

Maintenance of Aquarium

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Introduction

- For a healthy and easy-care aquarium, these recyclers (destructors) are particularly important, even if they are often much more inconspicuous than the colorful fish.
- Nevertheless, some outside help is needed to keep the ecological balance stable, especially in the long term.
- Here the aquarium owner must become active and exercise regular care measures.
- Aquarium keeping begins with proper water quality to ensure a healthy aquatic environment.
- Although water may appear crystal clear and safe for fish, that cannot be assumed. **Consistent testing and maintaining water parameters is essential for healthy aquarium life.**

Testing the Aquarium Water :

Regular aquarium maintenance would not be complete without testing important water parameters.

Because we can't determine water quality by looking at it, it is very important to do regular testing. Testing your aquarium water is like checking the body's vital signs. The results can tell us a lot about imbalances, therefore allowing us to detect and prevent looming problems.

Vital parameters to test as part of routine aquarium maintenance include nitrate, nitrite, pH, carbonate hardness, and salinity (saltwater only). We highly recommend including testing in your regular maintenance schedule. Below are our basic guidelines for testing important aquarium water parameters.

Nitrates : Nitrates should be kept below 10 ppm in freshwater, and 5 ppm or lower in saltwater and reef aquariums.

Nitrites : Nitrites should be undetectable at all times (except during cycling). If nitrite is detectable, be sure to test for ammonia as well.

pH : pH must remain stable. pH in the range of 6.5–7.5 is suitable for most species, but they should be fine if it's slightly out of range.

KH (carbonate hardness) : KH (carbonate hardness) is a measure of pH stability. If KH drops close to 4.5 dH (degree hardness) or 80 ppm, you should monitor it frequently. If hardness drops below 45 dH, the pH of the aquarium water will crash. A half teaspoon of baking soda per twenty-five gallons of water raises KH by approximately 1 dH (17.8 ppm).

Filter Maintenance :

Regular aquarium maintenance includes servicing the filter

The aquarium filter should be serviced monthly. A densely stocked aquarium may require more frequent filter cleanings. Think of your aquarium's filter the same way you think of your kitchen trash can. The filter is nothing more than a receptacle for waste. Once it gets "full", you need to empty it; otherwise it will contaminate the home of your fish. Servicing and maintaining the filter is simple and straight forward. Change dirty filter inserts, along with any media (activated carbon, Algone, etc.) that is due to be replaced. Occasionally a complete rinse of the filter is also required. The frequency depends on individual tank conditions, but generally once every 4 weeks is adequate. Avoid touching the bio wheels or any other beneficial bacteria supporting media during this process.

Important : Only use clean, fresh water when rinsing the filter or any other aquarium equipment. Never scrub the inside of the filter. Do not use soap, bleach, or chemical cleaners, because they will kill the beneficial bacteria required for healthy aquarium life.

Why Do Maintenance?

Often aquarium owners don't give much thought to maintenance. After all, they have a filter, and some bottom feeding fish to pick up stuff that falls there. So what else is needed? Some will

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cite the fact that nobody is cleaning the rivers, lakes, and oceans, and they do fine. So why clean the aquarium? That's actually a good question. Mother Nature is not idle, she does a pretty good job of cleaning things up in the great outdoors. Lakes, rivers, and oceans are large bodies of water that have currents and waves circulating the water. Rain falling adds fresh water, and live plants produce oxygen while absorbing carbon dioxide. The sheer volume of water also serves to dilute any harmful toxins.

Unlike bodies of water in nature, an aquarium is a relatively small amount of water. Add to that the fact that it is a closed system, and it becomes quite different than a habitat in nature. Nothing goes into or out of the tank unless you have a hand in making it happen. Filters certainly help, but if not maintained, filters become clogged and can cause more harm than good. Meanwhile, fish continue to produce waste, uneaten food decays, and potentially harmful byproducts slowly build up. The only way an aquarium will remain clean is if you take the time to perform maintenance on a regular basis. Otherwise, over time the habitat will become less and less healthy for the fish.

Frequency of Maintenance :

It is neither practical nor healthy to clean every surface in the aquarium on a daily or even weekly basis. For that matter, it's never wise to clean everything at the same time. To minimize the impact cleaning has on beneficial bacteria, cleaning of colony rich areas, such as the filter and the substrate, should be staggered. If the bacterial colonies are disturbed too much, it can disrupt the nitrogen cycle enough to cause a spike in ammonia and/or nitrites. For that reason, it's also wise to test the water a few days after a significant cleaning, to ensure nothing is amiss.

