

Everything You Ever Wanted to Know about Bottling but Were Afraid to Ask

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Bottling Line Readiness | March 21, 2019
UC Davis

Bottling Preparation

- Planning (at least 8 weeks in advance)
- Bottling sanitation
- Regular preventive maintenance
- Wine packaging supplies incoming inspection
- Final wine preparation and analysis
- Complying with Law (TTB)
- Wine and packaging specification sheets

QC Lab Pre-Bottling Analysis

- Complete wine analysis performed and checked against Winemaker spec. sheet
- Microbiological check of the wine provide guidance to winemakers for the final filtration decision
- Comparing bottling tank against first bottle Alcohol, DO, CO₂ & turbidity

Bottle-ready wine final analyses													
VINTAGE		ESTATE				DATE							
VARIETY		APPELLATION				LOT #							
TANK #	B1		B2		B3		B4		TARGET/	BOTTLE INSPECTION			
	1st fill	2nd fill	1st fill	2nd fill	1st fill	2nd fill	1st fill	2nd fill	LIMIT	This information is for bottling on the date above.			
										Initials	TIME	CASE #	
										Temp.	Fill (mL)	DO (mg/L)	
												CO ₂ (ppm)	
FSO ₂ (ppm)													
TA (g/100mL)													
pH													
VA (g/100mL)													
RS (g/100mL)													
MAD (g/L)													
DO (mg/L)													
CO ₂ (ppm)													
Turbid. (NTU)													
Temp. (°F)													
Analyzed by:													
Date:													
Approved by:													
Date:													
Tasted by:													
Date:													
Bottling from this Tank Began:													
Tank Emptied:													

Wine-specific analysis targets can be recorded here.

2nd Fill column is used when a single tank is filled and emptied more than once in a day.

Analysis results are recorded here.

Record the date on which the analysis was performed if other than the date of this form.

Initial here.

All of these fields must be filled in.

		Winery Specifications		
BOTTLING TANK	Units	Sauvignon Blanc	White	Red
DO in wine*	(mg/L)	0.3	0.3	0.3
FSO2 (mg/L)	(mg/L)	Target set by Winemaker		
CO2 in wine (mg/L)*	(mg/L)	800-1400	800-900	< 800
Temp. of wine (°F)	(°F)	58-66	58-66	58-66
*Comments: Sparge as necessary to target. DO NOT OVERSPARGE				
Gassing the tank w/N2 during bottling all the time				
BOTTLED WINE		Sauvignon Blanc	White	Red
O2 in purged empty bottle (mg/L)	(mg/L)	<0.3	<0.3	<0.3
DO in wine (mg/L)	(mg/L)	delta 0.30 or max 1.0		
FSO2 (mg/L)	(mg/L)	Target set by Winemaker		
CO2 in wine (mg/L)	(mg/L)	800-1400	800-900	< 800
Temp. of wine (°F)	(°F)	58-66	58-66	58-66
Vacuum (psi)	(psi)	(-3 to 0)	(-3 to 0)	(-3 to 0)

Mobile Wine Bottling Quality Standards and Specifications			
*Line will be stopped if any of the following "Wine" Specs are not attained			
Wine	Spec	Frequency	Comments
Wine Alcohol %	0.1% difference between tank and bottle	Start-up	Alc % is checked at start up and anytime water is introduced into the system. If Alc % is out of Spec then recheck will be done until resolved
Dissolved Oxygen in wine (DO)	<1 mg/L in bottle at start up < than 0.3 mg/L delta pick up	Start-up and every 1/2hr during run, if line stops for breaks.	Line cannot start unless <1 mg/L is obtained, if the wine DO is >1 mg/L trouble shooting will occur until <1 mg/L is reached
Wine Temperature	58-62F	Monitored throughout bottling	Cellar expected to send wine to line at or below max temp., if temp is exceeded line must stop and resolution must be offered.
Sterilization/Sanitation	No chlorinated products	Sanitation needs to be confirmed (180 F for min 30 min, chemical concentration with strips or indicators). ATP swabbing will be performed in the sparger and filler tubes as well as in the corker jaws. The ATP results under 10 RLU are acceptable. If the results are in between 10-30 RLU, 70% food grade ethanol will be used to spray the tubes or jaws and ATP swabbing will be repeated. If RLU is greater than 30 RLU the sanitation will need to be repeated.	SSOP from Mobile Bottleris required and should be reviewed by QC and Winemaking.
Packaging	Spec	Tolerance	Comments
Label Height Front	44mm from base to bottom of label	+/- 2mm	RMW Representative will communicate variance to Operator and work for resolution
Label Height Back	55mm from base to bottom of label	+/- 2mm	RMW Representative will communicate variance to Operator and work for resolution
Label Spacing			
Label Tilt		+/- 1mm	
Capsule Torque	Must meet standards set by Vendor		
Bottle Coding	LO 099 12 02 15:35	must be able to code bottles	in compliance with Bioterrorism act
Case Labeling			Case will be provided and applied by RMW during Bottling.

