Citric Acid Passivation Procedure

Document Approvals

Responsibility	*Print Name*	*Signature*	*Date*
VP of Operations	Tim Reuter		14-MAY-2018
Test Bay Manager	Matt Moore		2-MAY-2018
Engineering Manager	Tou Vang		3-MAY-2018
Quality Manager	Tommy Holder		2-May-2018

NOTE: Signed and dated copies are kept on file.

SOP Revision History

VERSION	DATE	REASON FOR CHANGE DESCRIPTION	AUTHOR
1.0	04/06/2012	Updated format, supersedes SMI-SOP-028	Kurt Paape
2.0	08/13/2012	Updated numbering references and removed form.	Dan Jackson
3.0	6-Nov-2014	Updated page 1&2. Updated Document approval names. Added SOP number into header. Inserted Sani-Matic format into header. Inserted readable phone numbers and page of page information into footer. Formatted entire document.	Tommy Holder
4.0	10/Jun/2015	Corrected several locations where the "Degree" symbol was actually a "ZERO" and added Celsius "C" numbers, added log information 6.1.1 & 6.1.2, added all of 6.2.19 (ad)	Tommy Holder
5.0	1/APR/2016	Changed all steps to require D.I. water only, added min FPS requirements to all steps, added SDS information, added identification tag to 6.4.7.	Matt Moore
6.0	15-May-2018	Restructured sections 3 through 9, added section 4, changed 7.2.1 from 140°F/60°C to 130°F/55°C and changed 7.2.6 from 145°F/62.7°C to 130°F/55°C, and changed 7.2.12 "c" from pH of less than 2.2 to pH of 2, and changed 7.2.13 from 140°F/60°C to 130°F/55°C,, removed 7.2.13 bullet point, and changed 7.3.2 from 110°F/43.3°C to 120°F/49°C, and changed 7.3.5 adding verbiage "up to".	Matt Moore

1915 S. Stoughton Rd., Madison, WI 53716 (o) 800-356-3300 (f) 608-222-5348 **sanimatic.com**

Table of Contents

1. SCOPE

This procedure is for assuring quality and safety when performing passivation using a citric acid based material (Hydrite Chemical Co. AC-5095-01) on equipment at Sani-Matic, Inc. (SMI).

NOTE 1: The precautions and steps of procedure must be followed to provide consistent results.

NOTE 2: This procedure is limited to use in SMI facilities and only under SMI supervision.

NOTE 3: It is not for any other use.

NOTE 4: SMI accepts no responsibility for any other use of this procedure.

PLEASE REFERENCE THE LITMUS CHART AT ANY TIME – PAGE 8

2. PURPOSE

This procedure will provide the proven best practice structure related to safely performing tank cleanliness.

3. RESPONSIBILITIES

a. It is the responsibility of the Department Manager to ensure that all persons involved in all aspects of the passivation process: safety precautions, PPE, set-up, execution, teardown checmical disposal, cleanup, etc. are qualified and properly trained to perform each respective task.

b. The personnel responsible for the entire passivation process will follow the guidance of this procedure to prepare, document, and execute the passivation process.

c. The Quality Manager will maintain all training records in accordance with set training requirements.

4. RELATED DOCUMENTS

Number	Type	Description
NA	PDF	LITMUS chart

5. DEFINITIONS

TERM/ACRONYM	DEFINITION
DI Water	Deionized water produced by passing potable water through a resin bed.
EPDM	ethylene propylene diene monomer
SMI	Sani-Matic, Inc.
TAP Water	Potable city water
LITMUS STMP	Paper test that indicates PH levels in liquid
FPS	Feet per second

6. SAFETY PRECAUTIONS

In addition to complying with the normal safety procedures in SMI facilities, the following precautions must be followed during passivation:

- Be sure personnel are familiar with safe use of the passivation materials and the use of protective equipment required; resolve any questions
- Verify all emergency equipment is operational and that there is always a clear path to it
  (Eyewash, shower, first aid, electric shut-offs, etc.)
- Notify people to avoid the area when acids or caustics are being handled and to avoid the area when the pumps are circulating acidic or caustic solutions
- Place yellow weld curtain barriers with signs to keep people out of the immediate area of passivation
- Splash goggles, face shield, gloves, must be worn properly to protect from injury
- Contact lenses are prohibited from being worn by persons working with acids or caustics and by persons in the immediate vicinity of equipment using acids or caustics
- Follow all of the rules and procedures of the test station policy when performing passivation
- Do not passivate in any area where ventilation is insufficient and passivation fumes could build-up and cause breathing discomfort
- Have "Sodium Bicarbonate" also called "baking soda" or "soda ash" ready to neutralize any spilled acid.
- Have a charged water hose ready to rinse any spilled solutions from the outside of the equipment and to dilute any spilled solutions (if spill occurs)
- Neutralize and dilute any spills before rinsing to sewer