- a) **Daily Maintenance :** Do a quick visual check of the aquarium to ensure the filter is running at full strength, the lights are functioning properly, and any other equipment you have is running normally. Check the temperature to ensure it's in the proper range. Count the fish and check if they appear healthy. A good time to do this is when you feed them, as they will be out and easy to observe. Once they have finished eating, examine the tank to see if there is uneaten food remaining on the bottom. If you notice that there is often uneaten food left after ten minutes, cut back on the volume of food you give your fish at each feeding. Should you notice that uneaten food starts building up on the bottom of the tank, use a siphon to remove it. If the water level has dropped, top it off with treated or aged water as needed.

This is a good time to start an aquarium journal or log if you haven't done so already. While there is no need to record everything, it is helpful to note anything out of the ordinary on your daily checks. That way you can catch trends that may be occurring. For instance, the temperature dropping by a degree isn't a huge deal, but if it drops a degree four days in a row, that's a tip-off that something may be wrong with your heater. All of this can be done in literally a matter of minutes, so it's not a huge time investment.

- Count and observe the fish
- Visual equipment check
- Temperature check
- Remove uneaten food
- Top off the water level
- Note concerns in a journal or logbook

b) **Weekly/Bi-Weekly maintenance** : Some experts are proponents of weekly partial water changes, while others prefer to do them every other week. As long as you are regularly performing partial water changes every couple of weeks, the exact frequency is not so critical. Use water that is treated, and if possible, aged. Replacement water should be close to the temp. of the aquarium. However, prior to performing the water change, perform the other weekly & every other week tasks first, leaving the partial water change as the last task.

The other task that should be performed every week or two is the general cleaning of the tank. By performing light cleaning every couple of weeks, your tank will never get overly dirty. Wipe down the outside tank surfaces with a non-ammonia aquarium safe cleanser, or simply use a damp cloth. Gently shake plants, whether they are live or artificial, to dislodge debris. Scrape the inside glass to remove any algae, then take a break for ten or fifteen minutes and let everything settle a bit. When you come back, gently siphon the substrate to remove debris. Lastly, perform a partial water change. Make notes in your log or journal of the maintenance you performed, and anything unusual going on in the tank.

- Wipe down outside surfaces
- Shake debris off plants
- Scrape inside glass
- Siphon substrate
- Partial water change

- c) **Monthly Maintenance** : Water testing should be performed monthly to ensure nothing unseen is brewing. I recommend testing the following parameters: pH, ammonia, nitrite, and nitrate. If you have algae problems, you may also test for phosphates to see if that may be part of the root cause. Perform water tests first before water changes and any other maintenance. If you have live plants, inspect them and remove any dead leaves, and trim excess growth.

Next perform the weekly/biweekly cleaning tasks, followed by the partial water change. Save a bucket of the water removed from the tank to use for performing filter

maintenance. If you use exhaustible media, such as activated carbon or zeolite, replace it. Using the water saved from the water change, rinse the mechanical media. If the mechanical media is very clogged, replace it. However, avoid replacing all the filter media at the same time. Instead, retain part of the media to avoid losing too large a portion of the beneficial biological colonies. The next month you can replace the remaining filter media. Mechanical filter media (foam) generally only has to be replaced once or twice a year.

- Water tests
- Trim live plants as needed
- Perform weekly/bi-weekly tasks
- Change filter media
- Note maintenance and test results in a log

- d) **Periodic Maintenance** : In addition to the scheduled maintenance tasks, there are a few things that should be done as needed. These include replacing the light bulbs once per year, regardless of whether they have burned out. Inspect the air pump tubing and the filter tubing if you have a canister filter. Clean the canister filter intake using a filter brush. If you have live plants, fertilize them.

- Replace light bulbs
- Inspect & clean tubing
- Clean filter intake
- Fertilize plants.

