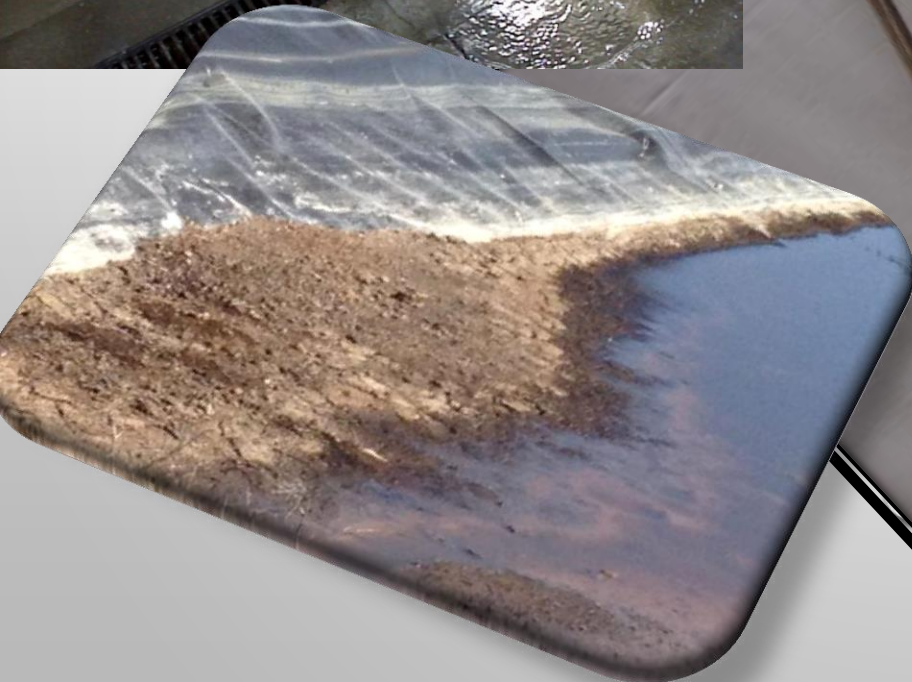


WINERY WATER CONSERVATION

OREGON WINE SYMPOSIUM, 21 FEBRUARY 2017

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Topics

- Common Water Conservation Methods for Small Wineries (Best Management Practices)
- Water and Energy
- Winery Wastewater Management in Oregon

Where Does A Winery Use Water?

Harvest Activities

- Hopper Rinse/Sanitation
- Bin Rinse/Sanitation
- General Press Sanitation
- Pushing Must
- Chasing White Juice
- Chasing Red Pressings
- Crush Pad Clean-up
- Cleaning Tankers
- Solids / Stockpile Management
- Process Water Screen

Cellar Activities

- Pushing Wine / Line Sanitation
- Tank Sanitation
- Barrel Cleaning
- Barrel Storage Sanitation
- Lees Filter Sanitation
- Cross-flow Sanitation
- Centrifuge Cooling / Sanitation
- Hoses, Nozzles, Pressure Washers
- Leaks and Drips
- Electrodialysis
- Bottling and Sterilization
- General Sanitation
- Vacuum Pumps
- Misters
- Chillers
- Boilers, Heat Exchangers, Heaters

Other

- Tasting Rooms
- Bathroom and Break Rooms
- Lab
- Landscaping

Water Balances for Three Wineries

	HC	GR	PR
General Press Sanitation	2 %	4 %	8 %
Wine Pushing / Line Sanitation	28 %	17 %	2 %
Tank Sanitation	15 %	14 %	3 %
Barrel Cleaning	21 %	17 %	--
Cross-Flow Sanitation	16 %	13 %	3 %
Electrodialysis - Stabilization	--	--	40 %
Bottling	6 %	15 %	17 %
Vacuum Pumps	--	9 %	18 %
	88 %	89 %	91 %

Large Water Uses Account For ~ 90% Of Total Use

Winery Water Conservation

- Measure Your Water Use
- Take Advantage Of Electronic Data Sharing
- Standard Operating Procedures
- Water Conservation Creates Energy Conservation
- Water Conservation Minimizes Wastewater Generation



Opportunities for Winery Water Conservation

Winery Processes

Conservation Options

Wine Pushing / Sanitation

Pigs and air

Tank Cleaning and Sanitation

Measure your flows

Barrel Cleaning

Use pressure and steam

Filtration, Fining, Stabilization

Cross-flow, electrodialysis

Cleaning and Sanitation

*Use pressure and steam, timers,
separate solids*

Bottling

Gases, not liquids. Mobile service?

