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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 CHRISTOPHER J. SAVAGE IN SUPPORT OF WINE INSTITUTE'S PETITION FOR REVIEW RE: WINE QUALITY**
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, Christopher J. Savage, 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.

2. I am the Chair of the Environmental Committee of Petitioner Wine Institute. I am also Senior Director for Global Environmental Affairs at E. & J. Gallo Winery. I have been employed by Gallo for 16 years. As part of my responsibilities as Chair of the Environmental Committee and for Gallo, I have been involved in investigating the potential effects of the use of emissions control devices on wine quality and taste.

3. Attached to this declaration as **Exhibit A** is a document entitled "Microbiological Concerns Related to Potential Proposed Requirements of Alcohol Emission Fermenter Ducting" that Wine Institute submitted to the U.S. Environmental Protection Agency on September 14, 2017. This document was prepared by wine industry experts under the guidance of the Wine Institute's Environmental Committee.

4. The attached document addresses the potentially significant negative impacts arising from the use of emissions control devices connected to wine fermentation tanks.

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 Modesto, California.

Christopher J. Savage

CHRISTOPHER J. SAVAGE

EXHIBIT A

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Microbiological Concerns Related to Potential Proposed Requirements of Alcohol Emission Fermenter Ducting

Wine Production – A General Overview

Grape juice is converted to wine due to the fermentative action of yeast on the sugars contained within the grape juice. While white wines are generally made from 'white' grape varieties and red wines are generally made from 'red' grape varieties, in some instances, white wines are made from the skin-free juice of red grapes. Wine production can therefore be grouped into the following very large categories:

1) Fermentation of grape juice only

2) Fermentation of grape juice in the presence of grape skins

While the microbiological profile of these two groups may be similar, the potential for the proposed ductwork causing microbiological contamination can be even greater in the latter category because the grape skin can harbor a larger and more varied microbiological flora. For both, the current fermentation system does not pose the risks of microbial growth discussed herein as potentially created by the proposed addition of ductwork. This is because the current fermentation process utilizes a system of isolated stainless steel tanks. During the limited times the tanks are open and the fermented wine is exposed to ambient air, the wine is protected by its naturally low pH, alcohol content, its high content of organic acids and the presence of many polyphenolic compounds, many of which have anti-microbial properties[a-b]. Adding the proposed ductwork without adequate and feasible cleaning options risks this.

Microbial Ecology Related to the Proposed Addition of Enclosed Ductwork - Fermentation of Grape Juice Only

This category represents the production of white wine from 'white" grape varieties, as well as the production of white wines from skin-free 'red' grape varieties as described above. In both instances, grape juice is present in the fermenter, including its fermentable sugar, grape solids, and naturally occurring microorganisms such as yeast, bacteria and mold. To initiate fermentation, a known strain of yeast, purchased from commercial vendors at a considerable monetary investment, is added to the juice that converts the juice into wine. In the early stages of fermentation, the rate of carbon dioxide emissions is very high, which may cause foaming within the fermenter. If this foam is forcefully ejected from the tank (in an incident known as a "foam-over", which does occur regularly), and if the proposed ducting was to be put into place, the foam could enter that ducting, coating the interior surfaces. This introduces whatever microorganisms were present in the fermenting liquid into the ducting, which could grow unchecked

if adequate cleaning is not feasible. If such ducting was interconnected with other tanks, these microorganisms could then affect interconnected adjacent fermenting tanks, which could be disastrous for wine quality. As mentioned previously, wineries spend a considerable amount of money and exert complete control on the strains of yeast used to conduct fermentations. In addition, most wineries use more than one strain of yeast: juices from different varieties of grapes are fermented with different strains of yeast to produce the desired final product characteristics. This process, including specifically which strains of yeast are used in combination with which varieties of grapes, creates the 'biological signature'[c] - [d] of wine, which is a competitive advantage and irreplaceable for all wineries. The taste and quality of the wine produced is significantly influenced by the strain of yeast used to make it. Therefore, any threat to this control, including any cross-contamination of fermenting yeast, will seriously compromise the consistency of the product. For example, if the ducting surfaces were to become contaminated with multiple strains of fermenting yeast, complete disassembly of the infrastructure may be required for cleaning and sanitation. Therefore, manifold designs should allow for such frequent disassembly, as well as provisions for adequate handling for foam over events.