Cleaning Equipment :

Aquarium maintenance does not require a lot of equipment. However, it does help to have a few specialized tools on hand. The most important piece of equipment to have is a dedicated aquarium bucket, and make sure you do not use it for anything else. Having two buckets is helpful, but not absolutely necessary. In addition to the bucket, a siphon, water conditioner, algae scrubber, filter brush, aquarium-safe glass cleaner, soft cloth and some towels round out your cleaning materials. All of these items can be stored inside the aquarium bucket to make cleaning day quick and easy. Additionally, you'll need fresh filter media and if you have live plants, fertilizer, and small scissors to trim the plants.

- Water bucket
- Siphon
- Algae scrubber
- Filter brush
- Aquarium safe cleaner
 - i. Cleaning cloths/paper towels
 - ii. Replacement filter media
 - iii. Scissors to trim plants
 - iv. Plant fertilizer

There are three goals you are trying to achieve when you clean your fish tank; these are known as the three Rs.

1. Regulate the nitrogen cycle
2. Remove dissolved and particulate organic compounds
3. Replenish essential minerals
1. **To keep the nitrates in low concentration :** The nitrogen cycle is the process in which ammonia is converted by bacteria to nitrite and then to nitrate. Both ammonia and nitrite are toxic to fish, and so having bacteria colonies in your fish tank is essential to convert them harmful compounds to nitrate. Nitrates are much less harmful to fish, and can be removed by regular water changes. Before you introduce any fish to a tank, ideally it will have been cycled; there are a number of different ways to cycle your tank. One of the better ways is to add artificial ammonia to your tank to start building

2. **To remove dissolved and particulate organic compounds :** Organic compounds are defined by chemists as those that are made up of both C and H; (they can also contain other atoms too). E.g. include sugars, fatty acids, vitamins, amino acids and proteins.

Organic matter is classified into dissolved organic matter (DOM) and particulate organic matter (POM). DOM is defined as any organic material which can pass through 0.2 to 1.0 μm filters, whilst POM will not pass through. Organic matter includes any waste which is made as a natural by-product of having a tank full of fish which are regularly fed. Just like ammonia is broken down by the colonies of bacteria, so is food waste and other organic matters in your tank.

Plants in freshwater tanks can use some of these organics, and the rest can be controlled by regular water changes and cleans – we'll look at this in depth later on in the article.

3. **To replenish minerals :** When fish are kept in water with insufficient minerals, either too high or too low, this can result in osmotic stress, which can in turn lead to osmotic shock, and ultimately death. Often when fish keepers add water to their tank, they use RO water that is water, which has been through the reverse osmosis process. This process removes the vast majority of tap water impurities, but it also removes the essential minerals which your fish need. Therefore one should use a product to add these essential minerals back into the aquarium (see table 5.1).

Table : 5 Water Parameters

Freshwater Parameters			
Parameters	Freshwater	Blackish	Pond
Temperature (°F)	72-82	72-82	33-76
pH	6.5-7.5	7.5-8.4	6.5-7.5
Alkalinity (carbonate hardness) KH	4-8	10-18	4-8
General hardness (GH)	4-12	12-20	4-12
Ammonia	0.00	--	--
Nitrite	0.00	--	--
Nitrate (ppm)	< 50	< 50	< 50
Saltwater Parameters			
Parameters	FOWLR aquarium	Reef aquarium	Coral reef
Temperature (°F)	72-82	72-78	82
pH	8.1	8.4	8.0-8.5
Alkalinity (dKH)	8-12	8-12	6-8
Specific gravity	1.020- 1.025	1.023-1.025	1.025
Ammonia (NH ₃)	Undetectable	Undetectable	Near Zero
Nitrite (NO ₂)	Undetectable	Undetectable	Near Zero
Nitrate – Nitrogen (ppm)	< 30	< 1.0	< 0.25
Phosphate (PO ₄) (ppm)	< 1.0	< 0.2	< 0.13
Calcium (ppm)	350 -450	350- 450	380-420
Magnesium (ppm)	1150-1350	1250-1350	1300
Iodine (ppm)	0.04-0.1	0.06-0.1	0.06
Strontium (ppm)	4-10	8-14	8-10

How to Clean your Tank in Five Easy Steps :

1. Preparation
2. Water Removal
3. Algae Removal
4. Filter Cleaning
5. Water Replacement

Step One – Preparation :

Gather all the supplies you need; listed below.


