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Wine Institute

BEFORE THE HEARING BOARD OF THE SANTA BARBARA COUNTY

AIR POLLUTION CONTROL DISTRICT

IN RE: PETITION OF WINE INSTITUTE FOR REVIEW OF ATC ISSUED TO CENTRAL COAST WINE SERVICES FINAL AUTHORITY TO CONSTRUCT 15044; FID 11042; SSID 10834.	H.B. Case No. 2017-21-AP; H.B. Case No. 2017-24-AP **DECLARATION OF MARIANNE F. STRANGE IN SUPPORT OF WINE INSTITUTE'S PETITION FOR REVIEW**
IN RE: PETITION OF WINE INSTITUTE FOR REVIEW OF ATC ISSUED TO CENTRAL COAST WINE SERVICES FINAL AUTHORITY TO CONSTRUCT MODIFICATION 15044-01; FID 11042; SSID 10834.	Date: TBD Time: TBD Place: TBD

I, Marianne F. Strange, hereby declare:

1. I make this declaration of my own personal knowledge, except where stated on information and belief, and if called to testify to the matters stated herein, I could and would do so competently.

A. Background, Education and Work Experience

2. I am the President of M. F. Strange & Associates, Inc. (MFSA). MFSA is a small business firm providing consulting services in the fields of project permitting; environmental management systems; quality and environmental auditing, management, data collection and analysis; and environmental description and impact assessment. I hold a Bachelor of Arts Degree in Geography from the University of California, Santa Barbara. I have been involved in the natural sciences for more than 30 years. During my career, I have worked as an Environmental Specialist with the U.S. Forest Service, an Air Quality Engineer with the Santa Barbara County Air Pollution Control District, and as a consultant. My project experience has primarily addressed the applied atmospheric and marine sciences, but has also included project management, conducting workshops and seminars, and environmental surveys and impact assessments.

3. I have developed New Source Review (NSR) compliance management strategies for companies which are pursuing large scale expansions. Inherent in all such projects is the analysis, determination of applicability, and implementation of technological standards, including Reasonable Available Control Technology (RACT), Best Available Control Technology (BACT), and innovative operational alternatives.

4. On this project, I worked with David W. Briggs. Mr. Briggs is an Associate with MFSA. He holds a Bachelor's of Science Degree in Physics from the University of California, Santa Barbara. Mr. Briggs has been involved in diverse federal, state, and local environmental, health, and safety programs. He has provided regulatory permitting services and environmental consulting for onshore and offshore oil production companies; aerospace companies; wineries;

manufacturing; agriculture operations; and concrete batch plants. During his career, Mr. Briggs has worked as Technical Manager for Betz Energy Chemicals, General Manager for Water and Energy Systems Technology, Inc., and Facilities and EHS Manager for Medtronic Neurosurgery.

B. History of MFSA work with Central Coast Wine Services

5. Central Coast Wine Services (CCWS) contracted with MFSA in January of 2017 for assistance with obtaining an Authority to Construct (ATC) permit from the Santa Barbara County Air Pollution Control District (District).

6. Prior to contracting with MFSA, CCWS had received an ATC (ATC-14350-01) for forty (40) stainless-steel closed top fermentation tanks. ATC-14350-01 was subsequently superseded by ATC 14632, which required the implementation of BACT controls, with a control efficiency of 90% or greater, and source testing on the forty (40) new tanks. Prior to exercising the ATC 14632, CCWS, the vendors of the emission control devices (NohBell and EcoPAS) and the District attempted to identify the parameters of a source test for the emission control devices. However, that source test was never conducted. CCWS ultimately withdrew that ATC application and accepted a Permit to Operate (PTO-14696) with conditions that restricted the operations of these 40 tanks: only 10 tanks could be used for white wine fermentation, the remaining thirty tanks could be used only for wine storage. This PTO also included a condition which stated:

> *Any future emission increases resulting from the expansion of the project authorized by this permit shall be considered emissions from this project and shall be added to the project emissions total for the purpose of determining future BACT requirements. If BACT is triggered by future emission increases, BACT shall be applied to the entire project, including all project expansions.*[1]

This condition language was referred to by the District as a BACT re-opener condition.

