

WHAT IS A VAPORIZER?

A vaporizer is any device used to raise the temperature of a material in order to release (thermally desorb) desirable components in the form of vapor without reaching combustion.

Although the vaporizer concept has been around for decades, it is only in the last 15 years or so that commercial vaporizers have been manufactured and sold. Today, the benefits of vaporization are becoming more widely known, consequently the number and variety of devices has been rapidly increasing. This makes classifying vaporizers unexpectedly difficult, but every vaporizer has two essential components: a heat source, and a delivery system.

HEAT SOURCES

Although all vaporizer designs use one of three ways to employ heat for the primary heat source, they almost always benefit from the secondary effects of one or both of the other types. The primary types are:

- Convection works by flowing heated air over and through the material. Most modern vaporizers primarily use convection because it heats the material more evenly and efficiently, and temperature control is easier.
- Conduction works by direct contact of the material with a heated surface. The earliest commercial vaporizers used conduction. Although it fell out of favor when convection vaporizers appeared, some successful modern designs have revived conduction.
- Radiation works by transferring heat using energy emitted as electromagnetic waves. There are few radiation vaporizers, but some vaporizer designs take advantage of radiated heat as a supplemental source.

Heater types

Most heaters for conduction vaporizers are metal, usually stainless steel because it is inert at vaporizing temperatures. The heater surface can be either solid metal or a screen. An advantage of this type of heater is quick heating and cooling, but some designs use a solid metal block rather than a plate. The advantage of this is that the block does not cool off significantly as you draw air over it, but of course it is slower to cool down.

For convection vaporizers, the most popular heater is ceramic, again because the ceramics used are inert at vaporizing temperatures. Ceramic heaters are slower to warm up but once hot, they retain heat well and minimize the cooling caused by incoming air. Some designs supplement the ceramic heater with stainless steel or other metal that acts as a heat exchanger, further stabilizing the temperature. As with metal blocks, these designs cool down slowly.

Some vaporizers use a nichrome wire wrapped around a glass chamber as a heat source. Because this design is sensitive to cooling air, this type of heater is controlled by a programmed chip, which gives it the potential of providing the most stable temperature of all heater types.

Power sources

In order of use by designers, power sources for heat are:

Electric

Most electrically powered vaporizers either have a variable control for setting a consistent reproducible temperature, or are set to a fixed temperature. We can subdivide them into two more types:

Wall plug or desktop

These designs are often called desktop vaporizers because they require an electrical outlet. This is normally your house circuit, but designs of this type can also be taken on camping trips and outdoor excursions by using a car adapter and inverter combination.

Plug-in vaporizers employ a power transformer (often referred to as a brick) since heaters require DC power. You can use a variable voltage power supply to change the operating temperature of a fixed temperature vaporizer, but this is not common and might be hazardous.

Battery powered

Battery designs are intended to be portable, meaning they are simple to carry around and use without being plugged in. Most, but not all, can be easily slipped into a pocket.

The batteries used in vaporizer designs are rechargeable but there are different types:

NiMH and LiPo

These batteries can be removed and easily replaced. They are usually recharged using an external charger. Because their power capacity is limited and vaporizing demands high heat, they are depleted quickly. Some users avoid them because they require careful management in order not to run out at an inconvenient time.

Li-Ion

These batteries are not easily removable and usually cannot be replaced without returning the unit to the manufacturer. They require a connection to the device to recharge, either with USB or through a power brick. Some power adaptor models let you use the device while connected, but the power drain disallows charging while in use. USB charging cannot deliver enough power to allow use while plugged in.

Flame

Most designs using flame for the heat source employ a butane powered torch lighter. Regular butane fueled lighters work for some simple pipe or glass tube vaporizers, but they are not as effective. At least one design, now discontinued, used an alcohol burner.

Flame-based vaporizers typically are conduction, but there are some convection designs. The heat can be applied directly, insulated by only a surface such as glass, or it can be applied to a ceramic or metal plate that transfers the heat. As you might expect, these designs often (but not always) resemble pipes. They are usually used like pipes, in that you must hold the flame near the heating chamber as you do when lighting a traditional pipe. This requires learning the correct distance and time for heating in order not to cause combustion.

Because almost all flame heat used for vaporizing is from butane, some users avoid this type of design because they do not want to risk the chance of unhealthy by-products from impure or incompletely burned butane. To avoid this objection, some designs completely isolate the vapor path from the butane heat source.

Originally, flame-based vaporizers were the popular choice for those wanting portability. The disadvantages were the need for careful technique, difficulty of obtaining consistent results, and the requirement for a butane torch lighter. New battery-powered portable designs have eliminated these problems and largely replaced flame vaporizers; however, the lower cost of flame models has kept them on the market.

Other sources (rarely used)

Heat gun

The heat gun is popular in home-made vaporizers. Heat guns have been adapted for use with some vaporizers that were designed for use with butane torch lighters.

Catalytic converter

There are also a few butane-powered designs that eliminate the need for a torch lighter by using catalytic converters, which also ensure complete burning of the butane.

Radiant heat

A halogen bulb provides enough radiant heat for vaporization. Although this type of design is rare, at least one successful design uses radiant heat.

