

# Water Purification Systems and Air Purification Systems

By Tamar Clarke

September 27, 2019, Updated October 18, 2019

The purpose of this presentation is to give an overview of water and air purification systems and what is out there. Individual needs may vary depending what is in your environment and what causes health issues. It is no means a comprehensive overview. The costs also can vary considerably.

# Overview

- Opening
- Section on Water Purification
- Types of substances found in water
  - Graphic on Substances Found in Water
  - Heavy Metals
  - Petroleum Contaminants
  - Pharmaceuticals
  - Radiologicals
  - Volatile Organic Compounds (VOCs)
  - Other Compounds Found in Water
- Testing By a Third Party On Water Filtering
- Water Filter
  - Various types of water filters
    - On the Counter
    - Under the sink and whole house
    - Pitcher
    - Portable Bottles
    - Others
  - Berkey
    - Water Filter for Drinking and Cooking
    - Shower Water Filter
  - Propur
  - Aquagear
  - Brita
- Bottled Water
- Concluding Comments on Water Filters
- Section on Air Purification
- Questions to Ask About Air Purifiers
- Air Pollution Basics
- Basic Types of Substances found in the Air
- Basic Guidelines for Air Purification Filters
- Air Filters Features
- Types of Air Purification Technology
- Twelve Harmful Chemicals in our Air
- Examples of Air Purification Systems
- Air Purification Systems – Use of Plants
- Concluding Comments on Air Purification Systems
- Addendum
  - Bibliography
  - Companies that Produce Water Filters
  - Glossary
  - Shower Filters (for water)
  - Specialty Water Filters
  - Water Filter Bottles
  - Water Filters Using Reverse Osmosis
  - Water Tester
- Conclusion

# Opening

- As we become more aware of the pollution that is affecting our water supply as well as the air we breathe, we look towards devices that can remove the toxins and unsafe chemicals from water and from air.
- Before purchasing a water filtration system, it helps to know what are some of toxins and unsafe ingredients in your area (municipal or rural). The next few slides indicate some of the types of substances found in water.
- The same is true for air filters.

# Section on Water Purification Systems



## Graphic on Substances Found in Water

Source: [Grocerysecrets.com](http://Grocerysecrets.com)

# Heavy Metals found in water

- Aluminum
- Antimony
- Arsenic
- Barium
- Cadmium
- Chromium
- Chromium-6 (Hexavalent)
- Cobalt
- Copper
- Lead
- Manganese
- Mercury
- Molybdenum
- Nickel
- Thallium
- Vanadium

Source: [https://berkeyfilters.healthrangerstore.com/berkey-water-filters.html?utm\\_source=aimtell&utm\\_medium=push&utm\\_campaign=BerkeyPromo0110](https://berkeyfilters.healthrangerstore.com/berkey-water-filters.html?utm_source=aimtell&utm_medium=push&utm_campaign=BerkeyPromo0110)

# Petroleum Contaminants found in water

- Crude Oil
- Diesel
- Gasoline
- Kerosene
- Mineral Spirits
- Refined Oil

Source: [https://berkeyfilters.healthrangerstore.com/berkey-water-filters.html?utm\\_source=aimtell&utm\\_medium=push&utm\\_campaign=BerkeyPromo0110](https://berkeyfilters.healthrangerstore.com/berkey-water-filters.html?utm_source=aimtell&utm_medium=push&utm_campaign=BerkeyPromo0110)

# Pharmaceuticals Found in Water

- Acetaminofen
- Bisphenol-A
- Caffeine
- Carbamazapine
- Ciprofloxacin HCL
- Diclofenac Sodium
- Erythromycin USP
- 4-para-Nonylphenol
- 4-tert-Octylphenol
- Gemfibrozil
- Naproxen Sodium
- Primidone
- Progesterone
- Triclosan
- Trimethoprim

Source: [https://berkeyfilters.healthrangerstore.com/berkey-water-filters.html?utm\\_source=aimtell&utm\\_medium=push&utm\\_campaign=BerkeyPromo0110](https://berkeyfilters.healthrangerstore.com/berkey-water-filters.html?utm_source=aimtell&utm_medium=push&utm_campaign=BerkeyPromo0110)

# Radiologicals found in our water

- Americium-241
- Californium-251 & -252
- Cesium
- Iodine-129 & -131
- Mendelevium-258
- Neptunium-237
- Plutonium-238 & -239
- Polonium-210
- Promethium-145
- Protactinium-231
- Radium-226 & -228
- Strontium-90
- Technetium-99
- Thorium-232
- Uranium-235 & -238

Source: [https://berkeyfilters.healthrangerstore.com/berkey-water-filters.html?utm\\_source=aimtell&utm\\_medium=push&utm\\_campaign=BerkeyPromo0110](https://berkeyfilters.healthrangerstore.com/berkey-water-filters.html?utm_source=aimtell&utm_medium=push&utm_campaign=BerkeyPromo0110)

# Volatile Organic Compounds Found in Water (and air)

- **Volatile organic compounds (VOCs)** are organic chemicals that have a high vapor pressure at ordinary room temperature. Their high vapor pressure results from a low boiling point, which causes large numbers of molecules to evaporate or sublimate from the liquid or solid form of the compound and enter the surrounding air, a trait known as volatility. For example, formaldehyde, which evaporates from paint and releases from materials like resin, has a boiling point of only  $-19^{\circ}\text{C}$  ( $-2^{\circ}\text{F}$ ).
- VOCs are numerous, varied, and ubiquitous. They include both human-made and naturally occurring chemical compounds. Most scents or odors are of VOCs. VOCs play an important role in communication between plants,<sup>[1]</sup> and messages from plants to animals. Some VOCs are dangerous to human health or cause harm to the environment. Anthropogenic VOCs are regulated by law, especially indoors, where concentrations are the highest. Harmful VOCs typically are not acutely toxic, but have compounding long-term health effects. Because the concentrations are usually low and the symptoms slow to develop, research into VOCs and their effects is difficult.
- Hundreds were listed, too many to include in this PowerPoint
- Source: [https://en.wikipedia.org/wiki/Volatile\\_organic\\_compound](https://en.wikipedia.org/wiki/Volatile_organic_compound)