[1] Santa Barbara County Air Pollution Control District Permit to Operate 14696, Condition 12.

7. When CCWS contracted with MFSA in 2017, CCWS's goal was to have the use restrictions on these tanks removed so that CCWS could meet the projected demand for fruit processing during the next harvest season. MFSA began working on an ATC application to allow all of the new tanks to be used for red or white wine fermentation. Because of the BACT re-opener condition, we believed that BACT would be required. The District's Rule 802.d requires that BACT shall be the more stringent of:

a. The most effective emission control device, emission limit, or technique which has been ***achieved in practice*** *for the type of equipment comprising such stationary source; or*

b. The most stringent limitation ***contained in any State Implementation Plan****; or*

c. Any other emission control device or technique ***determined after public hearing to be technologically feasible and cost-effective by the Control Officer.***

We were not aware of any "achieved in practice" BACT technologies that would apply to this project, and no BACT technologies were required by any State Implementation Plan (other than temperature controls for open and closed-top tanks, and pressure relief valve settings for closed top tanks, which were already in-place), so we began working on a determination of whether emissions controls would be "technologically feasible and cost-effective." MFSA began preparing a Top-Down BACT cost analysis using the U.S. EPA's guidance manual.[2]

C. Summary of March 28, 2017 Permit Pre-Application Meeting with the Santa Barbara County Air Pollution Control District and ATC Application Preparations

8. Shortly after MFSA began work on the ATC application, including the BACT Top-Down analysis, we requested a pre-application meeting with the District. The purpose of this meeting was to review the project with the District and to receive the District's input on the

[2] EPA Air Pollution Control Cost Manual Sixth Edition EPA/452/B-02-001, January 2002.

application's content to avoid confusion or application incompleteness issues. There were three primary topics that the CCWS and MFSA team wished to discuss with the District: New Source Review (NSR) as it applies to the project and the entire facility; BACT and BACT Top-Down cost analysis requirements; and short-term potential-to-emit calculation methodology.

9. In August of 2016, the District issued a revised NSR Rule.[3] Among the changes presented in this revised rule was a change to the emissions offset threshold. The daily emission offset threshold had been 55 pounds per day for Reactive Organic Compounds (ROC). Ethanol, which is emitted during wine fermentation, is considered an ROC. The new rule changed this threshold to 240 pounds per day. CCWS had been employing ethanol capture devices in order to keep their daily emissions below the 55 pound per day offset threshold (thus avoiding offset obligations). At this meeting the CCWS and MFSA team was going to seek confirmation that this same approach would be applied in the new ATC, with the exception of a daily facility ROC emission limit of 240 pounds per day being applicable.

10. The CCWS and MFSA team wanted to acknowledge to the District that the ATC application would be addressing the BACT re-opener condition and that we would be looking at the cost effectiveness of the identified control technologies. To properly complete this analysis, certain input parameters were needed from the District. Among these were the interest rate and equipment life expectations for determining the Net Present Value of future costs, and the cost effectiveness thresholds which would be used to determine which control technologies are cost effective. In prior discussions with the District we were advised that the District does not have a published policy on the topic and assesses BACT cost effectiveness on a case by case basis. The CCWS and MFSA team wished to request that the District provide the cost effectiveness threshold value that would be used to assess this project.

11. The PTO[4] that CCWS was operating under at that time did not include any

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[3] Santa Barbara County Air Pollution Control District Rule 802, August 25, 2016.
[4] Santa Barbara County Air Pollution Control District Permit to Operate 14696.

discussion on how the District had assessed the short-term emissions for the 40 new tanks. The only short term emission reference included in the PTO was the short term ROC emission limit of 54.99 pounds per day for the entire facility. The short term emission rates are necessary to estimate the short term emission flow rates to the control devices for proper sizing in the Top-Down cost analysis.

