



An Overview of Winery Sanitation

Verifying and Validating

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ETS Laboratories

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Good Wines come from Clean Wineries

Eighty percent of great winemaking is cleanliness.

Bob Pepi

Winemaker Magazine Spring 2000

Making good wine requires a great deal of water.

Ancient French proverb

As quoted by Émile Peynaud in "Knowing and Making Wine" 1984

One of the surest and best methods of screening wines from disease of any sort may be summed up in the possession of a clean cellar, clean casks, clean utensils, and clean surroundings.

Arthur J Perkins, Government Viticulturist

Journal of Agriculture, South Australia, Volume 4

Paper read before the SA Winegrowers Association on November 28 1900

There is one item largely concerned in the manufacture of good wine which to save repetition must be insisted upon from the beginning and that is the most scrupulous cleanliness as respects the vessels, persons, and every operation performed.

Peter B. Mead

An elementary treatise on American grape culture and wine making 1867

Winery Sanitation: Definitions

- **The general state of the facility**
 - Control of physical factors in the human environment that could harm development, health, or survival
 - Includes management, waste issues, safety, organization, compliance, and cleanliness
 - Prevention of contamination, adulteration, and spoilage of product.
- **The reduction of microbial life**
 - The magnitude of the reduction and the type of microbe vary with terminology



Sanitary?



Sanitation Guide for Wineries

Wine Institute, 1963, 1971 (A. Davison)

1. Keep the winery clean and free of refuse both inside and outside
2. Inspect the winery premises, the equipment and cooperage at least once a month and do this on a regularly scheduled basis
3. Keep all winery equipment clean and in good working condition. Equipment should be arranged in an orderly way and the work areas free of clutter
4. Use plenty of clean water, sterilizing materials and cleaning agents
5. Get rid of harmful bacteria, mold, insects and rodents. Then take any measures to prevent recurrence of these pests

The Cleaning Process

1. Remove visible soil
2. Rinse with water
 - Temperature dependent on soil type
 - Hot: tartrates
 - Cool to warm: sugars and proteins
3. Clean
 - Physical methods
 - Chemical methods
 - Thermo methods
4. Rinse with water
5. Validate/confirm effectiveness of cleaning

