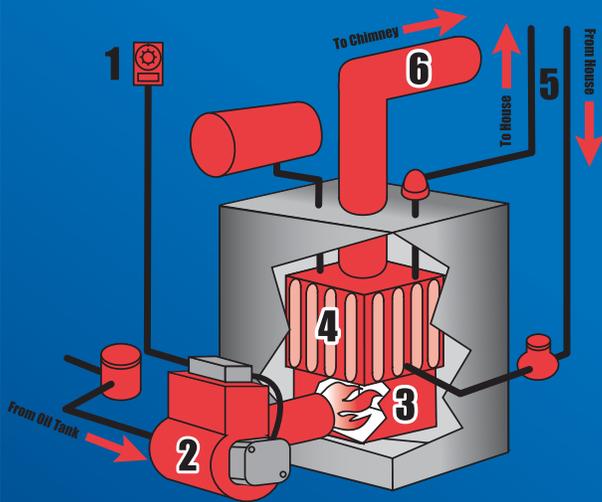


Average annual fuel consumption in the 1980s



Average annual fuel consumption today

## How an Oil Boiler Works



- 1** The thermostat senses that the room's temperature has fallen below the designated setting. In response, it sends a signal to the controls on the oil burner.
- 2** Oil is then sent to the burner through a fuel pump. A filter on the pump converts the oil into a fine mist, which is then sent to the combustion chamber.
- 3** Inside the combustion chamber, the fine mist is mixed with air and then ignited, which causes the chamber to get extremely hot.
- 4** Water is heated as it circulates around the combustion chamber, and is then pumped throughout the baseboard heaters of the home. This results in warmth issuing from the baseboard heaters.
- 5** As the water circulates and begins to cool, it is drawn back to the boiler and heated again and again, until the designated thermostat temperature is maintained.\*
- 6** Combustion emissions from the system are sent through the flue pipe and out the chimney, leaving the home.

*\*Note: In a steam system, steam is generated instead of hot water. The steam rises to the radiators and automatically circulates. If water levels drop, there is an automatic low water cutoff to protect the boiler.*

## BOILERS

While furnaces heat and distribute air, boilers heat and distribute water. One of the advantages of an oil-fired boiler is that it can heat a home's domestic hot water as well as the home itself. A separate water heating unit is not needed. Another advantage of a boiler is that it heats a home very evenly.

What's more, because of new technology, such as small, flexible air ducts, homeowners with boilers can now install a central air conditioning system more easily than in the past.

Additionally, boilers can be used in homes that have duct systems by means of a hydro-air system. In a hydro-air system, heated water is sent to an air handler to warm the house. The concept is much like that of a central cooling system where refrigerant is sent to an air handler to cool the house. The hot water in the hydro-air system warms the air in the air handler and the heated air blows through the ducts to warm the home.

Over the years, many different models and designs of oil boilers have been manufactured and installed in homes. In most cases, however, these statements about boilers are true.

- Oil-fired boilers are generally heavier and smaller than oil furnaces. On average, efficiency ratings for conventional boilers 30 years old or older are in the mid-60% range.
- Often, the same boiler block can be used to produce either hot water or steam, but this also depends on the particular electrical and mechanical components that are present.

### Tip for your client:

Today's Oilheat equipment is so compact, homeowners can open up a great deal of space in a basement, garage or utility room by installing a new Oilheat system. Some models take up as little as five square feet.

## HOT WATER BOILERS

In a hot water (hydronic) boiler system, heated water from the boiler is pumped by a circulator through radiators, radiant tubing or baseboards. With hot water heating, zoning—or dividing the system into separate heating areas of the home—is easily accomplished. Zoning provides efficient, comfortable, inexpensive heating.

Radiant heating, one of the oldest forms of hot water heating, has made a comeback in recent years due to its warmth and efficiency. Advances in technology have made radiant piping more durable and affordable.



*In radiant heating, the boiler circulates heated water through flexible tubing, which can be installed under floors and behind walls. It can even be installed outside — under walkways, patios and driveways to melt snow and ice.*

Hydronic boiler systems can distribute hot water through:

- Radiators
- Baseboards
- Convectors
- Vents (hydro-air systems)

## Boiler Designs

Some older oil boilers you may see have been converted from coal. Due to antiquated designs, these systems are plagued by high draft loss and poor heat transfer.

Newer oil-fired boilers are more efficient, in part because of low-mass construction and reduced water storage. This results in less heat loss.

You are most likely to find either a steel or cast-iron boiler in homes you inspect. The most common design for steel boilers uses fire tubes. Combustion gases flow into these long tubes, which are surrounded by water. The oil burner fires into the combustion chamber, which has a dry base design. A dry base design means there is no water surrounding the firebox. All the water is contained in the upper section of the boiler.

Other steel boilers have a wet base design in which water surrounds the combustion chamber. This design is more efficient because the hot gases pass through the fire tubes twice before they are vented. The wet base design is also called a two-pass system.

Like steel boilers, cast-iron boilers also have dry base and wet base designs. In a cast-iron boiler, the hot gases rising out of the firebox pass over the outside of each of the boiler's cast sections through flue channels. (Flue channels are located between the cast sections.) The gases are then vented through the flue pipe to the chimney.

All boilers have internal passages for the combustion gases. If the passages are too wide, the heat transfer rate will be low. (Combustion gas passages that are too wide are often a problem in boilers converted from coal to oil.)

