



**JJM**  **ALKALINE  
TECHNOLOGIES**

A Burning Question:  
How to Ensure  
Compliance of Your  
High-Efficiency  
Appliances



**High-efficiency heating appliances** are a recent innovation that reduce a building's carbon footprint and deliver significant energy bill savings. Today, high-efficiency appliances, which include condensing boilers, furnaces, and hot water heaters, are found in nearly all residential and commercial installations where efficient heat is required, such as hot water for a hospital, temperature control for an office building, or instant heat to warm a home on a cold winter night.

Although high-efficiency appliances are a game-changer to effectively bring heat to our homes and buildings, they come with one small, yet concerning, side effect. Acidic condensate is a byproduct of high-efficiency combustion. **If left untreated, it can cause damage to a building's infrastructure, local sewage systems, and the environment.**

High-efficiency heating appliances are growing in popularity, but the proper treatment of the acidic condensate remains a widely overlooked or unknown issue. However, the industry has found an easy solution that can be implemented with the installation of high-efficiency appliances.

## What is a High-Efficiency Appliance?

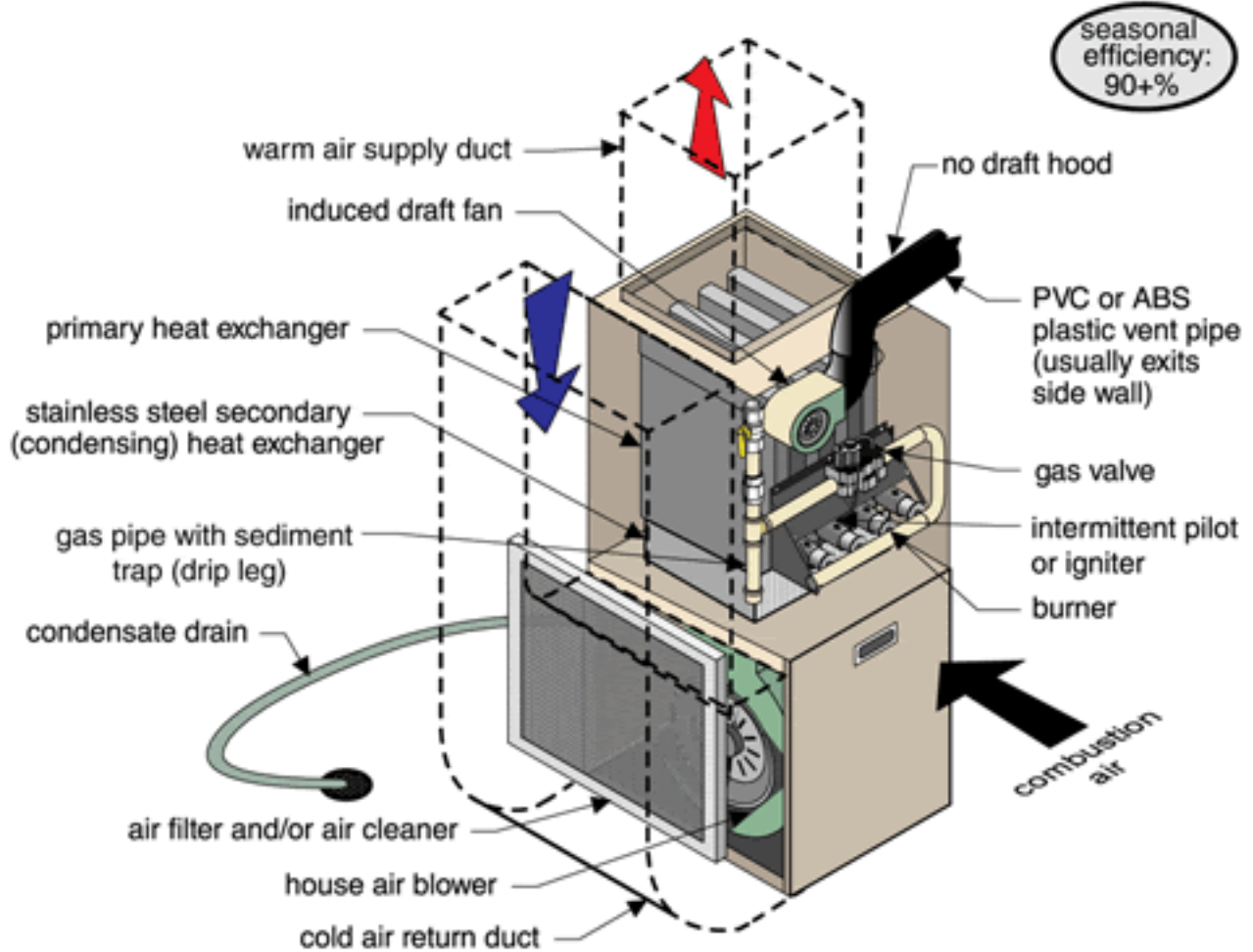
High-efficiency appliances, which are rated at a minimum of 90% efficiency, are so called because (i) they extract more heat out of the gas consumed and (ii) are more precise in the amount of energy required for the job.

