KAGURA

RESEARCH REPORT

Research on the wine market

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Contents

Introduction

My name is Thanh Thuy Do. I am currently studying in the Faculty of English for specific purposes at the University of Da Nang – University of foreign language studies. At school, I am taught how to improve communicative skills in daily topics and situations as well as instructed to build my confidence in language uses and practices and develop learning autonomy after graduation.

To describe myself, I am an inquisitive and persistent girl. Besides, I am proud of my patience, diligence and tenacity which can help to keep my career move forward. With a great passion for Japanese, I start pursuing a goal for a deeper knowledge of Japanese and after 3 years of hard learning, I got an N3 certificate as proof of my ability.

At the moment, with the will to go further in the Japanese studying path, I am doing the Japan Internship Program which is a meaningful program from the Japanese Government facilitating interns from all over the globe to experience the innovation and competitiveness of Japanese companies. I am chosen to be an intern in Kagura Feast Corporation – A company of KAGURA decanter manufacture and sale. This is a precious chance not only for my Japanese improvement but also Japanese workplace culture exploration.

First and foremost, I would like to express my sincere thanks to my supervisor, Mr. Mitsuhiro Iwanaga. He is always willing to answer my question, give me appropriate advice and instruction to complete my task, share assistance and experiences.

Besides, I would like to thank Pasona for bringing me such a great opportunity for the Japan internship experience. Especially, many thanks to Ms Phuong Linh, the coordinator in the Da Nang intern team, who always gives me helpful support.

Last but not least, I would like to thank my teacher, Ms Vo Nguyen Thuy Trang, for her devoted assistance. She is an amazing teacher who helped me with Recommendation Letter for my internship eclection.

1. Research on the history of wine.

a. The earliest winery

Wine has been produced for thousands of years, with evidence of ancient wine production in Georgia from c. 6000 BC (the earliest known traces of wine), Iran from c. 5000 BC, Armenia from c. 4100 BC (large-scale production, and Sicily from c. 4000 BC. The earliest evidence of a grape and rice mixed based fermented drink sometimes compared to wine was found in ancient China (c. 7000 BC)

- Source: Wikipedia- the free encyclopedia

The earliest remnants of wine were discovered in the site of Hajji Firuz Tepe, in the northern Zagros Mountains of Iran. The wine dated back to the Neolithic period (8500-4000 B.C.). Carbon dating confirmed the wine was from sometime between 5400-5000 B.C.

- Source: (Jackie)

Archaeological records indicate that wine was first produced in China around 7000 B.C., followed by Armenia and Georgia, around 6100 to 6000 B.C., respectively. In fact, researchers discovered the world's oldest winery in Armenia. There is also evidence of early winemaking in ancient Iran, Egypt, Israel, Greece, Cypress, and Sicily.

- Source: (Hagan, 2020)

b. Timeline of winery

7000 B.C.
According to Dr. Patrick McGovern, the foremost wine scientist and anthropologist, the world's first chemically confirmed alcoholic beverage — including wine — was discovered at Jiahu in the Henan province of China.
Clay jars from this Early Neolithic Period were used to create and store a fermented drink made of wild grapes (including Vitis amurensis and Vitis thunbergii grape varieties), rice, honey, and hawthorn fruit. McGovern and his colleagues concluded that storing sugary fruit with yeast on its skins inside these vessels shows how the liquid was fermented.
It hasn't been confirmed whether the grapes were used by themselves or in combination with other fruit. Whatever the case, evidence suggests that these alcoholic beverages were used in burial and religious ceremonies.

- Source: (Hagan, 2020)

4100 B.C.
The Oldest Winery Is Founded In Ancient Armenia
The oldest-known winery was discovered in the "Areni-1" cave in Vayots Dzor, Armenia. Dated to c. 4100 BC, the site contained a wine press, fermentation vats, jars, and cups. Archaeologists also found V. vinifera seeds and vines. Commenting on the importance of the find, McGovern said, "The fact that winemaking was already so well developed in 4000 BC suggests that the technology probably goes back much earlier."

3100 B.C
The Pharaohs Rise To Power In Egypt
The pharaohs rise to power in Egypt. They begin making a wine-like substance from red grapes and, due to its resemblance to blood, use it in ceremonies. During this time, the Egyptians come in contact with Jews as well as the Phoenicians. It would be the Phoenicians who would cultivate the wine and begin to spread it around the world.

1700 B.C.

Wine Was Drank At Least 3,700 Years Ago In Northern-Israel

Archaeologists discovered a 3,700-year-old cellar in northern-Israel. The scientists who have studied the findings say that more than 500 gallons of wine were once stored in this cellar (that's enough to fill 3,000 bottles!).

1200 B.C. ～ 539 B.C.

The Phoenicians Begin To Trade Across The Mediterranean

The Phoenicians begin to trade across the Mediterranean, including the Middle East (current day Israel) and stretching around the sea from North Africa to points in Greece and Italy. It was during their trading that they also brought with them wine, transported in ceramic jugs, as well as grapevines. During travels, the Phoenicians come in contact with the Jews, who began to use wine to mark religious ceremonies. We first hear the mention of wine in the book of Genesis, when, after the flood, Noah, drunk on wine, exposes himself to his sons.

800 B.C.

The Rise Of Greece & Hellenistic Conquest

The Greeks, having been exposed to wine by the Phoenicians, begin to perfect the beverage. Wine becomes a symbol for trade, religion and health. A god is named in honor of wine: Dionysus. As the Greek city-states begin to rise in power, they colonize other land around the Mediterranean, and, along with their armies, travel with wine. After a new colony was conquered, Greeks would settle the area, bringing grapevines with them. Sicily and southern Italy formed some of the earliest colonies, and the wine then traveled up the boot toward Rome.

146 B.C.

Rome Conquers Greece & Builds an Empire

The Romans take wine as their own, creating Bacchus, their own god of wine, and make wine a central part of their culture, just as the Greeks had done. They build upon and formalize the Greek's cultivation methods to the point that terroir is recognized and famous vintages (121 BC the most well-known) are enjoyed for decades. As the Empire and its troops expand across Europe, Romans plant grapevines in modern day France, Germany, Italy, Portugal, Spain as well as a number of Central European nations.

380 A.D.

The Roman Empire Adopts Christianity

As the Roman Empire adopts the Catholic Church and Christianity, wine becomes a central part of the sacrament. Wine's importance to Catholicism and Mass causes the Catholic Church to focus on wine cultivation and production. Monks in Italy and France begin working as vintners, and winemaking technology is perfected. As the Catholic Church grows across Europe, wine goes with it.

1492 A.D.～ 1600 A.D.

Wine Travels To The New World

Wine travels to the New World and it's brought to Mexico and Brazil by the conquistadors. Wine spreads across South America from these two original locales.

1543 A.D.

Portuguese Jesuits Arrive In Japan

The Portuguese sail to Japan. Saint Francis Xavier brings wine as a gift for the feudal lords six years later. Jesuits convert over 100,000 Japanese citizens to Catholicism. At the same time they introduce imported European wine to the population. In 1587, when Toyotomi Hideyoshi reunifies Japan, Christianity is banned. Grapevines are finally planted around 300 years later, during the Meiji restoration, when the nation embraces Western culture.

1554 A.D.
Spanish Missionaries Spread Across the Americas
Spanish missionaries, traveling from points North, including Mexico, establish Chile's first winery.

1556 A.D.
Spanish Missionaries Travel From Chile To Argentina
Spanish missionaries travel from Chile to Argentina, settling in the Mendoza wine region, and planting the region's first grapes.

1562 A.D. ～ 1564 A.D.
Wine Briefly Comes To The U.S. In Florida
Wine comes to America, being made for the first time by French Huguenots in Jacksonville, FL. The Huguenots did not bring European grapes with them, but instead used native grapes they found growing in the area. The wine made was not pleasant to the Huguenots, and they stopped making the wine shortly after they began.

1608 A.D.
Samuel De Champlain Establishes Permanent French Settlements In Canada, Founding Quebec City
Norseman Leif Eirikson is believed to have cultivated wildly growing grapes in 1001 AD, but the settlement didn't last. The French claim Canada as their territory in 1534, but they do not establish permanent settlements until 1608, when Samuel de Champlain founds Quebec City. Jesuits quickly follow and attempt to grow European grapes. They have little success so they turn to the local grapes.

1619 A.D.
The French Begin Cultivating Imported Grapevines In Virginia
The French imported French grapevines and begin cultivating wine in Virginia. Wine starts to be made up and down the Eastern Seaboard, but, due to the colony's Puritanical roots, it does not immediately take off.