## Volatile Organic Compounds (VOCs) - Removed to below Lab detectable limits

1,1,1,2-Tetrachloroethane	Dicamba	Aldicarb	Monochlorobenzene
1,1,1-Trichloroethane (TCA)	Dichloroacetic Acid	Aldicarb Sulfone	m-Xylenes
1,1,2,2-Tetrachloroethane	Dichlorodifluoromethane (CFC 12)	Aldicarb Sulfoxide	Naphthalene
1,1,2-Trichloroethane	Dichloromethane	Aldrin	Napropamide
1,1,2-Trichlorotrifluoroethane	Dichlorvos	alpha-Chlorodane	n-Butylbenzene
1,1-Dichloroethane (1,1-DCA)	Diclorprop	Ametryn	Norfuralon
1,1-Dichloroethylene (1,1-DCE)	Dieldrin	Aroclor (1016, 1221, 1232, 1242, 1248, 1254, 1260)	n-Propylbenzene
1,1-Dichloropropene	Dinoseb	Atraton	Oxamyl
1,2,3-Trichlorobenzene	Diphenamid	Atrazine	o-Xylene
1,2,3-Trichloropropane	Disulfoton	Baygon	Febulate
1,2,4-Trichlorobenzene	Disulfoton Sulfone	Bentazon	Pentachlorophenol
1,2,4-Trimethylbenzene	Disulfoton Sulfoxides	Benzene	Picloram
1,2-Dibromo-3-chloropropane (DBCP)	Endrin	Bromacil	Prometon
1,2-Dibromoethane	EPTC	Bromoacetic Acid	Prometryn
1,2-Dichloro-1,1,2-trifluoroethane (CFC 123a)	Ethoprop	Bromobenzene	Pronamides
1,2-Dichlorobenzene	Ethylbenzene	Bromochloromethane	Propazine
1,2-Dichlorobenzene-d4	Ethylene Dibromide (EDB)	Bromodichloromethane	p-Xylenes
1,2-Dichloroethane	Fenamiphos	Bromomethane	sec-Butylbenzene
1,2-Dichloropropane	Fenarimol	Bromoform	Simazine
1,3,5-Trimethylbenzene	Fluorobenzene	Butachlor	Simetryn
1,3-Dichlorobenzene	Fluridone	Butylate	Stirofos
1,3-Dichloropropene	gamma-Chlorodane	Carbaryl	Styrene
1,4-Dichlorobenzene	Glyphosate	Carbofuran	Tebuthiuron
2,2-Dichloropropane	Halo acidic Acids (HAAs)	Carbon Tetrachloride	Terbacil
2,4,5-T	Heptachlor	Carboxin	Terbufos
2,4,5-TP (Silvex)	Heptachlor (epoxide)	Chloramben	Terbutryn
2,4-D	Hexachlorobenzene	Chlordane	tert-Butylbenzene
2,4-DG	Hexachlorobutadiene (HCB)	Chloroacetic Acid	Tetrachloroethylene (PCE)
2-Butanone (MEK)	Hexachlorocyclopentadiene	Chlorobenzene	Tetrahydrofuran (THF)
2-Chlorotoluene	Hexazinone	Chloroethane	Thiobencarb
2-Hexanone	Isopropylbenzene (Cumene)	Chloroform	Toluene
2-Methyl-2-propanol	Lindane (Gamma-HCH)	Chloromethane	Toxaphene
3,5-Dichlorobenzoic Acid	Merphos	Chlorpropham	trans-1,2-Dichloroethylene
3-Hydroxycarbofuran	Methiocarb	cis-1,2-Dichloroethylene	trans-1,3-Dichloropropene
4-Bromofluorobenzene	Methomyl	cis-1,3-Dichloropropene	trans-Nonachlor
4-Chlorotoluene	Methoxychlor	cis-Nonachlor	Triademetron Tribromoisacetic Acid
4-Isopropyltoluene	Methyl Paraoxon	Cycloate	Trichloroacetic Acid
4-Methyl-2-pentanone	Methyl tert-Butyl Ether (MTBE)	Decthal Acid	Trichloroethene (TCE)
4-Nitrophenol	Metolachlor	Dalepon	Trichloroethylene
5-Hydroxydicamba	Metribuzin	Diazinona	Trichlorofluoromethane (CFC 11)
Acetone	Mevinphos	Dibromoacetic Acid	Tricyclazole
Acifluorfen	MGK 264	Dibromochloropropane (DBCP)	Vernolate
Alechlor	Molinate	Dibromomethane	Vinyl Chloride

## Examples of Substances Found in Water in more Detail

Source: [https://berkeyfilters.healthrangerstore.com/berkey-water-filters.html?utm\\_source=aimtell&utm\\_medium=push&utm\\_campaign=BerkeyPromo0110](https://berkeyfilters.healthrangerstore.com/berkey-water-filters.html?utm_source=aimtell&utm_medium=push&utm_campaign=BerkeyPromo0110)

# Other compounds found in water (including bottled water)

- Arsenic:
  - A heavy metal that has been found in bottled water is arsenic. It was found in water sold by Whole Foods. Issues with arsenic are:
    - Liver disease
    - Cancer
    - Coma and even death
  - Arsenic can harm an unborn child through the mother.
  - Arsenic also bioaccumulates in the body.
- Fluoride
  - Fluoride is an industrial waste that is added to municipal water systems.
  - Microplastics are another type of substance that can be found in bottled water.

