



HOW TO PASSIVATE BREWING VESSELS

Including descaling, pickling and the right chemicals to
sanitize and preserve your tanks

SUMMARY

The old method of passivating tanks with high concentrations of nitric acid. Then air drying your vessels for 24 hours isn't the best way to care for your tanks. Find out why here-->

[Asian Beer Network](#)

How to Passivate Brewing Vessels

It seems a lot of new breweries in Asia are searching the term "How to passivate brewing vessels?"

There are new breweries popping up all over Asia. The resulting purchase of equipment in places from Bali to Hong Kong means there a lot of brewing tanks in need of passivization.

If you want to make sure your new brewery isn't producing beers with off-flavors such as metal. Then you need to passivate your brewing tanks prior to brewing your first batches of beer.

N.B. You also need to passivate brewing tanks every 6 month to maintain your brewing equipment depending on which process you use.

Today we are going to discuss how to passivate your current tanks if you're an older brewery. Then next we will explain how to passivate brewing vessels if you have new equipment installed.

So, what is Tank Passivation?

When discussing how to passivate brewing vessels we should really start with what passivation is. In brewing it is a process of chemically treating stainless steel (what most brewing tanks are made from).

The aim is to create an invisible layer or coating on the inner tank walls so the metal will not be susceptible to corrosion and pitting caused by:

- Cleaning chemicals (acid, caustics and sanitizers)
- Carbon Dioxide and beer
- Chlorides (like salt) can be hard on stainless steel
- Beer with low pH



There are other causes of corrosion but these are the main ones. Before we dive deeper into passivation, we need to look at descaling/pickling.



What is Descaling and Pickling?

Descaling and pickling should not be confused with passivation. With older tanks you will get buildup of deposits which need removing (oxide removal).

Before we can even discuss how to passivate brewing vessels you must first clean down to the bare metal to ensure the passivation is successful.

The descaling and pickling on metal is to remove oxides from stainless steel. With strong acids such as hydrochloric acid, hydrofluoric acid, sulfuric acid or nitric acid used in descaling.

The Old Way - Traditional Passivation

There are two chemicals often used in the older passivation method. They are citric and nitric acid. Citric acid is mild organic acid and is good at chelating iron, but doesn't itself leave a protective coat behind to protect your tank.

Using citric acid will leave your tanks susceptible to chemical attack when you further clean your tank after use. Brewers mostly opt for nitric acid when they're passivating tanks.

It is used in high concentrations (roughly 20% or higher). Using nitric you will CIP your tank for an hour and then drain the tank (can be used again in another vessel - but check the concentration).

After the CIP you will allow the tank to air dry for 24 hours (keep the tank man-way open). This allows time to create an invisible chromium oxide layer to protect the metal.

The main problem with this method is that the layer isn't permanent. With the passivation process not repeated in a brewery due the dangers of using nitric in such dangerous concentrations.

You need to passivate your tanks at least twice a year with the method described above. However, the newer way we describe below will help keep your tanks clean and in tip-top condition on an ongoing basis.

How to Passivate Brewing Vessels - The New Safer Method

There exists a new way to passivate your tanks and keep them in good condition, flavor-neutral and shiny. The new method doesn't involve using dangerous chemicals in high concentrations.

Also, it must be noted that acid cleaning and drying to form a chromium oxide layer; no longer works as well as it once did either.

It can lead to "flash rusting" (iron deposits) around vulnerable points in your tank (like welds).



The newer method of using nitric followed by a non-caustic alkaline cleaner is now widely used in the brewing industry as one of the best ways to keep your metal clean **AND** passivated.

Conversion Coating Passivation

The idea of cleaning with acid first and then following with an alkaline cleaner seems counter-intuitive to most brewers.

For brewers the common method is caustic, water rinse, acid and final water rinse of tanks. This method is great for removing protein soiling but less effective on beer stone and doesn't properly passivate metal over time.

In time the result can be soil build up and the metal can develop microbial corrosion (MIC). Allowing this to continue can lead to metal pitting and put you at higher risk of infections. As it is harder to properly clean and sanitize your tanks.

Below we outline the method many brewers have now turned to that allows them to keep their tanks in the best condition possible.

How to Passivate Brewing Vessels - The Procedure

Note: This procedure is for tanks already in your brewery and have been used. For new vessels we cover that later in this booklet.