1659 A.D.
The Dutch East India Company Colonize South Africa
As the Dutch East India Company colonizes South Africa, there is a demand for wine to supply the sailors for their long journey back from Africa to Europe. Vines are planted and wine production begins in Cape Province to fill this need. Later the English would seize the colony.

1769 A.D.
Spanish Missionary Junípero Serra Travels To California
Spanish missionary Junípero Serra, having traveled from Spain to spread the gospel in the New World, travels to California from Mexico City, opening a mission in San Diego and bringing with him grapes in order to create the region's first wine. Spanish missions then spread across California, and the Franciscan monks bring with them the art of making wine, establishing Sonoma's first winery in 1805.

1785 A.D.
Thomas Jefferson Is Appointed The Minister To France
Thomas Jefferson is appointed the minister to France. Jefferson travels to France and falls in love with French wine, particularly Bordeaux and Burgundy. Jefferson becomes convinced wine of equal caliber can be produced in the US. He returns with more French grape cuttings, and a desire to see wine thrive in Virginia.

1788 A.D.
The First Fleet Sails To Australia Via South Africa
The First Fleet, having departed the UK in 1787 in order to travel to Australia to establish the penal colony, makes a stop in South Africa. During the stop the fleet picks up grape cuttings that will be planted in Australia upon the fleet's arrival.

1832 A.D.

James Busby Is Appointed British Resident Of New Zealand

James Busby, a British resident living in Australia who is considered the father of the Australian wine industry, is appointed to the position of British Resident of New Zealand by the British government. Busby travels from Australia to New Zealand and brings with him grape cuttings from Australia. He establishes New Zealand's first vineyard in 1836.

1848 A.D. ～ 1855 A.D.

The California Gold Rush

Americans seeking to better their prospects travel west, bringing with them a desire for riches and a taste for wine. Their taste for wine not only increases demand for the wine already being made in California, but the gold rushers also bring with them vines from the East coast, most indigenous to France, but also Zinfandel, a grape for which California would become known, that originated in Croatia.

1863 A.D. ～ 1962 A.D.

Wine Planted By French Colonists In Algeria Flourish During The Great French Wine Blight

Phoenicians planted wine here back in their era, but Islamic rule eventually stuffed that out. When France took control of Algeria in 1830 they started replanting vineyards. Wine production soared when phylloxera decimated the French wine industry in the 1860s - 70s. Production hit a high point in the 1930s, with most of the wine being exported, particularly to French winemakers in the Languedoc for blending. When the French ceded control in 1962, production went into a long decline.

1870 A.D.

Basque & Italian Immigrants Arrive In Uruguay

Don Pascual Harriague, a French Basque immigrant plants Tannat vines, which will come to be considered Uruguay's 'National Grape.'

1980 A.D. ～ 2013 A.D.

China Opens Up Its Economy

As the Chinese economy opened to the world under Deng Xiaoping, imports of French wine arrived, followed by the French themselves, working with local partners to plant vineyards. In 30 years, as China's middle and upper class populations ballooned, the nation has grown into both one of the world's largest consumers and producers of wine. See our posts on China: 'What's The Deal With China And Wine' & 'The Biggest Consumers Of Wine In 2013'

- Source: (How Wine Colonized The World, n.d.)

2. Research on the types and regions of wine

a. Types of wine: By vinification methods and style

Red wine is made using the skins of the grapes. The skins give the wine a dark color, and chemicals called tannins that taste bitter. Red wine can be sweet or "dry", meaning low in sugar.

White wine is made without the grape skins at all, so it is usually less bitter and more acidic. Like red wines, they can be sweet or dry.

Rosé wine (a French word meaning "pink") is in between: it has some flavor and color from the skins, but not as much as a red wine.

Picture 1: Red Wine

Wine sometimes has bubbles in it, called **Sparkling Wine**. Sparkling wine can be red, white, or rosé, but is usually white. It can be made in any country, but the best-known sparkling wines are champagne, which comes from France, and prosecco, from Italy.

Picture 5: White Wine

Picture 5: Rose Wine

Picture 5: Sparkling Wine

Picture 5: Dessert Wine

Dessert Wines
As the name suggests, dessert wines are very sweet wines that are drunk after a meal with (and sometimes as) dessert.

Fortified Wines are wines with spirits like brandy added in during the fermentation process. Because these wines are sweetened by the alcohol, the ones with lower alcohol content are considered dessert wines and are also paired with desserts.

Table wines are inexpensive wines that often do not specify the grape variety used or the region of origin. They are alternatively called "vins de table" (in French), "vino da tavola" (in Italian), "Tafelwein" (in German) or "vino de mesa" (in Spanish), which translate to "table wine" in English.

Cooking wine or **cooking sherry** usually refers to inexpensive grape wine (or rice wine in Chinese and other East Asian cuisine) which is intended for use as an ingredient in food rather than as a beverage. Cooking wine typically available in North America is treated with salt to allow its sale in non-licensed grocery stores. This also acts as a preservative, as the salt in cooking wine inhibits the growth of the microorganisms that produce acetic acid. This will preserve a bottle of cooking wine, which may be opened and used occasionally over a long period of time.

b. Types of wine: By vintage or variety

A **vintage wine** is one made from grapes that were all, or mostly, grown in a single specified year, and are accordingly dated as such. Consequently, it is not uncommon for wine enthusiasts and traders to save bottles of an especially good vintage wine for future consumption.

varietal wine is wine made from a dominant grape such as a Chardonnay or a Cabernet Sauvignon and labeled by the name of the grape variety. The wine may not be entirely of that one grape and varietal labeling laws differ. In the United States a wine needs to be composed of at least 75% of a particular grape to be labeled as a varietal wine. In the European Union, a minimum of 85% is required if the name of a single variety is displayed, and if two or more varieties are mentioned, they combined must make up 100% and they must be listed in descending order. E.g., a mixture of 70% Chardonnay and 30% Viognier must be called Chardonnay-Viognier rather than Viognier-Chardonnay.

- Source: Wikipedia- the free encyclopedia.

c. Wine terms refer to geography

Ancient World Wine
Today's most well-known wine regions are not where wine originated. These ancient wine areas — including China, Armenia, Iran, and Egypt — are where the world's first winemakers developed techniques for fermenting grape juice into alcohol.

Old World Wine

Old world wines come from countries widely considered to be the birthplace of wine – mainly Europe and the Middle East. Old world countries include France, Spain, Italy, Austria, Portugal, Greece, Turkey, Israel, Romania, Hungary, etc. Old World wine production uses a common grapevine, known as Vitis vinifera. This grape is native to the Mediterranean region. Old World wines are typically named from the region.

New World Wine

New World wine comes from just about any other region that isn't considered ancient or old. For instance, Australia, New Zealand, Argentina, Chile, South Africa, and Canada are New World wine regions. Of course, there's also the United States, with California, Oregon, and Washington being the most-well known wine-producing states.

Old World wine production also uses the Vitis vinifera wine grape, but different adaptations have been made to help it grow successfully in these varying climates. The names of wines from New World countries are usually derived from the grape varietal it was made from.

- Source: (Chase, 2019)

3. Research on the production methods of wine.

Winemaking can be divided into two general categories: still wine production (without carbonation) and sparkling wine production (with carbonation – natural or injected). Red wine, white wine, and rosé are the other main categories. Although most wine is made from grapes, it may also be made from other plants.

- Source: Wikipedia - the free encyclopedia.

a. Basic stages to the still wine making process:

The Harvest

Harvesting or picking is certainly the first step in the actual wine making process. Without fruit there would be no wine, and no fruit other than grapes can produce annually a reliable amount of sugar to yield sufficient alcohol to preserve the resulting beverage, nor have other fruits the requisite acids, esters and tannins to make natural, stable wine on a consistent basis. For this reason and a host more, most winemakers acknowledge that wine is made in the vineyard, at least figuratively. The process of making fine wine requires that the grapes are harvested at a precise time, preferably when physiologically ripe. A combination of science and old-fashioned tasting usually go into determining when to harvest, with consultants, winemakers, vineyard managers, and proprietors all having their say. Harvesting can be done mechanically or by hand. However, many estates prefer to hand harvest, as mechanical harvesters can often be too tough on the grapes and the vineyard. Once the grapes arrive at the winery, reputable winemakers will sort the grape bunches, culling out rotten or under-ripe fruit before crushing.

Picture 6:Havesting.

Picture 7: Destemming.