Source: <https://articles.mercola.com/sites/articles/archive/2019/07/31/bottled-contaminated-with-arsenic-and-pfas.aspx>

# Other compounds found in water (including bottled water) continued

- PFAS
  - One substance found in water is PFAS as they are persistent in our environment. It stands for per- and polyfluoroalkyl substances.
  - The EWG (Environmental Working Group) maintains an interactive map of water supply contamination in the U.S.
  - PFAS are man-made chemicals that repel water and oil. It does not break down in the environment or the human body.
  - The effects of PFAS are:
    - Affect children's ability to grow and learn
    - Reduce fertility in men and women
    - Interfere with hormone levels
    - Alter the immune system
    - Increase risk of high cholesterol, high blood pressure and certain cancers.

Note #1: The EPA in the United States regulate tap water and groundwater.

Note #2: The FDA in the United States regulates bottled water.

Source: <https://articles.mercola.com/sites/articles/archive/2019/07/31/bottled-contaminated-with-arsenic-and-pfas.aspx>

## Test Conducted

## Result

Pathogenic Bacteria and Cysts (E. Coli, Klebsiella, Pseudomonas Aeruginosa, Giardia, Cryptosporidium, Raoltella Terrigena, Bacillus Atrophaeus)

Viruses (MS2 - Fr Coliphage) Reduced to > 99.999%

Parasites Reduced to > 99.999%

Pharmaceuticals - (see table) Reduced to > 99.9%

Chlorine Removed to Below Detectable Limits

Chloramines Reduced to > 99.9%

Perfluorochemicals Reduced to > 99.9%

BPA Reduced to > 99.9%

Nitrites Removed to > 95%

Glycophate > 75% (75% was reporting limit of testing equipment. Removal rate may be higher)

THM's (Trihalomethanes - Bromodichloromethane, Bromoform, Chloroform, Dibromochloromethane) Removed to Below Detectable Limits

MTBE's (Methyl tert-Butyl Ether) Removed to Below Detectable Limits

Other VOC's Removed to Below Detectable Limits

Radiologicals - See Table below Removed up to 99.8%

Selenium and Thallium 95% and greater

Heavy metals 99% and greater



## Testing by a Third Party Source on the Berkey Water System

Source: Berkey Water Filters

# Various Types of Water Filters

- Bath Filters
- Countertop Filters
- Pitcher Filter
- Portable Camping
- Refrigerator
- Replacement Filters
- Reverse Osmosis
- Shower Filters
- Under sink Filters
- UV Sterilizer
- Water Filter Bottles
- Whole House

# Walter Filter System: Berkey Water System



- This company has a number of different water purification models. It depends on the use and the number of people in the household, to be used for drinking and cooking.
- The prices range from \$250 to \$300 plus the cost of the filters.
- The black filters are replaced on an annual basis and the white filters filtering arsenic and fluoride every six months.
- Third party testing

# Water Filter System: Berkey Shower Head Filter

- As chemical sensitivities increases, so does sensitivity to the chemicals found in municipal water. This includes sensitivity to fluoride and chlorine.
- A filter can be placed with a shower head to remove these contaminants.

**Berkey Shower Filter  
Replacement**  
**\$46.00**

REGULAR PRICE \$64.00



# Water Filter System: Propur Water Filter



The main image shows the Propur Big Gravity Water Filter System, which consists of a tall, cylindrical filter unit with a black lid and a smaller cylindrical filter element attached to its side. A blue border highlights the main filter unit.

**PROPUR BIG GRAVITY WATER FILTER  
WITH 2 G2.0 7" FILTER ELEMENTS**

☆☆☆☆☆ No reviews

**\$237.15**

Qty:  [ADD TO CART](#)

[Ask a Question](#)

Type: Countertop Filters  
Vendor: Propur  
SKU: P3-202POG

**Description:**

The Propur® Big is essential for an emergency preparedness plan for you and your family. It is economical, convenient and easy to use. The system requires no electricity to provide reliable water filtration just about anywhere whether at home, office, vacation, camping or college dorms! Works with just about any water source including tap, lake, river, stream, pond and rain water.

# Water Filter System: Propur Water System

## Description:

The Propur® Big is essential for an emergency preparedness plan for you and your family. It is economical, convenient and easy to use. The system requires no electricity to provide reliable water filtration just about anywhere whether at home, office, vacation, camping or college dorms! Works with just about any water source including tap, lake, river, stream, pond and rain water.

Ideal for emergency or daily use. Each container is made from high quality premium 304 stainless steel for lasting durability, corrosion and oxidation resistance and attractive appearance. The system comes equipped with two ProOne® G2.0 7" All-In-One contaminants & fluoride filter elements and can be expanded up to three filters.