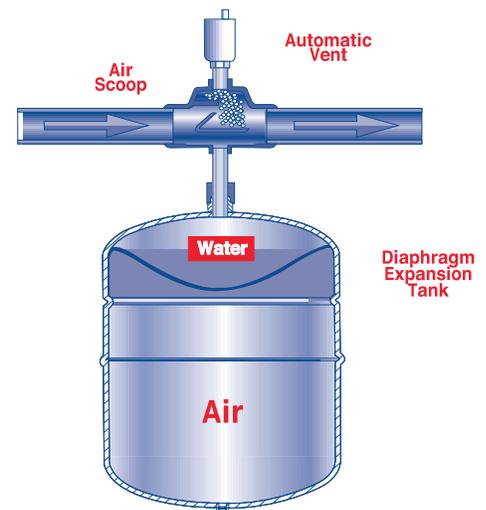
## Efficiency Ratings

Cast-iron and steel boilers are tested to verify their heating capacity and efficiency. Boiler ratings are published by The Hydronics Institute. Rating indicators for each boiler model include hot water output in BTUs per hour and the Annual Fuel Utilization Efficiency (AFUE) ratio.

AFUE is determined by a testing procedure specified by the U.S. Department of Energy. All heating equipment manufactured after 1980 is required to have a label indicating its AFUE. The AFUE ratio is a measurement of a heating system's seasonal efficiency, taking into account how well the system performs over an entire season of starts and stops.

AFUE should not be confused with combustion efficiency, which indicates how well the burner converts oil into heat. In many oil-heated homes, there are tags attached to the equipment that may indicate combustion efficiency.

If the combustion efficiency is below 78, you may want to encourage your client to consult with an Oilheat professional. While the unit doesn't have to be replaced if its combustion efficiency is less than 78, a careful analysis may indicate that the homeowner could save energy and money by upgrading the burner, furnace or boiler. Such an assessment would require a review of the household's heating oil bills, and the cost of new equipment, including installation, to determine if upgrading to new equipment is justified.



*All hot water systems use expansion tanks. Older boilers typically have a steel expansion tank, which must be recharged with air periodically. Newer boilers have a pressurized tank with a diaphragm, a design that requires less maintenance.*



## Determining age and life expectancies

“How old is it and how long do you think it will last?”

You’ve probably heard these questions hundreds of times after evaluating the heating system in a home. As you know, it can be difficult to determine equipment age, especially if you’re dealing with a furnace or boiler that’s a real old-timer. And unless you practice astrology too, you don’t want to start predicting the future of any equipment you’ve inspected.

Here are some guidelines, however, that may help you give a partial answer to your clients’ questions, one that will put them more at ease.

One way to determine a system’s age is by checking the serial number; the date of manufacture is sometimes “hidden” within the serial number. Look for labels and tags too. The date of manufacture may be on a label, and it’s possible that the installer tagged the system with the date of installation.

As far as longevity is concerned, oil-fired boilers and furnaces can last for decades, unlike most major appliances that typically wear out in 10–15 years. The life span of heating equipment also depends on the quality of the maintenance and service it has received.

## STEAM BOILERS

In a steam system, water heated in the boiler turns to steam, and the steam rises to radiators to heat the home. For the most part, steam boilers have not been installed in new homes since the 1940s, when forced hot water heating systems were introduced. While there are many similarities between a steam boiler and a hot water boiler, there are a few differences, including devices found in a steam boiler system that may be unfamiliar to you.

**Steam valves.** Located on the radiators, these valves vent the air in the pipes to make room for the steam. If you notice white calcium buildup around a steam valve, it means steam is escaping.

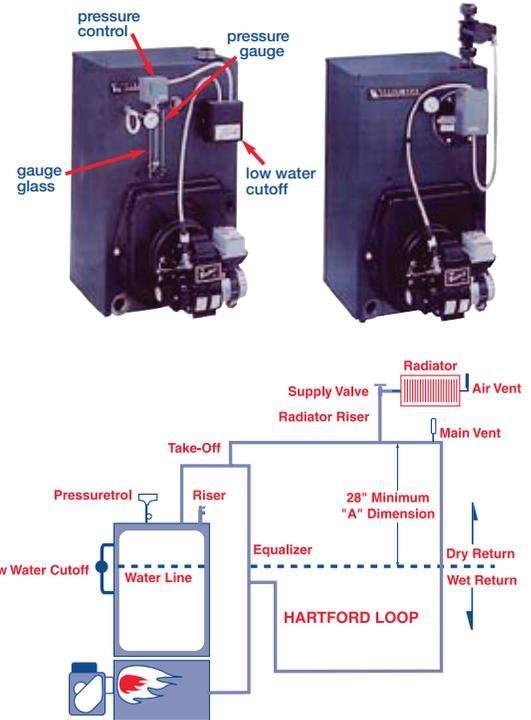
**Gauge glass.** This shows the water level in the boiler. The normal level is usually in the center of the glass. The water level in the glass will fluctuate slightly when the burner runs.

**Low water cutoff.** Required by code, this device shuts off the burner if the water level in the boiler falls too low.

**Automatic water feeder.** This optional device, which is sometimes found on steam systems, automatically adds water to the boiler if the level gets too low. Even if a system has an automatic water feed, the homeowner should still check the boiler’s water level on a regular basis.

**Pressure relief valve.** The pressure relief valve is a safety device to prevent the system from over-pressurizing.

**Steam limit control.** Sometimes called a pressuretrol, the steam limit control turns off the burner when sufficient steam pressure is achieved.



*A typical configuration for a one-pipe steam heating system.*

### Tip for your client:

The external low water cutoff on a steam boiler should be drained once or twice a month to flush sediment out of the system. This helps expel mineral deposits that form after the water turns to steam.