Commercial Detergents

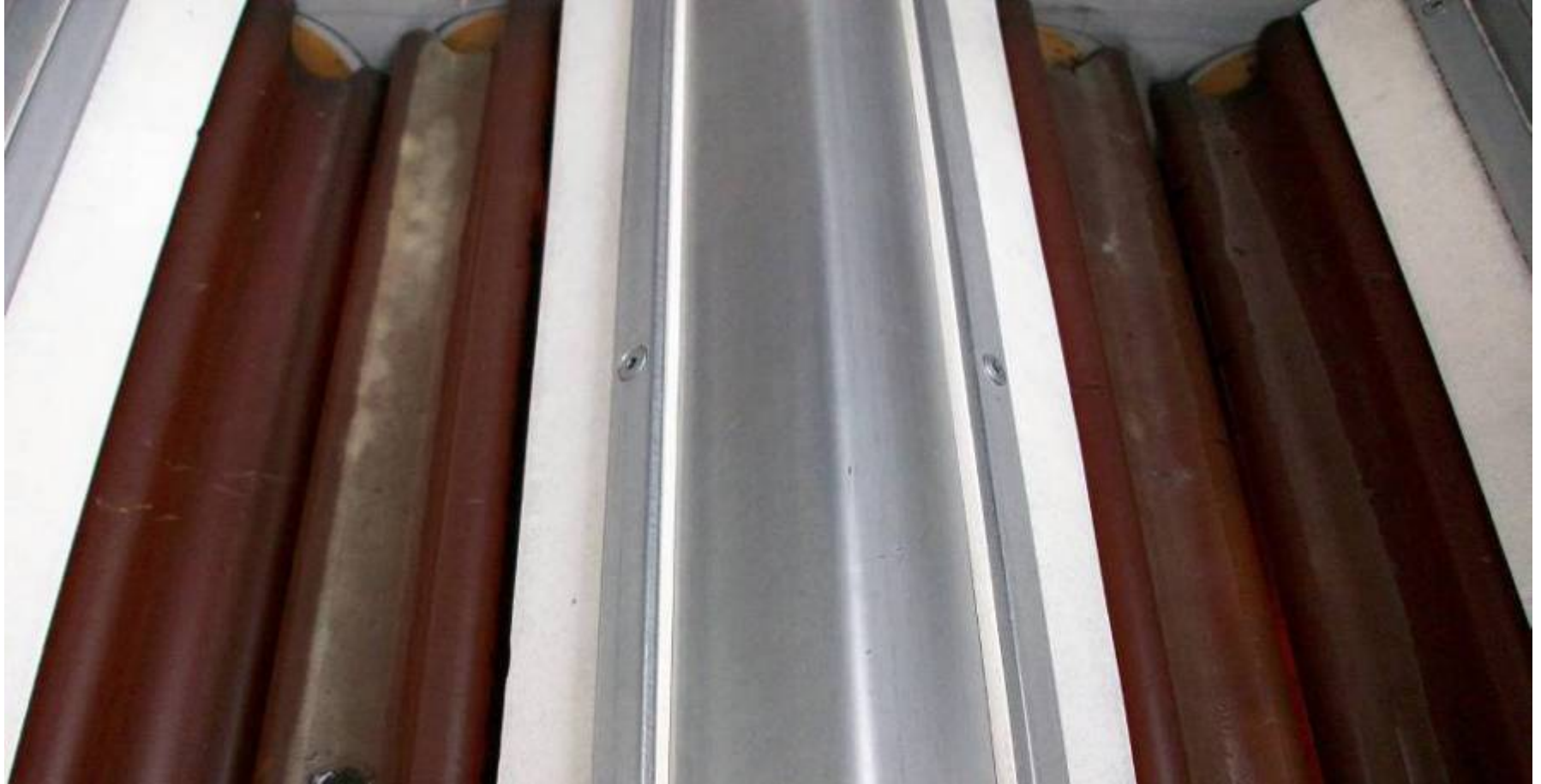
- **Detergents:** formulations of cleaners, surfactants, and chelators used to solubilize debris.
- **Cleaners:** break down proteins and lipids so that they may be detached from the surface; usually caustic.
 - Sodium hydroxide, Sodium Carbonate, Sodium Percarbonate, TriSodiumPhosphate, Potassium hydroxide, Sodium Silicate are all caustic (high pH).
- **Surfactants:** wetting agents that lower the surface tension of a liquid and help to solubilize debris
- **Chelators** : prevent hard water metals from reducing the effectiveness of the surfactants; metal ions are surrounded by the claw-like chelating structure and inactivated.
- Important variables in detergent effectiveness are:
 - formulation,
 - concentration,
 - contact time,
 - temperature,
 - application method (agitation, soaking, etc)
 - soil type/load.

Verifying Cleaner Concentration

- Alkali detergents have high pHs (>9) and should be monitored for effective concentration
- pH is one indicator of detergent concentration
- pH test strips are often used in cellar environments
- Final rise water is also tested (for neutrality)
- Strips are available in many ranges
 - Choose the right range and sensitivity