Supplies You will Need to Clean :

- i. A siphon gravel vacuum
- ii. Algae scraper/pad (we recommend a magnetic cleaner)
- iii. Large bucket (make sure this is only ever used for cleaning your aquarium so households chemicals don't get into your tank)
- iv. New filter media (optional)
- v. Used clean towel/cloth
- vi. Prepared water (the amount and type will depend on how much you need to replace and whether you have a saltwater or freshwater tank)
- vii. Water testing kit
- viii. Power head and heater (saltwater aquarium)
- ix. A salinity probe (saltwater aquarium)
- x. The majority of aquariums are too heavy to move, so you'll need a siphon which allows you to take water out of the tank, and a bucket which allows you to bring replacement water to the tank.
- xi. Unplug all the electrical elements in your aquarium including; heater, filter and any pumps.
- xii. Remove any large decorations or ornaments.

Top-Tip :

1. Make sure you do this slowly and so you don't stir up any debris at the bottom of the tank.
2. If you have artificial plants, you can remove them if they need a clean, but never remove live plants – this will disturb the root growth.

Step Two – Water Removal

- i. You'll need to replace roughly 10-20 % of the water in your aquarium every 2-3 weeks.
 - ii. Use a siphon gravel vacuum, with an attached hose to clean the gravel and remove the water.
 - iii. You should suck up small amounts of gravel using the siphon, the waste will then be sucked through the tube into the bucket along with some of the water, and the gravel will fall back into place.
 - iv. Use your thumb to block the end of the tube to slow down the siphoning process, and make sure none of the gravel makes it into the tube.
 - v. Some siphons have a built-in regulator to control the flow of water; some also come with longer hoses so the water can be taken straight to the sink (if you don't need to keep it to wash other equipment in).
 - vi. Not only does this step remove the water, but it also cleans the gravel by removing plenty of the waste that has fallen into the substrate.
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Step Three – Remove Algae :

The easiest way to clean the glass in your tank is to use magnetic algae cleaner. A magnetic algae cleaner consists of two magnets with a soft felt covering. You place one magnet on the inside of the aquarium, and attach the other to the outside of the aquarium. You then drag the outer magnet around the glass of the aquarium, and the inner magnets follows and gently remove the majority of the algae. If you have an acrylic aquarium, be sure to choose a cleaner which won't scratch the surface. If you want to clean any of the other larger decorations you've removed (from step two), you can do this in the bucket of siphoned out water; using a clean soft-bristled toothbrush. Never use soap or other cleaning products; this can be deadly to your fish. You might also want to consider having a clean-up crew, which will eat some of the algae in the tank.

Step Four :

Filter Cleaning : Depending on the type and quality of filter that you use, you will need to clean and sometimes change the medium in your water filter. The most common type of filter is a sponge filter. To clean this, you should remove it and rinse it out in the bucket of water that you have removed from the tank. Never run your filter under tap water, because it removes the beneficial bacteria which has built up which is necessary for your tank. Any other filters which act as a mechanical filter, as a sponge does (ceramic rings, filter fiber etc.) should also be rinsed and returned as quickly as possible to avoid losing the bacteria colonies. If your filter contains carbon, ammonia absorbers, or, ion-exchange resins it will need replacing every couple of weeks because it will no longer be able to absorb materials. You should also clean the rest of the filter, including the tubing; use a filter brush for this.

Step Five :

Water Replacement : Your aquarium now needs to be topped back up with water. The type of water you add depends on whether you have a saltwater tank or a freshwater tank.

Freshwater Water Preparation : If you have time to prepare the water in advance, leave the tap water out for 24 hours in advance of cleaning your tank to allow the chlorine in the water to evaporate. You'll need to use a water conditioner to remove any of the heavy metals, chlorine and toxins which are harmful to fish. By preparing your water in advance, this allows the water to reach room temperature too.

Saltwater Water Preparation : You'll need to be more precise with water changes in saltwater tanks. You need to observe three parameters – salinity, temperature and pH. For reef aquariums you'll need RO/DI water (reverse osmosis and/or deionized water). You can buy this from your local fish store, or you can buy a system which produces RO-DI water. Ideally you should use this water for any type of saltwater tank. You should only use tap water if your local supply is excellent, and even then, tap water should only be used for fish-only aquariums. If you

Every aquarist should have following types of instruments :

Elastic or Plastic Hose : It is long elastic or plastic hose with a diameter of 8-12 mm. It serves to exhaust water; it can also be utilized to clean the base of the remaining parts of the indispensable movement of fish.