# Water Filter System: Propur Water System

## Propur® Big system features include:

- Recommended for 2-4 people
- 2.75 gallon capacity
- Standard # of filters: 2
- Maximum # of filters: 3
- Height: 22.5"
- Diameter: 9.25"
- High quality premium 304 polished stainless steel
- Embossed with the Propur® 304 logo
- Includes 2 ProOne® G2.0 7" filter elements
- Includes solid 304 stainless steel spigot and non-slip pad

# Water Filter System: Propur Water System

The ProOne® G2.0 filters for the Propur® Big

- Filter element size is 2.75" x 7"
- Recommended replacement for 2 ProOne® G2.0 7" filter elements: up to 12 months
- Most economical "All-In-One" contaminants & fluoride filter element
- Removes fluoride, heavy metals, contaminants, glyphosate and more
- Silver infused to help prevent growth of bacteria
- NO priming required
- Easy to clean
- Leaves good minerals, including calcium, in water
- Nut and Alumina Free

# Water Filter System: AquaGear Water Pitcher



- This is one water pitcher systems with testing results.
- The filters are replaced periodically and can be mailed to your home.
- Source:  
<https://www.goaquagear.com/products/waterfiltrationpitcher>

# Water Filter System: Brita Water Pitcher



**FEATURED**

**Monterey with Longlast Filter**  
\$39.99  
★★★★★

10 cup capacity  
One Longlast Filter used = 900 plastic bottles saved  
Compatible with **Brita Longlast®** and **Standard** filters

**MOST POPULAR**

**Grand**  
\$36.99  
★★★★★

10 cup capacity  
Most popular pitcher size  
Compatible with **Longlast** and **Standard** filters

**Lake**  
\$29.99  
★★★★★

10 cup capacity  
Space-efficient design  
Compatible with **Longlast** and **Standard** filters

Source:

<https://www.brita.com/water-pitchers/>

# Water Filter System: Water Pitchers (Others)

			
<p>New Wave Alkaline Plus Lead Removal Water Filter Pitcher</p> <p>★★★★★ No reviews</p> <p>Enjoy an inexpensive, portable option for filtered water! The New Wave Alkaline Plus Lead Re...</p>	<p>Propur Water Filter Pitcher (Reduces Fluoride)</p> <p>★★★★★ No reviews</p> <p>Propur™ Water Filter Pitcher Benefits Remarkably Clean and Healthy Water Removes more contaminant...</p>	<p>Seychelle pH2O Pure Alkaline Water Filter Pitcher</p> <p>★★★★★ 2 reviews</p> <p>The pH2O PUREWATER filter increases the pH of drinking water from 7.0 up to 9.5*. The filter re...</p> <p></p>	<p>Seychelle Radiological Water Filter Pitcher</p> <p>★★★★★ No reviews</p> <p>The new filter removes the four basic zones of contamination: Aesthetic (Chlorine, taste and odor...</p>

## Gravity Water Filter/Purifier Comparison Chart

Gravity Water Filter/Purifier Comparison Chart							
Company	NMCL	AquaCera	AquaCrock	Pro Pur	Doulton	Aqua Rain	Katadyn
Model	Big Berkey	Ceraggrav-LP5	AquaCrock	Pro Big	GSS-2	Model 400	Gravidyn
Virus Removal [A]	Yes	No	No	No	No	No	No
Element Rating	Purifier [A]	Filter	Filter	Filter	Filter	Filter	Filter
Base System Cost	\$263	\$139	\$399	\$239	\$229	\$239.99	\$219.95
Max Daily Output (Gal/Day) Base	84	10	18	9	14	12	24
Max Daily Output-Max # Elements	168	25	18	18.5	20	24	24
Approx. People Served [B]	42	6	5	4	5	6	6
Maximum Gallons/Element	3,000	535 [C]	535 [C,D]	1,500 [E]	535 [C]	1095 [F]	730 [G]
Replacement Time Limitation	No Time Limit	6 Months [C]	2 Years [C,D]	12 Months [E]	6 Months [C]	1 year [F]	Up to 6 months
Price of Elements (Each)	\$54.50	\$30.00	\$36.00	\$49.50	\$36.00	\$42.99	\$56.00
Approx Cost Per Gallon (Cents)	1.8	5.6 [H]	6.7 + electric [H]	3.3 [H]	6.7 [H]	3.9 [H]	7.6 [H]
Maximum Element Capacity	4	5	3	4	4	4	3
Food Color Test [I]	Pass	Fail	Fail	Pass	Fail	Fail	Fail
Turbidity Flow Rate Test [J]	Pass	Pass	Pass	Pass	Pass	Fail	Pass
Test Results Available	Yes	Yes	Yes	No	Yes	Yes	Yes
Tested to NSF Standards	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NSF Certified Claimed	No	No	No	Yes [K]	No	No	No
Guarantee	6 Mos (elem 2-Yr)	None Published	1 Year Ltd.	2 Year	None Published	None Published	None Published
System Cost-Max Elements	\$363	\$274	\$399	\$338	\$299	\$319.99	\$219.95
System Material	AISI 304 Stainless	HDPE	Ceramic	Stainless	AISI 304 Stainless	Stainless	Silicone
System Production	Plasma Welded	Molded	Kiln	Deep Drawn	Plasma Weld	Deep Drawn	Molded
OTHER INFORMATION							
Element Composition	Proprietary Formula	Ceramic/Carbon	Ceramic/Carbon	Ceramic/Carbon	Ceramic/Carbon	Ceramic/Carbon	Ceramic/Carbon
Number of Elements	2	2	3	2	2	2	3
Element Height	9"	7"	5"	9"	7"	~9"	10.4"
Elements cleanable	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Storage Tank Capacity (Gallons)	2.25	3.5	Not Stated	2.75	2.25	3	2.6
Electricity Required	No	No	Yes	No	No	No	No
Plumbing Required	No	No	No	No	No	No	No
Post Filters	Yes	Yes	Yes	Yes	Yes	No	No
Height	19.25"	28.5"	17.5"	21.5"	19.25"	20.5"	18"
Diameter	8.5"	11.25"	11"	9.25"	8.5"	11"	11"
Dry Weight (Approx.)	6 lbs	5 lbs	26 lbs	5 lbs	5.5 lbs	7 lbs	6.5 lbs

# Bottled Water

- If you are not able to have access to filtered water, there is bottled water.
- Most of the bottled water comes from natural springs or municipal sources.
- There are now a number of bottled water available. They can be purified, spring water, and distilled water.
  - Spring water – from a spring
  - Purified – water has been purified
  - Distilled – water has been boiled to the point of becoming steam
- With purified water, there is the question as to what ingredients are filtered. Also, a second question is how often is it tested for impurities.