7. PROCEDURE

To minimize time and to reduce the chance for injury, accident, or chemical residue build-up; the passivation process should be scheduled to allow enough time to complete all passivation procedure steps 6.2.1 through 6.2.17 un-interrupted

7.1. Preparation and pre-cleaning inspection

7.1.1 Print out "SMI-LOG-007 Passivation Check List" to execute process and capture data

7.1.2 Also, document the execution record in the "LOG BOOK" (located PPE cabinet, test bay at P1 and testing documentation cabinet at P2)

7.1.3 Verify that all materials that will be in contact with the passivation chemicals are suitable for service with the acid and caustic solutions used in this procedure

7.1.4 Specifically, remove all Buna elastomers and replace with EPDM elastomers or other material that is suitable for the chemicals and temperature used in the procedure

- (Sodium hydroxide in the cleaning solution will destroy Buna.)

7.1.5 Inspect surfaces to be passivated

7.1.6 Remove any materials that are not removed by cleaning with the Grease-X 367 solution such as:

- Ink, marking materials, and adhesives are materials that must be removed prior to circulating any cleaning or passivation solutions

7.1.7 Add enough D.I. water to leak test, called "pre-rinsing"

- This determines the amount of solution needed for both the cleaning and the passivation steps of this procedure
- Circulate the pre-rinse through all circuits of the equipment
- A Minimum of 5 FPS of flow should be achieved

7.1.8 Drain this water to sewer

7.1.9 Clean out strainers, orifices, spray devices, etc., that may have collected debris during this leak test

REFERENCE THE LITMUS CHART AT ANY TIME – PAGE 8

7.2. Passivation

7.2.1. Use D.I. water and heat to a minimum of 130°F/55°C to prevent foaming, and then add Grease-X 367, to the water to make a solution of 2 ounces of Grease-X 367 to each gallon of water

7.2.2 Keep the amount of mixed solution to a minimum

7.2.3 The minimum amount required is only enough to keep the pump suction supplied at all times

a. (Preventing Cavitation), and to provide wetting of all product contact surfaces

7.2.4 Wetting of all product contact surfaces must be achieved, by either spray or flood:

a. A Minimum of 5 FPS of flow should be achieved

7.2.5 Adding an anti-foam agent instead of mixing additional caustic or acid can minimize cavitation

a. (If anti-foam agent is needed use Foam Nox, follow label instructions)

7.2.6 Circulate the Grease-X 367 solution at a minimum temperature of 130°F/55°C. for 30 minutes to remove any grease, oils, and other soils from the interior surfaces of the system

a. This caustic solution will provide a very clean surface ready for passivation with the acid material

7.2.7 Drain the solution to sewer using a steady flow of D.I. water, which will continuously dilute the Grease-X 367 solution it as it enters the drain

7.2.8 Rinse with warm D.I. water, circulate through entire circuit, and drain the D.I. water to sewer

a. Repeat until all signs of soap and suds are gone

7.2.9 Check the product contact surface to be sure that D.I. water does not form beads on it

7.2.10 **Note:** *D.I. water splashed onto the surface should run off in a sheeting action. If this sheeting action is not achieved, a re-cleaning is needed.*

7.2.11 **Repeating steps 7.2.1, (above), through step 7.2.9 is required**

7.2.12 The Citric acid mixture for passivation may already exist in a holding tank

a. It is made of AC-5095-01 and tap water
b. Test the pH of the passivation solution before attempting to using LITMUS STMP
c. It should have a pH of 2
d. Transfer the passivation solution from the holding tank before mixing any additional passivation acid
   - To make passivation solution:
     - Add AC-5095-01 to D.I. water to make a solution of
     - 1 part AC-5095-01 to 5.25 parts water (1 to 5.25 mixture(s))
     - CAUTION: NEVER ADD WATER TO ACID, ONLY ADD ACID TO WATER

e. Mixing example: If there is 100 gallons of water in the system:

Calculation:

1) Divide 100 by 5.25 to obtain the amount of AC-5095-01 chemical needed
2) Added to water:
3) 100/5.25 = 19 gallons of AC-5095-01

Application:

A) Put the water mixture in the tank
B) Now, you can add the AC-5095-01 to the water