Mud Cleaner : The mud cleaner is a more immaculate device for expelling soil from the bottom. Usually a mud cleaner is purchased from a pet store.

Windshield Wiper : The wind shield wiper serves to evacuate the algae from the aquarium glass; It is a long handle on which just like a single razor head is fitted which the glass will rub. To evade scratches on the glass wall, it is ideal to embed a plate of hard elastic or rubber. Now it is available in the pet store. They comprise of 2 sections: the external, which is moved from the outside on the glass of the aquarium, and the internal which moves inside the aquarium, deleting the plaque of algae.

Sharp Blade or Knife : It is used for trimming the plants. It is also used to maintain health of plants and to make beauty of your aquarium. Many aquarists use a sharp blade for trimming plants. Many aquarists want to utilize scissors.

Tweezers : It is a small forceps type tool which is used to pick up objects from any part of the aquarium. It is also used for planting and feeding of fish.

Thermometer : It is used for measuring the temperature of water to monitor the water quality. In aquarium, two types thermometer are used such as floating and fixed type. The fixed type thermometer mounts on a holder to the wall of the aquarium. The floating type thermometer floats on the water surface due to sealed inside the air.

Aquarium Fish Net : It is a fine net with various mesh size and handle. It is used for washing food and feeding, catching aquarium fish;

Plastic Feeding Rings : This ring is made up of plastic and is equipped with suction cup for holding. It may be free floating or attached to the side of the tank. It floats on the surface of the aquarium during feeding fish with artificial and dry food. It controls dispersal of food and helps to lessen food waste. It also control filter clogging and keeps food in a specific area.

Aquarium Fish Feeder : It is an electric or electronic device which is used to feed aquarium fish. This feeder is attached to the wall of the tank just above the water. It automatically maintains a regular feeding schedule at regular intervals. It has a hopper and timer with a variety of dry foods and the timer rotate the hopper at regular interval for dispensing food.

Aquarium Heater : To keep your aquarium water temperature at a suitable level, aquarium heater plays an important role. As an essential device, it helps to adjust or preset the water temperature in the aquarium. In the pet supplies market, there are many types of a heater with sensible cost. For better tank management, best aquarium heaters should be used.

Coil Brush : It is a long and flexible brush which is used for cleaning aquarium filters or U-tubes. It is designed to clean hard to achieve spots to guarantee the long-life and smooth and

persistent running of your aquarium system. It is also used to maintain the aquarium filter tubes to ensure best filter performance. It is found in different shapes and sizes and available in pet fish store with reasonable prices.

Aquarium Air Pump : Aquarium Air Pump is very basic equipment for any aquarium. It oxygenates the water by creating water current and enhances the good water quality. It helps to eliminate any impurities from water by circulating the water in your aquarium. It also makes your aquarium more attractive by creating the nice visual effect. In the pet supplies market, various sizes of air pumps are available with various wattages. It is recommended to use best air pumps for maintaining water quality in your aquarium.

Freshwater Master Test Kit : To make your aquarium environment and its inhabitants healthy, you should take few minutes every week to maintain and observe aquarium conditions. In this case, you should have a freshwater test kit. It helps to test the water parameter that affects the health of the fish. These water parameters are: water pH, hardness, Ammonia, Nitrite and Nitrate etc. This kit provides accurate result and economical with complete instruction booklet.

Aquarium Filter : Aquarium filter is a very basic device to keep aquarium water clean. Waste products are produced by aquarium inhabitants which are very harmful to any aquatic lives. In this case, aquarium filter helps to eliminate any waste products from your aquarium and make your aquarium water clean and safe for aquarium inhabitants. In the pet fish market, there are various types, shapes, and sizes aquarium filters available with suitable costs. Keep your tank environment clean and healthy, best aquarium filters should be used.

Algae Scraper : Algae scraper is a perfect device for expelling algae growth from aquarium glass that makes aquarium dark or nasty and unclear aquarium views. By utilizing this valuable apparatus, you can aquarium upkeep task short and efficient. At present unique shapes and sizes algae scraper apparatuses are accessible in the market with various costs. To keep your aquarium impeccable and sound, you should buy this device promptly.