Primary fermentations are open air events, where at the beginning and end of fermentation, the product is exposed to air. Therefore, if the proposed ducting was added to the process, the interior surfaces of the ducting would also be exposed to the open air, including microorganisms that exist naturally in the air that we breathe. This would allow the fermenter ducting surfaces, potentially already coated with fermenting juice foam from a foam over event, to also be exposed to unfiltered air, potentially allowing microorganisms which may be present in that air to colonize the interior surfaces of the ductwork. Without adequate cleaning systems, this raises a series of rather serious concerns from a wine quality standpoint. Wine, in its finished form, is a product that does not support the growth of pathogenic organisms. Indeed, Louis Pasteur, the renowned French researcher and father of modern microbiology, stated that "Wine is the most healthful and hygienic of all beverages"[e]. However, adding the proposed ductwork would introduce potentially colonizing, microorganisms into this process, along with their metabolic end products, without adequate cleaning systems.

One such undesirable metabolic end-product could be acetic acid. Acetic acid bacteria (Acetobacter spp.)[f], which are a common inhabitant of air and require oxygen for their growth, could exhibit unrestricted growth on the ducting interior surfaces. Carbohydrates, moisture as well as alcohol could all be available under these conditions, and could support the growth of this bacterium. In addition to generating some foul-smelling products, Acetobacter spp. produces large amounts of acetic acid (the main acid in vinegar)[g]. If this acid were to make its way into the wine, it would not only render it with poor quality, but may also place the wine into an 'illegal' category as the amount of acetic acid in the product may exceed the concentrations allowed by the federal regulations governing wine production[h].

Acetic acid can also be produced by bacteria other than Acetobacter spp. One such organism is Lactobacillus kunkeei, the 'voracious lactobacillus', as identified and named by Professor Edwards at Washington State University[i]. This organism is a lactic acid bacterium that does not produce acetic acid from alcohol itself, but instead uses other carbohydrates to produce extraordinary amounts of acetic acid. This organism has been shown to produce up to 1% acetic acid, a level that is sufficient to stop an active fermenter. This organism is a naturally occurring inhabitant of grapes, and therefore can easily be foreseen to become implanted onto ductwork surfaces, and if allowed to grow, the acetic acid that it produces could be disastrous to wine quality. Another lactic acid bacterium, Pediococcus spp. could follow the same scenario, and if it were allowed to contaminate a wine, would render it undrinkable and unsalable[j].

Ductwork surface colonization can also be foreseen by a bacterium known as Bacillus spp. without adequate cleaning. This organism produces extremely resistant and resilient spores, so its presence could be very persistent[k]. The Australian wine industry reported the presence of this organism in brandy[l]. If it is found in brandy, which has an alcohol content of approximately 40%, it is frightening to think what it may be capable of in wines with alcohol contents less than half of that amount.

Streptomyces spp., a filamentous bacterium, is an organism which is coming to the forefront as possibly being the causative agent of many of the 'cork taint' smells, such as 2,4,6 trichloroanisole (TCA) and geosmin, which have plagued the domestic and international wine industry for a number of years[m]. This organism is a common inhabitant of soil, air and water. Canadian researchers have implicated this organism as the causative agent for the production of TCA in a domestic water supply system, concluding that Streptomyces spp. is highly resistant to the chlorine used and in the presence of that chlorine, produces TCA[n]. Other researchers have shown that this organism is also resistant to ozone, a material commonly used in winery sanitation. These facts, coupled with the ubiquitous nature of Streptomyces spp., raise very real concerns as to methods for its control. If this bacterium colonizes ducting surfaces, and if chlorine is used as a sanitizer, then the very real possibility exists that TCA could be produced in the ductwork. TCA is very volatile, and it will easily make its way into the wine and spoil it. TCA also produces negative effects on wine quality at extremely low levels (3 parts per trillion and sometimes less)[o] If ozone is used, Streptomyces spp. will not be killed by it, and it would then be capable of producing compounds other than TCA, such as geosmin. Obviously, then, the feasibility of adequately sanitizing the interior surfaces of the ductwork is of paramount importance.

