The Importance of pH- Corrosion/Environmental Impact

pH is a measure of the hydrogen ion, (H+), concentration in a liquid and classifies liquids as either acidic or caustic.

Liquid discharges that are either too acidic or too caustic may cause corrosion damage to Downstream piping systems and may also adversely affect the environment, or create problematic conditions for waste water treatment plants.

It should be noted that acidic and caustic liquids can be equally harmful, hence they should be treated with equal attention.

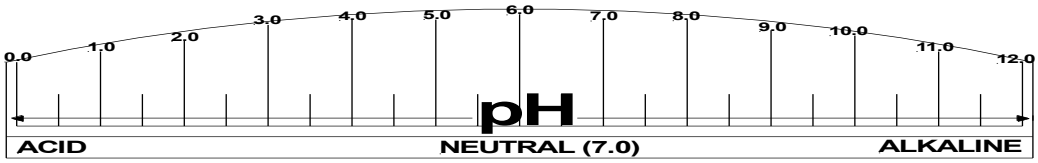
Chemical effluent should be treated to ensure that the pH level is as close to a 7 as possible, (or other values dictated by the local governing body).

pH Scale

pH values range from 0-14 and indicate the degree of acidity or alkalinity of a liquid. A liquid with a pH value below 7 is acidic and a liquid with a pH value above 7 is alkaline. A pH of 7 indicates that the liquid is neutral. The pH scale is logarithmic rather than linear. This means that for each change in a whole number on the pH scale the hydrogen ion concentration varies by a factor of 10.

For example:

1. Liquids with a pH of 8 is 10 times more caustic than one with a pH of 7
2. Liquids with a pH of 6 is 10 more acidic than one with a pH of 7
3. Liquids with a pH of 8 and 6 both have hydrogen ion concentrations 1000 Times that of pH 7 and have the same corrosive ability.
4. Liquids with a pH of 5 is 100 times more acidic than one with pH of 7

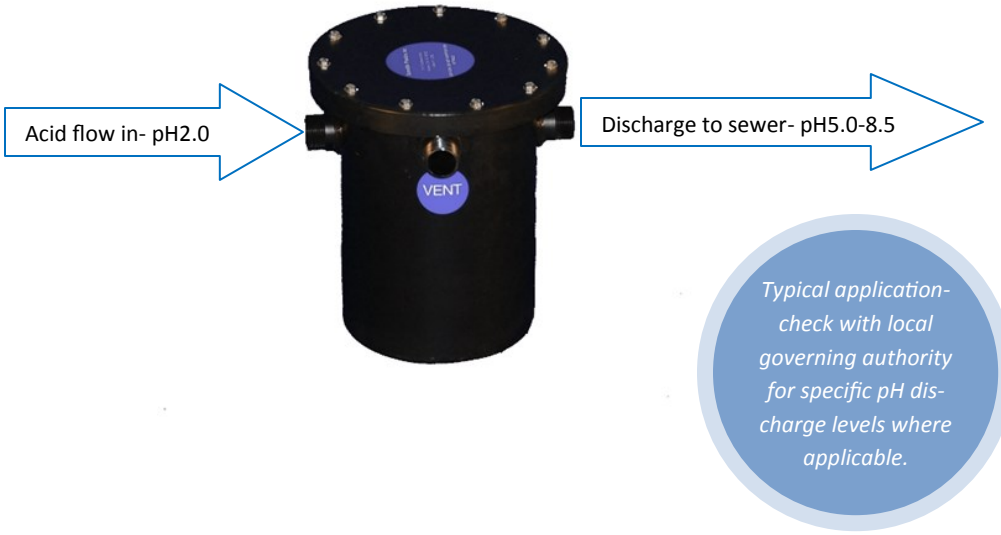


pH Values of Common Liquids

Liquid	pH	Liquid	pH	Liquid	pH
Apple juice	2.9-3.3	Lemons juice	2.9-2.4	Baking Soda	8.0
Beer	4.0-5.0	Bleach	10.9-11.2	Detergent	9.5-10.0
Grapefruit juice	3.0-3.3	Lime Juice	1.8-2.0	Milk	6.3-6.6
Soda	2.0-4.0	Vinegar	2.4-3.4	Wine	2.8-3.8

Chemical Waste Discharge Guidelines

Generally effluent with a pH range of 5.5 – 8.5 can be disposed of without treatment, but local requirements may vary and must be adhered to. However, even mild caustics and acids within this range can cause severe damage to a piping system depending on the piping material. It is recommended, therefore, that the compatibility of individual piping materials are checked for suitability against the predicted pH discharge level and the individual chemicals being discharged to ensure compatibility. Many common products can cause severe damage over a period of time. The items listed (pH values of common liquids) are examples of liquids that would cause piping damage if not treated beforehand.