Destemming

Destemming is the process of separating stems from the grapes. Depending on the winemaking procedure, this process may be

undertaken before crushing with the purpose of lowering the development of tannins and vegetal flavors in the resulting wine. Single berry harvesting, as is done with some German Trockenbeerenauslese, avoids this step altogether with the grapes being individually selected.

Crushing and Pressing

Crushing the whole clusters of fresh ripe grapes is traditionally the next step in the wine making process. Today, mechanical crushers perform the time-honored tradition of stomping or trodding the grapes into what is commonly referred to as must. For thousands of years, it was men and women who performed the harvest dance in barrels and presses that began grape juice's magical transformation from concentrated sunlight and water held together in clusters of fruit to the most healthful and mystical of all beverages - wine. As with anything in life, change involves something lost and something gained. By using mechanical presses, much of the romance and ritual has departed this stage of wine making, but one need not lament too long due to the immense sanitary gain that mechanical pressing brings to wine making. Mechanical pressing has also improved the quality and longevity of wine, while reducing the winemaker's need for preservatives. Having said all this, it is important to note that not all wine begins life in a crusher. Sometimes, winemakers choose to allow fermentation to begin inside uncrushed whole grape clusters, allowing the natural weight of the grapes and the onset of fermentation to burst the skins of the grapes before pressing the uncrushed clusters.

Picture 8: Crushing

Picture 9: Pressing.

Up until crushing and pressing the steps for making white wine and red wine are essentially the same. However, if a winemaker is to make white wine, he or she will quickly press the must after crushing in order to separate the juice from the skins, seeds, and solids. By doing so unwanted color (which comes from the skin of the grape, not the juice) and tannins cannot leach into the white wine. Essentially, white wine is allowed very little skin contact, while red wine is left in contact with its skins to garner color, flavor, and additional tannins during fermentation, which of course is the next step.

Picture 10: Fermenting must berries.

Fermentation

Fermentation is indeed the magic at play in the making of wine. If left to its own devices must or juice will begin fermenting naturally within 6-12 hours with the aid of wild yeasts in the air. In very clean, well-established wineries and vineyards this natural fermentation is a welcome phenomenon. During or after the alcoholic fermentation, a secondary, or malolactic fermentation can also take place, during which specific strains of bacteria (lactobacter) convert malic acid into the milder lactic acid. This fermentation is often initiated by inoculation with desired bacteria. This means they will kill the wild and sometimes unpredictable natural yeasts and then introduce a strain of yeast of personal choosing in order to more readily predict the end result. Regardless of the chosen path, once fermentation begins, it normally continues until all of the sugar is converted to alcohol and a dry wine is produced. If the sugar content of the grapes is too low to obtain the desired alcohol percentage, sugar can be added (chaptalization). Fermentation can require anywhere from ten days to a month or more. The resulting level of alcohol in a wine will vary from one locale to the next, due to the total sugar content of the must. An alcohol level

of 10% in cool climates versus a high of 15% in warmer areas is considered normal. Sweet wine is produced when the fermentation process stops before all of the sugar has been converted into alcohol. This is usually a conscious, intentional decision on the part of the winemaker.

Punching down

When fermentation is taking place, the production of CO2 causes the grape skins to rise to the top of the fermenting juice to form a thick crust. This 'cap' of skins means that there is very little contact between the skins and the bulk of the fermenting juice which will result in a pale pink wine unless you do something about it. So the skins are 'punched down' into the wine either by feet (traditional, if unhygienic way!) or with some kind of tool. Punching down is generally used in non-commercial winemaking, so tools such as a trusty 5-iron are frequently used!

Pumping over

In this case, wine is pumped from the bottom of the fermenting tank of wine and then sprayed with some force down over the cap of skins pushing them down to mix with the rest of the juice. This happens several times over a 24 hour period.

Cold stabilization

Cold stabilization is a process used in winemaking to reduce tartrate crystals (generally potassium bitartrate) in wine. These tartrate crystals look like grains of clear sand, and are also known as "wine crystals" or "wine diamonds". They are formed by the union of tartaric acid and potassium, and may appear to be [sediment] in the wine, though they are not. During the cold stabilizing process after fermentation, the temperature of the wine is dropped to close to freezing for 1–2 weeks. This will cause the crystals to separate from the wine and stick to the sides of the holding vessel. When the wine is drained from the vessels, the tartrates are left behind. They may also form in wine bottles that have been stored under very cold conditions.

Clarification

Picture 11: Aging wine barrels.

Once fermentation is completed, the clarification process begins. Winemakers have the option of racking or siphoning their wines from one tank or barrel to the next in the hope of leaving the precipitates and solids called pomace in the bottom of the fermenting tank. Filtering and fining may also be done at this stage. Filtration can be done with everything from a course filter that catches only large solids to a sterile filter pad that strips wine of all life. Fining occurs when substances are added to a wine to clarify them. Often, winemakers will add egg whites, clay, or other compounds to wine that will help precipitate dead yeast cells and other solids out of a wine. These substances adhere to the unwanted solids and force them to the bottom of the tank. The clarified wine is then racked into another vessel, where it is ready for bottling or further aging.

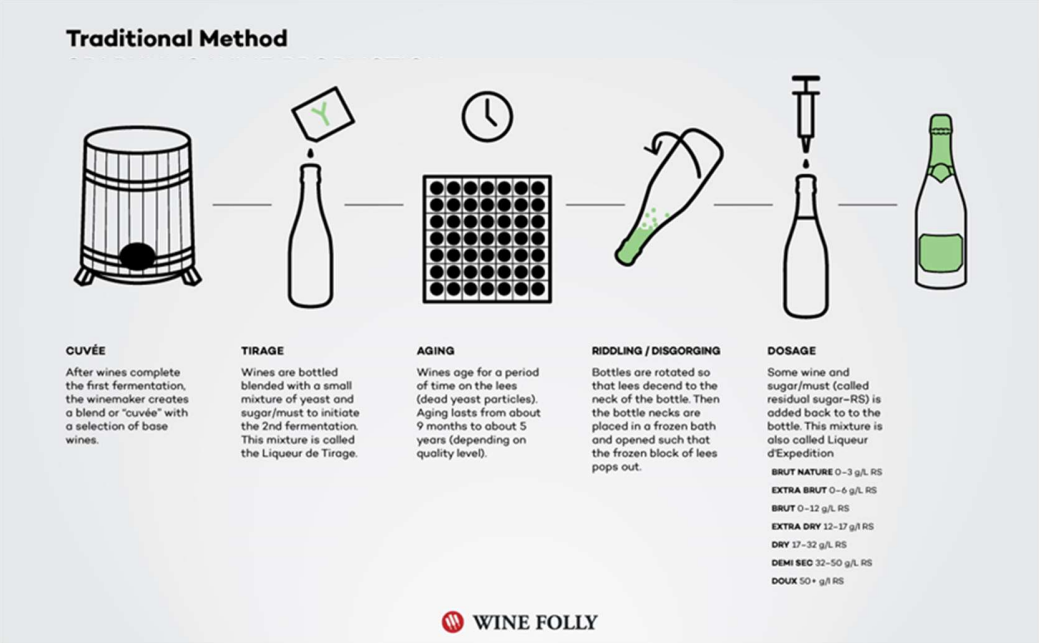
Aging and Bottling

The final stage of the wine making process involves the aging and bottling of wine. After clarification, the winemaker has the choice of bottling a wine immediately, which is the case for Beaujolais Nouveau, or he or she can give a wine additional aging as in the case of Grand Cru Bordeaux and great Napa Valley Cabernet Sauvignon. Further aging can be done in the bottle, stainless steel or ceramic tanks, large wooden ovals, or small barrels, commonly called barriques. The choices and techniques employed in this final stage of the process are nearly endless, as are the end results. However, the common result in all cases is wine.

- Source: (Learn The 5 Steps of The Wine Making Process, n.d.)
- Source: Winemaking, Wikipedia.

b. Sparkling wine making process:

- **Traditional Method**



Picture 12: Traditional method

Examples: Cava, Champagne, Crémant, some Sekt, Italian Metodo Classico wines (including Franciacorta and Trento)

Base Wine or "Cuvée": grapes are picked (usually just a tinsy bit younger to preserve acidity) and fermented into a dry wine. The winemaker then takes the various base wines and blends them together into what the French call a "cuvée", which is the final sparkling wine blend.

Tirage: Yeast and sugars are added to the cuvée to start the second fermentation and wines are bottled (and topped with crown caps).

2nd Fermentation: (inside the bottle) The second fermentation adds about 1.3% more alcohol and the process creates CO2 which is trapped inside the bottle thus carbonating the wine. The yeast dies in a process called autolysis and remain in the bottle.