# Concluding Comments on Water Filters

- One, it helps to have your water tested to determine what substances are in the water. This includes both municipal and well water. It is suggested that it be done on a periodic basis.
- Two, select a system that fits your budget and types of substances that need to be filtered from your water.
- Three, there are specialized filters designed to filter specific types of substances. These (all) filters need to be replaced on a periodic basis.
- Four, it is suggested that you use a product that has a third party independent testing.
- Five, more information is in the appendix covering water filters and bottled water.

# Section on Air Purification Filters

# Questions to ask About Air Purifiers

- What are the substances that you need to filter out?
- What area needs to be covered? A room, a whole house, a commercial facility, industrial facility, or a medical facility?
- This presentation covers residential use and mainly covering a room.
- A whole house filtering system is much more expensive.
- Some air filtering systems cover specialized situations like the aftermath of a fire, mold issues, and etc.
- A filtering system requires ongoing maintenance.

# Air Pollution Basics

- Air pollution occurs in two types of areas.
  - One, is outside known as outdoor pollution
  - Two, is air pollution that exists within indoors, especially in homes. It also occurs in the workplace.
- Exposure to Air pollution (levels of exposure)
  - Pollution that does not cause damage to living things
  - One that causes irritation when exposed
  - Pollution that if exposed for too long leads to chronic illness
  - Lastly, pollution that causes an acute reaction, even death

(Note: The focus of this PowerPoint is on indoor pollution, in our homes.)

Source: <https://azchemistry.com/harmful-chemicals-in-air-pollution>

# Basic Types of Substances Found in our Air

## Types of Substances

- Natural Substances
  - Dust
  - Mold
  - Pet Dander
  - Pollen
  - Radon
  - Volcanic Eruptions
- Synthetic Substances
  - Chemicals
  - Chemtrails
  - Cigarette and Cigar Smoke
  - Fumes from Paints
  - VOC – volatile organic compounds
- Radioactive Substances
  - Nuclear accidents
  - Radioactive testing (medical)

## Sources of Substances

- Mobile Sources
  - Motor vehicle traffic
  - Sea transportation
- Stationary Sources
  - Power plants
  - Industries
  - Households

Source: <https://azchemistry.com/harmful-chemicals-in-air-pollution>

# Basic Guidelines for Air Purification

- One, minimize air pollution sources such as cigarette smoke, fireplace smoke, dust, and animal dander. Outside sources include fumes from heavy traffic, pollen, industry, coal plants, chem trails, and other sources.
- Allergy testing can specify which substances are a problem.
- Also, test for mold is another suggestion.
- Volatile Organic Compounds include organic compounds from adhesives, paints, cleaning products, and other gaseous pollutions. It depends upon what the filters will clean or even specific VOCs.
- Change furnace filters frequently or as needed
- Maintain heating and cooling equipment
- Don't store chemicals, solvents, glues, cleaning products, and other types of gaseous products near living areas.

# Air Filter Features

- Fan – Most air filters use a fan to suck in air (they work better than those without a fan). Keep in mind, the noise level of the unit.
- Servicing indicator – Feature lets you know when the filter needs to be cleaned or replaced
- Programmable time – You can specify when you need to have the air filter system to run
- Carrying handle – Makes it easier to move the unit from room to room
- Number of speeds- How much needs to be removed, less when sleeping and more doing high pollen season
- Ionizer – Is the use of electricity that attracts particles. (Some people may be sensitive to ozone if the unit produces ozone.)
- Remote control – Can adjust settings from a remote basis
- Dirt sensor – Unit can adjust fan speeds according to the level of dirt or dust in the air
- Washable prefilter – The benefits vary, whether to use a washable filter or replacement one.

# Types of Air Purification Technology

- Techniques for purification
  - Active – Releases negatively charged ions into the air, causing pollutants to stick to surfaces
  - Passive- Uses air filters to remove pollutants, especially by size
- Some examples of air purification technology
  - HEPA – High-efficiency particulate air (or arrestance) removes 0.3 micrometer particles (or larger)
  - Ultraviolet germicidal irradiation - sterilizes air
  - Activated carbon – absorbs volatile chemicals on a molecular basis
  - Polarized-media electronic air cleaners used both electronic air cleaners and passive mechanical filters
  - Others

# 12 Harmful Chemicals in our Air

- Carbon Dioxide – result of complete combustion of carbon with oxygen in the combustion of coal, oil and gas in the industry
- Carbon monoxide-can replace oxygen
- CFC- carbon that binds with chlorine and fluorine atoms, a threat to ozone layer
- Chlorine – is a green gas with a stinging smell
- Gas Pb (lead) – produced by the burning of a motor vehicle
- Nitrogen dioxide – very toxic to the lungs
- Nitrogen Oxide – includes nitrogen monoxide and nitrogen dioxide, comes from motor vehicle fumes
- Particulate Dust – a small particle size of dust that can enter the lungs
- Sulfur dioxide (SO<sub>2</sub>) – a compound derived from combustion of petroleum industry, coal, and other sources
- Sulfur trioxide – oxidized SO<sub>2</sub> and causes acid rain
- Tin – dangerous to children under the age of six, from paint