7.2. Passivation - continued

7.2.13 Circulate the passivation solution in all circuits at a minimum temperature of 130°F/55°C. for 30 minutes

7.2.14 After all of the circuits have had the passivation solution properly circulated through them for 30 minutes:

a. A Minimum of 5 FPS of flow should be achieved
b. Stop the circulation
c. Check the condition of the passivated surfaces

7.2.15 There should be no streaks, spots, beading of water, or coloration

a. Any other sign of non-uniformity, contamination, or lack of cleanliness is not allowed
b. Management or a quality inspector must approve the finished surface before proceeding

7.2.16 After approval, transfer the passivation solution to the holding tank

7.2.17 Cover all openings to the holding tank and be sure the tank is properly labeled

a. If any passivation solution is to be drained to the sewer, it must first be neutralized

7.2.18 The small amount of passivation acid that has not fully drained from the equipment must be neutralized and drained to the sewer

7.2.19 To neutralize and dispose of passivation acid solution:

A. **DO NOT** add un-dissolved powdered neutralizers to acid!

1) CAUTION: CAUSTIC SODA IS EXTREMELY CORROSIVE, SEE MSDS FOR APPROPRIATE INFORMATION
2) Add sodium hydroxide liquid (50% caustic soda) to neutralize the acid in the holding tank
3) Add only a small amount at first: approx. 8 oz. of caustic (50% caustic soda) to 100 gallons of passivation solution
4) Add it very slowly while watching for heat build-up from the chemical reaction until ratio of 30% caustic to acid (example, 15 gallons acid = 5 gallons of caustic)
5) If the temperature rises to 150 degrees F.; stop adding; but add tap water for cooling (**DO NOT SPLASH** the water into the acid)

B. Circulate the neutralized solution to assure complete mixing and check with litmus paper to determine that a pH of 6 to 8 is reached

1) If the pH is less than 6, add a smaller amount (4 oz.) of sodium hydroxide (50% caustic soda) and re-check for pH
2) Continue to add smaller and smaller amounts as the pH nears 6; and until the solution has a pH of 6 to 8

C. Drain the neutralized solution to the sewer only if it is between 6 and 8 pH;

1) Add a constant flow of tap water to continuously dilute this discharge as it enters the drain

D. Add tap water to rinse the wetted parts of the neutralization equipment

1) Circulate the rinse for 4 minutes with the pump, if applicable
2) Drain the rinse to the sewer
3) Repeat this rinsing and draining up to 3 rinse/drain cycles are made

REFERENCE THE LITMUS CHART AT ANY TIME – PAGE 8

1915 S. Stoughton Rd., Madison, WI 53716 (o) 800-356-3300 (f) 608-222-5348 sanimatic.com

7.3. Rinse

7.3.1 Add DI water, (enough to prevent cavitation)

1) This dilutes the acid remaining in the system but it is still an acid and requires neutralizing

7.3.2 Add De-ionized water heated to 120°F/49°C to rinse the system:

1) A Minimum of 5 FPS of flow should be achieved

7.3.3 Circulate the rinse for 4 minutes through the same piping circuits used for passivation

7.3.4 Drain the rinse to the sewer

7.3.5 Repeat this rinsing and draining up to 3 rinse/drain cycles if required

7.4. Inspection and Drying

7.4.1 The room air should be free from fumes and visible dust.

7.4.2 Inspect the product contact surfaces

1) Any "puddling" of rinse water must be eliminated by draining or blotting with a towel to allow the passivated surface to contact the surrounding room air

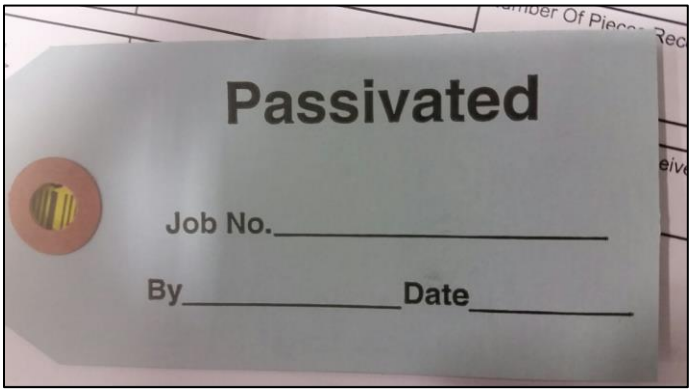
7.4.3 Protect the surface from contact with anything, other than clean ambient air during and after the clean-up

7.4.4 Do not leave ports or tanks "un-capped"

7.4.5 Do not leave water puddled anywhere in the equipment

7.4.6 Disconnect all air and electrical connections made for the passivation process after it passes inspection and before starting the final clean-up of the system

7.4.7 Tag system or item with a blue Passivated tag located with the log book. Tag should be placed in visible area (e-stop button, cabinet door handle, or packaged with component) to make everyone aware passivation has occurred.