Aquarium Water Changer : Aquarium water changer is an exceptionally basic instrument which is utilized to change the aquarium water for making aquarium condition sound. It is built by utilizing plastic materials and it has diverse parts including gravel tube, control valve, faucet connector, and water stream valve. At present, it is accessible in the market with sensible cost, and it is created to roll out routine water improvements in aquarium. To keep your aquarium crisp and magnificence, you should purchase water changer and connect with water faucet to utilize water weight to clean and fill aquarium.

Aquarium Wipes : To make your aquarium clean and excellence, you should have aquarium wipes. It is non lethal, pre-immersed wipes to clean your glass or acrylic aquariums. It is also used to minimize repeat of fingerprints, water spots and dust. It is anti-static and safe for freshwater and saltwater aquariums. You can evacuate lime scale and algae utilizing this aquarium wipes. It is not destructive for fish or plants. It is currently accessible in online pet shops with sensible costs of different amounts.

What Is a Cottage Industry?

A cottage industry is a small-scale, decentralized manufacturing business often operated out of a home rather than a purpose-built facility. Cottage industries are defined by the amount of investment required to start, as well as the number of people employed. They often focus on the production of labor-intensive goods but face a significant disadvantage when competing with factory-based manufacturers that mass-produce goods.

How Cottage Industries Work : The first cottage industries were light manufacturing operations in England and the United States engaged in subcontracted garment-making, textiles or sewing, as well as shoemaking and small metal machine parts. They may have been made up of family members engaged in producing finished goods by utilizing raw materials supplied by a business manager. Many contemporary industries that currently operate in factories were once cottage industries before the Industrial Revolution. Many modern cottage industries serve a market that seeks out original, handcrafted products as opposed to mass-produced, name brand products. These can include anything from clothing items to crafts to decorative home furnishings.

Special Considerations : Cottage industries play a significant role in the economies of developing countries. These economies may lack the capital and financial systems to support larger industries. It may be difficult for smaller firms to grow due to a lack of available capital or because of uncertainty relating to private property and legal rights. Developing countries also are more likely to have a comparative advantage in the use of labor compared to the use of capital, allowing them to produce labor-intensive goods more cheaply than developed countries. Because cottage industries may employ labor methods that are heavily reliant on traditional tools and machinery or which require the use of hands, they are more likely to see lower productivity. Thus, even though they may employ a large portion of the population, they may not produce a proportional amount of output.

Example of a Cottage Industry :

Competitive dancers, figure skaters, and other similar performers often wear original, handmade costumes. At the lowest levels of youth competition, parents might make costumes for their children. As performers rise to higher levels of competition, however, the demand for costumes of higher quality grows, creating opportunities for the most highly skilled costume designers to fill those demands. If skilled enough, designers who began by creating costumes for their own children and maybe a few others can end up creating a cottage industry for themselves. Designers who have costumes worn by top competitors in the sport can see increased demand for their original creations. Even at regional levels in these sports, there are designers who create names for themselves with their costumes and can be very successful within such a niche market.

Freshwater Aquarium Setup :

1. **Choosing the Right Aquarium :** Although it is important to choose an aquarium that you think will look good in your living room, there are other equally important considerations that affect the ongoing expense as well as the health of the inhabitants!. In general we have found that stability of the environment is the most important secret to successful fish keeping. A lot of material has been written about the ideal environment for various species of fish, whether they like warm water or cold water, high Ph or low Ph, hard water or soft water, but this is generally useful only if you are attempting to breed the fish or are planning on keeping a very sensitive fish that is known to be challenging. In choosing all of the items and the fish themselves, always keep in mind the stability of the environment. One of the first choices you will face is whether to purchase a glass or acrylic aquarium.

2. **Size of the Aquarium** : Always choose the largest size that fits your living room and your budget! Don't be fooled into thinking that the smaller the aquarium the easier it will be. Actually, the larger the aquarium is the more stable it will be and the easier it will be to maintain healthy fish. The amount of oxygen available (which is critical to fish survival) is determined mainly by the amount of surface area of the aquarium (not just the size) since oxygen enters the water primarily at the surface. Although aeration, with an air stone or a power head, seems like it is directly adding oxygen to the water,

most of the benefit comes from moving water from the bottom of the aquarium to the surface where oxygen is exchanged for carbon dioxide.