# BURNERS

## Flame Retention Burner Introduced

In the late 1960s, the manufacturers of Oilheat equipment introduced the flame retention burner, which produced a smaller, more compact flame. Since its advent, the high efficiency flame retention burner has saved homeowners billions of dollars in fuel costs. More than six billion gallons of fuel have been conserved. The flame retention burner has also helped reduce emission levels of oil-fired heating systems to almost zero. Compared with older burners, the flame retention burner:

- Burns cleaner
- Has an efficiency level that's 5%–15% higher
- Produces a hotter flame
- Maintains an airflow pattern that results in a more complete mixing of fuel and air

An oil burner has these key characteristics:

- An electric motor drives the fan and fuel pump.
- The fan pushes air to the burner's air tube to support combustion.
- The pump draws oil from the tank and delivers it to the nozzle.
- The regulating valve, located in the pump housing, produces the right amount of pressure to atomize the oil.
- The ignition/transformer produces a high-voltage spark that provides enough heat to vaporize the atomized oil from the nozzle and achieve ignition.
- The drawer assembly holds the nozzle and electrodes.

## Clean Burning

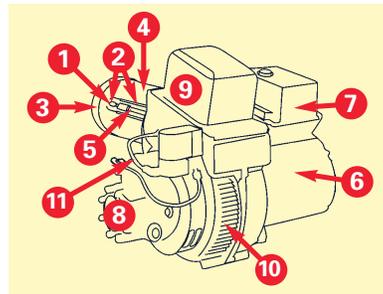
The newest burners for Oilheat systems make home heating with oil cleaner and more environmentally friendly than ever before.

- Modern oil burners use electronic pre-purge and post-purge controls that ensure ultra-clean starts and stops. The high static air pressure produced by the burner helps prevent particle buildup.
- An Oilheat system with one of today's modern burners is capable of burning 99.9% clean.
- The oil burners of today are so clean that they produce on average six ounces of particulate emissions (or soot) a year. To put that in context, consider that the six ounces of emissions comes from burning three tons of heating oil.



### Tip for your client:

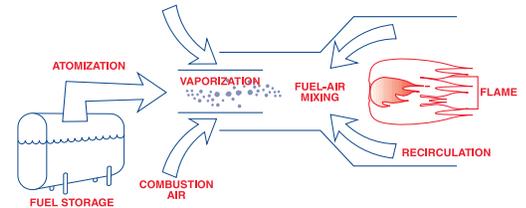
If a heating system appears to be in good shape but the burner is out of date, a flame retention burner should be considered. A new burner often pays for itself in just a few years as a result of lower fuel costs. Less fuel will be used, because a flame retention burner burns cleaner and operates more efficiently.



- 1 nozzle
- 2 electrodes and porcelain insulators
- 3 end cone
- 4 blast tube
- 5 firing assembly
- 6 burner motor
- 7 cad cell relay
- 8 fuel pump
- 9 ignition transformer
- 10 burner fan and coupling
- 11 nozzle line

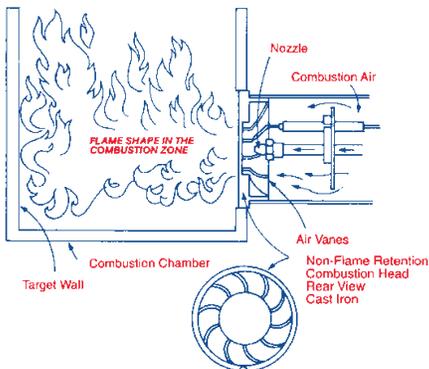
## How an oil burner works

SIMPLIFIED SCHEMATIC OF COMBUSTION PROCESS

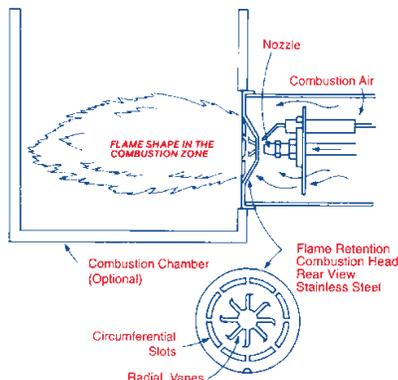


Heating oil in liquid form must be turned into vapor and mixed with air before it can burn. When the oil from the storage tank reaches the burner's nozzle, it's broken into small droplets. This process is called atomizing. These droplets are mixed with air and then ignited by the burner.

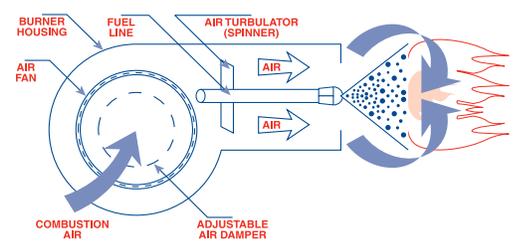
Non-Flame Retention Combustion



Flame Retention Combustion



DRAWING OF OIL BURNER OPERATION



The efficiency of the oil-air mix achieved by a burner depends on its design. The biggest difference between old burners and modern ones is the air handling step of the process.

# OILHEAT-POWERED HOT WATER

Homeowners with oil-fired water heaters have discovered they have low cost access to virtually unlimited amounts of hot water. Oilheat's ability to produce a reliable, inexpensive supply of domestic hot water is one of its strongest features. Although an oil-fired water heater may cost a little more to install upfront, its efficiency in heating water translates to extremely low operating costs over the life of the unit.