12. At the March 28, 2017 pre-application meeting, before the CCWS and MFSA team could present the project and their questions to the District, the District informed us that the District had determined that the NohBell and EcoPAS control technologies had been classified as Achieved in Practice (AIP) BACT. The District stated that EPA Region 9 had reviewed the data that CCWS had submitted as required in their PTO and determined that each of these control devices had a capture and control efficiency of 76%. When the District was pressed on substantiation of the 76% control efficiency, the District's staff stated that CCWS should present a reasonable control efficiency in the ATC application for the District's consideration.

13. Of the three topics that the CCWS and MFSA team wished to discuss, the only one that we discussed was the topic of the short-term emission calculation. We were advised that the District was not prepared to discuss that type of detail and we were referred to the permitting engineer, Mr. Kevin Brown, who was not present at the meeting.

14. Subsequent discussions with Mr. Brown revealed that the District does not have a short-term (daily) potential to emit (PTE) for these 40 tanks that they could share. Since the daily facility emission limit was set at 54.99 pounds per day ROC to remain under the offsetting requirements threshold, there was no need to document a daily emission rate from these 40 tanks. Mr. Brown did advise that the 240 pound per day ROC emission limit could not be used unless an Air Quality Impact Analysis (AQIA) was performed. Otherwise, the daily limit would be restricted to below the 120-pounds-per-day AQIA threshold.

15. Using the guidance from Mr. Brown, we estimated (through calculation) that any capture and control device operating on these 40 tanks would need to achieve a 65.7% capture

and control efficiency in order for CCWS to remain below the AQIA threshold. Therefore, in preparing the ATC application package, we rounded up that figure slightly and asked the vendors of the control devices to guarantee a 67% capture and control efficiency. This proposed control efficiency was not based on any testing of the emissions control systems, but simply on the level of control that CCWS needed to achieve in order to meet the District's requirements.

16. After these guarantees were received from the vendors, the District provided additional direction, stating that unless CCWS wanted to keep separate daily records for the 40 new tanks and the 106 legacy tanks, CCWS would be required to implement BACT on all fermentation tanks in the facility. It was therefore decided to structure the ATC application based upon the implementation of BACT on all 146 fermentation tanks. Although the change from 40 tanks to 146 tanks negated the control efficiency calculation that we had performed, which was based on need and not on the performance of the controls, we nevertheless decided to present the 67% performance guarantees from the vendors in the final ATC application documents. The 67% performance guarantee values are based upon math, not scientific data.

D. MFSA's understanding of Achieved in Practice (AIP)

17. The term "Achieved in Practice" is not clearly defined in federal law. However, in my experience, an AIP determination is not based on *an expectation* that a particular control technology will work, but on *a track-record* demonstrating that it has worked as expected when used in the same manner that a BACT control technology would be used. Therefore, before a control device is determined to be AIP, we would expect that the control device would be used on a continuous basis on the source, under all of the operating conditions that may arise during regular use, over an extended period of time, and that the control efficiency of the device would be measured and documented.

18. Until recently, there was no minimum time of use before an AIP determination could be made. However, EPA Region 9 now considers six months of successful operation sufficient to demonstrate AIP. What is considered successful operation is still being questioned.

E. Application of AIP to Controlling Emissions

19. It is important that an AIP determination is not made before an adequate period of successful use. BACT is established by a successfully designed and operated control device, which may then be considered AIP. Once a control device is considered AIP, other manufacturers will have to meet the newly established BACT emission rate for any similar process. However, due to differences in operating conditions and engineering designs, there can be cases where a control device cannot meet the BACT limits that were established in a successful operation.

20. An example is the use of a thermal oxidizer to control waste and/or excess gas. The produced gases from oilfields vary significantly and can have unpredictable flows in both quality and quantity. In its function as an 'excess' burner, the thermal oxidizer is required to quickly respond across a range of volume and heat value inputs. These types of fluctuations, and the resulting oscillation in the feed control mechanisms and swift heat build-up, can and will destroy the flame mantle.