Water movement at the surface also increases oxygenation and will generally increase the stocking capacity as well as the health of the fish. Keep in mind that air stones and power heads can (and generally will) fail at some time or another so don't overstock an aquarium to the point that your fish will die if the power goes out for a couple of hours! It is almost always more desirable to have a few less fish that are colorful and healthy than to push the limits of the tank and risk losing some of your fish. Not only are fish happier, but the maintenance is easier!

3. **Filters and Filtration** : There are three main types of filtration for freshwater aquaria: biological, mechanical, and chemical. Utilizing each of these three types of filtration will provide you with the most stable and most easily maintained aquarium. General aquarium filters manufactured today include each of these three main types of filtration in some manner. We will also mention several other methods below, that are more commonly used in reef systems, but that can also be beneficial for fish only systems.

The three main types of filtration are

1. **Biological Aquarium Filtration** : This is the most important type of filtration for stability and reduction of toxic wastes.

Nitrification : In any biological environment there will be a production of ammonia from normal respiration (fish release ammonia from their gills) and the breakdown of wastes. Ammonia is toxic to fish and in nature is reduced to nitrite by bacteria called Nitrosomonas. Nitrite is also poisonous to fish and is further broken down into nitrate by bacteria called Nitrobacter. Nitrate is relatively harmless to fish but is a primary food for plants and algae. Frequent water changes (say 10% every week or two) will control nitrate levels. Collectively **the process of turning ammonia to nitrate is called nitrification** and is carried out in the presence of oxygen (aerobic conditions).

De-nitrification: This is the process where nitrates are converted to nitrogen gas in the absence of oxygen (anaerobic conditions). Denitrification is generally not of concern to the freshwater aquarist unless the control of nitrates is desired.

Sponge filters : Work by passing water over a highly porous sponge where bacteria are allowed to grow. They are almost purely biological with some mechanical filtration provided by the sponge itself. The sponge should not be cleaned or allowed to dry out because this will kill the nitrifying bacteria. Sponge filters are good for breeding situations



Sponge/Foam Filters

where very small fish are at risk of being sucked up by the strong intake currents of canister filters or overflows. They are also good for fish like bubble-eyed goldfish that may be injured by strong intake currents of power or canister filters. Sponge filters can be powered by air pumps or small water pumps.

Under Gravel Filters : are the most common type of biological filter and work by pulling water down through a bed of gravel at the bottom of the aquarium and pulling it up through the uplift tubes. Reverse flow under gravel filters are set up to pull water from the top of the aquarium by pushing it down the uplift tubes and up through the gravel. Reverse flow filters are slightly more efficient since they take water from the top of the aquarium which contains more oxygen. Since nitrification is more efficient in the presence of oxygen and the air contains about 20% oxygen, as compared to about 7% oxygen for water, **trickle or wet/dry filters** were developed in the 1980's which increased the efficiency of biological filters dramatically. They place the bacterial growing medium, filter balls with large surface areas, in the air (usually outside the aquarium) and trickle the water to be filtered over them. Many kinds, sizes, and shapes of trickle filters have been in use since they were introduced. Although many trickle filters are external devices used in a sump or hang on the back type of filters, several manufacturers including the "Sea Clear System II" aquarium contain trickle filters built into the back of the aquarium itself. The problem with trickle filters is they usually produce high levels of nitrate, and so are not often used in reef aquariums or other situations where nitrates are undesirable.

2. **Mechanical Water Filtration** : Mechanical filtration is good for keeping the water clear and free of debris!. Mechanical filtration refers to the removal of particulate matter from the aquarium. Canisters and power filters which force the water through some kind of floss or pleated cartridge are both examples of mechanical filtration. Some canister filters such as the "Hot Magnum" provide one media basket for your choice of mechanical filter media or carbon. Other canister filters have more than one basket for a combination of mechanical, chemical (carbon), and biological filtration. Under gravel filters also act as mechanical filters by trapping debris in the gravel. This is one reason the gravel should be siphoned periodically to remove trapped debris. Diatomaceous earth filters, commonly available in canister filters, can remove particles as small as 3 microns in size which really 'polishes' the water. They can be used to remove bacteria and algae blooms but generally clog after a short period of time and should not be used on a continuous basis.
3. **Chemical Aquarium Filtration** : Chemical filters are most useful in getting rid of the yellow color that often develops in aquarium water over time!. Chemical filters are used to remove things that are dissolved in the water, and therefore cannot be removed by