Oil-fired water heaters have high recovery rates, which means they can heat large amounts of water quickly. A water heater's recovery rate is the amount of water whose temperature the unit can raise by 100° in one hour. For example, if it can increase the temperature of 40 gallons of water by 100° in an hour, the unit has a 40-gallon recovery rate. Oil-fired water heaters have recovery rates as high as 120 gallons per hour.

Homeowners can contact an oil dealer to find out which water heating option is best for their home and family. The oil company can work with them to make sure the water heater they choose has a sufficient recovery rate for their needs. Two adults, for instance, may never need more than 30 gallons of hot water an hour, but a family of six may need 70 gallons.

An oil dealer can help homeowners with another choice too, because oil-fired water heating systems come in two categories: direct and indirect.

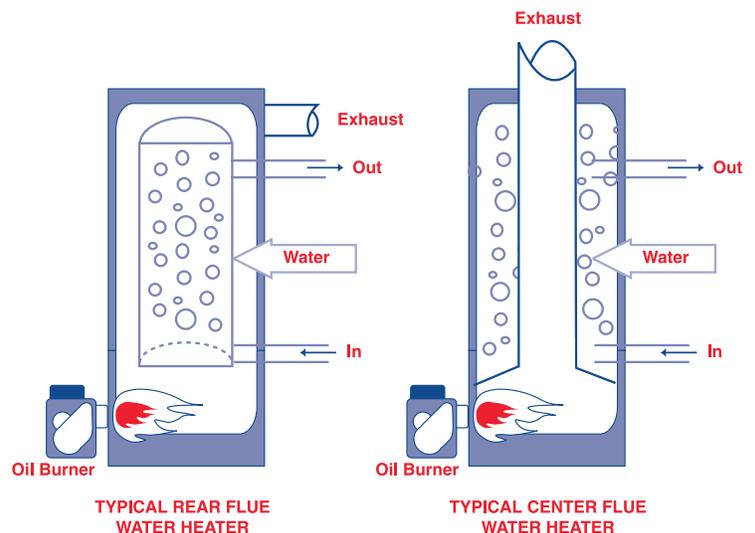
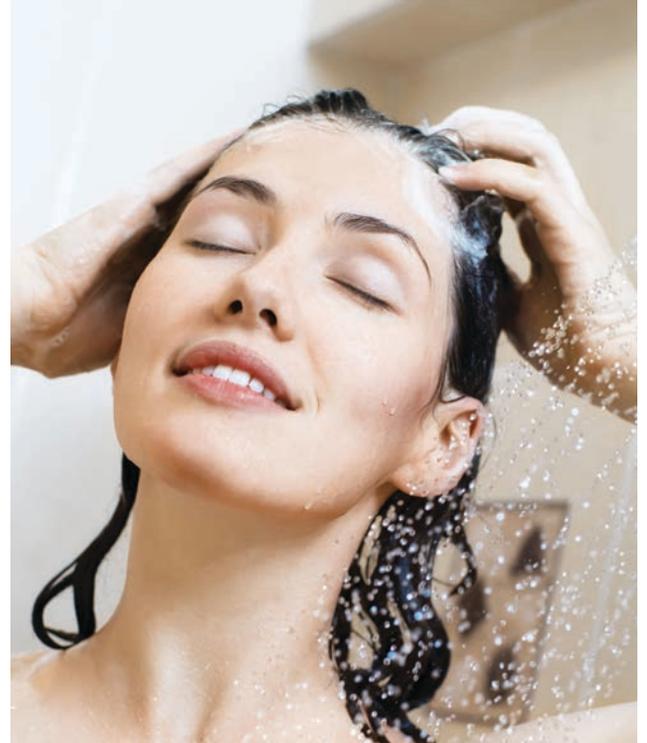
## Direct-Fired Water Heaters

In a direct-fired water heater, the water is heated directly by the heat of the oil flame. You'll usually find a direct-fired water heater in a home with a warm air furnace. The oil is burned in a combustion chamber under the water storage tank, and hot flue gases heat the water in the tank. (See illustration below.)



## Indirect-Fired Water Heaters

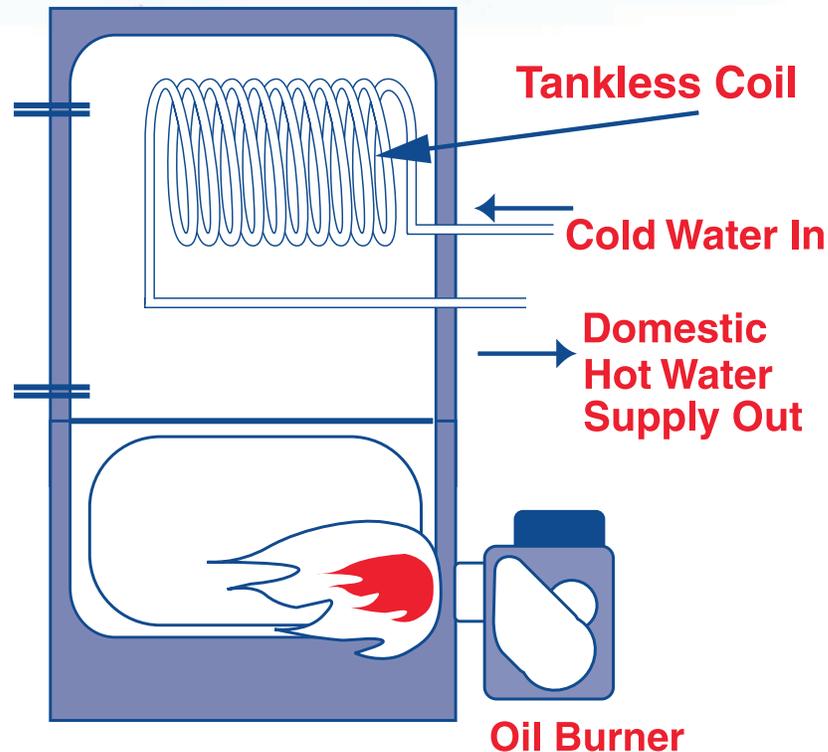
In an indirect-fired water heating system, the domestic water is heated by hot water from the boiler. In many oil-heated homes, you may find an indirect-fired system that is also tankless. A tankless, indirect-fired water heating system can work in conjunction with either a hot water boiler or a steam boiler. There are three variations: internal tankless coil, external tankless coil and tankless coil with storage tank.