In the heating process, gas combustion mixes with oxygen and forms water vapor, which includes nitrogen compounds. In older, lower-efficiency appliances, such vapor was vented straight out of the home or building. However, with high-efficiency appliances, heat is recovered, or returned, to extract more energy and in doing so, the vapor begins to cool. When this vapor reaches the dew point, it condenses inside the appliance. Thus, high-efficiency appliances are also referred to as "condensing" appliances.



## High Efficiency Gas Furnace

© 2011 Carson Dunlop



Although high-efficiency appliances are a relatively recent innovation, they are quickly becoming the preferred appliance for commercial and residential buildings. This trend is due to state and national efficiency mandates for appliances and the growing natural gas infrastructure in the U.S. Also, organizations including the [EPA](#) and DOE have incentivized the installation of energy-efficient appliances. The adoption of high-efficiency appliances is only expected to continue as they become increasingly reliable and efficient, and more affordable.

*As the installation of condensing appliances increases, homeowners and commercial building owners are starting to realize a potential side effect of high-efficiency: acidic condensate.*

## What is Acidic Condensate?

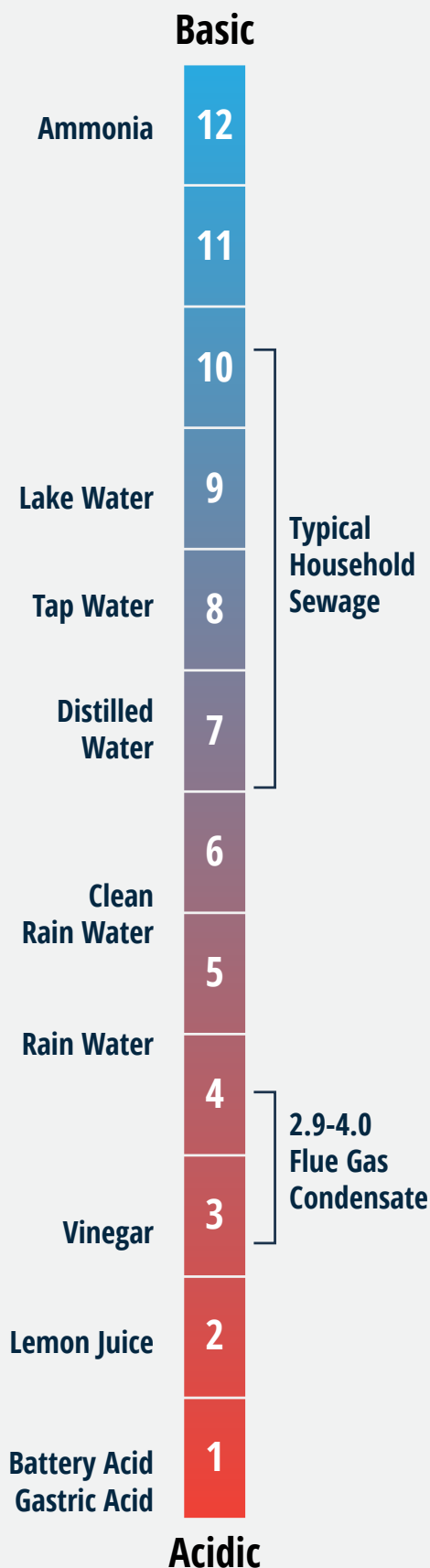
Acidic condensate is a byproduct of the combustion process in a gas-fired, high-efficiency appliance. This condensate can contain a concentration of nitric, sulfuric, sulfurous, and hydrochloric acids.

### HOW CONDENSATE IS FORMED:

- High-efficiency appliances extract heat from the exhaust gases through a condensing phase
- Heat is released from the gases
- Vapor in the gases meets the dew point and condenses into a liquid condensate
- Condensate collects in the appliance and must be discharged

Condensate produced by high-efficiency appliances has a pH between 2.9 and 4.0, which makes it acidic and corrosive to buildings and their drainage systems. Pure water is neutral and has a pH level of 7.0. When comparing wastewater to pure water, it's important to remember that acidity is not measured on a linear scale. It is logarithmic, which means that each whole number step below 7 is 10 times more acidic than the next higher number. Therefore, 3.0 pH is 100 times more acidic than 5.0 pH.

Due to such acidity, the condensate from high-efficiency appliances can **eat through copper piping within months and destroy almost any material except PVC**. To be safe, acidic condensate must be "neutralized" by raising its pH level to at least 5.0 pH.



