ozone
technologies ltd

winery solutions
barrel disinfection

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sustainable, chemical free solutions
for enhanced hygiene in wine production

barrel disinfection

Ozone has long been used in wineries, in many water treatment areas. These include disinfection of rinse water prior to bottling, cold water cleaning of tanks, and reducing organic loading in wastewater, to enabling re-use for irrigation.

Why change from aqueous ozone treatment to gas for barrels?

- Calibrated ozone plant provides direct known application rates.
- Dry process, no chance of re-contamination through water borne source.
- Heat treatment of next barrel can be done while treatment occurs.

Use of gas phase ozone in other areas of food production have shown remarkable reductions in spoilage losses, microbial control, ethylene removal, increased shelf life by an average of 30% across a wide range of foods, and improved production area environments.
We have developed a winery specific treatment for use as a biocide, particularly for the control of brettanomyces and other contaminants in wine barrels. Gas phase ozone treatment is an effective, swift procedure, and is added to your cleaning regime as the final step prior to barrel filling. This replaces standard treatments without affecting the wood's properties.

Ozone gas can penetrate porous surfaces and air pockets far more effectively than ozone in water, at much higher concentrations. This helps to eliminate fungal or bacterial contamination below the wood surface. With a half-life of 24 hours in the gas phase, on-going sterilization occurs readily.

All ozone is consumed or decayed within an hour of treatment, as organic matter or pathogens in the wood is consumed. Barrels have been filled within 20 minutes of treatment, instantly consuming any final traces of ozone & without flavour compromise or quality.

Treatment provides a greater than 99.99% kill rate of Brettonomyces. Size of barrel is not an issue, cuve disinfection in heavily contaminated state has occurred as readily as in the barriques.

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protecting our environment

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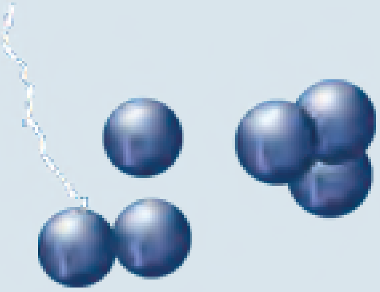
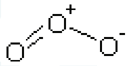


wine production applications

barrel disinfection

So what is ozone anyway? 

Ozone is the tri-atomic form of oxygen, with each atom linked together so that no atom is free of the other two. Ozone is produced commercially by physically disrupting an oxygen molecule, and combining each of the free atoms with a stable oxygen molecule.One of these atoms making ozone is more active than the other two. When released from the stable oxygen molecule, this more active atom is available to combine with readily oxidizable substances, such as bacteria, fungi (mould, penicilliums, yeast), odorous organic compounds, virus'; and dissolved metals such as iron and manganese are no longer soluble. The organic destruction process occurs through cell lysing, and the micro-organism cannot recover from the damage. Enough applied ozone will dissolve even traces completely.

Ozone cannot be stored, as it is thermally unstable and reverts rapidly back to the oxygen from which it was produced. Demand placed on ozone in the form of organic loading or oxidizable substances means more ozone must be applied to overcome this need and provide a residual ozone level (if needed, this applies to many applications in both aqueous and gas phases) for ongoing disinfection needs. Ozone is therefore always generated on site, and experienced ozone treatment providers should be consulted to ensure the system design and application meet your requirements.

How is ozone created for this process?

Our ozone generating systems are based on corona discharge principles (much as lightning is), where a high voltage electrical discharge causes a percentage of the oxygen available in the generator's feed gas to form tri-atomic oxygen. This produces high concentrations of ozone, from either dry air with a dew point of >-60ºC or from an oxygen generator or cylinder. We use oxygen for these gas phase systems to reduce the size of the ozone generator and create the high doses needed to overcome loading and enable the brief contact time required in barrel cleaning. Using lower ozone producing methods such as UV or air feed is both inefficient and time consuming, and may not actually produce enough ozone to complete the disinfection process.

Why change from aqueous ozone treatment to gas for barrels?

Ozone is only partially soluble in water, and contacting methods are very important to achieve reasonable levels for disinfection. Traditional portable washdown ozone systems use injectors and mixers to introduce ozone to water, with varying degrees of transfer efficiency. Larger contacting systems using a recirculating loop or diffusers to boost ozone levels are more effective, and these have many important uses in the winery. A residual ozone level of between 1.5 & 5ppm in these systems provides excellent cold water disinfection for rinsing and cleaning of surfaces over a several minute contact duration. In barrel treatments this has followed a high-pressure hot water wash to remove solids from the barrel, to provide sterilization and cool the barrels. With a half-life of 20 minutes in water, this means an applied level of 2ppm would be 1ppm after the 20 minutes, and is not a high CT level (concentration x time).