Typical Chemical Waste Treatment Applications

Laboratories	Decontamination/Waste Holding	Commercial/Industrial
Middle Schools	Hospital decontamination areas	Chemical plants
High Schools	Emergency ambulance stations	Battery charging facilities
Universities	Chemical manufacturing plants	Linen cleaning facilities
Pharmaceutical	Fire departments	Photographic developing
Biotechnology	Nuclear facilities	Printing shop
Pathology		
Forensic		

Tank Materials

Scientific Plastics Company, is pleased to inform that we manufacture our tanks from virgin high density polyethylene Resin conforming to ASTM D 1998-06 and ASTM D 4976 with fittings conforming to the updated ASTM F 1412. Our standard color is black, however it may also be supplied in opaque or white. The effluent must be discharged at the bottom of the tank to maximize dwell time. Covers are either bolted down or threaded onto the tank. The inside bottom of the tank shall be flat with no recessed areas where acid waste or other contaminates can pool.

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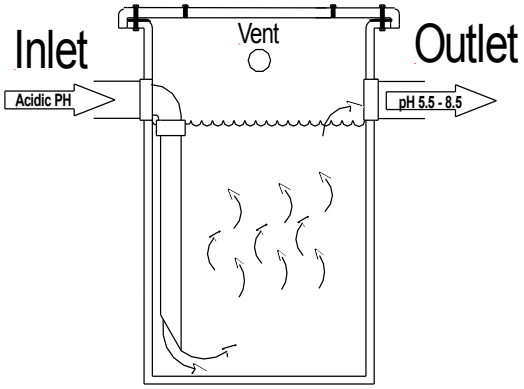
Chemical Waste Treatment Overview

Neutralization

Neutralization is a chemical reaction resulting from the physical mixing or extended contact of a base and an acid to form a neutral solution of water and salt. This neutral solution is suitable for discharge into sanitary sewer systems. Neutralization is accomplished by either of two methods, dilution or limestone chips (calcium carbonate).

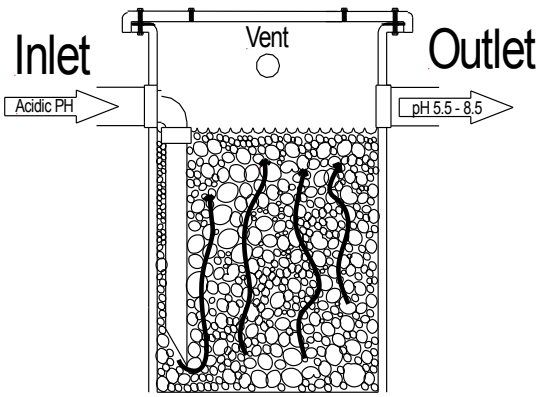
Dilution

Dilution is the physical mixing of chemical waste with water in order to stabilize the waste. Initial dilution can be as simple as flushing the chemical with water at the sink and discharging the mixture through a p-trap and the associated drainage piping. Alternatively, dilution can be accomplished via a large dilution trap or dilution tank located under the bench at each sink. In either case the waste pipe should discharge into the central neutralization system for further treatment prior to discharge into the sewer system.



Limestone chip neutralization

In a standard system, acidic waste is drained into a tank filled with high purity limestone chips. After a designated dwell time in the tank (approximately 3 hours) the chemical is neutralized and subsequently discharged by gravity flow into the sewer system.



Both styles may be vented to prevent gas build-up.
Chemical reaction example with hydrochloric acid

$$CaCO_2 + HCl = CaCl_2 + C0_2$$

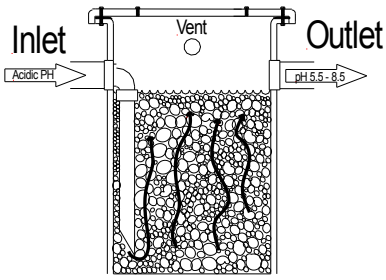
The CO_2 is off-gassed through the venting system

Typical applications-check local regulations for specific pH discharge levels where applicable.

Limestone Neutralization Tanks

When chemical waste flows cannot be neutralized by dilution alone, it is necessary to effect neutralization by some other means – either by introducing calcium carbonate into the liquid flow, or by dosing chemicals into the flow.

The most common and cost effective method of neutralization is the process where acidic chemical waste is brought into contact with calcium carbonate in the form of limestone chips. The calcium carbonate undergoes a chemical reaction with the waste flow which is then discharged into the sewer at acceptable pH levels. Water is added to the tanks to initiate the dilution process with a by-product of the chemical reaction being carbon dioxide gas, hence all limestone tanks should be vented. This method of neutralization is only effective with acidic flow. Caustic flows must be dosed with chemicals.



Limestone Specifications

The limestone supplied by Scientific Plastics is certified as having a calcium carbonate content in excess of 90%. This high purity is essential to the successful neutralization of the acidic waste and to minimize the sludge build up in the tank. The limestone chips should be 1" - 3" in size and be of irregular pattern to facilitate a liquid percolation throughout the limestone bed. If the limestone chips are too small they may clog the tank and prevent both effective neutralization and proper liquid flow. If the chips are too large there may not be enough surface area to react effectively with the acidic waste. Calcium carbonate contact is important since if the purity is to low the chemical reaction within the tank will not properly neutralize the acids and will create sludge and prevent future neutralization and restrict the flow.