Additional Inspections for Potential Contaminants

- All gases used in contact with wine should be sterile filtered and de-moisturized at the point of use
- All waters used in the bottling process should be softened and sterile filtered (0.2 micron)
- Chemical residues (sanitation and maintenance chemicals)
- Check pipelines for any potential dead ends
- Positive pressure in the filler room
- Use exhaust fan against fruit flies

Important Paperwork

- Bill of Materials (BOM)
 - Contains list of all supplies needed to successfully preserve the wine and proudly present the final package to consumer
- Wine Specification Form
 - Winemakers provide guidance for the QA/QC Lab & Bottling
- Wine Packaging Specification Form
 - QA/QC provides guidance for the bottling crew

Bottling Wine System (BWS)

- Start from anything that touches the bottle-ready wine

Bottling tank >

Hoses >

Pump >

Pipeline >

Filters >

Rinser >

Filler >

Capper >

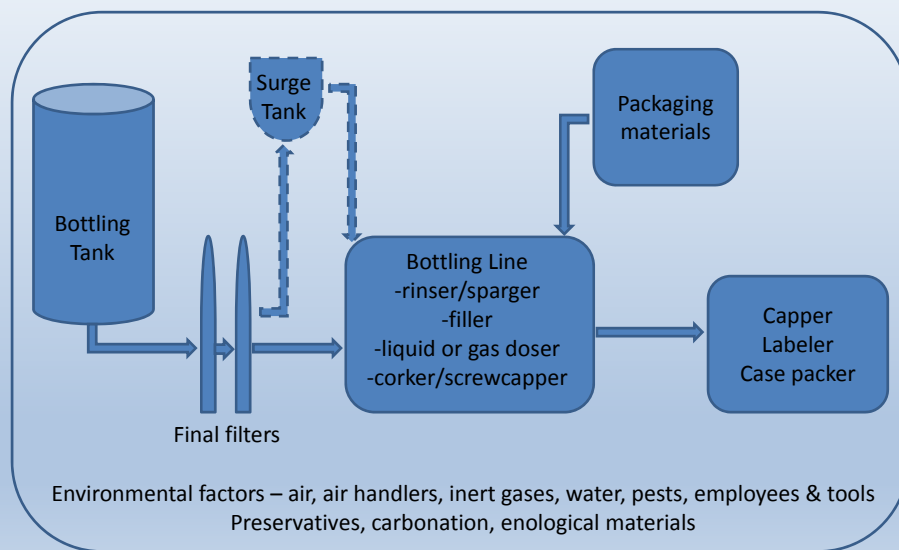
Bottling Line Sanitation Regimen

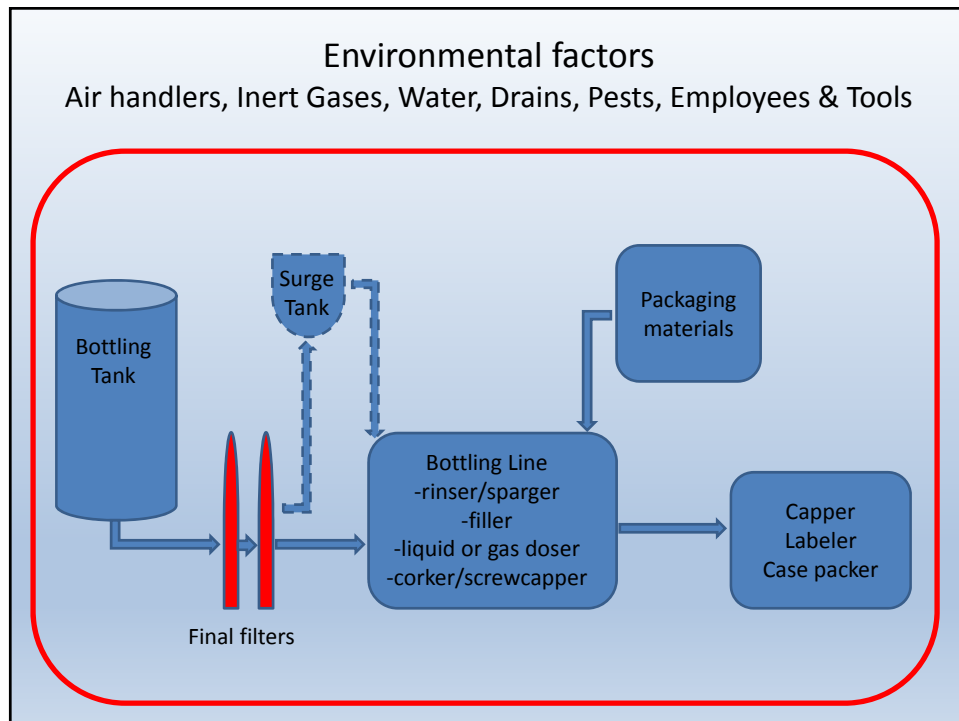
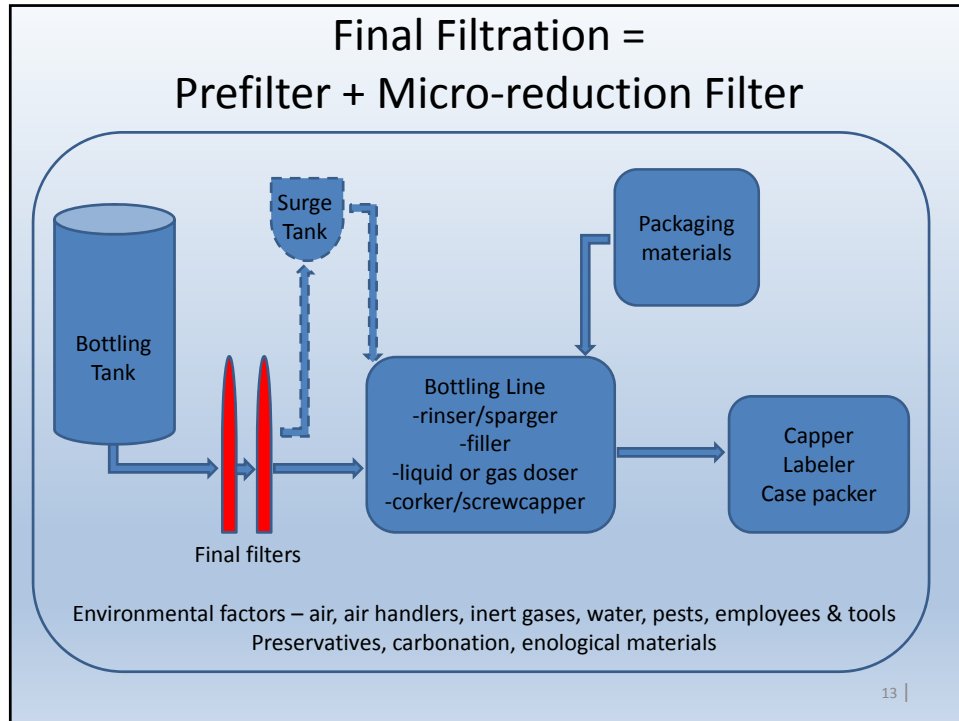
- The complete line including final filters and filler has to be sanitized with filtered steam or 180°F hot water for min 30 min prior to every day bottling
- In addition the nonchlorine chemical sanitation should be performed weekly to remove wine & water stains including potential bio-films
- Cooling of the bottling line including filters