Recycle Water in the Facility

*Continuous loops, reuse clean water
before discharging*

Wastewater Management Factors

Solids Separation

Stormwater Separation

Moving Must, Juice, And Wine

[2 – 28% of Water Balance]

Push Must with Water

- 6-in Diameter Line
- 50-ft from Press to Fermenter
- **73.5** Gallons of Water

Push Wine with Water

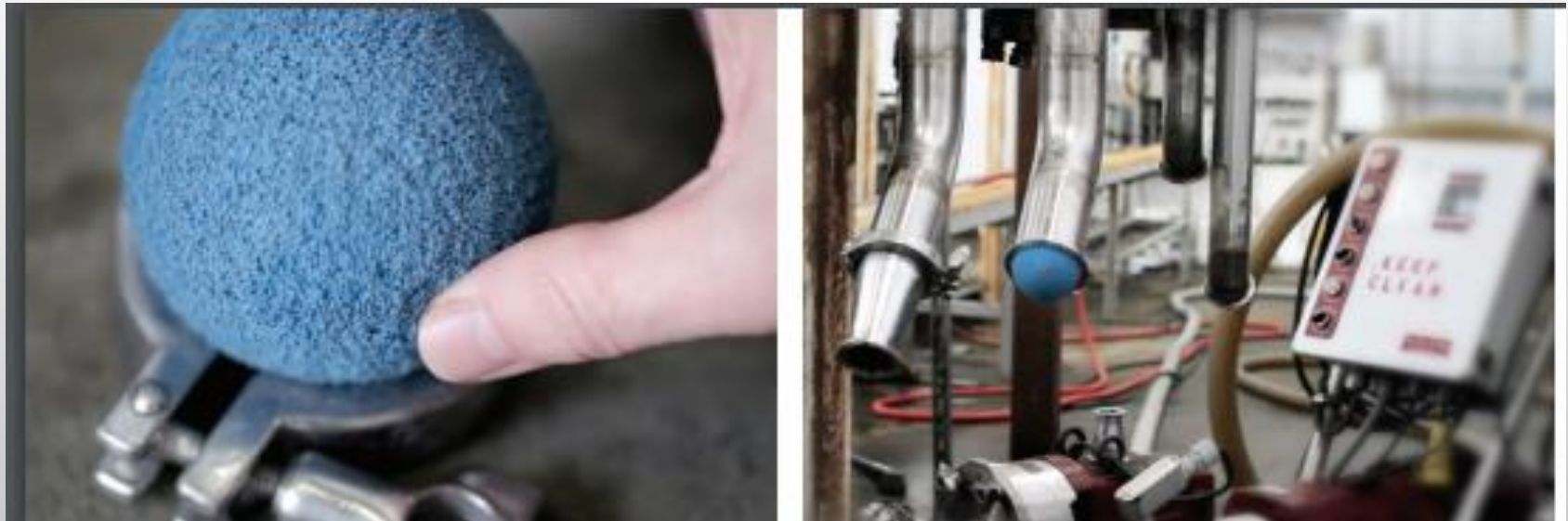
- 2-in Diameter Line
- 50-ft from Tank to Filter
- **8.2** Gallons of Water Needed

Pipe diameter	Gallons per Foot	Gallons per 50 Feet	Gallons after 100 pushes
2 inch	0.163	8.2	800
3 inch	0.37	18.4	1,840
4 inch	0.65	32.7	3,260
5 inch	1.02	51	5,100
6 inch	1.5	73.5	7,350