# Examples of Air Purification Systems

Under \$75



[Hamilton Beach \(04384 Air Purifier, Odor Eliminator, Permanent HEPA Filter, For...](#)  
by Hamilton Beach

\$59<sup>99</sup> prime

2,723

\$75 to \$100



[LEVOIT LV-H132 Air Purifier with True HEPA Filter, Odor Allergies Eliminator...](#)  
by LEVOIT

\$89<sup>99</sup> prime

2,399

\$100 & Above



[Honeywell True HEPA Allergen Remover, 465 sq. Ft, HPA300](#)  
by Honeywell

\$172<sup>49</sup> \$249.99 prime

1,947

# Examples of Air Purification Systems continued

Amazon's Choice

for "air purifiers for home"



[See Color Options](#)

GermGuardian AC4825 22" 3-in-1 Full Room Air Purifier, True HEPA Filter, UVC Sanitizer, Home Air Cleaner Traps Allergens, Smoke, Odors, Mold, Dust, Germs, Pet Dander, 3 Yr Warranty Germ Guardian by Guardian Technologies

\$74<sup>99</sup> 

FREE Delivery by Sun, Dec 9

Save 5% with coupon

 8,502

[See newer version ▶](#)

Home Gift Guide



[See Size Options](#)

LEVOIT LV-H132 Air Purifier with True HEPA Filter, Odor Allergies Eliminator for Smokers, Smoke, Dust, Mold, Home and Pets, Air Cleaner with Optional Night Light, US-120V, White, 2-Year Warranty by LEVOIT

\$89<sup>99</sup> 

FREE Delivery by Sun, Dec 9

[More Buying Choices](#)

\$66.20 (20 used & new offers)

 2,399



[Honeywell True HEPA Allergen Remover, 465 sq. Ft, HPA300](#)

by Honeywell

\$172<sup>49</sup> ~~\$249.99~~ 

FREE Delivery by Sun, Dec 9

 1,947

## Examples of Air Purification Systems continued

Example of a company that sells various types of air filtration systems.



Intellipure Compact

\$499.99

# Air Purification Systems – Use of Plants

- One, plants used indoor can help with cleaning the air.
  - English Ivy (*Hedera Helix*)
  - Golden Pathos (*Epipremnum Aureum*)
  - Boston Fern (*Nephrolepis Exalta Bostoniensis*)
  - Dracaena (*Dracaena Deremensis*)
  - Bamboo Palm (*Chamaedorea seifrizii*)
  - Dragon Tree (*Dracaena Marginata*)
  - Peace Lily (*Spathiphyllum*)
  - Lady Palm (*Rhapis Excelsa*)
  - Spider Plant (*Chlorophytum Comosum*)
  - Snake Plant (*Sanservieria Trifasciata*)

Source: <https://www.healthyandnaturalworld.com/best-air-filtering-plants/>

# Concluding Comments on Air Purification Systems

- The more informed all of us are on our exposure to air pollution, the more we can educate others and our legislators both on the federal and state level on the need for a strong EPA and clean air without ties to various industries not supportive of clean air and water. We can also take steps to protect ourselves from the dangers of air pollution.
- The dangers of air pollution are not just to our own health and the health of our communities, it is also a threat to our environment. They are:
  - Our health
  - Affects our crops and plants
  - Acid rain
  - Damage to the ozone layer
  - Greenhouse effect (causes global warming, too)

Note: Another consideration to keep in mind is the level of oxygen in the atmosphere. Apparently, in industrial areas, the levels are lower than what is found in rural areas. Everyone needs to be aware of this and it has direct impact on everyone's health.

# Addendum

# Addendum

- Bibliography
- Other Water Purification Technology
- Companies that Produce Water Filters
- Glossary
- Shower Filters (for water)
- Specialty Water Filters
- Twelve Major Toxins found in Water
- Water Bottles Containers
- Water Filter Bottles
- Water Filters Using Reverse Osmosis
- Water Testing Devices

# Addendum: Bibliography

- <https://articles.mercola.com/sites/articles/archive/2019/07/31/bottled-contaminated-with-arsenic-and-pfas.aspx>
- <https://azchemistry.com/harmful-chemicals-in-air-pollution>
- <https://www.consumerreports.org/cro/air-purifiers/buying-guide/index.htm>
- <https://www.healthyandnaturalworld.com/best-air-filtering-plants/>
- Low Cost Emergency Water Purification Technologies: Integrated Water Security Series 1st Edition, Kindle Edition by [Chittaranjan Ray](#) (Author), [Ravi Jain](#) (Author)
- <https://www.youtube.com/watch?v=sFfLbeXDav8> (Web video comparing different types of water filters)

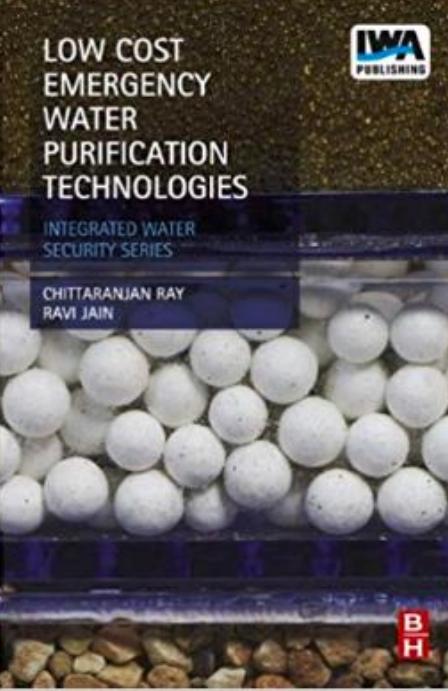
# Addendum: Other Water Purification Technology