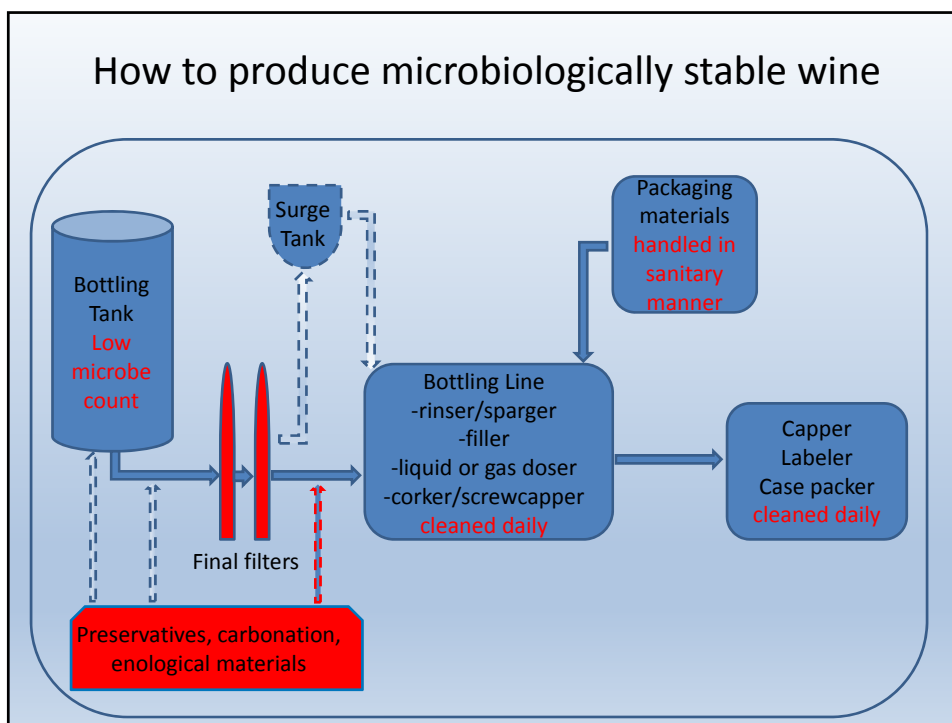
Other than Filler Equipment Sanitation

- Bottle Rinser and Corker parts that come into contact with the bottle brim should be sprayed with 70% Ethanol (food grade)
- Corker jaws need to be clean and wiped with 70% EtOH and lubricated, the excess lubricant need to be wiped out
- ATP swabbing is used to confirm sanitary conditions of the rinser, filler and corker

Simplified Bottling Diagram







Line Start-up

- Final filter bubble point or pressure differential test
- Alcohol check within 0.1-0.2% by Vol. (or use of refractometer)
- Dissolved Oxygen (< 1mg/L @ start-up, delta <0.3mg/L)
- Vacuum in the bottle (-5 to 0 inches of Hg)
- Fill point & proper ullage (headspace) table
- Start checking the whole bottle package
- Ambient, glass & wine temperature
- Label and ambient humidity level
- Wet glue temperature (not for pressure sensitive labels)

Ullage Calculator for Bottling 750ML Wine Bottles

#1 Select Wine Bottling Conditions

Select Wine Temperature at Bottling 68 °F

Enter Cork Size 45 mm

#2 Recommended Headspace and Internal Pressure

Recommended Ullage by Volume 6.5 mL

Headspace In Millimeters 17.5 mm*

Fill Height 63.5 mm*

Recommended Maximum Bottle Pressure 2 PSI (relative)

#1 Select Wine Bottling Conditions

Select Wine Temperature at Bottling 68 °F

Enter Cork Size 54 mm

#2 Recommended Headspace and Internal Pressure

Recommended Ullage by Volume 6.5 mL

Headspace In Millimeters 17.5 mm*

Fill Height 72.5 mm*

Recommended Maximum Bottle Pressure 2 PSI (relative)

Ullage Calculator for Bottling 750ML Wine Bottles

#1 Select Wine Bottling Conditions

Select Wine Temperature at Bottling 56 °F

Enter Cork Size 54 mm

#2 Recommended Headspace and Internal Pressure

Recommended Ullage by Volume 7.8 mL

Headspace In Millimeters 21 mm*

Fill Height 76 mm*

Recommended Maximum Bottle Pressure -1.1 PSI (relative)