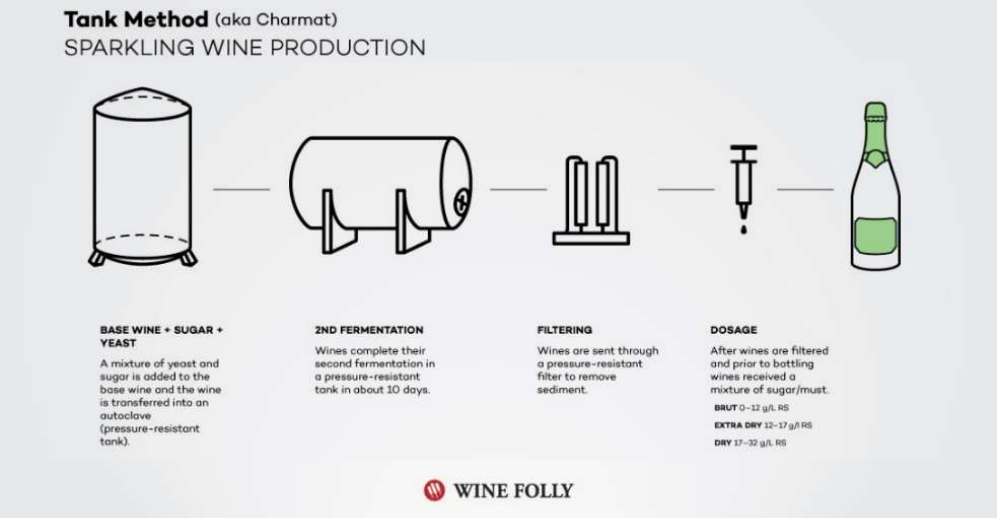
Aging: Wines are aged on their lees (the autolytic yeast particles) for a period of time to develop texture in the wine. Champagne requires a minimum of 15 months of aging (36 mos for vintage Champage). Cava requires a minimum of 9 months of aging but requires up to 30 months for Gran Reserva Cava. Most believe the longer the wine ages on its lees, the better.

Riddling: Clarification occurs by settling the bottle upside down and the dead yeast cells collect in the neck of the bottle.

Disgorging: Removing sediment from bottle. The bottles are placed upside down into freezing liquid which causes the yeast bits to freeze in the neck of the bottle. The crown cap is then popped off momentarily which allows the frozen chunk of lees to shoot out of the pressurized bottle.

Dosage: A mixture of wine and sugar (called Exposition liqueur) is added to fill bottles and then bottles are corked, wired and labeled.

- **Tank Method**



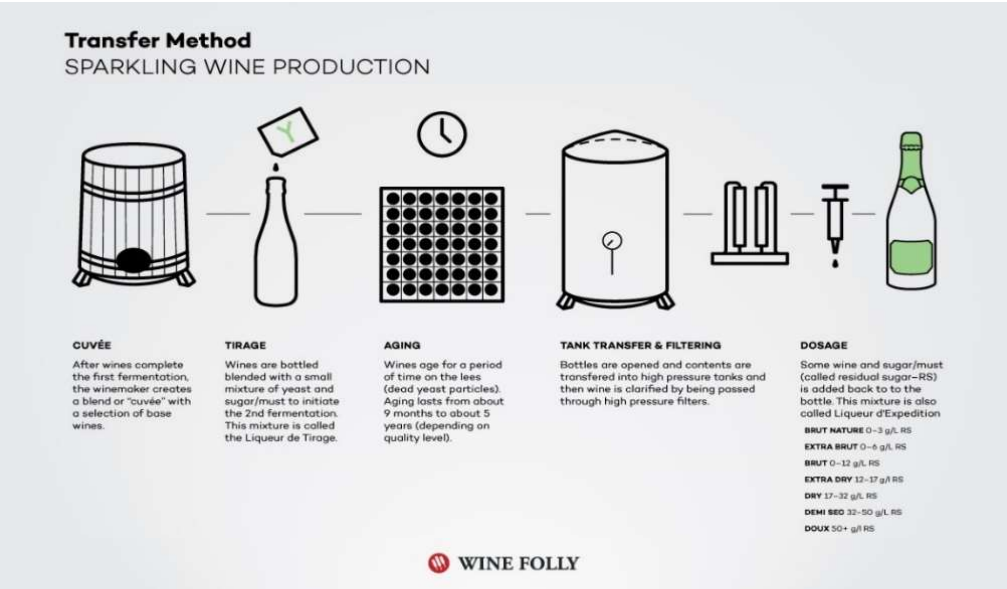
Picture 13: Tank method.

Examples: Prosecco, Lambrusco

The tank method came about during the industrial advancements made in the early 20th century and is the main process used for Prosecco and Lambrusco wines. The major difference between the tank method and the traditional method is the removal of the individual bottle as the vessel used to turn a still wine into a sparkling one. Instead, base wines are added together with the sugar and yeast mixture (Tirage) into a large tank. As the wine has a second fermentation, the CO2 released from the fermentation causes the tank to pressurize, whereafter wines are then filtered, dosed (with Expedition liqueur) and bottled without aging.

Tank method sparkling wines have a much more freshly made character with stronger secondary (yeasty) flavors. Some may argue that the tank method is not as high-quality of a production method as the traditional method of sparkling wine. While the process is more affordable (and thus is popular with lower quality wines), it is still used for fine sparkling winemaking.

- **Transfer Method**

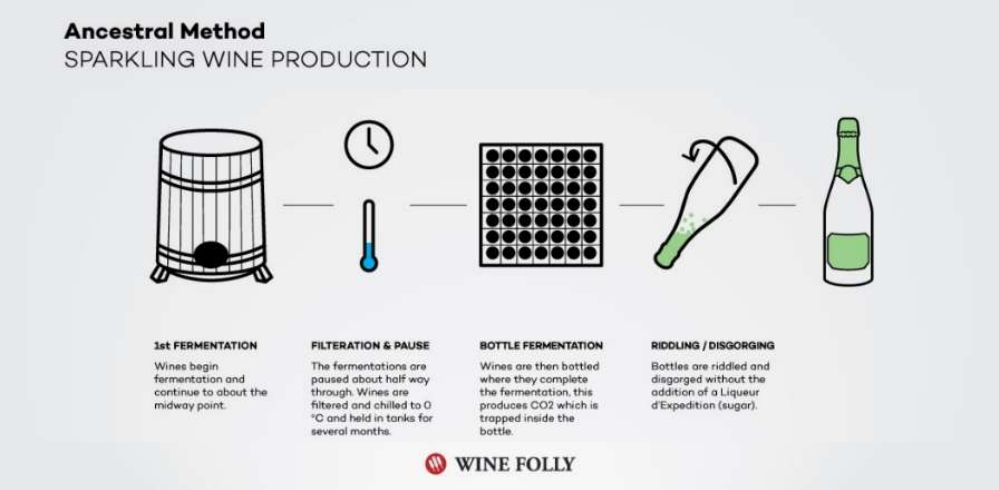


Picture 14: Transfer Method.

Examples: Small format (187 ml) and large format (3L+) Traditional Method sparkling wines

This method is identical to the Traditional method except that wines need not be riddled and disgorged in the same manner. Instead, the bottles are emptied into a pressurized tank and sent through pressurized filters to remove the dead yeast bits (lees). Then, the wines are bottled using pressurized fillers. You'll find this method used most commonly for non-standard sized bottles (splits or jerobaum and above).

- **Ancestral Method**



Picture 15: Ancestral Method.

Examples: Loire, Jura,

This method of sparkling wine production uses icy temperatures (and filteration) to pause the fermentation mid-way for a period of months and then wines are bottled and the fermentation finishes, trapping the CO2 in the bottle. When the desired level of CO2 is reached, wines are chilled again, riddled and disgorged just like the traditional method, but no expedition liqueur (sugar) is added. The technique is referred to as the Ancestral Method because it's assumed that this is one of the earliest forms of sparkling winemaking.

Méthode Diose Ancestrale: This variant of the Ancestral Method empties the wines into a pressurized tank and filters instead of riddling and disgorging.

- **Carbonation**

Examples: NewAge

The carbonation method simply takes a still wine and carbonates in a pressurized tank. While it's possible that this method has benefits, at the moment the only carbonated wines are lower quality bulk wines.

- **Continuous Method**

Examples: Lancers

The Russians may have it with the strangest sparkling wine production method yet! The process gets the name from a continual addition of yeast into pressurized tanks thereby making it possible to increase the total pressure to 5 atmospheres (or as much as most Champagne). Wines are then moved into another tank with yeast enrichments (sometimes wood shavings) which the dead yeast bits attach to and float around in the wine. This gives the wines a similar-tasting autolytic character to the traditional method. Finally, the wines move into the last set of pressurized tanks where the yeasts and enrichments are settled out, leaving the wine relatively clear.