21. This is a good example when an established BACT technology cannot be used by all operations in the same industry even with a guarantee from a manufacturer. In all operations and industries, there are unexpected variables that may prevent a control device from achieving the required efficiencies. Unfortunately, when operations are outside of the preferred range, there can be catastrophic and dangerous events. In one case involving a thermal oxidizer, regardless of modifications to the mantle, control system, and insulation, the device failed to achieve the required destruction efficiency and, after the third catastrophic failure, was decommissioned.

F. CCWS AIP Determination

22. In the case of CCWS, to my knowledge, the NohBell and EcoPAS control technologies were never used at CCWS as BACT controls, neither prior to the District determining that they would be considered AIP or since. These controls have not been used continuously by CCWS throughout a complete fermentation cycle on any tanks.

23. When the District advised CCWS that the control systems would be considered AIP, there was no performance standard for them that had been established through source testing. To my knowledge, there was no source testing with the controls in place to determine the efficiency of either system. The control efficiency that CCWS proposed was calculated based on the efficiency that CCWS needed, rather than the efficiency that the systems were capable of achieving. That control efficiency was based on the manufacturers' guarantees, and not on any track-record from prior use.

24. There was also no economic analysis to determine whether the use of the systems was cost effective as a BACT technology. We had begun a cost analysis, but that process was cut short by the District's AIP determination.

25. CCWS leased the NohBell NoMoVo and EcoPAS emissions control systems. CCWS reportedly paid NohBell $37,376 annually for the lease of each of the two NoMoVo units. CCWS also reportedly paid EcoPAS $31,253 to lease one EcoPAS100 model. But, to my knowledge, no analysis has been performed to determine whether the use of NoMoVo and EcoPAS emissions control systems at CCWS will exceed cost effectiveness thresholds.

26. NohBell's NoMoVo emission control system is reported to have a purchase cost of $67,500 per unit[5] and the EcoPAS emission control system is reported to have a purchase cost of $195,000 per unit.[6] Businesses purchasing one or more of these systems will also incur additional expenses for installation, maintenance, electricity, and slurry and/or condensate removal and disposal. The quoted costs do not include the cost of a chiller system necessary to support the devices or a clean-in-place system to clean the ductworks to prevent cross contamination of the tanks.

27. Our firm prepared an analysis of the cost effectiveness of the emissions control

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[5] May 1, 2014 letter from Daniel Belliveau, CEO NohBell Corp. to David Warner, Director of Permit Services San Joaquin Valley APCD.

[6] July 6, 2016 letter from Patrick Thompson, CEO EcoPAS, LLC to Arnaud Marjollet, Director of Permit Services San Joaquin Valley APCD.

systems to be used at CCWS using the South Coast Air Quality Management District's (SCAQMD) approved methodology for conducting a Top Down BACT analysis.[7] A true and correct copy of our analysis is attached as Exhibit A. Our cost effectiveness analysis uses the leasing costs paid by CCWS as a recurring annual cost and the emissions control systems manufacturers' cost quotes sent to the San Joaquin Valley APCD. The cost effectiveness analysis is designed to determine whether the emissions control systems meet cost effectiveness thresholds. The District does not have its own established cost effectiveness thresholds, so our analysis uses cost effectiveness thresholds from the SCAQMD.[8] The two thresholds are for "total incremental costs" (the initial capital investment plus one year of operating costs) and for "total 10-year average costs" (the initial capital investment plus ten years of operating costs, calculated using the net present value of future money).

28. For the NoMoVo system, the cost effectiveness analysis indicates that the system does not meet the thresholds for total incremental costs or for the average 10-year costs. For the EcoPAS system, the cost effectiveness analysis indicates that the system meets the threshold for total incremental costs, but does not meet the threshold for average 10-year costs. Thus, even with the liberal assumptions that the manufactures provided in their comments to the San Joaquin Valley APCD (which did not include several line items required by the EPA Control Cost Manual), both systems did not meet the 10-year average cost effectiveness threshold.