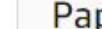
**Kindle Edition**

by Chittaranjan Ray (Author), Ravi Jain (Author)

★★★★★ 6 customer reviews

[Look inside](#) 



**Kindle**  \$47.36

**Paperback** from \$35.50

**Other Sellers** See all 5 versions

**Buy**

**eBook features:**

- Highlight, take notes, and search in the book
- Page numbers are just like the physical edition
- Length: 206 pages
- Enhanced Typesetting: Enabled
- Page Flip: Enabled
- Similar books to Low Cost Emergency Water Purification Technologies: Integrated Water Security Series
- Due to its large file size, this book may take longer to download

**Available on these devices:**

- Kindle Fire HDX
- Kindle for iPad
- Kindle for iPhone
- Kindle for Android Phones
- Kindle for PC
- Kindle for Mac
- [See all supported devices](#)

**Sold by:** Amazon Digital Services LLC

ISBN-13: 978-0124114654

ISBN-10: 0124114652

[Why is ISBN important?](#)

# Addendum: Companies that Produce Water Filters

- AquaCera
- Berkey
- Crystal Quest
- Environ Products
- Pelican Water Filters
- Propur Water Purification Systems
- Rainshowr Filters
- Saychelle
- Sprite Shower Filters
- Vitashower

# Addendum: Glossary

- HEPA – HEPA: Acronym that stands for High-Efficiency Particulate Air and for High-Efficiency Particulate Arrestor. HEPA filters are used for isolation and immunocompromise units, operating rooms, removal of allergens from the air (for hay fever, asthma, etc.) and other applications where maximum reduction or removal of submicron particulate matter from air is required. being, using, or containing a filter usually designed to remove 99.97 percent of airborne particles measuring 0.3 micrometers or greater in diameter passing through it. How to use HEPA in a sentence.
- Radiologicals -  
(Nuclear Physics) of, relating to, or involving radioactive materials: *radiological warfare*.

# Addendum: Glossary continued

- Total Quality Water Tester-A TDS meter (aka ppm pen, nutrient tester, tds stick) is an inexpensive and convenient digital tool to instantly check your overall water quality. TDS = Total Dissolved Solids, which is any salt, metal or mineral in the water. With the push of a button, the TDS-EZ can tell you your overall water purity level, which will be displayed on the screen in ppm (parts per million).
- The lower the TDS level, the purer the water, with 0 ppm being pure H<sub>2</sub>O. The TDS-EZ is great for checking your tap water quality, or knowing when to change a filter. (The meter does not test for biological contaminants.) The TDS-EZ is a great tool for drinking water, water filtration and purification, hydroponics (test your nutrients), aquariums, RO/DI systems, pools and spas, and more.
- VOC - Volatile organic compounds from adhesives, paints, and cleaning products, and other types of gaseous pollutants, however, are another matter. Some portable models with carbon prefilters are claimed to filter VOCs, but the Environmental Protection Agency warns that such filters are specific to certain gaseous pollutants, not for others, and that no air purifier is expected to remove all gaseous pollutants found in the typical home. Carbon filters also must be replaced often, typically every three to six months, or they stop working.

# Addendum: Shower Filters (for water)



Crystal Quest Combo Handheld Shower Filter Chrome or White

★ ★ ★ ★ ★ No reviews

A Crystal Quest handheld combo shower filter gives you the ease of showering with a massage showe...



Crystal Quest Handheld Shower Filter Chrome or White

★ ★ ★ ★ ★ No reviews

The Crystal Quest Handheld Shower Filter represents the current peak of shower filtration technol...



Crystal Quest Shower Filter Chrome With Optional Massage Shower Head

★ ★ ★ ★ ★ No reviews

There is no need to give up the relaxing pleasures of a optional massage shower head when you ins...



Crystal Quest Shower Filter White With Optional Massage Head

★ ★ ★ ★ ★ No reviews

Saving you money on moisturizers by preventing chlorine from stripping the natural oils from your...

# Addendum: Specialty Water Filters

## SPECIALTY WATER FILTERS



Acid Neutralizing Filters



Alkaline Water Filters



Arsenic Water Filters



Fluoride Filters



Iron Water Filters



Lead Water Filters



Nitrate Water Filters

# Addendum: 12 Major Toxins found in Water

- Arsenic (heavy metal) – used in a variety of industrial processes
- Chlorine – has disinfectant properties and used for cleaning and swimming pools
- Dacthal – a herbicide that contaminates the soil and water, still being used
- DDT – used as an insecticide in the 1940s, now banned, however, it persists in the atmosphere and can travel vast distances in the atmosphere
- Dioxins – released during combustion, such as burning of hazardous waste, forest fires, cigarette smoke, and burning oil and coal
- Fluoride – added to drinking water, it is a neurotoxin and harms the thyroid and calcify the pineal gland
- HCB – was used as a pesticide, has been banned. Still formed as a by-product from the production of other chemicals
- Lead (heavy metal) – from corroded pipes, very toxic, harmful to cardiovascular system and kidneys
- MtBE – a gasoline additive, and is able to pollute the ground water
- Mercury (heavy metal) – it can become a vapor, mercury vapor that can linger in the atmosphere and travel halfway around the globe
- PCBs – polychlorinated biphenyls are chemicals used for industrial purposes, while banned, they are present in landfills and still pose a danger to the environment
- Perchlorate – key ingredient in rocket fuel and explosives, seeps into the ground water