Evaluating Cleaning Effectiveness

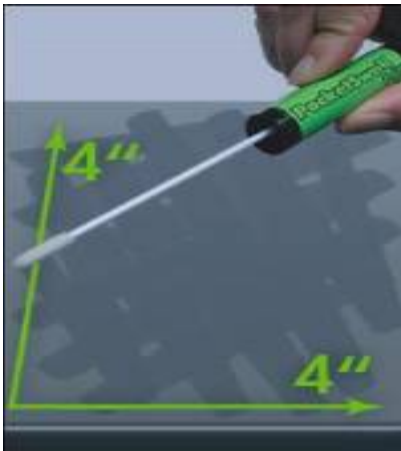


Evaluating Cleaning Effectiveness

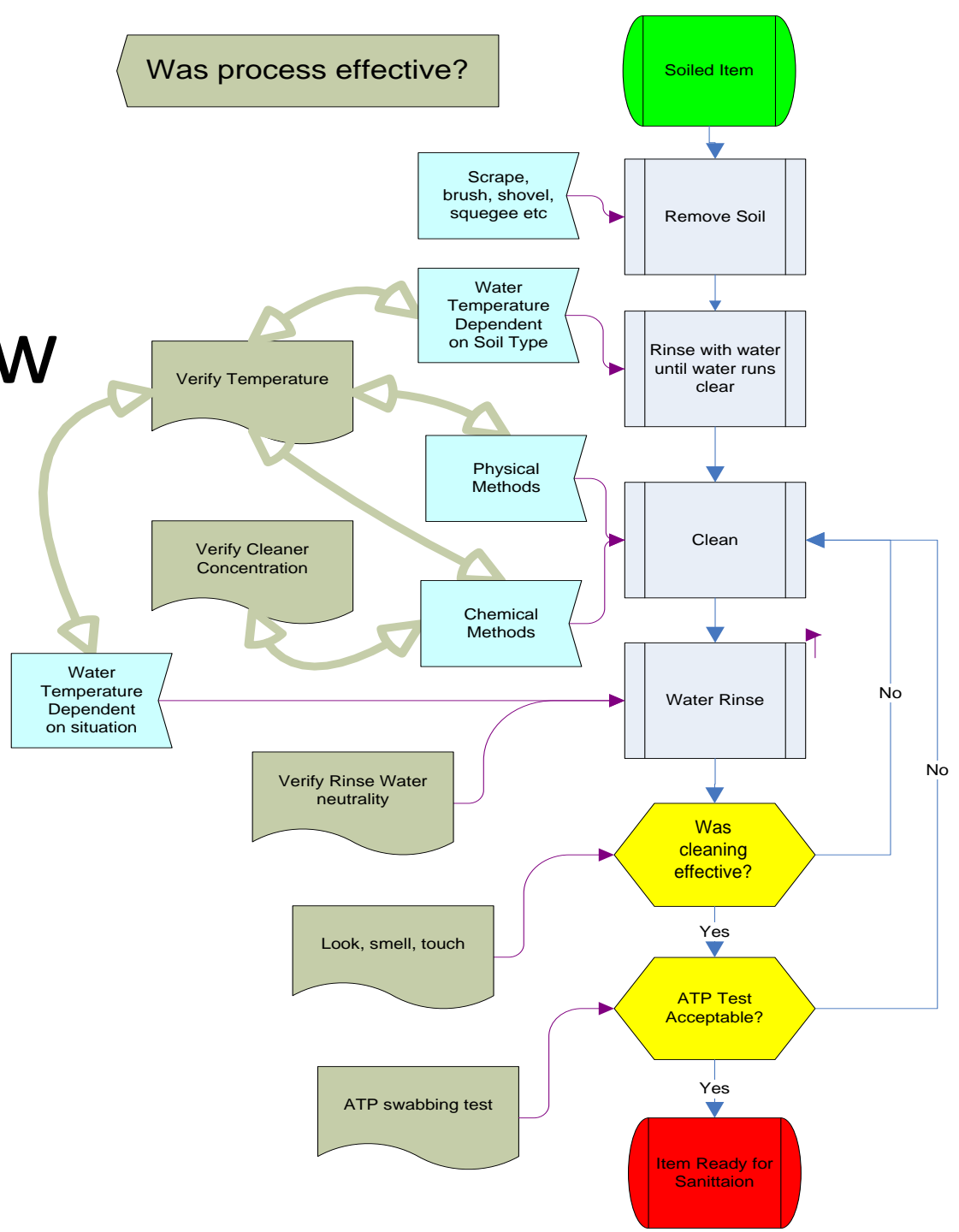


Evaluating Effectiveness: ATP residue

- Bioluminescence methods check for the presence of ATP (**A**denosine **t**riphosphate); all cells contain ATP.
- Enzymes from fireflies (luciferase) react with ATP to give light, which is read in a sensitive photo detector
- Results are within seconds, but do not differentiate living cells from dead, or types of cells (grape skins, yeast, bacteria, etc).



Example: Cleaning Flow Chart



Cleaning, Sanitizing, or Sterilizing?

- Clean is the absence of “filth”
- Sanitary is the reduction of 99.999% of vegetative cells on a food contact surface.
- Sterile is the complete absence of viable organisms of any form

Autoclave a dead rat: Sterile but not clean



Biofilms

- A mixed group of microbial species protected by a polysaccharide/exopolymer coating.
- Resistant to many chemical cleaners.
- Usually need to be removed by physical action (scrubbing, brushing, high pressure).
- Many wine microbes can form or join biofilms.
- Commonly found at liquid boundary regions.
- Can be invisible to the naked eye.