1. Rinse excess soil if necessary (with hot water 60-70C).
2. Make up a 2% solution of water with a nitric phosphoric acid blend (make sure it is pH 2 or lower).
3. Recirculate this liquid through spray-ball (CIP) for a minimum of 15 minute at a maximum temperature of 140F (60C). You want the nitric acid in the solution not the air.
4. Drain the solution **BUT DON'T RINSE!**
5. Depending on the soiling make a 2-3% solution of non-caustic alkaline cleaner that contains either hydrogen peroxide or sodium percarbonate.
6. Recirculate through spray-ball at between 120-140F (50-60C) for 15-30 minutes.
7. Drain the solution and IMMEDIATELY move onto step 8.
8. Rinse the tank with the water (if possible, with potable water the same temperature as in step 6).
9. Check the pH of rinse water and inner tank wall if possible, waiting for the pH to be neutral (around 7). When pH is neutral passivation is complete.

How to Passivate Brewing Vessels - Working with New Tanks

When you have a delivery of new equipment delivered to your location. Often there's residue left over inside the vessel from the manufacturing process.

You can see unwanted machine oil, dirt and debris left over from working on the tank. The first move is to give the tank a hot water rinse to drain to make sure there aren't pieces of metal or dirt that could break your pump.

We recommend a non-chlorinated liquid built caustic CIP Cleaner it removes machine oil and debris (use a 3% solution at 70C). You then follow this CIP with a hot water rinse until you have neutral pH.

If you see any signs of surface rust then a citric acid rinse is an easy way to remove this rust. Followed by the obligatory rinse to neutral.

Your tank is then ready for the 9-step routine we outlined earlier. So, pre-steps are:

1. To remove any unwanted machine oil, dirt and debris left over from working on the tank. Use a 3% solution of a heavy-duty, non-chlorinated liquid built caustic CIP cleaner at 140-175F (60-80C) for 15-30 minutes.
2. You can then drain the liquid and rinse immediately. Do a visual inspection to make sure all unwanted dirt has been removed. If there is still some residual dirt repeat step 1.
3. When there's no dirt left, you can do a citrus acid CIP. If you see any signs of surface rust. Make a 2% solution and recirculate through the spray-ball at 120-130F (50-55C) for 15-30 minutes. Then rinse well.
4. After rinsing the citric acid, you can begin the CIP with a phosphoric/nitric acid blend followed the non-caustic cleaner using the method explained below.

The Passivation of New Vessels

1. Rinse your vessel with ambient to warm water.
2. CIP with a 2% solution of a nitric/phosphoric acid blend at 120-130F (50-55C) for 15-30 minutes.
3. Drain the vessel but do not rinse the tank.
4. Using a 2% solution of a phosphated, silicated and oxygenated non-caustic acid cleaner CIP for 15-30 minutes at 120-140F (50-60C).
5. Rinse well till you have neutral pH rinse water.
6. The passivation of the tank is now complete.

Conclusions

Keeping your tanks passivated will help your beers be the best they can be. If you are unsure about what chemicals to use in this process then your chemical supplier should be able to help.

To carry out an acid clean, draining **but not rinsing** then followed immediately by an alkaline cleaner is what metallurgists call phosphate/silicate coating.

This passivation technique is different to the high concentrate nitric acid method that leaves a chromium oxide layer on the metal.

The phosphate/silicate coating method offers some passivation properties but without the use of dangerously high concentration of chemicals and with time savings as you do not have to air dry for 24 hours too.

It is safer to carry-out, easier to plan into a brewery schedule and is an ongoing way to keep your tanks safe, sanitized and passivated.



Who Is Asian Beer Network?

Asian Beer Network helps bring the Asian craft beer scene together. We have latest news, interviews and information to keep people informed.

With 24 years of international brewing experience with several in Asia (now based in China) we have large network of contacts and can help those looking to source equipment from Asia.

Brewing Consultation Services

We offer brewing consulting services to help breweries purchase plus install equipment and getting them operational in Asia.

For those outside Asia we can help in the purchase of Chinese brewing equipment offering a tailored service to suit everyone's needs.

Be it you want to buy a whole turnkey brewery or simply need to upgrade some equipment say purchase a centrifuge from China.

Please [click here](#) to contact us if you want to chat or need advice.

Some Further Reading

Why Chinese beers sales are up in S. Kores - [Chinese Beer Craze in South Korea: A Hot Take](#)

How craft beer sales are growing in China - [Chinese Beer Market: Imported Craft Beer Data](#)

Introduction on how to buy equipment made in China - [How To Buy Chinese Brewing Equipment](#)