Source: <https://www.globalhealingcenter.com/natural-health/12-toxins-in-your-drinking-water/>

# Addendum: Water Bottles Containers

- 1: PET or PETE – used for single use bottles, can release heavy metals and chemicals that affect hormonal balance
- 2: HDP or HDPE (best and safest form of plastic)
- 3: PVC or 3V – releases two toxic chemicals that affect hormones in our bodies
- 4: LDPE – cannot be used for bottles, but can be used as plastic bags
- 5: PP – white or semi transparent plastic, used for packing syrups and yoghurt cups
- 6: PS – releases some carcinogenic substances, used in the production of coffee cups and fast food casings
- 7: PC or non-labeled plastic – dangerous form of plastic and releases PBA chemicals, used in production of sports water bottles and food containers

Source: <https://realfarmacy.com/bottled-water-symbols>

Note: See next slide for symbols



Examples of symbols  
found on plastic  
bottles

# Addendum: Water Filter Bottles



Seychelle 20oz  
Extreme Water Filter  
Bottle

★★★★★ No  
reviews

The new Seychelle 20oz.  
Extreme water filter  
bottle is ideal for any  
indoor or outdoor use. It  
re...



Seychelle 20oz  
Standard Water  
Filter Bottle

★★★★★ No  
reviews

The new Seychelle 20oz  
water filter bottle with  
Seychelles standard filter  
removes up to 99.99%  
O...



Seychelle 24oz Pull  
Top Water Filter  
Bottle (Advanced)

★★★★★ No  
reviews

Being able to drink fresh,  
filtered water anywhere  
without the need for  
water pressure or  
electri...



Seychelle 28oz  
Extreme Flip Top  
Water Filter Bottle

★★★★★ No  
reviews

The bottle produces up  
to 100 gallons of great  
tasting water; Designed  
to remove: Gross Beta,  
Alp...



# Addendum: Water Filters using Reverse Osmosis

 <p>Aquacera NilusPRO Premium Reverse Osmosis Water Filter System</p> <p>5 star rating, No reviews</p> <p>NilusPRO™ Premium Reverse Osmosis System incorporates our best filtration technologies with the l...</p>	 <p>Crystal Quest 2000MP 16 Stage Reverse Osmosis System with Pump</p> <p>5 star rating, No reviews</p> <p>Water travels through 16 stages of filtration: Comes with a pressure pumpIn stage 1, Water trave...</p>	 <p>Crystal Quest 4000MP Reverse Osmosis With Pump</p> <p>5 star rating, No reviews</p> <p>Water travels through 17 stages of filtration: In stage 1, Water travels through a 5 micron solid...</p>	 <p>Crystal Quest Portable 10-stage Reverse Osmosis System</p> <p>5 star rating, No reviews</p> <p>Reverse osmosis filtration is some of the most effective available today, capable of removing eve...</p>
---	--	--	--

# Addendum: Water Filters using Reverse Osmosis



**APEC Top Tier Alkaline Mineral pH+ 75 GPD 6-Stage Ultra Safe Reverse Osmosis Drinking Water Filter System (ESSENCE ROES-PH75)**  
by APEC Water Systems

**\$229<sup>95</sup>** ~~\$310.00~~ **prime**  
FREE Delivery by **Fri, Dec 7**

★★★★★ **733**

# Addendum: Water Filters Using Reverse Osmosis



## [Home Master TMHP-L Hydroperfection Loaded Undersink Reverse Osmosis Water Filter System](#)

by Home Master

**\$592<sup>95</sup>** prime

FREE Delivery by Thu, Dec 6

More Buying Choices

\$534.90 (7 used & new offers)



Product Features

... Highly pure water with 9 stages of filtration, purification, and...

# Addendum: Water Filters Using Reverse Osmosis

APEC Top Tier Alkaline Mineral pH+ 75 GPD 6-Stage Ultra Safe Reverse Osmosis Drinking Water Filter System



[APEC Top Tier Alkaline Mineral pH+ 75 GPD 6-Stage Ultra Safe Reverse Osmosis Drinking Water Filter System \(ESSENCE ROES-PH75\)](#)

by APEC Water Systems

\$229<sup>95</sup> ~~\$310.00~~ prime

FREE Delivery by Fri, Dec 7



# Addendum: Water Tester



[Watts Premier 273001 Digital Water Purifier Tester](#)  
by Watts Premier

**\$34<sup>64</sup>** ~~\$39.95~~ prime

FREE Delivery by Thu, Dec 6

Only 2 left in stock - order soon.

[More Buying Choices](#)

[\\$33.26 \(2 new offers\)](#)

# Conclusion

- It is always a good idea to test your water before deciding on the type of water filter that you need. This includes allergy testing that would impact on the water you drink as well as what you breath.
- As for what you breathe, be aware of the existence of mold as well as allergy reactions to environmental pollens, not to mention toxic chemicals that can dissolve into our atmosphere.
- As we become more aware of the toxins found in our water and air, there are equipment and filters that can clean up what is in the water and others that can clean up what is in the air.
- It is also helpful to be aware of the levels of oxygen in the atmosphere, especially in industrialized areas.
- Clean water and air are also essential for the health and wellbeing of our children and the next generation.

Note: Eating clean food, and checking out what is in your nutritional supplements and medications is also key to achieving wellness and optimum health.