Sanitizers and Sanitizing Methods

Common Food Plant Sanitizers

- Chlorine Gas, Hypochlorites, Chloramines
- Chlorine Dioxide
- Iodine Compounds
- Quaternary Ammonium Compounds
- Acid-Anionic Surfactants
- Peracetic Acid Solutions

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Other Sanitizers in Wineries

- Alcohol
- Sulfur Dioxide gas
 - Metabisulfite/citric acid solutions
- Citric Acid

Other Sanitizing Methods

- Ozone
- Heat, Steam, Hot Water
- UV light
- Microwaves
- Radiation

Verifying Concentration of Chemical Sanitizers

- pH
 - pH test strips for acid sanitizers
- Concentration (critical to get the right range and sensitivity)
 - Ozone test strips
 - Iodine test strips
 - Chlorine test strips
 - Chlorine dioxide test strips
 - Peracetic acid test strips
 - Quaternary Ammonia strips
 - Peroxide test strips
 - Sulfite test strips



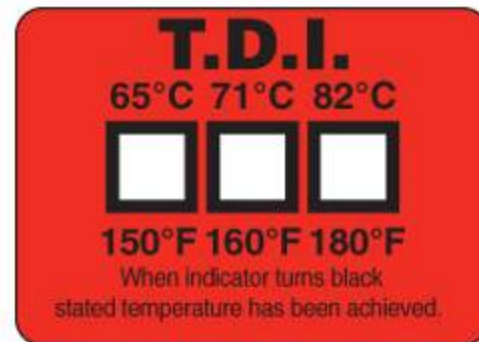


Hot Water Sanitation

Degrees C	Degrees F	Minimum hold time at temperature	Reference
77	170	30 seconds manual immersion	1995 Food Code
74	165	Single tank/single temp ware washing machines	
82	180	Other ware washing machines	
77	170	5 minutes	Grade A Pasteurized Milk Ordinance
85	185	15 minutes	Arizona Office of Environmental Health
80	176	20 minutes	

Verifying Temperature

- Digital Thermometers
- Infrared thermometers
- Steam test strips and tape (for autoclaves)
- Temperature indicating crayons
- Temperature indicating labels



Verifying Time

Heat sanitizing time **starts** when the equipment reaches the desired temperature

The time to get equipment up to temperature can be significant, especially with large equipment such as filler bowls