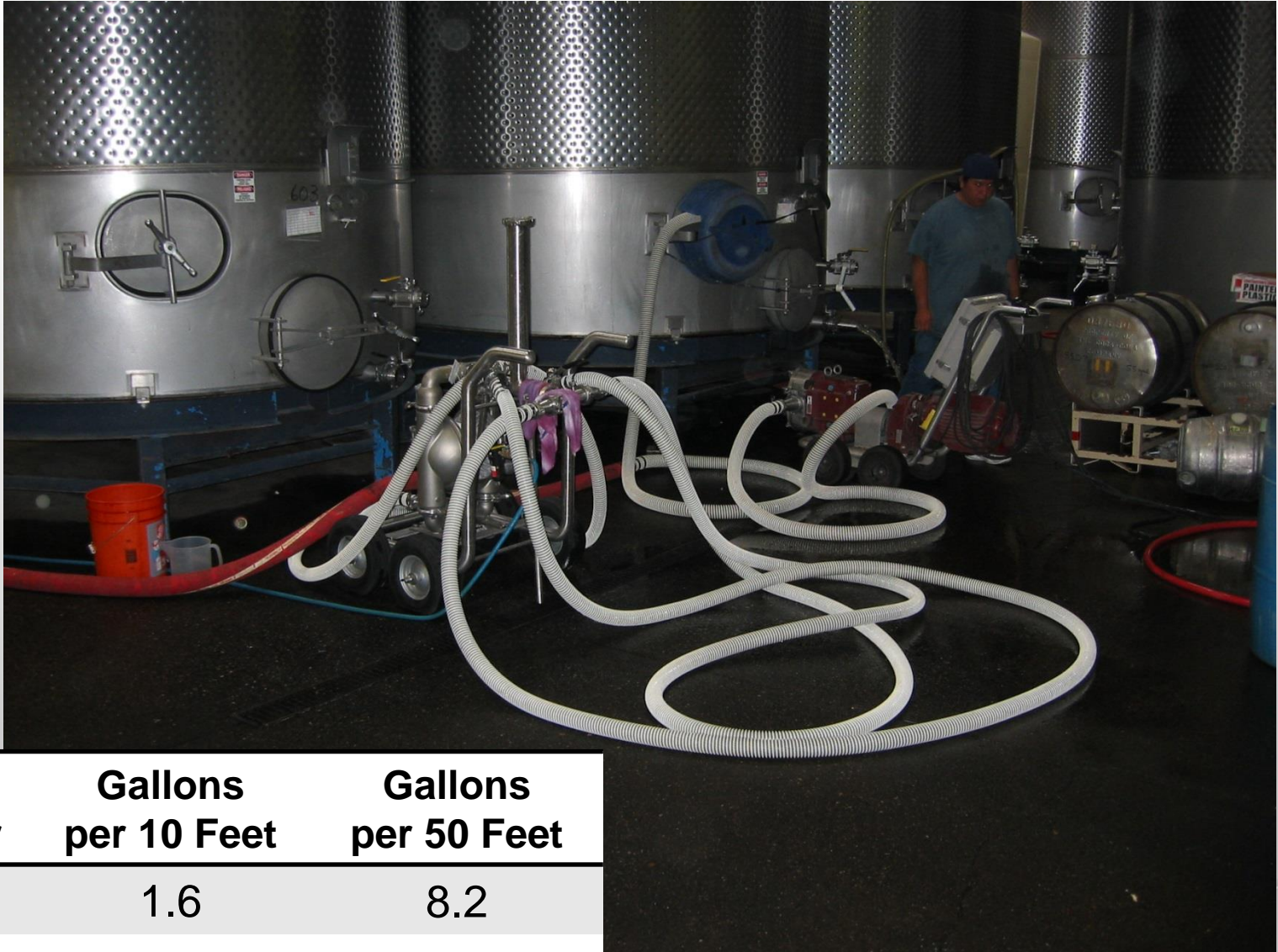
Moving Must, Juice, And Wine

[2 – 28% Of Water Balance]

Use Pigs to Push with Gases



Control Your Hose Runs!