All in all, the process takes about a month. At the moment, there aren't many producers who use the continual method save for a couple of large companies in Germany and Portugal (and Russia).

- Source: (Puckette, How Sparkling Wine is Made, 2016)

4. An investigation into the oxidation of the wine.

a. Wine Oxidation Mechanisms

Picture 16: Oxidized apple.

Wine oxidation can be divided in enzymatic oxidation and non-enzymatic oxidation. Enzymatic oxidation almost entirely occurs in grape must and is largely correlated with the content of hydroxycinnamates, such as caffeoyltartaric acid and para-coumaroyltartaric acid, and flavan-3-ols. Non-enzymatic oxidation, also called chemical oxidation of wine, prevails in fermented wine and begin by the oxidation of polyphenols containing a catechol or a galloyl group. These phenolic reactions, both enzymatic and non-enzymatic, result in by-products named quinones. Sulfur dioxide (SO2) and ascorbic acid, when added to wine, are able to reduce the quinones. Alternative options have been assessed for the prevention of oxidation during wine storage; nevertheless, these are not fully understood or commonly accepted. During aging, aldehydes are important intermediates in the chemical transformations occurring in wines, leading to color and flavor changes. In the same way, a range of off-flavors can be formed from wine oxidation. At low concentrations these flavors may add to the complexity of a wine, but as these increase they begin to detract from wine quality.

Acetaldehyde is an organic chemical compound that naturally occurs in fruits, breads, coffee, and wine. This is the source of the flatness and sour flavor that develops in an oxidized wine. Metabolizing these foods also causes the creation of acetaldehyde in the human body. Given enough time, the acetaldehyde can further convert into acetic acid. This is not the normal kind of acid in wine. Acetic acid will take you from wine to vinegar. This shows how drastic of a chemical effect oxygen has on alcohol over time. Limiting exposure is paramount in preventing the chemical changes of wine oxidation. Anthocyanins and phenols, two components of wine, are very susceptible to oxidation.

In addition to the major chemical browning involving wine phenols, the main oxidation reactions occurring during grape juice heating or storage are caramelization and Maillard reaction, which are temperature dependent.

- Source: (Oliveira, Ferreira, Freitas, & Silva, 2011)

b. How Long Does Wine Last After It's Opened

Many factors affect how quickly a wine oxidizes once you pop its cork.

Red or White

In general, red wines oxidize more slowly than white wines. Structured red wines will last several days longer than whites. In general, a white wine lasts about three days, while a red may last up to a week. Blush wines have more in common with whites than reds, and typically last about three days after opening.

Age and Tannins

Youthful, strongly tannic wines typically last longer after opening than lighter reds, those with fewer tannins, and those that have been well-aged. For example, a young Bordeaux less than ten years of age may last for a week while a well-aged Bordeaux with soft tannins and a few decades under its belt may

begin to degrade from oxidation immediately. Fruity reds, like Boujoulais Noveau, will also degrade more quickly. Delicate reds like a soft Burgundy or Pinot Noir may also degrade from oxidation more quickly. In general, plan to drink a delicate, fruity, or well-aged red within three days, while a full-bodied, tannic red may last up to a week.

Sugar and Alcohol Content
Both sugar and alcohol act as preservatives, slowing oxidation. Resultantly, dessert wines like Eiswein and Sauternes may keep for as long as a year, as may fortified wines like Sherry or Port. Likewise, higher alcohol reds such as Zinfandel may keep a little longer than their lower alcohol bretheren. A high-alcohol Zin may last a week to ten days, depending on age, alcohol content, and tannins.

Decanting, Aerating and Amount in Bottle
The less wine remaining in the bottle, the more air there is in the bottle with the wine, leading to quicker in-bottle oxidation. Likewise, if you have decanted or areated the wine, you may wish to drink it relatively quickly - within a day or two of opening it.

- Source: (Frazier, n.d.)

c. The drinkability of oxidized wine

Yes, we can drink oxidized wine. It's not dangerous to consume, it just has an unpleasant taste**.** Drinking oxidized wine is no different from consuming flat soda or stale bread. The chemical makeup has altered slightly, but there are no compounds added that would prevent us from being able to drink a glass. Studies have also shown that acetaldehyde naturally breaks down in the human body without adverse effects. The only benefit of oxidized wine is that the lowered alcohol content may also lower the calories in wine. The metallic taste of the oxidation will outweigh the taste of the sugar in wine. The best bet is to toss the wine and get a new bottle. Oxidized wine isn't even worth using as a cooking wine due to the diminished alcohol content.

d. Oxidized Wine with human health

No, there are no known issues that arise from drinking oxidized wine. Though acetaldehyde is considered a toxin, the low levels found in an oxidized wine are not dangerous to consume. Drinking oxidized wine is similar to drinking vinegar. It's not going to damage human body, but it tastes harsh.
There is some evidence that acetaldehyde contributes to the feeling of a hangover after drinking. We may be at increased risk of a hangover from drinking oxidized wine. The wine will certainly not be enjoyable to drink, but it is unlikely that you will get sick from doing so. The wine alcohol content will also be lower due to the conversion of ethanol to acetaldehyde. It may also be safer for people who have wine allergies, but it's better to avoid.

e. How to Fix Oxidized Wine

Depending on how oxidized wine is, we may be able to halt wine oxidation in winemaking using powdered skim milk. A simple mistake in brewing can cause your mixture to take on a brown hue or make the taste metallic. If caught early, you can introduce another substance to stabilize the mixture. This won't reverse the oxidation but may keep the wine from becoming undrinkable. For each liter of wine, add 1/2 ml powdered skim milk and 5 ml of cold water. Stir the wine and continue the process. It will be about two weeks until the final product is ready.

f. How to Keep Wine From Oxidizing

The best way to keep wine from oxidizing is to limit the amount of contact the wine has with air. Keep wine sealed. Even resealing an open wine will not stop the oxidation process. When putting a stopper in a bottle and tossed it back in the fridge, the taste is much worse the next time we open the wine bottle.

That's because the oxidized layer of wine continues to convert additional alcohol within the bottle. This is the same for all wine bottle sizes. Oxidation during fermentation even affects the tannins in wine, so your red wine can actually turn out to be a brown vinegar.
Instead of preventing oxidation, we can intentionally limit the oxidation wine to achieve greater depth.

- Source : (Weatherwax, n.d.)

Some ways to slow the oxidation process:

- Cork the bottle tightly to prevent more oxygen from entering.
- Pour the remaining wine into a smaller (375 mL) bottle and cork it tightly. This may add a day to the wine's life.
- Put the wine in the refrigerator, which will slow down the chemical process of oxidation. You may gain a day or two by doing so.
- Use a vacuum wine preserver such as the Vacu Vin Wine Saver, which allows you to pump excess air out of the bottle and slow down oxidation. This may add a few days to the wine's life.

- Source: (Frazier, n.d.)

g. Good points of oxidation

Wine does need oxygen. The whole “let the wine breathe” phrase isn’t total nonsense; introducing oxygen to a newly opened bottle of wine or a freshly poured glass (hence, why we decant and swirl) is entirely beneficial. The moment that wine encounters oxygen, it begins to break down, or “open up,” as many people say. Oxygen allows the aromas in wine to become more present, making it easier to identify what exactly you’re smelling. Introduction of oxygen also softens the mouthfeel of wine; this is due to the breaking down of tannins, the cause of that harsh, dry sensation you may feel along your cheeks and tongue. This practice is extremely beneficial in young reds, whose bright acidity and gripping tannins can seem austere and unpleasant at first.

- Source: (Denig, n.d.)

Orange wines, which are fermented on skins, are naturally more exposed to oxidation. And there is oloroso sherry, which is aged without the presence of flor and is intentionally oxidized. Oxidation these days has moved beyond bad corks and flaws and has become a sophisticated tool that can be used to control against vegetal aromas or to impart to a wine umami or nuttiness—or nearly intangible yeasty characteristics.

- Source: (Case, 2017)

5. An investigation into the formation of lees in wine and their effect on the taste buds.

a. What are “lees” in wine?

Picture 17: Lees in wine.

Lees are leftover yeast particles from autolysis, which is the self-destruction of yeast cells by enzymes created from fermentation. As strange as this may seem, lees are used in white and sparkling wines to add beneficial textures and flavors.