#1 Select Wine Bottling Conditions

Select Wine Temperature at Bottling 56 °F

Enter Cork Size 45 mm

#2 Recommended Headspace and Internal Pressure

Recommended Ullage by Volume 7.8 mL

Headspace In Millimeters 21 mm*

Fill Height 67 mm*

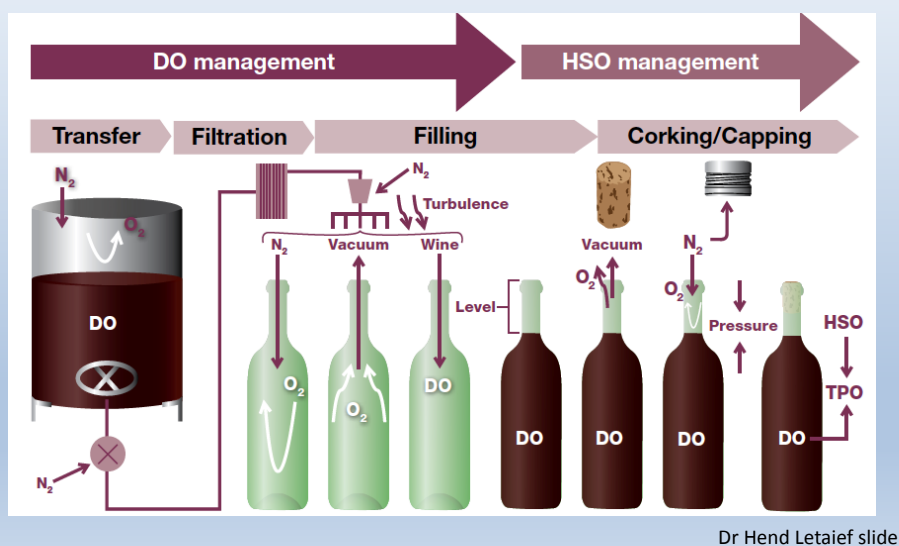
Recommended Maximum Bottle Pressure -1.1 PSI (relative)

Bottle Pressure by Temperature*				Fill Chart by Temperature*			
Wine Temperature	Fill Level From Top	Max Pressure*		Wine Temperature	Fill Level From Top	Ullage*	
		45mm Cork	49mm Cork			45mm Cork	49mm Cork
72°F	63.5mm	4.6 psi	5.4 psi	72°F	61.3mm	15.3mm	11.3mm
71°F	63.5mm	3.9 psi	4.5 psi	71°F	61.8mm	15.8mm	11.8mm
70°F	63.5mm	3.2 psi	3.6 psi	70°F	62.4mm	16.4mm	12.4mm
69°F	63.5mm	2.6 psi	2.8 psi	69°F	62.9mm	16.9mm	12.9mm
68°F	63.5mm	2.0 psi	2.0 psi	68°F	63.5mm	17.5mm	13.5mm
67°F	63.5mm	1.5 psi	1.3 psi	67°F	64.1mm	18.1mm	14.1mm
66°F	63.5mm	1.0 psi	0.7 psi	66°F	64.6mm	18.6mm	14.6mm
65°F	63.5mm	0.5 psi	0 psi	65°F	65.2mm	19.2mm	15.2mm
64°F	63.5mm	0 psi	-0.5 psi	64°F	65.7mm	19.7mm	15.7mm
63°F	63.5mm	-0.4 psi	-1.0 psi	63°F	66.3mm	20.3mm	16.3mm
62°F	63.5mm	-0.8 psi	-1.5 psi	62°F	66.8mm	20.8mm	16.8mm
61°F	63.5mm	-1.2 psi	-1.9 psi	61°F	67.4mm	21.4mm	17.4mm
60°F	63.5mm	-1.6 psi	-2.3 psi	60°F	67.9mm	21.9mm	17.9mm
59°F	63.5mm	-1.9 psi	-2.7 psi	59°F	68.5mm	22.5mm	18.5mm
58°F	63.5mm	-2.2 psi	-3.1 psi	58°F	69.0mm	23.0mm	19.0mm
57°F	63.5mm	-2.6 psi	-3.4 psi	57°F	69.6mm	23.6mm	19.6mm
@ 97 F with 45 mm cork =0 mm ullage ; @ 90.5 F with 49 mm cork = 0 mm ullage https://www.corkqc.com							