*There are two direct system designs: a rear flue heater (left) in which flue gases are vented out the back, and a center flue heater (right) in which gases are vented through the top of the water heater.*



## Boiler



**Internal tankless coil.** In this type of indirect tankless water heating system, the coil containing the domestic water supply is located in the water jacket of the boiler. One drawback to this design is the absence of hot water storage; another is the need to maintain the temperature of the boiler water at a high level, high enough to heat the domestic water as it passes through the coil.

**External tankless coil.** This indirect-fired water heater has a separate storage tank that contains an internal coil. The unit connects to the sides of the boiler. A newer version of the external tankless coil water heater is the plate heat exchanger. It contains a series of wafers or plates with internal porting; plates alternate between boiler water and domestic water.

**Tankless coil with storage tank.** Better known as an aqua booster, this indirect water heating system was introduced to boost water heating capacity. After water has been heated by going through the indirect system's coil, it is stored in a vertical storage tank. The temperature of the hot water in the tank is usually maintained by means of a recirculating loop; it allows water to be reheated by going back to the coil, either by gravity or forced circulation.

*NOTE: Some local codes require an anti-scald control, also called a tempering valve, for tankless coil indirect water heating units. (See following section on water heating controls.)*

## Boiler and hot water heating controls

Regardless of design, any water heating system that stores hot water should have a pressure relief valve; it's installed to protect the system from high pressure.

- With tankless coil designs (where no water is stored in a tank), a pressure-only relief valve may be used; it protects the coil and piping from excessive pressure.
- A vacuum relief valve vents the system if a vacuum occurs inside the tank.
- A backflow preventer prevents boiler water from flowing into potable water systems.
- A direct-fired water heater needs an aquastat to control operation and temperature; it also needs a primary control and heat detector for safe operation of the oil burner.
- The new indirect-fired units typically have a triple aquastat, which controls high and low temperatures. This device communicates with the oil burner via a built-in cad cell relay. The aquastat can also control zone valves and the circulator.
- Because water inside a tankless coil can be extremely hot, all tankless coil systems should have an anti-scald device known as a tempering valve or mixing valve. When necessary, it automatically mixes in an appropriate amount of cold water to lower the temperature of the water to the chosen temperature setting.

### Common misconception:

When you see a tankless coil system, don't assume the hot water capacity is inadequate. When you test the hot water output, always do it under normal circumstances. For example, if a homeowner were filling a bathtub, he would open both the hot and cold water valves. Do the same. Keep in mind that the hot water unit may also be deficient due to a lack of maintenance. In hard water areas, calcium deposits in the coil must be cleaned out regularly.

## Comparing Water Heating Options

UNIT	WHAT IT IS	HOW IT WORKS	PROS	CONS
<b>DIRECT-FIRED</b>	a storage tank with its own oil burner	burner heats domestic water in tank	<ul style="list-style-type: none"> <li>– never runs out of hot water</li> <li>– perfect for big families</li> </ul>	<ul style="list-style-type: none"> <li>– higher service costs due to separate burner</li> <li>– medium lifespan</li> </ul>
<b>INDIRECT-FIRED</b>	a storage tank with coiled pipes inside	hot water from the boiler passes through the coil, which heats up the domestic water surrounding it	<ul style="list-style-type: none"> <li>– never runs out of hot water</li> <li>– lasts for 30 years or more with minimal service</li> <li>– extremely fuel efficient</li> </ul>	<ul style="list-style-type: none"> <li>– only used in conjunction with a boiler</li> </ul>
<b>TANKLESS COIL</b>	a coiled pipe inside the boiler	domestic water passes through the coil, which is heated up by the boiler water around it	<ul style="list-style-type: none"> <li>– inexpensive to purchase with new heating unit</li> <li>– very efficient in winter</li> </ul>	<ul style="list-style-type: none"> <li>– expensive to service</li> <li>– during summer, can't meet big load requirements (more showers, laundry, etc.)</li> </ul>
<b>AQUA BOOSTER</b>	a storage tank hooked to a tankless coil	stores hot domestic water made by tankless coil	<ul style="list-style-type: none"> <li>– improves hot water response and efficiency of tankless coils</li> <li>– long lasting</li> </ul>	<ul style="list-style-type: none"> <li>– depends on efficiency of tankless coil in boiler</li> </ul>

# OIL HEATING CONTROLS

The proven reliability of modern oil heating controls has been an important factor in making today's oil a remarkably safe and efficient fuel for home heating. A wide range of limit controls, thermostats and switching relays are used in oil heating systems. They have become more accurate and sophisticated with the introduction of more technologically advanced equipment. Here's a brief overview of some of these controls to help you better understand how an Oilheat system works.