As the yeast cells start to break down during the process of autolysis, they release tiny amounts of sugars (called polysaccharides) and amino acids. The presence of these compounds is sensed on our tongues and palates as a textural weightiness or increased body in the wine. White and

sparkling wines aged on the lees are often described as creamier, richer, fuller-bodied, or with greater depth and complexity of flavor.

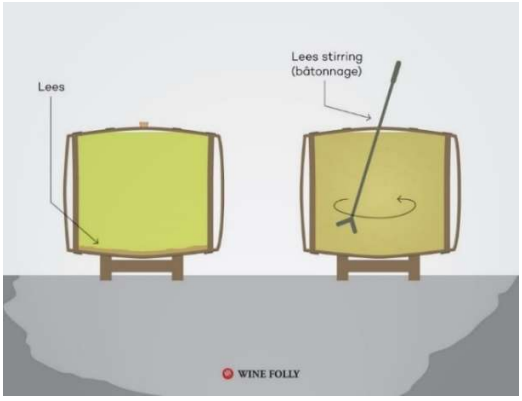
b. Kinds of lees

Lees are predominantly dead yeast cells left over from the fermentation process, but there are two kinds. 'Gross lees' refers to the general sediment that forms in the wine after fermentation. Gross lees tend to naturally fall to the bottom of the winemaking vessel and are generally separated from the liquid quite quickly, although not always.
Fine lees are smaller particles that settle more slowly in the wine.
They can also be filtered out, but some winemakers choose to leave them in for differing lengths of time in an effort to enhance the complexity of the wine.
Some winemakers might stir the lees to encourage the development of extra texture and aromas in their wines – a method also known as batonnage.

- Source: (Mercer, 2021)

c. "Aged on lees" meaning

Leaving wine in contact with dead yeast cells might not sound too appealing on paper, but lees ageing can be used to enhance certain aromas or bring more body and texture to wines. It's a technique commonly associated with white wines and sparkling wines, but not exclusively and not for every style.
Wines can be aged on lees for a few weeks and months or several years.
By law, a non-vintage Champagne must be aged for 15 months in bottle and spend at least 12 months on lees, according to the Comité Champagne.
A vintage Champagne must be aged on lees for three years minimum, although in reality many houses age wines for longer than this baseline threshold.



Picture 18: "Aged in lees".

- Source: (Mercer, 2021)

d. Benefits of lees

The most important yeast-cell-derived compounds for improving wine sensory properties are amino acids, polysaccharides, mannoproteins and fatty acids. Amino acids have been related to enhancements in both wine texture and aroma, with a strong positive correlation between amino acid concentration and wine score. In addition, the presence of yeast cells can lead to the production of positive organoleptic compounds through oxidation reactions and modifications to oak-derived aroma and flavour.
Another benefit is the ability of lees to scavenge oxygen entering through the barrel staves and the bunghole, especially when they are stirred. This oxygen-scavenging capacity can result in lower concentrations of SO2 being required to prevent oxidation, although excessive stirring can introduce too much oxygen leading to the loss of SO2 and potentially the formation of acetaldehyde and acetic acid. Topping barrels will also introduce additional oxygen.

- Source: (Winemaking Treatment – Lees Contact, n.d.)

e. Lees 's effect on taste buds.

The main components of the nitrogen fraction of musts and wines are amino acids, peptides, proteins

and ammonium ion. Their presence in wine is from amino acids of grapes, enzymatic degradation of grape proteins, excretion by living yeasts at the end of fermentation and to proteolysis during yeast autolysis. Thus, amino acids are important contributors of the wine savory taste and flavor.
The free amino acids present in wine may be from different sources such as those derived from grapes which are partially or totally metabolized by yeast during fermentation, and amino acids released by living yeast at the end of fermentation to proteolysis using their enzyme degradation of low molecular weight peptides releasing different amino acids to the medium or derived by proteolysis during yeast autolysis. Therefore, wines matured on yeast lees such as sparkling wines, flavor nucleotides may enhance the wine autolysis character.

- Source: (Vilela, Inês, & Cosme, 2016)

Besides the added textural creaminess, the release of fatty acids (which come from the breakdown of the yeast cell wall) adds to the aromas/flavors in a wine.
Sparkling Wines: Traditional method sparkling wines that are aged for extended periods on the lees will have increased flavors of toast, bread-like aroma, cheese or buttermilk-like aroma, and floral elderflower-like aromas and sometimes sweet, nutty aromas.
White Wines: Still white wines will also have increased yeast-like flavors similar to sparkling wines. Additionally, lees aging in oak barrels will extract additional aroma compounds from the wood, including sweet, caramel-like notes, smoke-like flavors, clove flavors, and umami or meaty flavors vanilla.

- Source: (Puckette, What Are Wine Lees? (Sur Lie Explained), 2016)

6. Production trends in the wine market.

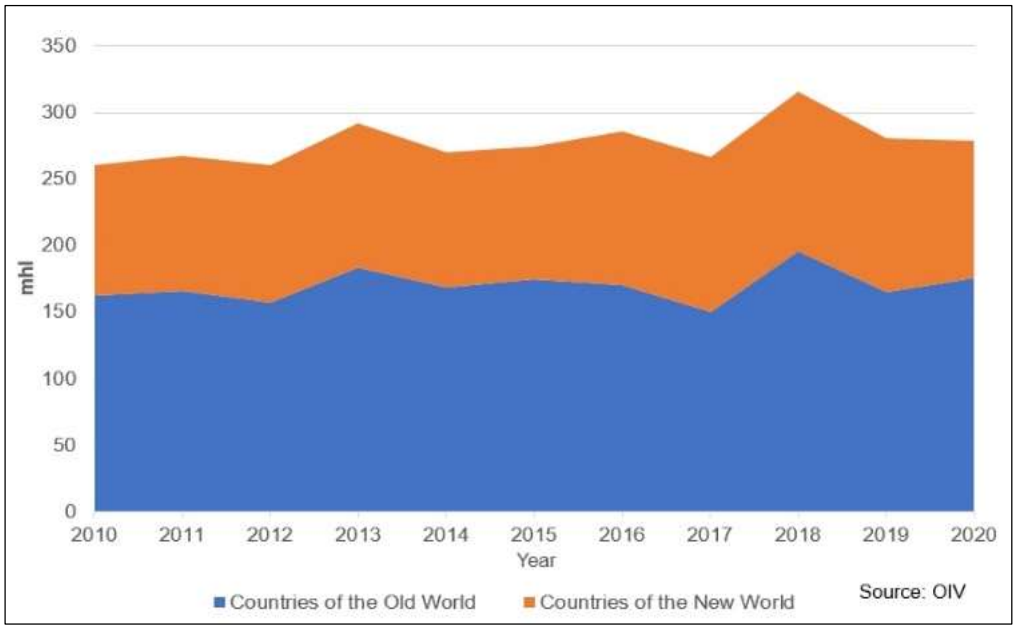


Figure 1: Wine Production in the World.

World wine production, excluding juices and musts, in 2020 is estimated at 260 mhl, marking a slight increase of almost 3 mhl (+1%), compared to 2019. Overall, after two consecutive volatile years of 2017 and 2018, 2020 is in line with the 2019 global wine production level that can be defined as slightly below average.

a. Trends in the main wine-producing countries

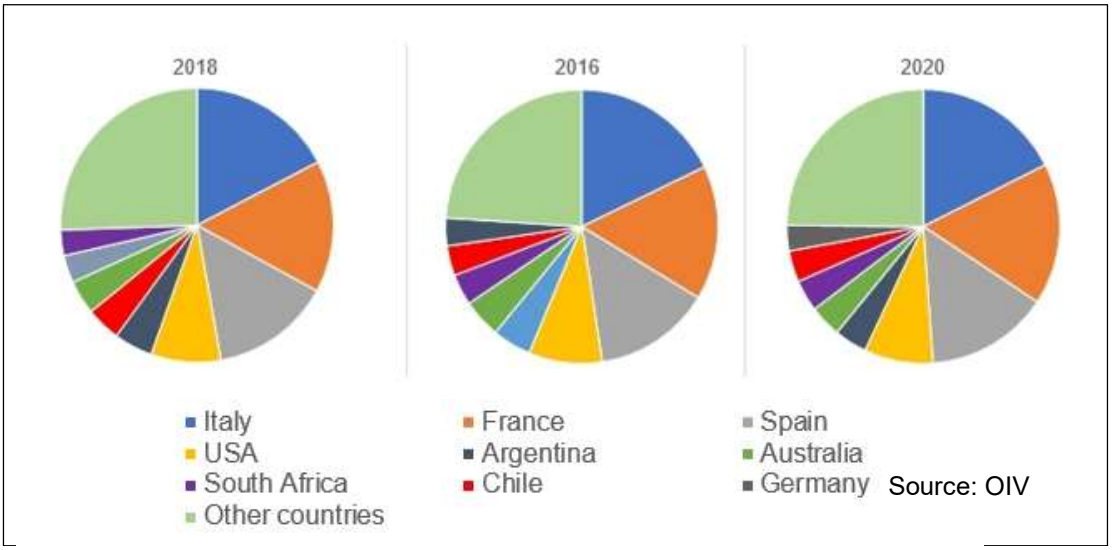


Figure 2: Top ten wine production countries.