29. The EcoPAS system meets the total incremental cost threshold because CCWS is leasing not purchasing the EcoPAS system, and thereby avoiding the initial capital expenditure of purchasing the system. The EPA Control Cost Manual assumes that emissions control systems will be purchased, not leased. If the EcoPAS systems were purchased, the total incremental costs would increase and the total incremental cost criterion would be exceeded.

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[7] Top Down BACT Analysis of Cost Effectiveness of EcoPAS and NoMoVo Emissions Control Devices at Central Coast Wine Services, prepared by Marianne F. Strange & Assocs. (January 4, 2018).

[8] San Joaquin Valley APCD's cost effectiveness thresholds are lower. If such thresholds were applied in Santa Barbara County, both systems would clearly be cost prohibitive.

30. Our cost effectiveness analysis does not include the cost of a redundant capture manifold system or a clean-in-place system. One of these options may be necessary in order to have the ability to clean the emissions control systems and maintain continuous use as a BACT control technology. (If the capture systems were disassembled for cleaning, the facility would be unable to process wine during the time that controls were offline.) Because CCWS has never used the systems as BACT, it is unknown whether a clean-in-place or redundant capture manifold system will be required. If either of these is required, then additional ducting, instrumentation, and other costs would be incurred. If these costs were included, the EcoPAS system would likely fail the total incremental cost threshold, even without the direct purchase of the control devices.

31. Our firm has previously prepared two similar cost effectiveness analyses of the EcoPAS and NoMoVo emissions control systems for other winery clients. In both cases, the emissions control systems failed to meet cost effectiveness thresholds for total incremental costs and for average 10-year costs.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration was executed this 8 day of January, 2018, at Santa Barbara, California.

Marianne F. Strange

MARIANNE F. STRANGE

EXHIBIT A

Table 1

Control Costs Comparison

	ECOPas PAS-100 (Quote Comparison Methodology)	NohMoVo (Quote Comparison Methodology)
Estimated Control Efficiency	67%	67%
Total Incremental Cost	$1,395,597	$2,663,452
Tons Ethanol Controlled in One Year	20.28	20.28
Incremental Cost Effectiveness, $/Ton	**$68,807**	**$131,316**
SCAQMD BACT Cost Effectiveness Value	**$88,125**	
10 year Cost Basis	$6,337,007	$17,409,624
Tons Ethanol Controlled in Ten Years	202.83	202.83
Average Cost Effectiveness, $/Ton	**$31,243**	**$85,835**
SCAQMD BACT Cost Effectiveness Value	**$29,375**	