Pipe Diameter	Gallons per 10 Feet	Gallons per 50 Feet
2 inch	1.6	8.2
3 inch	3.7	18.3

Tank and Barrel Cleaning And Sanitation

[3 – 15% of Water Balance]

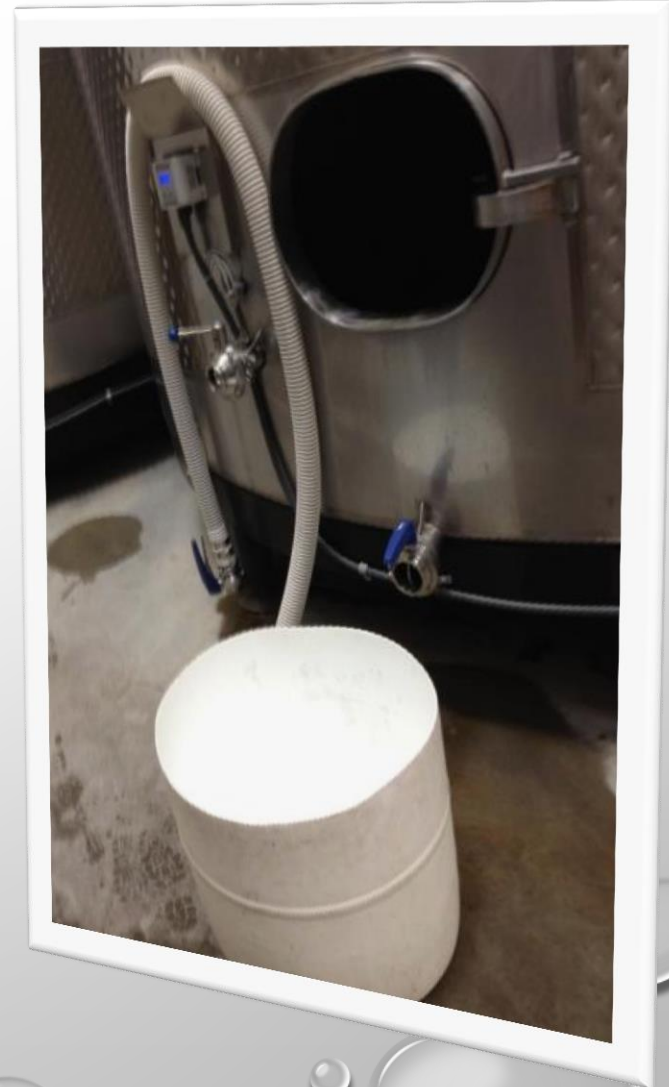
Implement Lower Flow Tank Washing

- Use Pressure and Heat, Smaller Water Volume
- Smaller First Flush
- Capture Caustic and Neutralizing Solutions for Reuse
- Collect Cleaner Rinse Water for Reuse in Next Tank



Tank Cleaning and Sanitation

- Measure Your Flows
- Standard Operating Procedure
- Review Results To Improve Operations



Barrel Cleaning and Sanitation

[0 – 21% of Water Balance]

Consider

- Use Low Flow, High Pressure System
- Substitute Steam Cleaning for part of the Process – Sanitation?
- Capture First Flush to Remove Solids
- Manage Hot Water in Your Facility



Water Management For Filtration

	HC	GR	PR
Cross-Flow Sanitation	16 %	13 %	3 %
Electrodialysis - Stabilization	--	--	40 %

Consider

Use same cleaning and sanitation principles:

- Collect and manage first flush solids
- Capture and reuse cleaning chemicals
- Recycle rinse water

Use of electrodialysis for stabilization lowers energy use

General Winery Sanitation - 1

- Maximize Dry Cleaning Methods for Solids
- Use Pressure and/or Steam, not Water
- Manage Nozzle Size
- Use a Timer on Hose Bibs



General Winery Sanitation - 2

Hose Diameter	Flow Rate	Gallons in 10 minutes
$\frac{3}{4}$ inch	35 gpm	350
$\frac{3}{4}$ inch with Nozzle	10 gpm	100
2 inch	200 gpm	2,000
2 inch Gamajet	10 gpm	100
Pressure Washer	6 gpm	60
Squeegee	0 gpm	0