Unwanted bacteria are not the only types of organisms that could colonize the proposed ductwork surfaces and cause problems. Yeast of all species are natural inhabitants of the air, and could become attached to the surfaces. Several types of wine spoilage yeast such as Brettanomyces spp., Pichia spp., Hanseniaspora spp., Zygosaccharomyces spp., Kloeckera spp., and Candida spp. could contaminate the fermenting product[p]. Winemakers go to extraordinary

lengths to protect their wines from contamination with yeasts of these types. Some of these yeasts, such as Zygosaccharomyces spp., are highly resistant to sulfur dioxide, a commonly used antimicrobial agent in winemaking[q], and can wreak havoc in wines that they contaminate. Pichia spp. will grow on the surface of a wine and form a 'mat' of biomass in addition to synthesizing odiferous metabolites. Brettanomyces spp. will synthesize odor-active compounds oftentimes referred to as 'barnyard smells'[r] and this, obviously, could be injurious to wine quality. Hanseniaspora spp. and Kloeckera spp. can both synthesize acetic acid and Candida spp. can cause biohazes as well as undesirable smells and tastes.

A final category of microorganism to be considered are molds. Molds are common inhabitants of air, soil, grapes etc., and are omnipresent[s]. They are perhaps the most tenacious growers of all the microbial groups, and the most difficult to control. Their various genera produce toxins such as aflatoxin and ochratoxin[t]. Both compounds are potent human toxins, and should be kept to the lowest levels technologically possible. It is possible that these genera of molds could infest and colonize fermenter ductwork surfaces without adequate cleaning systems. Once they become established, their control and eradication would be extremely difficult. As discussed earlier, the commonly used sanitizing agents, chlorine and ozone, are limited because chlorine can lead to the formation of spoilage compounds[u], and ozone has little or no sanitizing effect.

This is a very serious consideration, as it casts very severe doubts on the ability to sanitize enclosed ductwork surfaces without the use of a redundant and reliable clean-in-place systems. If complete cleaning and sanitation is not possible, then the biological integrity of the ductwork surfaces could be quickly compromised and the quality of the wine being produced could also be compromised.

Microbial Ecology Related to the Proposed Addition of Enclosed Ductwork - Fermentation of Grape Juice In The Presence of Grape Skins

In addition to the microbiological considerations discussed above, which would also apply to this category, the potential for contamination is even higher in this category because of the presence of grape skins in the fermenter itself. As discussed, the skins can harbor very large numbers and types of microorganisms. In addition, when skins are present in the fermenter, they float as a 'cap' on top of the fermenting liquid. This cap oftentimes experiences fermenting temperatures in excess of the temperatures in the fermenting liquid[v]. For that reason, the fermenting liquid is pumped onto the top of the cap and allowed to percolate through it, as a means of achieving reasonable temperature control and efficient color extraction. It is a well-known fact that high cap temperatures promote excessive growth of the bacterium Acetobacter spp.[w], and the consequences of its unchecked growth have already been discussed. Similarly, the molds which have come into the fermenter with the skins, could grow in the cap, and could be forcefully ejected into the ductwork during a foam over, if such an event should occur. It must be remembered that it could take only one such explosive event to impact the associated ductwork. Therefore, significant investments must be made

into proper monitoring, foam over controls, and regular and complete cleaning options, such as clean in place systems.

Summary

The wine industry has developed and meticulously refined sanitation and handling practices that ensure the quality of their wines. From growing and harvesting the grapes through fermentation and bottling, the industry employs practices that comply with federal and state law, and safeguard the integrity of their finished products. Carbon dioxide and foaming are necessary and naturally occurring byproducts of the wine fermentation process. Winemakers cannot be forced to compromise the quality of their wines to capture ethanol emissions through the addition of ductwork, which will result in increased potential of microbial contamination of the wine product. Additionally, if such ductwork includes cross-connection between multiple fermentation tanks, cross-contamination will also result. Microbiological consequences of these actions are largely unstudied, but have the potential to produce severe and deleterious consequences. There is a significant chance that either or both of this contamination and cross-contamination could result in a significant threat to the quality of the wine.

It is evident that the construction and use of enclosed fermenter ductwork must be approached with extreme caution. The microbiological considerations of this approach require the implementation of appropriate monitoring, controls, and cleaning systems. Even with such controls, there is no guarantee of complete protection of the wine.[1]

Wine, because of its naturally low pH, the presence of alcohol and various other naturally occurring substances, has enjoyed the scientifically appropriate reputation of being biologically stable. This reputation cannot be compromised. If, through the addition of controls, this reputation is put at risk or quality is compromised it puts the future of the California wine industry at risk. An unacceptable circumstance when consideration is given to the fact that controlling ethanol VOC will provide little to no air quality benefit in California air basins.

[1] It should be noted that the issue of grape varietal cross contamination between tanks is not directly addressed in the document but represents a significant concern for the industry as this could impact our ability to market wine as a specific varietal type (e.g. cabernet sauvignon) under Tobacco Tax and Trade Bureau regulations.

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