Table 2

PAS-100 Control Technology

Capital and Operational Costs

Line Item	Reasons & Remarks	EcoPASCost Quote Gallo Livingston	Estimated Cost CCWS Winery
Purchased Equipment Costs	Q3 2016 Cost per EcoPAS quotes dated 7/12/2016		
PAS-100 Units	Units (CCWS Units based upon 310 cfm per unit)	23	14
Equipment Purchase, EC (Pas-100)	PAS-100 units ($195,000 as Q3 2016 dollars per quotes)/CCWS Leases	$4,485,000	$0
Instrumentation (PAS-100)	Average Value (PAS-100 unit basis)	$146,000	$88,870
Sales Tax (PAS-100)	3.3% (PAS-100 Units & Instrumentation)	$148,454	$17,372
Freight (Pas-100)	Average Value (PAS-100 unit basis)	$11,111	$6,763
Equipment Purchase, EC (Ducting)	$200,000 for 72 legacy tanks and $111,100 for Series 40 tanks (est)		$311,100
Total Purchased Equipment Costs, PEC	**Sum of Above**	**$4,790,565**	**$424,104**
Direct Installation Costs			
Foundations & Support (Pas-100)	Average Value (PAS-100 unit basis)	$74,200	$45,165
Handling and Erection (Pas-100)	Average Value (PAS-100 unit basis)	$74,800	$45,530
Electrical (Pas-100)	Average Value (PAS-100 unit basis)	$43,333	$26,377
Piping (PAS-100)	Per EcoPAS	$0	$0
PLC Programming (PAS-100)	Average Value (PAS-100 unit basis)	$46,000	$28,000
Insulation (PAS-100)	Per EcoPAS	$0	$0
Painting (PAS-100)	Per EcoPAS	$0	$0
Handling and Erection (Ducting)	0.08 PEC per EPA Control Cost Manual, Section 3, Chapter 2, Table 2.3		$24,888
Total Direct Installation Costs, DC	**Sum of Above**	**$238,333**	**$169,960**
Indirect Costs (Installation)			
Engineering (PAS-100)	Per EcoPAS	$50,000	$30,435
Construction and Field Expense (PAS-100)	Per EcoPAS	$0	$0
Contractor Fees (PAS-100)	Average Value (PAS-100 unit basis)	$75,000	$45,652
Start Up (PAS-100)	Per EcoPAS/0.02 PEC per EPA Control Cost Manual, Section 3, Chapter 2, Table 2.3	$0	$8,482
Contingencies (PAS-100)	Per EcoPAS/0.03 PEC per EPA Control Cost Manual, Section 3, Chapter 2, Table 2.3	$0	$12,723
Performance Test (PAS-100)	Average Value (PAS-100 unit basis)	$210,000	$0
Contingencies (Ducting)	0.03 PEC per EPA Control Cost Manual, Section 3, Chapter 2, Table 2.3		$9,333
Total Indirect Costs, IC	**Sum of Above**	**$335,000**	**$106,625**
Total Capital Investment, TCI (Q3 2017 Valuation)	**TCI = PEC + DC + IC**	**$5,363,898**	**$700,690**
Direct Annual Costs			
Annual Equipment Lease	$31,253 per Unit (per CCWS contract)	$0	$437,542
Sales Tax (PAS-100)	3.30%	$0	$14,439
Operating Labor (PAS-100)	Average Value (PAS-100 unit basis)	$137,423	$83,649
Supervisor (PAS-100)	Average Value (PAS-100 unit basis)	$0	$0
Maintenance (PAS-100)	Per EcoPAS	$0	$0
Annual Source Test (Performance testing)	PAS-100 unit basis	$10,000	$10,000
Maintenance Labor (Chiller) (Skilled Labor cost = $75/hour)	1/2 hour per shift per EPA Control Cost Manual, Section 3, Chapter 2, Table 2.4		$10,125
Maintenance Materials (Chiller)	100% labor per EPA Control Cost Manual, Section 3, Chapter 2, Table 2.4		$10,125
Electricity (Chilller)	See Chiller Load - Cost per EPA Control Cost Manual, Section 3, Chapter 2, Table 2.4		$3,282
Ethanol Disposal Costs	Per Greenbelt Quote @ $1/lb		$40,565
Total Direct Annual Costs, DAC	**Sum of Above**	**$147,423**	**$609,728**
Indirect Annual Costs			
Overhead (Pas-100)	Per EcoPAS/0.6 Labor & Materials per EPA Control Cost Manual, Section 3, Chapter 2, Table 2.4	$0	$62,339.27
Administrative Charges (PAS-100)	Average Value (PAS-100 unit basis)	$37,523	$22,840
Property Tax (PAS-100)	Per EcoPAS	$0	$0
Insurance (PAS-100)	Per EcoPAS	$0	$0
Total Indirect Annual Costs, IAC	**Sum of Above**	**$37,523**	**$85,179**
Net Present Value of Annual Costs, NPV	4% APR, 10 year period, present value	**$1,500,078**	**$5,636,317**
One-Year Incremental Cost	**TCI + Annual Cost**	**$5,548,844**	**$1,395,597**
Total 10 Year Cost of Control Strategy	**TCI + NPV of Annual Costs**	**$6,863,976**	**$6,337,007**

Table 3

NohMoVo (Refrigerated Water Scrubber) Control Technology
Capital and Operational Costs