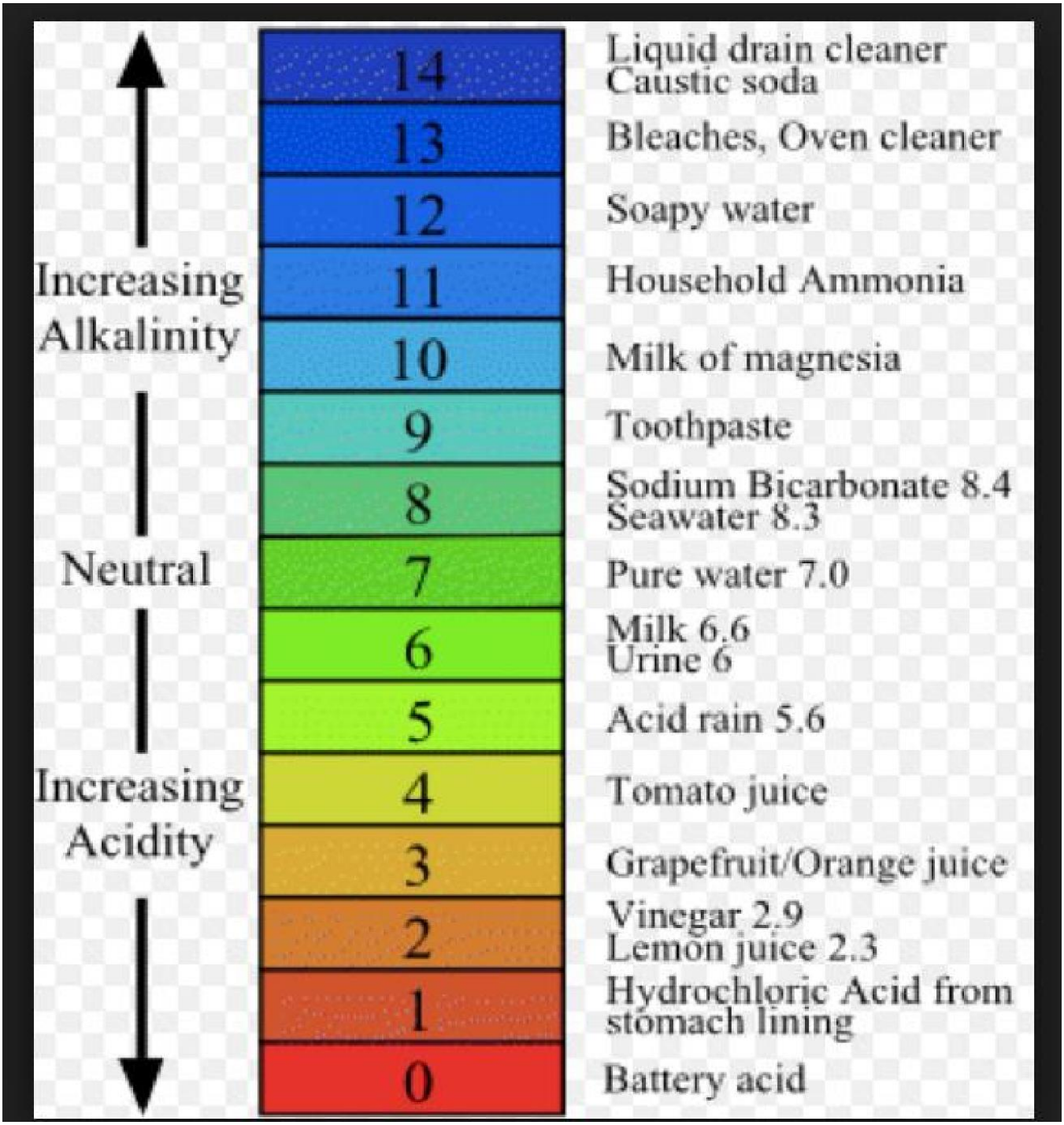
7.4.8 The unit is ready for final clean up at this point

7.4.9 DO NOT USE ANY REGULAR TAP WATER ON THIS UNIT AFTER IT HAS BEEN PASSIVATED!

7.4.10 USE DE-IONIZED WATER ONLY, AFTER PASSIVATION.

REFERENCE THE LITMUS CHART AT ANY TIME – PAGE 8

8. LITMUS chart



9. SDS information for chemicals used during Passivation

END OF PROCEDURE