DELIVERY SYSTEMS

Every vaporizer needs a way to transfer the vapor from the heating chamber to the user. Like heat sources, there is a wide variety. One way to classify delivery systems is whether they are assisted or unassisted. Note that some designs can be used with both methods.

Assisted

In this type of delivery system, a fan or pump forces hot air through the material to be vaporized and into a bag (sometimes called a balloon). Assisted designs are therefore convection designs.

The bag is made from the same plastic film used to make oven roasting bags. It is food grade, meaning it is safe to use and can tolerate high temperatures. Some designs include a valve at the opening to prevent vapor loss.

One advantage of this system is that bags are simple to fill and use. Another advantage is transportability. Once detached from the vaporizer, you can move bags easily to another location. Although it might seem that bags could be used to store vapor for later use, this is limited because vapor condenses as it cools, and also loses potency over time.

Disadvantages include a low vapor-to-air ratio unless you use a low flow rate and fill the bag slowly, deterioration in taste after multiple uses, and difficulty in cleaning the bags. These last two are related, since the taste degradation is due to condensed vapor inside the bag which has gone stale, leaving a disagreeable taste. It is usually easier to replace the bag rather than clean it.

Unassisted

Unassisted designs depend on your lung power to pull air over or through the material. They can be convection, conduction, or radiation.

Direct from the device

The simplest unassisted designs require that you draw directly from the device. These are portable devices designed to be used on-the-go. The lack of supplemental parts needed for delivery means they can be incredibly compact, but a direct vapor stream with a short path can be too concentrated and hot for some users. The positive side is that there is little opportunity for vapor to condense or lose flavor. Some designs can be supplemented with a whip or a tube, or both.

Whips

A whip is a length of food grade silicone or PVC tubing. One end of the whip usually has a mouthpiece, which is often glass but can be acrylic, metal, or even wood. The other end attaches to the heating chamber, typically through a glass connection.

Many users prefer silicone whips over PVC because it is more flexible, heat resistant, and can be cleaned without difficulty. PVC tubing is often hard to remove from attachments and can be easily damaged during cleaning. Also, some users feel there are health risks associated with subjecting PVC tubing to hot vapor flow.

Wands

In many whip designs, the heating chamber is a glass tube called a wand, which holds the material to be vaporized. The wand is then attached to the heating unit. There is usually a screen to prevent loose material from being drawn through the wand and into your mouth.

Tubes and stems

Tubes, sometimes called stems, are hollow glass, acrylic, or wood cylinders that you use like a straw. Sometimes tubes are used to supplement a device designed for drawing from directly, as described above. In most designs that require a tube, however, you pack the material to be vaporized into one end of the tube, similar to a wand. You then insert the loaded tip of the tube into the heating chamber. The tip is sometimes a different material, such as brass or silicone.

FORMATS

There seems to be an endless variety of combinations of the possibilities described above, but there are three general formats that are common and deserve specific attention.

Box vaporizers

These are basically a box built around a heater, often with a digital display for temperature control. The delivery system is a wand and whip combination. Box vaporizers have a reputation for delivering thick cloudy vapor but are probably the fastest to consume your material.

Box vaporizers are the most common format, partly because they are easy to build and simple to use. Unfortunately, this also means that there are a large number of cheap but poorly made and potentially unsafe vaporizers for sale on sites like eBay and Amazon. While these devices look like their more expensive reliable and safe brothers, they are traps for the unwary. Many of them never work properly, and many more fail soon after they are bought. They almost never come with a warranty, and if they do it is usually impossible to get service.

There are many good, reliable box vaporizers that are made from safe materials and come with a genuine warranty. Vape World sells several of them. If the box format appeals to you, be sure to buy from a reliable dealer with a reputation for service. Avoid cheap "bargains". This is a case of you get what you pay for, and you should expect to pay \$150 or more for a good box vaporizer.

Log vaporizers

Log vaporizers acquired the name because they are literally heaters enclosed in a machined piece of log, or wood. They are handmade, making each one unique. They are small, and attractive enough that some people actually use them as display pieces. Most log devices use a stem delivery system with a small load capacity, which encourages efficiency by limiting the amount used. This is why they have a reputation for being among the best devices for making

your material go farther. The biggest disadvantage of most log vaporizers is that they are fixed temperature devices, although there are some variable temperature designs. They also require a long warm-up time, generally 30 minutes or more. This disadvantage is offset by the fact that they are typically designed to be left on 24/7, although this can eventually lead to charring of the inner wood in some designs.

E-cig style vaporizers

This might be the fastest growing type of vaporizer available. Some are completely new designs. Others are existing e-cigarette designs that have been modified for other materials. E-cig designs are slim and tubular, so they are easily slipped into a pocket or purse.

This type of vaporizer is intended to be portable and is battery powered. Some require cartridges that must be pre-loaded, but most have a heating chamber that you can load yourself. Battery management can be a problem, since the high heat required for vaporizing can deplete your batteries quickly, depending on your usage pattern.

Because this is the newest variation of vaporizer design, there is a wide range in quality. Some designs, particularly the ones that are not modified from e-cigs, have been well received and reviewed. Others do not work well yet. If you are considering this format, be sure to do careful research and look for reviews and comments from owners. As always, purchase only from dealers with a reputation for reliability and service, such as Vape World.