Line Item	Reasons & Remarks	NohBell Cost Gallo Livingston	Estimated Cost CCWS Winery
Purchased Equipment Costs	Q3 2016 Cost per NohBell Cost dated 5/1/2014		
Tanks in Project	Number	24	112
NohMoVo Units	Units (CCWS units based upon 75 tons per unit)	18	44
Equipment Purchase (NohMoVo), EC	NohMoVo units (as Q3 2016 dollars per NohBell quote)	$1,215,000	$0
Recovered Ethanol Storage Tank (NohMoVo)	Per NohBell, Reference SJV APCD Project 1133555	$40,000	$40,000
Instrumentation (NohMoVo)	Per NohBell	$0	$0
Sales Tax (NohMoVo)	Per NohBell, 3.3%	$40,095	$0
Freight (NohMoVo)	Per NohBell, included in price (0.05% PEC for recovery tank)	$0	$0
Equipment Purchase, EC (Ducting)	$200,000 for 72 legacy tanks and $111,100 for Series 40 tanks (est)		$311,100
Total Purchased Equipment Costs, PEC	**Sum of Above**	**$1,295,095**	**$351,100**
Direct Installation Costs			
Foundations & Support (NoMoVo)	Per NohBell, Not required for NoMoVo	$0	$0
Handling and Erection (NoMoVo)	Per NohBell, 2% of PEC	$25,102	$7,022
Electrical (NoMoVo)	Per NohBell, 1% of PEC	$12,551	$3,511
Piping (NoMoVo)	Per NohBell, 1% of PEC	$12,551	$3,511
Insulation (NoMoVo)	Per NohBell, Not required	$0	$0
Painting (NoMoVo)	Per NohBell, Not required	$0	$0
PLC Programming (NoMoVo)	Per NohBell, Not required	$0	$0
Handling and Erection (Ducting)	0.4 PEC per EPA Control Cost Manual, Section 5, Chapter 1, Table 1.4		$124,440
Total Direct Installation Costs, DC	**Sum of Above**	**$50,204**	**$138,484**
Indirect Costs (Installation)			
Engineering (NoMoVo)	Per NohBell, 5% of PEC & DC	$67,265	$24,479
Construction and Field Expense (NoMoVo)	Per NohBell, 2% of PEC & DC	$26,906	$9,792
Permits (NoMoVo)	Per NohBell/SJV APCD	$10,000	$10,000
Contractor Fees (NoMoVo)	Per NohBell, 2% of PEC & DC	$26,906	$9,792
Start Up (NoMoVo)	Per NohBell, 1% of PEC & DC	$13,453	$4,896
Initial Performance Test (NoMoVo)	Per NohBell, Reference SJV APCD Project 1133555, $15K/unit	$15,000	$0
Owners Cost (NoMoVo)	Per NohBell, 5% of PEC & DC	$67,265	$24,479
Total Indirect Costs, IC	**Sum of Above**	**$226,795**	**$83,438**
Contingencies	Per NohBell, 20% of IC	$45,359	$16,688
Total Capital Investment, TCI (Q3 2016 Valuation)	**TCI = PEC + DC + IC**	**$1,617,453**	**$589,709**
Direct Annual Costs			
Annual Equipment Lease	$37,370 per 2 Units (per CCWS contract)		$822,140
Sales Tax (NohMoVo), 3.3%	3.30%	$0	$27,131
Operating Labor (NoMoVo)	Per NohBell, 2 hr/day/unit; 90 days $18.50/hr [CCWS = $75/hr total labor cost]	$59,940	$594,000
Supervisor (NoMoVo)	15% of Operator	$8,991	$89,100
Maintenance (NoMoVo)	1% of TCI	$16,175	$5,897
Wastewater Disposal (NoMoVo)	10% solution @ $0.08/gal	$9,530	$38,912
Annual Source Test (NoMoVo) (Performance testing costs)	Per NohBell & SJV APCD, $10,000 per unit	$10,000	$10,000
Electricity (NoMoVo)	2.5 hp x 0.746kW/hp x 2160 hr/yr: per unit:	$12,102	$29,583
Maintenance Labor (Chiller) (Skilled Labor cost = $75/hour	1/2 hour per shift per EPA Control Cost Manual, Section 5, Chapter 1, Table 1.3		$10,125
Maintenance Materials (Chiller)	100% labor per EPA Control Cost Manual, Section 5, Chapter 1, Table 1.3		$10,125
Electricity (Chilller)	See Chiller Load - Cost per EPA Control Cost Manual, Section 3, Chapter 2, Table 2.4		$3,282
Total Direct Annual Costs, DAC	**Sum of Above**	**$116,738**	**$1,640,295**
Indirect Annual Costs			
Overhead (NoMoVo)	60% of Labor	$56,997	$409,860
Administrative Charges (NoMoVo)	Per NohBell, 2% of TCI	$32,349	$11,794
Property Tax (NoMoVo)	Per NohBell, 1% of TCI	$16,175	$5,897
Insurance (NoMoVo)	Per NohBell, 1% of TCI	$16,175	$5,897
Total Indirect Annual Costs, IAC	**Sum of Above**	**$121,695**	**$433,448**
Net Present Value of Annual Costs, NPV	4% APR, 10 year period, present value	**$1,933,903**	**$16,819,915**
One-Year Incremental Cost	**TCI + Annual Cost**	**$1,855,886**	**$2,663,452**
Total 10 Year Cost of Control Strategy	**TCI + NPV of Annual Costs**	**$3,551,356**	**$17,409,624**