In the Northern Hemisphere

Vinified production in the EU in 2020 is estimated at 165 mhl, registering an increase of 8% (+12 mhl) compared to the low volume registered in 2019. Despite the attempt of national and EU regulations to

contain production and the decisions of several Italian, French and Spanish producers' associations to fix the vinified volumes at a level lower to that of 2019 because of the expected drop in demand on the global wine market, the favourable weather led to a bountiful harvest in many regions of the EU. For this reason, many forecasts and early estimates made in September 2020 have been revised upwards.

Italy (49.1 mhl), France (46.6 mhl), and Spain (40.7 mhl), which together account for 53% of the world wine production in 2020, saw a sharp rise in their wine production with respect to 2019. The production volumes in these three countries recorded increases of 1.5 mhl (+3%), 4.4 mhl (+11%), and 7.0 mhl (+21%) respectively compared to 2019. However, while for Italy the 2020 production volume remains in line with respect to its last five-year average, for France and Spain the shoot is much larger, with +6% and +8% respectively. This increase could be accrued to a warm spring and summer, experienced in these countries that favoured an early and large 2020 harvest.

On the other hand, apart from Germany which has also slightly increased its 2020 wine production (8.4 mhl, +2%/2019), all the other main wine producing countries in the EU recorded a drop with respect to 2019. In 2020, the production levels were: Portugal (6.4 mhl, -2% /2019), Romania (3.6 mhl, -7% /2019), Austria (2.4 mhl, -3% /2019), Hungary (2.4 mhl, -12% /2019) and Greece (2.3 mhl, -6% /2019). In Eastern Europe, Russia (4.4 mhl, -4% / 2019) and Ukraine (0.7 mhl, -33% / 2019) too, witnessed a notable downfall in wine production in 2020. Moldova underwent unfavourable conditions due to a drought, thereby documenting a less abundant harvest in 2020 with vinified production being equal to 0.9 mhl (-37%/ 2019). Georgia (1.8 mhl), contrastingly, is estimated to increase its wine production by 2% compared to 2019, recording a level 37% higher than its five-year average.

In Asia, the new data available for China indicate an estimated vinified production of 6.6 mhl in 2020, marking a decrease of -16% with respect to the already declining production level of 2019. This is a sharp decline in wine production for the fourth year in a row, a signal that the development of the Chinese wine sector could be more uncertain than previously expected. A potential explanation for this negative trend is the structural problems (such as difficult climate conditions, technological constraints and overall low productivity) facing China, which are making the Chinese wine industry less competitive compared to imported wines. In North America, wine production in the USA is estimated at 22.8 mhl, a decrease of 11% compared to 2019. This striking decline in 2020 can be mainly explained by the combination of factors- such as bad weather conditions, namely the dry lightning storm that raged fires in California from August to October, inducing lower yields and giving smoke taint to a part of grapes that were not harvested; and a response to overcome the oversupply problem of grapes and wine.

In the Southern Hemisphere

In South America, the overall trend for wine production in 2020 is negative with respect to 2019. This descent might be explained by the unfavourable weather conditions caused by El Niño with excess rainfall in the vine growing areas. Not only are the vinified productions in Argentina (10.8 mhl, -17% /2019) and Chile (10.3 mhl, -13% /2019) lower than last year, but they are also significantly lower than their five-year averages (-13% and -10% respectively). In 2020, Brazil (1.9 mhl) registered a decrease of 5% in its wine production from 2019. Except for 2016, when El Niño devastated the harvest, this is the lowest vinified production level registered in Brazil since the beginning of the century. In South Africa, 2020 production reached 10.4 mhl. This represents a swell of 7% with respect to the volume registered in 2019, and it is gradually headed for convergence to the average production levels recorded before the beginning of the drought that heavily impacted the country for three years in a row (2016, 2017 and 2018). Regarding Oceania, Australian wine production registers a decline for the third consecutive year, stooping to the lowest level recorded in the last decade, reaching 10.6 mhl in 2020 (-11% / 2019). On the flip side, New Zealand's wine production was 3.3 mhl in 2020, touching the highest recorded level ever, with a +11% growth compared to 2019.

- Source: (State Of The World Vitivinicultural Sector In 2020, 2020)

b. Sustainable technologies such as "pigging"

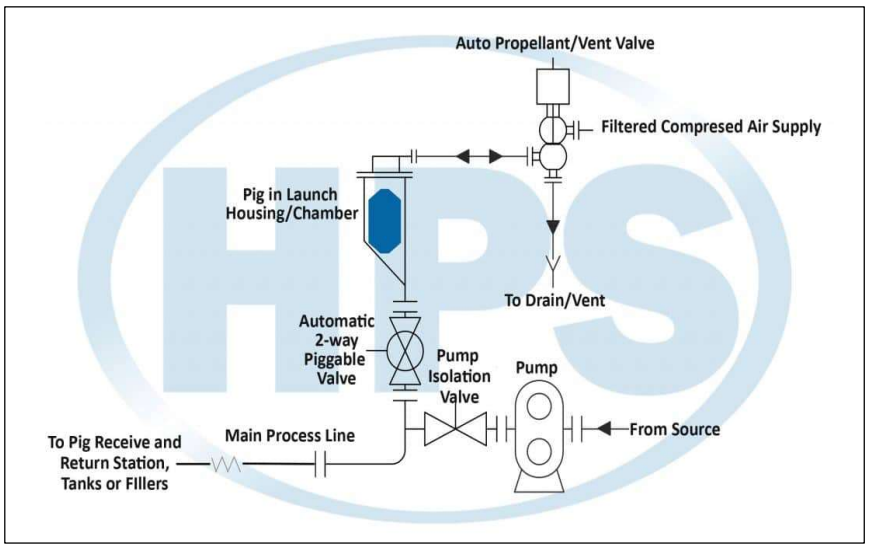


Fig. 3: Pigging System

With sustainability high on the agenda for many wine companies, we expect to see more companies incorporating hygienic product recovery (pigging) into their wine processing and production in 2021 and beyond.
Pigging is in wide use in the wine industry. And its use is increasing. The technology recovers liquid residual product from process pipelines, instead of wasting it.

Hygienic (sanitary) pigging systems are an incredibly effective way for wine manufacturers to increase yields, cut waste, and improve the efficiency of their operations. Pigging systems also significantly reduce water consumption, which is particularly pertinent because wine is often produced in areas where droughts are an issue and water can be in short supply.
Additionally, pigging systems can also help prevent dissolved oxygen (DO) and aeration problems during wine production.
So because pigging helps wine companies save so much waste, water, chemicals as well as transport and disposal costs, it drastically improves their environmental sustainability as well as improving efficiency, production capacity, profits and the bottom line.

c. New Formats of Wine

-box Wine

A key trend shaping the wine industry is the emergence of different wine formats – cans, bag-in-a-box, and other non-glass formats. This trend has largely accelerated due to changes in shopping and drinking patterns due to the global pandemic.
Even if the pandemic had never occurred, it is likely that manufacturers of canned wine would have celebrated success in 2020. This is due to new formats such as cans gaining wider acceptance in recent years. This trend has been increasingly driven by a significant cultural shift, as consumers, with Millennials particularly standing out as keen adopters of different wine formats that offer convenience.
The recent lockdowns restrictions throughout the globe appear to have revitalised the bag-in-box sector. Therefore, when pubs, restaurants, and socialising return to full capabilities, it is likely that demand for these formats will decrease. However, it's a different story for canned formats which offer

Picture 20: Canned Wine

immense potential. Generation Z, alongside Millennials, are even jumping on the bandwagon, with members who have reached legal drinking age, twice as likely to buy canned wine once they know it exists.

- Source: (Key Trends Shaping The Wine Industry In 2021 And Beyond, 2021)

7. Consumption trends in the wine market

World wine consumption in 2020 is estimated at 234 mhl, marking a 3% decrease compared to 2019. This fall of 7 mhl is analogous to the one seen during the 2008–09 global financial crisis. The first year of the COVID-19 sanitary crisis highlighted asymmetrical aggregate consumption behaviours in different countries in the world.