Ozone in the gas phase can penetrate porous surfaces and air pockets far more effectively to eliminate fungal or bacterial contamination below the wood surface. This makes the process ideal for this specific task, with applied levels depending on barrel size, pre-treatment and time treatment applied. With a half-life of 24 hours in the gas phase on-going sterilization occurs far more readily. All traces have been noted as consumed within an hour, as organic matter or pathogens in the wood is consumed.

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Antimicrobial Efficacy

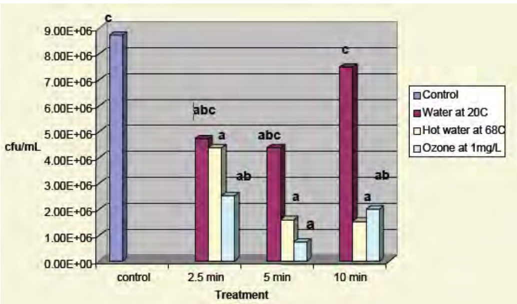
Efficacy studies conducted according to AOAC Official Method 961.02, Germicidal Spray Products as Disinfectants Test and AOAC Official Method 960.09, Germicidal and Detergent Sanitizing Action of Disinfectants (EPA formulated test and performance requirements), provided the following results using ozonated water in a washdown / spray treatment:

CT reductions in some micro-organisms, results drawn from aqueous ozone treatment:

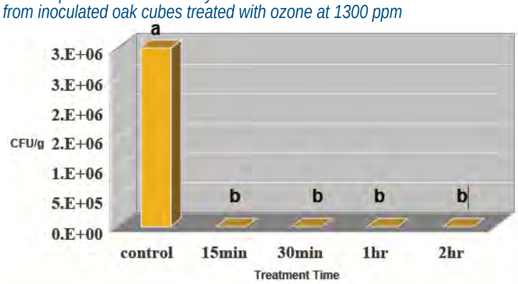
Organism	Ozone Residual	Duration	Reduction
Trichophyton mentagrophytes	1.85-2.25 PPM	30 seconds	6 log (99.9999%)
Salmonella choleraesuis	1.85-2.25 PPM	3 minutes	6 log (99.9999%)
Staphylococcus aureus	1.85-2.25 PPM	10 minutes	6 log (99.9999%)
Pseudomonas aeruginosa	1.85-2.25 PPM	5 minutes	6 log (99.9999%)
Listeria monocytogenes	1.85-2.25 PPM	3 minutes	4 log (99.99%)
Aspergillus flavus	1.85-2.25 PPM	5 minutes	4 log (99.99%)
Brettanomyces bruxellensis	1.85-2.25 PPM	3 minutes	4 log (99.99%)
Escherichia coli	2.1 PPM	30 seconds	5 log (99.999%)

Some gas phase ozone treatment results:

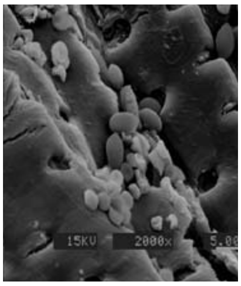
Population of Brettanomyces bruxellensis recovered from core barrel samples treated with ozonated water, hot water and water in a barrel



Time Population of Brettanomyces bruxellensis recovered from inoculated oak cubes treated with ozone at 1300 ppm



Control: Surface of oak cube contaminated with Brettanomyces.



surface of oak cube treated with ozone

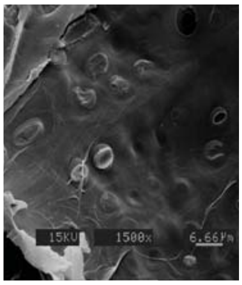
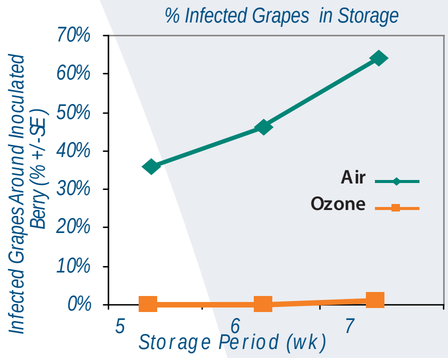


Table Grape Test Shows Reduction in Infection



Source: 2002 study by UC Davis, UC Riverside

control grapes, no ozone

ozonated storage grapes

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