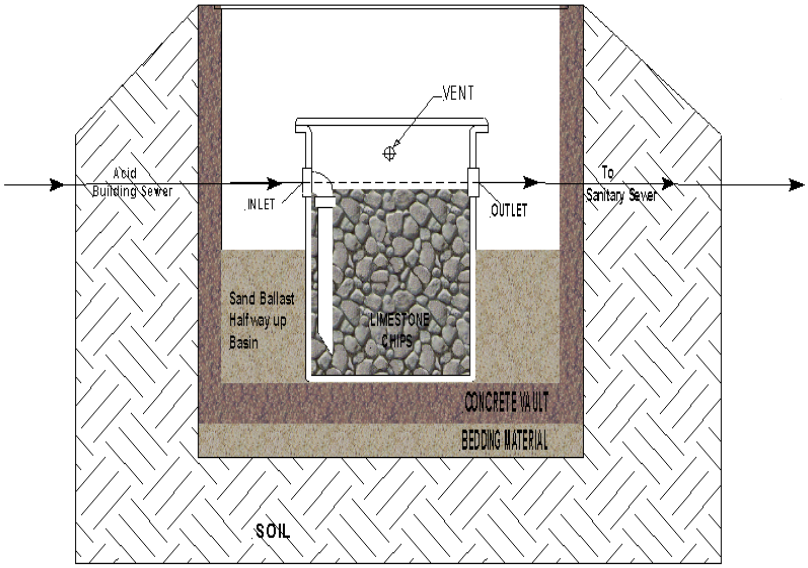
Sizing: Neutralizing & Dilution Tanks

Number of Lab Stations	Tank Size Gallon	Limestone LBS
2	5	50
4	15	150
8	30	250
16	55	500
25	100	1000
42	150	1700
55	180	2000
65	200	2500
80	275	3600
110	360	4500
150	500	6000
200	600	7500

Selecting proper tank size is done by relating the number of sinks and drains that are being discharged into the system, to the capacity of the tank. According to ASPE tank recommendation a "dwell time" of 2 -1/2 to 3 hours, is normal. ASPE has developed a sizing table which has been summarized as shown. Tanks should not be sized based only the number of sinks or drains. Certain types of wastes may require particular needs and may not fall within the standard sink to tank ratio. Other factors that can affect the tank size are the amount of flow thru the system piping. For commercial or industrial laboratories the number of lab stations in the table should be divided by two. A qualified engineer should make the final determination of tank size.

Buried Tank Installation

Tanks must be fully supported on the base by either an appropriate concrete pad that allows no overhang or a compacted stone free sand bed and when buried, tanks must be filled with water prior to backfilling. Tank tops are non-load bearing and should have a trap door or access cover over them supported by foundation or by the ground. They cannot be supported by the tank. The back fill of the material shall be free of stone and foreign matter and shall be capable of passing through a No. 10 screen. The depth of the back fill should be 6" to 8" thick around the tank and then normal sized back fill material may be used. Mechanical tamping is not recommended for tanks with extensions the above procedure should be Followed up to, or slightly above, the water level. From that point on up to ground level it is recommended that a 4" thick concrete sleeve be poured around the tank in multiple lifts. If this is not feasible then the normal back fill procedure may be used, up to 36" height water level, bearing in mind that backfilling will produce inward pressure on the empty portion of the tank. Care must be exercised during this operation to prevent inward buckling. A concrete vault must be used or a 4" thick concrete sleeve poured around the tank in Multiple lifts in areas with high water tables or poor soil conditions. If the tank is to be used as a pump-out holding tank, or similar type of operation, or the tank will be left empty, or partly full, then a vault is required. Tanks that are direct buried, should be Fiberglass, (FRP), wrapped. Tanks may be placed in concrete vaults as illustrated.
Once again, the vault base must be flat, uniform and free of sharp or irregular objects.



Testing

Scientific Plastics neutralization tanks must not be pressure tested. Test tank by filling it with water prior to use and inspect for any leaks.

Maintenance of Tanks

The limestone chips supplied by Scientific Plastics are 1-3" in size and have a calcium carbonate content certified to be in excess of 90%. Water is added to the tank to help facilitate dilution. A maintenance schedule should be established to observe and maintain proper limestone levels in the tank and limestone replacement should be performed at regular intervals. Typically, once every one to three months is sufficient. However, these intervals can be increased, or decreased, based upon application needs and performance. Factors affecting limestone are related to waste flow, chemical composition as well as operating temperatures. Solids in the waste stream can plug the tank and should be avoided.

Note: There are many variables that affect neutralization an dilution of chemicals discharged Through the system. Professional assistance should be employed in analyzing the effluent and The necessary maintenance service.

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