Types of Sanitizers

- Heat, w/ water or steam to saturate effect
  - Very effective anti-microbial, except some encysted forms
  - Exposure time critical
  - Non-corrosive, but energy intensive

- Chemical
  - Effectiveness varies with exposure time, temperature, concentration, microbial load, soil load
  - Can be corrosive
Chemical Sanitizers

- Chlorine-containing not recommended except for out of control microbial situations
  - Very effective anti-microbial

- Iodine-containing little used for wineries
  - Effective anti-microbial, except when diluted
Chemical Sanitizers

- Quaternary ammonium compounds
  - Attached alkyl group affects activity
  - Works well with light soils and with detergent
  - Fairly effective anti-microbial
  - Fairly environmentally friendly
  - Not tolerant of mineralized water
Chemical Sanitizers

- **Acid-anionic**
  - Only effective at low pH
  - Can be corrosive
  - Not tolerant of mineralized water

- **Fatty acid sanitizers**
  - Only effective at low pH
  - Can be corrosive
  - Can be used with acid rinse
Chemical Sanitizers

- Peroxides
  - Hydrogen peroxide, ozone (inorganic), peroxyacetic acid, peroxyborates (organic)
  - Very effective anti-microbials
  - Tolerant of mineralized water
  - Concentration dependent
  - Not corrosive
  - Can remove light bio-films
  - Environmentally friendly
Routine Barrel Care

- Check barrels for flaws before accepting
- Fill with water to test for leaks and MO’s
- Rinse and sanitize barrel before wine
  - High pressure rinse
  - Ozone or SO₂/citrate soak and rinse
- Clean and sanitize after wine
- Temporary empty storage with SO₂/citrate
- Longer empty storage with sulfur pastilles
- Top off and sample regularly for MO’s
Routine Tank Cleaning

- General Order: Stainless or plastic tanks, crusher-destemmers, presses, fittings
  - Cold water, high pressure rinse
  - Strong inorganic alkaline solution or paste scrub
  - Cold water, high pressure rinse
  - Cationic detergent, combined with peroxyacetic
  - Cold water, high pressure rinse
  - Hot water, high pressure rinse
  - Ozone treatment
Routine Barrel Cleaning

- General Order: Barrels free of faulty aromas or tastes
  - Cold water, high pressure rinse, 1-3 minutes
  - High pressure steam rinse, 1-3 minutes
  - Repeat cold and steam rinses twice more
  - Either refill with clean wine or
  - Fill with water
    - add ozone, if available
    - follow with filtered water + 45 pm SO₂/90 ppm citrate
  - After 1-4 days, empty and refill with wine or empty and burn sulfur pastille, re-bung and store
Contaminated Barrel

- **General Order:** Barrels with faulty aromas or tastes
  - Option 1 → Remove from winery and sell for non-wine uses
  - Option 2 → *Only if desperate:* Clean, sterilize, and re-use
    - Rinse cycles done as per barrel without faulty aromas or tastes
    - Fill with water, put steam wand in water and bring water to 160-180°F, steam to maintain temperature for 4-6 hours
      - add ozone, if available
      - follow with water + 45 pm SO₂/90 ppm citrate
    - After 1-4 days, empty and burn sulfur pastille, re-bung and store
    - After 1-4 weeks, rinse and fill with filtered water, after 1 week, take samples and then add 90 pm SO₂/180 ppm citrate while doing microbiological assay of samples
    - If samples are negative for spoilage microorganisms, re-use barrel, but sample periodically
Tank and Barrel Lees Management

- Light lees (1-25 microns) contact adds body and aromas
  - Proper enzymatic hydrolysis of yeast contents
- Heavy lees (>100 microns) contact can yield off-aromas
  - More reductive proteolysis of yeast
- Light lees effects greater in barrels and small tanks
  - Wine volume/yeast surface/ratio smaller
- Heavy lees effects greater in large tanks
  - Yeast compression → more reductive proteolysis
Tank and Barrel
Lees Management

- Lees Yeast Enzymatic Autolysis After Cell Death
  - Proteolysis of yeast contents
    - Amino acids, peptides, nucleotides
    - Amino acids can become complex flavor precursors
  - Breakdown of cell wall polysaccharides
    - Mannoproteins and glucans
    - Integrate with fruit and wood phenolics for structural maturation
  - More necessary for MLF/lees interactions
    - Best if MLF done soon after primary fermentation
    - Helps in clarification
  - Unstirred lees → higher amino acids and perceived fruit intensity
Settle/rack off whites before fermenting
- Non-soluble precipitates, MO aggregates, vegetative material, and protein complexes removed
- Cleaner fermentation and less reduced sulfur

Remove rough lees as soon as possible after fermentation
- If leaving reds with skins, stir regularly
- Only light lees are good for long term exposure to wine; rough lees can generate off odors
Tank and Barrel
Lees Management

- Stirring lees
  - Increases lees surface area contact
  - Can increase oxidative processes
  - More frequent stirring enhances yeast sensory, lessens fruit
  - More necessary for MLF/lees interactions
    - Helps in clarification
  - Unstirred lees → higher amino acids and perceived fruit intensity
Tank and Barrel
Lees Management

- Duration of Lees Contact
  - Lees promote slow, controlled oxidation
  - Stylistically driven; weeks to months
  - Usually no longer than 6 to 9 months
  - Followed by aerobic racking
  - Subsequent racking usually without aeration
Tank and Barrel
Lees Management

- **SO$_2$ and Lees**
  - Early use increases total SO$_2$ binding over life of wine
  - Enough to inhibit MO’s and limit excess oxidation
  - Not so much that slow oxidation is inhibited or aromatics are lessened by binding SO$_2$
  - Barrel topping and racking (oxygen) affect SO$_2$ needs
Lees Contact for Reds and Whites

- Anthocyanin and polyphenolic interactions differ
- Red color intensity reduced but less browning
- Mouthfeel, tannin astringency, and aromatic enhancements over ageing period may have greater effects in reds with high polyphenolics
Lees Exposure
Take-Home Lessons

- Light lees, not heavy
- Can have great stylistic influence
- Issues
  - Stirring
  - Oxygen/Reduction
  - SO₂ management
  - MLF
  - Duration
  - Racking
  - Whites and Reds
Take Home Lesson: Costs

- Vigorous Cleanliness, Sanitation, Microbial Monitoring is very desirable for quality maintenance

- What is cost?
  - Sanitation cost about ($0.50/gallon/yr)
  - Equipment cost substantial: estimate 40% extra for winery start-up or renovation, balanced by increased labor efficiency (estimated cost about $0.75/gallon/yr)
  - Monitoring costs substantial: average $50/sample (in-house and off-site labor or fees) and could average 100 tests/year (estimated cost of about $1/gallon/yr)

- Total cost about $2.25/gallon/yr
Take home Lesson: Benefits

- If each gallon of wine (5 x 750 ml bottles) saved has an estimated average retail value of $25-100, then 450 to 100 gallons saved is break-even per every 5,000 gallons sold, = 9%-2% of wine must be saved to justify cost.

- After 5-10 years, extra cost drops to about $1.50/gal/yr (inflation-adjusted dollars).

- Hidden benefits
  - Extra quality can yield extra price: to cover cost without saving any wine, need extra $0.95/bottle for 5-10 years, and then $0.65/bottle from then on.
  - Hidden dissatisfied customers can assassinate wines’ reputation, and wines highly dependent on reputation for both repeat and new customers.