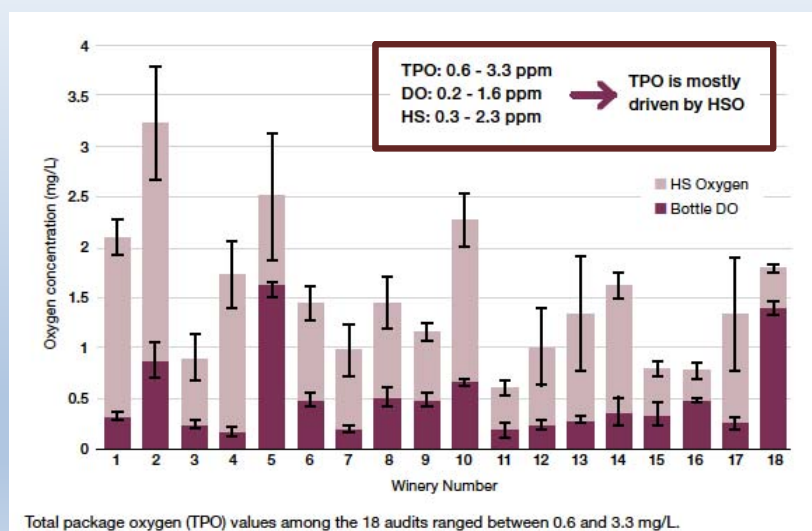
Bottling Line Sampling

- Regularly “fully dressed” bottles need to be taken from the line everyday by QA technician for microbial stability & QC holdback samples
- In addition, bottling operators need to observe the line performance by frequently checking vacuum, fill height, DO, Temperature, cork height, label placement, screw cap slip and torque among others (every 15-30 min)

Several key areas of concern for excess oxygen pickup during bottling



TPO variation Mid-bottling process



Out of Specification (OOS) Product

- Clear and quick decisions need to be made right on the spot
 - Determine the level & frequency of OOS
 - Put ON HOLD all possibly impacted cases
 - Alert Bottling & QA/QC Manager instantly
 - Audit cases on hold & determine GO or NO GO
 - Release, rework or destroy the product
- Proper protocol for QC hold need to be established ahead of time

At Completion of Wine Bottling

- Complete analysis for quality assurance
- Complete analysis for wine export
- Plating for checking microbial stability and QC hold release within 14 days
- Bottle pre-release tasting 3, 6, 9 & 12 months
- Keep all documentation in order for future needs

	QC Tech 1	QC Tech 2	Senior QC Tech
Skills	1	2	3
Sanitation check ATP filler spouts and corker jaws	X	X	X
Check cork hopper for cleanliness	X	X	X
Check Bottling Tank Gases (CO2 & DO)	X	X	X
Start Alcozyzer when lab QC not present		X	X
Email daily approved signatures for approved tanks		X	X
Check analyses vs. specifications	X	X	X
Check filter integrity being performed and passed	X	X	X
Catching wine at the filter and filler bowl	X	X	X
Checking color & taste of wine if pad filters used	X	X	X
Checking DO in the last filler spout first run	X	X	X
First bottle of second run sample & analyze for alcohol & NTU (leave for SO2)	X	X	X
Check laser date on the bottle	X	X	X
Checking all packaging materials		X	X
Vacuum gauge check and in the bottle - Pressure under screw caps	X	X	X
Inspect corker and screw capper application for damages		X	X
Fill heights and volumes of wine check	X	X	X
Label application	X	X	X
Case print check	X	X	X
Cork depth	X	X	X
Capsule application	X	X	X
Label placement	X	X	X
Every two hours check CO2 & DO in the bottled wine	X	X	X
Every two hours take samples for plating	X	X	X

	QC Tech 1	QC Tech 2	Senior QC Tech
Skills	1	2	3
Bottle dimensions	X	X	X
Secure seal tester		X	X
Slip and torque		X	X
QC Micro plating		X	X
Intellapack use to check packaging specifications		X	X
JDE use to process paperwork for QC ad winemaking libraries		X	X
Cork incoming inspection & keep track of them		X	X
Cork soaking and tallying results		X	X
Create packaging specification sheets and distribute them		X	X
Preparing QC and WM library samples for shipment	X	X	X
Maintaining winemakers library and QC closet		X	X
Tally QC holdback samples in the distribution centers		X	X
Create DMR for out of specification product or package		X	X
Harvest laboratory work	X		
Ice bucket, incubator and fridge label testing		X	X
Environmental chamber test		X	X
Cork extraction		X	X
Ability to help Cellar master train other Workers			X
Training bottling QC techs			X
Training Intellapack and JDE			X
Cork extraction and bottle dimension training		X	X

“The bitterness of poor quality
remains long after the sweetness
of low price is forgotten”

Benjamin Franklin

Suggestions for listening and reading

- Dr. Juran on quality trilogy:

<http://info.juran.com/hubfs/documents/App%20Files/TheQualityTrilogy%20by%20JM%20Juran.pdf>

<https://www.youtube.com/watch?v=LJ2Hj4RiPiM>

- Steve Jobs while @ Next talks about Dr. Juran and Quality:

<https://www.youtube.com/watch?v=XbkMcvnNq3g>