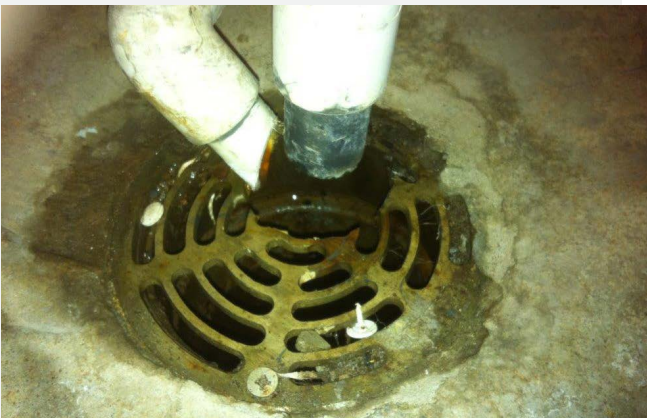




## The Damage Acidic Condensate Causes

Many residential and commercial building owners, contractors, engineers, and service technicians remain unaware of the potential damage from acidic condensate and the easy treatment solution. Due to old industry norms, condensate is commonly left untreated before being discharged into the sanitary drain system or the surrounding environment. If untreated, acidic condensate can cause extensive damage, including:

- Erosion of floors, drains, and concrete foundation
- Corrosion of pipes in homes and buildings
- Pollution of surrounding environment and groundwater
- Destruction of wastewater infrastructure, including sewers, pipes, and septic systems



The cast iron pipes found in older homes or buildings are especially susceptible to damage from acidic condensate. Although many new homes and buildings use PVC plumbing, floor drains, cast iron sewer lines in the neighborhood, septic systems, and even wastewater treatment facilities downstream are still vulnerable to damage from acidic condensate. As one can imagine, these issues can necessitate costly repairs. For instance, condensate corrosion can result in thousands of dollars worth of damage in homes where sewer lines run under the foundation slab.

Regulatory bodies have begun to address the issue of untreated acidic condensate. Similar to other wastewater streams, some national and state plumbing codes (e.g. UPC, IPC, PHCC, EPA) now require that home and building owners treat condensate before discharging it from a building. **Violations of such codes can result in fines and/or operational shut-down.**

## HOW DOES CONDENSATE DAMAGE SEPTIC SYSTEMS?

The acidic condensate liquid kills the good bacteria living within a septic system. Good bacteria is critical to septic systems, because it breaks down human waste and allows the system to work properly. Without this bacteria, septic systems become backed up and deteriorate, causing major problems for cities and municipalities.

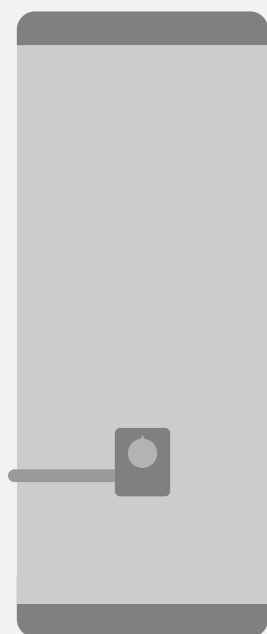
Like public septic systems, private septic tanks are vulnerable to costly damage due to untreated acidic condensate. If a septic tank fails, it can cost the owner \$10,000 — \$50,000.

*State plumbing codes (e.g. UPC, IPC, PHCC, EPA) now require that home and building owners treat condensate before discharging it from a building. Violations of such codes can result in fines and/or operational shut-down.*

According to [The International Plumbing Code \(IPC\) of 2018:](#)

"[A] neutralizing device [is] required for corrosive wastes. Corrosive liquids, spent acids or other harmful chemicals ... shall not be discharged into the plumbing system without being thoroughly diluted, neutralized or treated by passing through an approved dilution or neutralizing device."

Building owners, contractors, engineers, and service technicians should ensure to protect the buildings they manage, own, or service and the surrounding environment **by utilizing an easy treatment solution for acidic condensate.**



## A Simple Solution to Treat Acidic Condensate

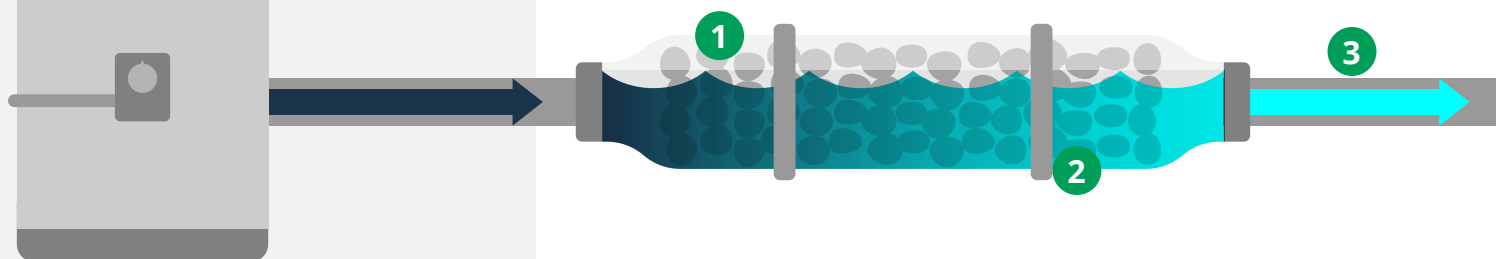
The potential damage from acidic condensate should not deter the use or adoption of high-efficiency appliances because the industry has an easy solution: condensate neutralizers.