Attachment 1

Ethanol & CO_2 Emission Rates

Ethanol Emissions

174.98	lb/day - Daily Fermentation Emission Limit (Ref: ATC 15044 Table 1)
9.99	Tons per Year - Annual Fermentation Emission Limit (Ref: ATC 15044 Table 1)
67%	Control Technologies Capture and control efficiency
530.24	lb/day, Uncontrolled Daily Emissions
30.27	Tons/year, Uncontrolled Annual Emissions (based upon permit condition restrictions)
46.07	MW Ethanol
11.51	LB-Moles Ethanol/day
379.48	ft3/lb-mol at 60 °F (519.67 °R) and 14.696 psia (molar volume constant)
4367.62	cu. ft. Ethanol/day during fermentation
3.03	cfm Ethanol

Juice Processing Volumes

6.2	lb/kgal - Red Wine ethanol emission factor, fermentation in Tanks
7	day, average fermentation cycle for red wines
598661	gal, Max Gal Juice fermenting daily
9765396	gal, Max juice processed annually

Fruit Mass Calculations

184	Gal juice per ton of red grape fruit
3253.6	Maximum tons of red fruit associated with daily juice
53072.8	Maximum tons of red fruit associated with annual juice

CO2 Emission Rate

0.33	Wt% CO2 (#CO2/#grapes), industry "rule of thumb"
306767.2	lb/day CO2
5112.8	lb/hr CO2

Total Fermentation Total Tank Vapor Flow Rate (Ethanol, CO2, water vapor & misc)

6.9	cfm /1000 gal fermentation (kenetic model of red wine fermentation, Boulton et al.)
4130.76	cfm - worst case

Attachment 2

Chiller Load Calculations

Chiller Load Calculations

Heat Contents		
CO2	0.20	Btu/lb-F @ 35.6 F
Ethanol	0.548	Btu/lb-F @ 32 F
Fermentation Emission Flow Rates		
CO2	5112.8	Lbs/hr
Ethanol	22.1	Lbs/hr
Temperatures		
Fermentation Temperature	80	F - Average
Chiller supply Temperature	32	Equilivent to CCWS winery glycol systems
Temperature change of tank vapors	48	F (delta)
Energy Required for Control Device Operations	49664	Btu/hr
	4.14	Tons refergeration
Electrical needs for chiller		
per EPA Control Cost Manual, Section 3, Chapter 2, Table 2.4	2.2	kW/ton
kW Load	9.105	kW
Operating Hours = 24 hr/day 90 day	2160	hours
Total annual electricity consumption	19666.9	kW-hr (24 hr/day; 90 days per year)
Electricity Cost	0.1669	$/kW