## Thermostats

When heat is needed, the thermostat starts the burner through the primary control and an electrical circuit. The thermostat is the unit that gets all of the other controls on an Oilheat system going. When the thermostat sends a signal for heat, it triggers a series of subsidiary controls.

There are a number of Wi-Fi enabled "smart" thermostats on the market which expand the programming options, can "learn" the household schedules, and adjust heat output and room temperatures accordingly, increasing the overall system efficiency substantially.



## Limit Controls

Limit controls regulate warm air, water temperature and pressure. There are two categories:

**High limit/safety controls.** These controls act as safeguards to prevent overheating. They turn off the burner if temperatures become too high in the furnace or boiler, or if the pressure in a steam boiler rises to an unsafe level.

**Low limit/operating controls.** These controls start and stop the burner on a signal from the thermostat or aquastat.

## Primary Controls

Three kinds of primary controls are in use today. The oldest are thermal-mechanical controls. Solid-state and advanced microprocessor-based controls are newer and more accurate.



## Cad Cell Controls

Additional protection circuits, such as the cad cell (cadmium sulfide photocell sensors), were added to Oilheat systems in the early 1970s. A cad cell, which is usually mounted on the burner, uses its photocell "eye" to send a shutdown message to the primary control board if it cannot "see" the burner's flame in about 45 seconds. Many cad cells made today feature 15-second safety timers.

## Burner Power Switches

There are usually two switches for cutting off electric power to the burner. A red emergency switch is typically located at the top of the basement stairs. If the heating system is in a utility room, look for the emergency switch near the room's entrance. A second burner power switch is often found on or near the heating system.

### Tip for your client:

Primary controls have a reset button. This button allows the homeowner to restart the burner should a problem cause the unit to shut down. (For example, burners may need to be restarted after a power outage.) Pushing the reset button should get the burner running, but if the safety switch shuts the burner down again, the homeowner should call for service. Homeowners should NEVER push the reset button more than once, because it might cause excess oil to be pumped into the combustion chamber. This will result in a lengthy and costly repair.



# OILHEAT TANKS



A heating oil storage tank offers an important advantage to a homeowner—the ability to safely store an adequate supply of heating oil that’s ready for immediate use whenever cold weather arrives or a need to heat the home arises.

Because there are so many misunderstandings about oil tanks, you probably already know you have to be careful about what you say to the homeowner. To help you have more confidence in your recommendations, here are some facts about residential heating oil tanks.

## Types of Tanks

Oil storage tanks, either aboveground or underground tanks, can be found in three locations.

1. An aboveground tank may be inside the home, usually in the basement, utility room or garage. The most common tank is the indoor 275-gallon basement tank.
2. Some aboveground tanks are located outside the home, either in the rear of or at the side of the house. (Like indoor tanks, these tanks usually hold 275 gallons of oil.)
3. Underground tanks are found in various locations outside the home, buried in the yard. They are usually larger than aboveground tanks, holding 550 or 1,000 gallons of fuel.



## Options for Aboveground Tanks

The term “aboveground tank” refers to any tank not buried in the ground. Most oil tanks are now built of corrosion-resistant materials. The newest generation of aboveground tanks generally can be installed in small or unusually shaped spaces in basements or garages. Tanks can also be installed outdoors and hidden in a tank enclosure. Many new heating oil tanks are also being installed below ground using new, innovative technologies.

### Common misconception:

*Tank leaks are common and lead to financial ruin.*

**Truth:** Every once in a while there will be a news story about a major oil leak that’s reported in a way that tends to sensationalize the issue and negatively shape perceptions. Most leaks can be prevented if tanks are properly maintained and replaced when testing has shown they have reached the end of their lifespan. In some states, there is a public fund for covering any cleanup costs that result from leaks. In other states, private insurance or a tank protection program may be useful to the homeowner.



## Evaluating an underground tank

Although leaks do occur in residential oil tanks, they are extremely rare. A major national study showed that the chance of a leak from an underground heating oil tank is less than one-quarter of 1%.\* If a homeowner asks about the condition of an underground tank, you can suggest that they contact their oil dealer.

\* Source: *Environ Corp.: Analysis of the Potential Hazard Posed by No. 2 Fuel Oil Contained in Underground Storage Tanks.*

## Checking the vent and fill pipes

In addition to the tank, a heating oil storage system includes the fill pipe and the vent pipe. The oil driver connects the hose from the delivery truck to the fill pipe when making a fuel delivery. The vent pipe releases air pressure from the tank as it's filled. Generally, the terminus of the fill pipe and vent pipe are outdoors and near each other. The National Fire Protection Association (NFPA) requires inside tanks to have an audible device (generally called a vent alarm) that indicates when, during a delivery, the tank reaches its fill point.

## Tank Regulations

Oil storage systems must comply with local fire ordinances; many municipalities have adopted NFPA standards in their building codes. For questions about a particular installation, call the local building department or a qualified heating contractor.

## Inspection checklist for aboveground tanks

- Make sure the fill cap and vent cap are secured, and check that they are not clogged or restricted by ice, snow or insect nests.
- Look for leakage from tank fittings, filters, piping or the tank gauge. Also look for weeping (moisture) at tank seams.
- Inspect for signs of oil spills around the tank, fill pipe or vent lines.
- Check the condition of tank legs. The tank belly should not be touching the ground.
- Look for signs of corrosion. An aboveground tank can be painted to prevent external corrosion; it also improves the appearance of the tank. This is especially beneficial for outdoor tanks.