A condensate neutralizer is a reliable, purpose-built solution that works with high-efficiency appliances to safely treat and discharge condensate.

Neutralizers act like a filtration device and are filled with neutralizing media, such as magnesium hydroxide, that interacts with the condensate to lower its acidity or raise its alkalinity.

### DURING THE NEUTRALIZATION PROCESS:

- 1 Acidic condensate from the appliance slowly enters the neutralizer and makes contact with the media, beginning its "soak time"
- 2 The media reacts with the condensate to raise the pH level, usually to 5.0-9.5pH, thereby "neutralizing" the condensate
- 3 Once neutralized, the condensate is safe to be released into the wastewater system





Neutralizers are relatively simple to install and inexpensive. They are designed in a variety of configurations and capacities, suited for small household heaters to hefty boilers found in multi-story office buildings.

A neutralizer is a necessary component to protect a home or building, its drainage pipes, the septic system, and the environment. With proper installation, they are the perfect complement to high-efficiency appliances.

## Benefits of the JJM Alkaline Technologies® Acidic Condensate Neutralizer

JJM Alkaline Technologies® is an industry leader in the design and manufacture of condensate neutralization products and solutions. Its products are trusted by engineers, contractors, and service technicians to ensure the safe treatment of condensate in compliance with industry, federal, state, and local codes. JJM® offers the broadest portfolio of solutions suited for various site operating conditions found in the heating and plumbing industries.

JJM® products use pH Power Pellets®, a highly effective, proprietary media developed over years, to effectively treat acidic condensate associated with today's high-efficiency appliances.



## THE NEED FOR PROACTIVE MAINTENANCE AND SERVICING

Like high-efficiency appliances, condensate neutralizers must be regularly maintained to ensure efficacy and safe discharge of condensate. It is recommended that the neutralizer is inspected and the media be replaced **about every six to twelve months**, or when the pH level is below 5.0 (or that of the local water authority code).

To determine if the condensate neutralizer requires new media, a service technician should test the acidity of the condensate from the neutralizer outlet using a pH sensor or litmus paper test. If the pH level is below 5.0, the media should be replaced immediately. Continued maintenance of neutralizers helps ensure compliance with plumbing codes and reduces the chance of drain and pipe corrosion.

## FOR RESIDENTIAL INSTALLATION AND MAINTENANCE

Plumbing codes require that homes with a high-efficiency appliance treat acidic condensate before discharging it into the wastewater system. Installation and service technicians of boilers, furnaces, and water heaters should also install neutralizers in order to be compliant. They should also educate homeowners about condensate and the significant value of neutralizers.

Technicians also play a role in protecting homes and upholding local and national plumbing codes. They should regularly service neutralizers by replacing the neutralizer media at least once annually. Replacing neutralizer media should be considered a standard part of the maintenance visits alongside other routine services, such as furnace inspection or air filter replacement. As a result, service technicians ensure compliance and protection for homeowners while creating a recurring revenue opportunity for their business.



## FOR COMMERCIAL INSTALLATION AND MAINTENANCE

Commercial contractors, engineers, and building maintenance personnel should ensure the inclusion of a neutralizer when designing, installing, or maintaining boilers, furnaces, or water heaters. National plumbing codes require proper treatment of acidic condensate, and purpose-built neutralizers are designed to do just that.

If a project or job is inspected and condensate is found untreated, the consequences can be severe, including fines or shut-down. By installing and maintaining a neutralizer, the building and facilities are protected and environmental compliance is assured. Building owners will appreciate the forethought and stewardship to keep their facilities safely operating.



## JJM Alkaline Technologies® is The Green Solution to Neutralization

Founded in 2005, JJM® is a leading designer and manufacturer of condensate neutralization solutions used in residential and light commercial installations. Its products are sold to leading Original Equipment Manufacturers, dealers, and distributors of heating and plumbing equipment throughout the United States and Canada. The company continues to innovate and bring to market the purpose-built solutions that the industry has relied on since its earliest days.

[Speak with a local heating and plumbing distributor about purchasing JJM products.](#)



Partnering with JJM Alkaline Technologies® is simple.  
For more information, visit [jjmalkalinetech.com](http://jjmalkalinetech.com).