Water Management in Microbreweries

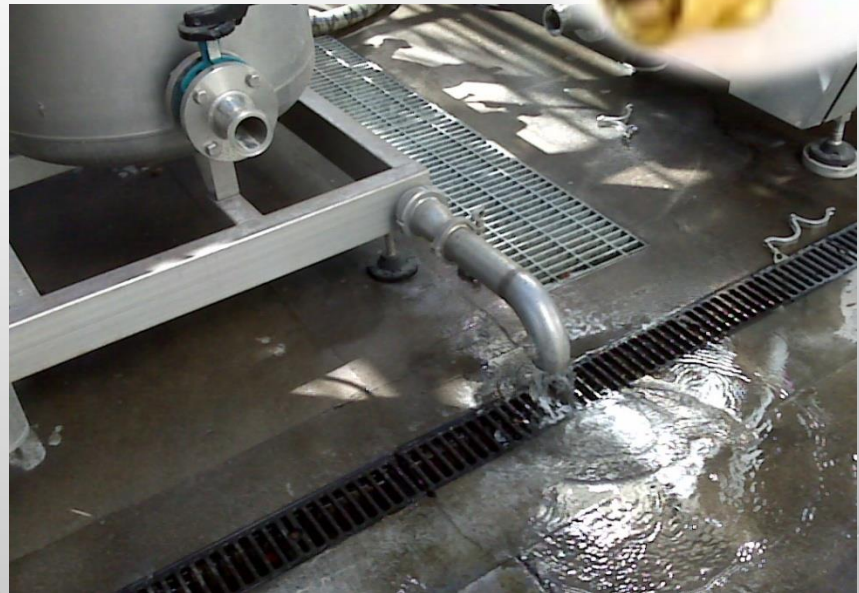


Water Recycling Methods

- Collect and remove solids as soon as practical
- Collect and reuse cleaning fluids and rinse water
- Eliminate 1-pass cooling by recirculating or stopping continuous flows [9 – 18% of water balance]

Related Issues

- Search for and eliminate leaks
- For hot water, save energy with demand hot water heaters and a smaller boiler



Solids Separation

A Recycling and Wastewater Issue

- Wastewater Strength is Directly Related to Inclusion of Solids in Water
- Including Solids Increases the Cost of Wastewater Disposal



Wastewater Management in Oregon

Common Methods for Winery Wastewater Discharge

- Municipal Wastewater Treatment Plant
- Land Application (Irrigation) of Wastewater on Crops
- Subsurface Discharge – often using a Screen, Settling Tank, and Drain Field.



Wastewater Treatment Plant Discharge

Comply With The City's Requirements, Commonly:

Solids removal

Screening Often Required

pH Adjustment

Pre-Treatment Required

Upsets & Slug Loading

Coordinate with POTW

Flow, BOD, TSS

Discharge fee based on cost analysis

Wastewater Treatment Plant Discharge

Example Municipal Discharge Fee

Parameter	Rate	Quantity Discharged	Cost
Flow per 1,000 gal	\$6.00	1,000 gal/day	\$6.00
BOD, (mg/L - 400)	\$0.005	1,500 mg/L	\$5.50
TSS, (mg/L - 400)	\$0.005	500 mg/L	\$0.50
Daily Total			\$12.00
Annual Total			\$4,380.00

Wastewater Treatment Plant Discharge

Example Municipal Discharge Fee During Crush

Parameter	Rate	Quantity Discharged	Cost
Flow per 1,000 gal	\$6.00	3,000 gal/day	\$18.00
BOD, (mg/L - 400)	\$0.005	4,500 mg/L	\$20.50
TSS, (mg/L - 400)	\$0.005	2,500 mg/L	\$10.50
Daily Total			\$49.00
40 Day crush / harvest / ferment season:			\$1,960.00

Wastewater Management in Oregon

General Permit 1400A for Wineries

County	Number of Permits
Benton	4
Clackamas	2
Coos	1
Curry	1
Douglas	2
Jackson	16
Josephine	2
Lane	3
Linn	1
Marion	4
Polk	12
Umatilla	3
Wasco	1
Washington	13
Yamhill	57
TOTAL	122

Department Of Environmental Quality Permit

- Intended for Land Application of Process Wastewater and Solids to Winery Property
- Flows Less than 25,000 Gallons per Day (That's Almost Everyone!)
- Wastewater cannot be Mixed with Sanitary Wastewater
- Winery Prepares and Follows a Wastewater Management Plan to Protect Groundwater and Prevent Nuisance Odors

Conclusion

You Should Get Started on Water Conservation this Year.

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Stormwater Separation