***If any of these conditions exist, contact the heating oil company.***



*Aboveground tanks installed outdoors can be hidden inside an enclosure like the one shown here.*

## Tip for your client:

Many oil dealers offer the option of automatic delivery. By tracking the weather and each customer's fuel consumption, they can refill the tank before the fuel level gets too low. The homeowner never has to think about it.

# CHECKLIST: IDENTIFYING PROBLEM SIGNS

- Operate the heating system using normal control devices to determine function.

*Tip: To run the system, make sure the thermostat setting is above room temperature.*

- Examine the exterior of the furnace cabinet or the jacket of the boiler/water heater. Look for signs of rust, discoloration, burn marks and soot buildup.

*For more information, see section on common home heating problems at right.*

- Check the aboveground tank and the condition, placement and size of the tank's vent pipe.

- Observe visible flue pipes, draft regulators and related components for safe operation.

- Observe the condition of ductwork and heat outlets, including vents, registers, baseboards and/or radiators. If you see marks that appear to be soot, be careful in making a conclusion about the cause. A homeowner often mistakes dark marks on walls for soot; they may actually be residue from cooking grease or candles. Marks on walls near registers and vents may also be "baked-on" dust.

*While these are possible explanations, there are others too, of course. Dark marks on walls could also indicate an inadequate draft, ignition problems or a cracked heat exchanger.*

## Common misconception:

### *Soot is normal*

If you see soot around registers or in vents in a home that's heated by a furnace, you should contact an Oilheat professional to determine whether there is a crack in the heat exchanger. In house heated by a steam or hot water boiler, water leaking from the boiler may indicate a crack or leak. Contact an Oilheat professional to assess the equipment.

## Common Home Heating Problems

In an effort to save energy, many homeowners have added insulation in their home, installed storm doors and double-pane windows, and followed other energy conserving strategies. In some cases, these energy saving changes can seal up a home so tightly that they prevent heating and cooling systems from having enough air to operate efficiently.

If you suspect this is a problem, encourage the homeowner to discuss the situation with a heating oil company. Poor air flow can also be caused by the following conditions.

- The furnace/boiler room is tightly sealed.
- A fireplace or exhaust fan may be operating at the same time as the burner. This can result in a smoky odor because a backdraft is pulling flue gases through the exhaust system and into the home.
- A clothes dryer, workshop or a pet's living quarters are near the oil burner. Lint, sawdust or animal hair can be drawn into the air openings of the burner and clog it.
- If the burner flame looks weak and is orange in color, and if there are signs of soot, there is probably a lack of combustion air. To confirm this, open a door or window to bring air to the area around the heating system and watch the burner flame. If it turns a bright white, lack of combustion air is the problem.

## For Safety's Sake

- If the power switch is off, determine why.
- There should be no combustible materials near the heating source.
- Don't turn on a heating system if circumstances are not conducive to safe operation or it may damage the equipment.
- Do not open any valves. You may not be able to close them again.
- Don't touch the relief valve or change settings on any valves or controls.

## Don't Play Taps

- Don't tap on the flue pipe to see if it's sound. (If you want to check the interior, shine a flashlight through the draft regulator.)
- Don't tap on a storage tank to try to determine how full it is. It doesn't work and you could damage the tank.

# PREVENTIVE MAINTENANCE: THE TUNE-UP

*Regular maintenance can extend the life of heating equipment.*

A homeowner who makes sure to have the heating system properly maintained may get several more years of satisfactory use from it. What's more, approximately 75% of all emergency repairs can be prevented with regular maintenance.

## How long does a tune-up take?

A complete professional tune-up generally takes from one to two hours. It typically includes a series of safety and operating tests to identify adjustments that need to be made to a system. These include, among many others, testing the draft, stack temperature, burner operation and system efficiency.



## Tip for your client:

Recommend that the homeowner call in a qualified technician from a full service heating oil company to complete a thorough inspection of the home's heating system. This is especially important if the system hasn't been serviced in the last couple of years.

Studies show that only 55% of U.S. homeowners have their heating equipment serviced regularly. Those who don't generally experience higher fuel bills.

Heating equipment that is maintained periodically uses less fuel than units not maintained, according to the U.S. Environmental Protection Agency.



## CONCLUSION

*New advances in Oilheat are constantly under development. As one example, the industry is moving toward wider use of cleaner-burning fuels. Tests show that low-sulfur heating oil and Bioheat® fuel reduce the need for equipment servicing. The combination of high-quality fuel and technologically advanced equipment makes Oilheat a good choice for today's homeowner.*

# FACTS

## SOME SURPRISING FACTS

- The average AFUE (Annual Fuel Utilization Efficiency) of a new Oilheat system is in the mid-80s to low-90s. These efficiency levels were reached even before a federal mandate required that all heating systems have a minimum AFUE of 78%.
- The newest oil heating systems (condensing boilers and furnaces) have AFUE ratings that exceed 95%.
- Oilheated homes warm up quickly and provide even, efficient heat. For every gallon of oil burned, a whopping 120,000-140,000 BTUs of heat is generated, and the flame temperature of Oilheat systems reaches about 3,000°.
- There are about 7 million Oilheated homes in the United States; 300,000 of them were built in the past decade.
- Millions of homes in Europe rely on Oilheat for comfort. Germany and Italy, along with the U.S., are leaders in the manufacture of Oilheat equipment.

### Oil-fired water heaters provide unlimited hot water at low cost

Not only does an oil-fired water heater save huge amounts of money over its lifetime, it is also perfect for homes with a high demand for hot water, such as homes with growing families or homes with Jacuzzi bathtubs.