Time/Temperature strips may be available that meet specific needs





Validating Winery Sanitation

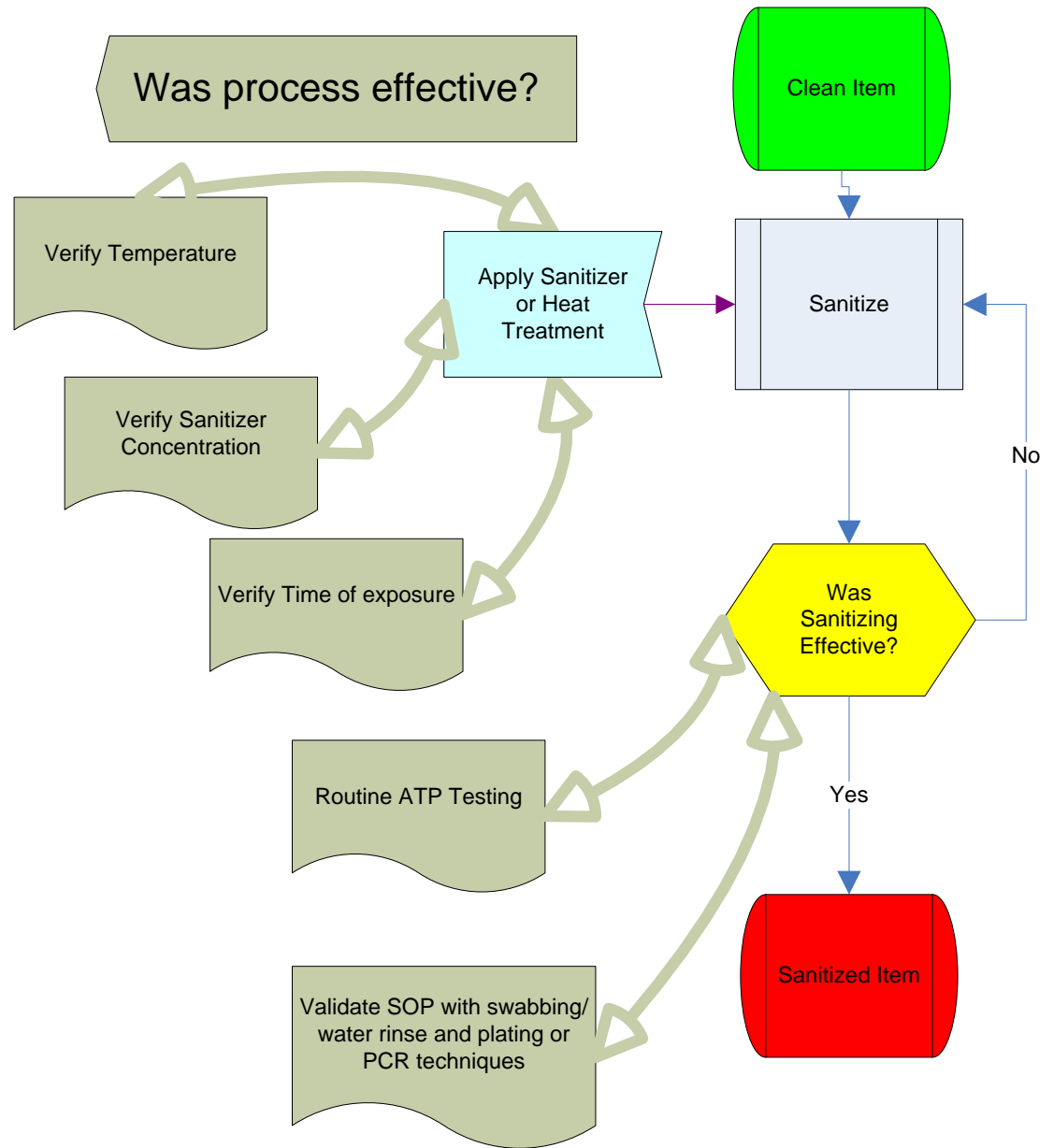
- Perform the sanitation operation using a standard operating procedure (SOP)
 - define equipment, concentration of sanitizer, time, temperature, surface type, cleaning state, bioload, etc.
- *Validate* that the SOP was effective
 - Use swabbing or soak/rinse water to get sample
 - Use microscope scans, plating, or PCR methods
 - Scorpions™ testing can provide fast results and target specific wine spoilage organisms.
- Changing any parameter in the SOP would indicate the need for additional validation.

Swab or Soak Sampling

- Specify the details of the sampling technique in the SOP
- Swabbing area and location
 - Use good sterile technique
 - Rub hard to break up biofilms
 - Place swab in labeled container of sterile saline
- Sterile water soak/rinse sampling may be appropriate for some situations.
- A concentration step may be helpful if low cell numbers are anticipated.
- A negative result (no cells found) does NOT indicate sterility.
- Ongoing testing and historical trends important in developing and implementing effective programs.

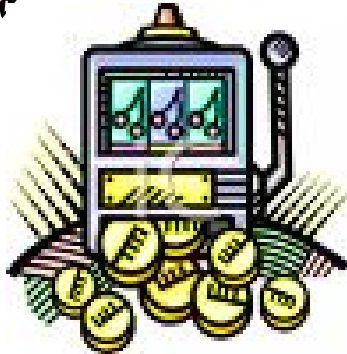
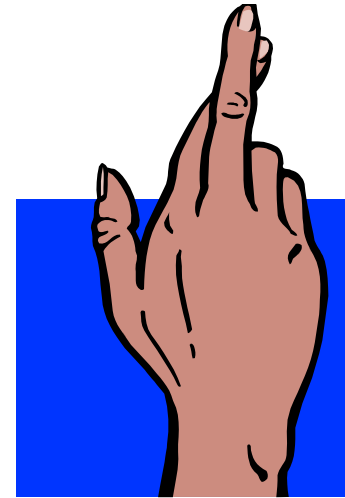
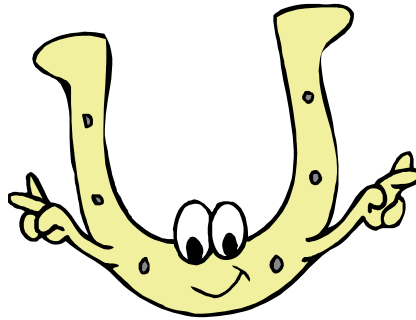


Example: Sanitizing Flow Chart



Validating Winery Sanitation

- Alternatives to validating sanitation SOPs or verifying effectiveness:





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