# RESOURCES *To learn more, here is a listing of state, regional and national Oilheat associations.*

## *Connecticut*

**Connecticut Energy Marketers Association**  
866-521-4272  
www.ctema.com

## *Delaware*

**Mid-Atlantic Petroleum Distributors' Association**  
410-349-0808  
www.mapda.com

## *Idaho*

**Idaho Petroleum Marketers & Convenience Store Association**  
208-345-6632  
www.wpma.com/idaho

## *Indiana*

**Indiana Petroleum Marketers and Convenience Store Association**  
317-633-4662  
www.ipca.org

## *Kentucky*

**Kentucky Petroleum Marketers Association**  
859-219-3571  
www.kpma.org

## *Maine*

**Maine Energy Marketers Association**  
888-863-3753  
www.meoil.com

## *Maryland*

**Mid-Atlantic Petroleum Distributors Association**  
410-349-0808  
www.mapda.com

## *Massachusetts*

**Massachusetts Energy Marketers Association**  
781-365-0844 or 781-365-1158  
www.massenergymarketers.org

## *Michigan*

**Michigan Petroleum Association/ Michigan Association of Convenience Stores**  
517-622-3530  
www.mpamacs.com

## *Nevada*

**Nevada Petroleum Marketers & Convenience Store Association**  
775-398-3000  
www.wpma.com/neveda

## *New Hampshire*

**Oil Heat Council of New Hampshire**  
603-415-8330  
www.nhoilheat.com

## *New Jersey*

**Fuel Merchants Association of New Jersey**  
973-467-1400  
www.fmanj.com

## *New York State*

**Empire State Energy Association**  
518-280-6645  
www.esenergy.org

## *New York State*

**New York State Energy Coalition**  
631-360-0200 or 212-695-1380  
www.nysenergycoalition.org

## *New York - Hudson Valley*

**Hudson Valley Oil & Energy Council**  
845-742-6754  
www.hvoec.org

## *New York - Long Island*

**Oil Heat Institute of Long Island**  
631-360-0200  
www.ohili.org

## *New York - New York City*

**New York Oil Heating Association**  
212-695-1380  
www.nyoha.org

## *New York State - Upstate*

**Upstate New York Energy Association**  
518-280-6645  
www.unyea.org

## *North Carolina*

**North Carolina Petroleum & Convenience Marketers**  
919-782-4411  
www.ncpcm.org

## *Ohio*

**Ohio Petroleum Marketers & Convenience Store Association (OPMCA)**  
614-947-8646  
www.opmca.org

## *Oregon*

**Oregon Fuels Association**  
503-670-1777  
www.oregonfuels.org

## *Pennsylvania*

**Pennsylvania Petroleum Association**  
717-939-1781  
www.ppmcsa.org

## *Pennsylvania - Berks & Schuylkill Counties*

**Berks-Schuylkill Oil Heat Association**  
www.bsoha.org

## *Pennsylvania - Central*

**Oil Heat Association of Central Pennsylvania**  
814-742-8438  
www.centralpaoilheat.com

## *Pennsylvania - Chester County*

**Chester County Fuel Dealers Association**

## *Pennsylvania - Franklin County*

**Franklin County Fuel Dealers Association**

## *Pennsylvania - Delaware Valley*

**Delaware Valley Fuel Dealers' Association**  
610-419-3242  
www.dvfda.org

## *Pennsylvania - Lehigh Valley*

**Better Home Heat Council of the Lehigh Valley**  
www.bhhclv.com

## *Pennsylvania - Northeast*

**Northeast Pennsylvania Energy Marketers Association**  
www.nepaenergy.org

## *Pennsylvania - Pittsburgh*

**Pittsburgh Petroleum Association**  
www.ppapgh.com

## *Pennsylvania - South Central*

**South Central Pennsylvania Energy Association**  
717-892-2209  
www.southcentralpaenergy.org

## *Rhode Island*

**Oil Heat Institute of Rhode Island**  
401-619-4553  
www.warmth4ri.com

## *Vermont*

**Vermont Fuel Dealers Association**  
802-230-4722  
www.vermontfuel.com

## *Virginia*

**Virginia Petroleum, Convenience & Grocery Association Inc.**  
804-282-7534  
www.vpcga.com

## *Washington D.C.*

**Mid-Atlantic Petroleum Distributors Association**  
410-349-0808  
www.mapda.com

## *Washington State*

**Washington Oil Marketers Association**  
360-443-6696  
www.waoil.com

## *Wisconsin*

**Wisconsin Petroleum Marketers Convenience Store Association**  
608-256-7555  
www.wpmca.org

## *Regional*

**New England Fuel Institute**  
617-924-1000  
www.nefi.com

## *National*

**National Oilheat Research Alliance (NORA)**  
703-340-1660  
www.noraweb.org

**Oilheat Manufacturers Association**  
802-325-3509  
www.oma-web.org

**Oil & Energy Service Professionals**  
888-552-0900  
www.thinkoesp.org



*The American Energy Coalition is a grassroots organization that advocates for Oilheat and the dealers who sell it. Formed in 2008, we represent Oilheat dealers throughout the United States, as well as manufacturers of Oilheat equipment and other professionals and vendors who work in Oilheat.*

*Our goal is to equip agents, brokers and home inspectors with accurate information that they can share with clients. Through the Realty program, AEC aims to promote successful sales of Oilheated properties.*

*Oilheat is a clean, efficient heat source, but even the most informed real estate professionals can use help. We want to raise the level of comfort with Oilheat, so we provide important resources like online information and informative brochures.*



A HOME  
INSPECTOR'S GUIDE TO  
**OILHEAT**