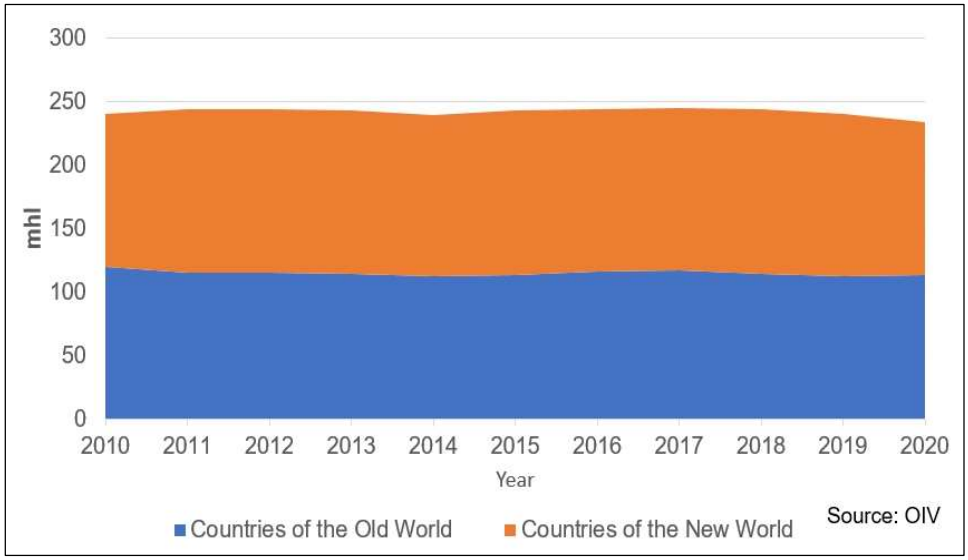


Figure 4: Wine Consumption in the World

a. Trends in the main wine-consuming countries

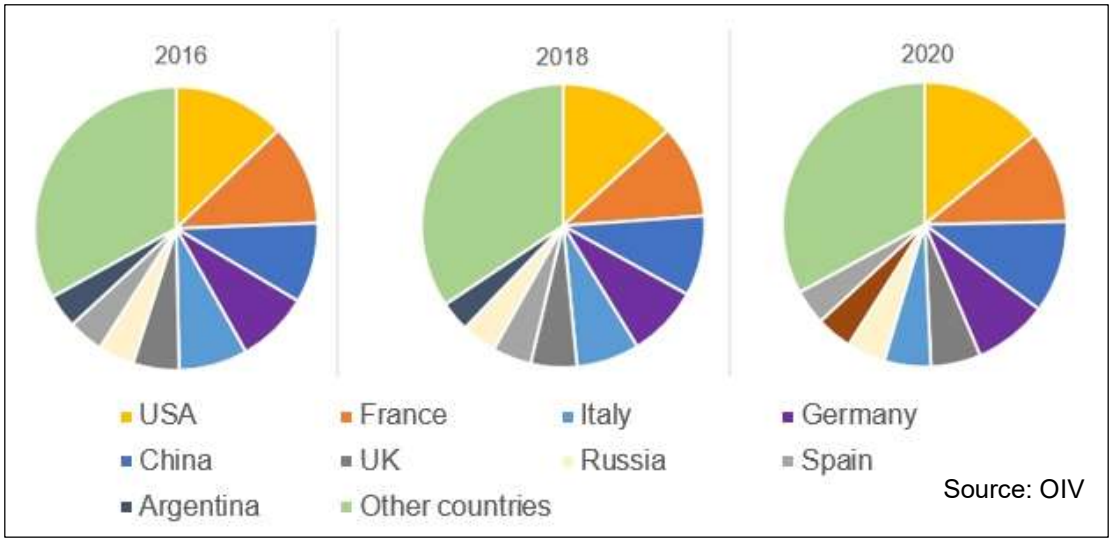


Figure 5: Top ten wine consumption countries

The USA, once again confirm their position as the world's largest wine consuming country, reaching 33.0 mhl in 2020. This volume is in line with 2019 notwithstanding the impact of the Covid-19 sanitary crisis, thereby proving to be a resilient market. This could be owed to the relatively less stringent lockdown measures as well as a notable spurge of e-commerce in USA. Concerning China, 2020 wine consumption is estimated at 12.4 mhl, showing a 17.4% drop with respect to 2019. The strict lockdown measures in the first quarter of the year certainly played a role. However, considering that this is a sharp decline for the third consecutive year, the rapid growth in wine consumption that started at the beginning of the century seems at its end9.Japan, the second highest consuming country in Asia, shows a stable level of consumption for the seventh consecutive year, estimated at 3.5 mhl. In South America, overall wine consumption increased in 2020 compared to 2019. In Argentina, with 9.4 mhl, wine consumption went up by 6.5% with respect to 2019. At 4.3 mhl in 2020, Brazil (+18.4% /2019) recorded the highest consumption level since the year 2000. In Chile, 1.8 mhl of wine consumption was recorded in 2020. Even though this level was 1.4% higher than 2019, it was 20.2% lower than its five-year average. With a decline of 19.4% as compared to 2019, South Africa (3.1 mhl) registered the lowest wine consumption of the last twenty years. This level in 2020, was down by 26.7% from its five-year average. A key driver of this major drop in consumption is certainly linked to the COVID-19 crisis: local sales of alcohol were banned (even online sales) for 14 weeks during the lockdown period, reducing sale opportunities by 30%, according to SAWIS10. In Australia, wine consumption is estimated at 5.7 mhl, a value 3.7% less than that observed in 2019 but overall in line with the last five-year average.

- Source: (State Of The World Vitivinicultural Sector In 2020, 2020)

b. Low and Non-Alcoholic Wine

The low and non-alcoholic beverages trend is expanding and improving. In 2020, low-and-no alcoholic spirits soared by 32.7%, with beer and cider making up the largest share of sales. By 2024, it's predicated that sales of low and non-alcoholic beverages will jump by a further 31%.
However, while low and non-alcoholic beer and other beverages are proving popular with many consumers, it's a different story for wine. In fact, low and non-alcoholic wine have struggled to gain traction, only making up a small proportion of sales. This is due to challenges surrounding consumers accepting non-alcoholic wine as well as difficulties with production and flavour.
Despite the challenges, there is still a massive untapped potential for the low and non-alcoholic wine sector. Only time will tell whether it will reach the heights that low-alcoholic beer and spirits have shown.

c. Health and Wellness become a trend

In tandem with the increasing focus on environmental concerns, the pandemic has accelerated the trend towards health, wellness, natural ingredients, authenticity, and proximity according to wine experts.
Alongside sustainability, these issues have acted as key drivers of the natural, vegan-friendly, organic, and biodynamic wine movement.
While these types of wines only represent a small fraction of global wine consumption, there is still huge potential for the market in the future.
In fact, organic wine is the trending product in the beverage industry, especially in wine drinking countries such as France, Italy, and Australia.
Consumers are becoming more aware of niche product categories such as natural and organic in the food and beverage industry. Therefore, this is a key driving factor which is expected to fuel the global wine market growth over the next few years.

d. The growth of Ecommerce

The shift towards ecommerce is another key trend dominating the wine industry. Although the trend of buying wine online was becoming more prevalent pre covid, ecommerce wine experienced a jolt in sales last year.

Due to lockdowns around the world, along with the closure of many establishments and limitations on physical shopping, this has prompted many consumers who would not have previously considered buying their wine online in normal circumstances to try it for the first time. And it has seen huge success! In fact, a wine company saw an 80% rise in sales in the first two months of lockdown last year.

Picture 21: E-commerce

However, there remains a big question about the future of wine e-commerce: when things return to normal and more pubs, restaurants and other establishments open, will consumers continue to use ecommerce channels to purchase their wine, or will they revert to traditional methods? With the high levels of recruitment and investment in ecommerce over the past year, buying wine online seems to be another pandemic-era shift that will probably stick around.

8. Bag-in-box wine investigation.

a. What is Bag-in-box?

A bag-in-box or BiB is a container for the storage and transportation of liquids. The BiB consists of a polyethylene bag with a tap, that is inside a cardboard box, and can be found in different sizes (from 1,5 up to 20L)

Picture 22: Bag-in-box

b. Advantage of bag-in-box wine.

It preserves the wine in perfect conditions: well, this is undoubtedly the most important issue for wine lovers. This is because the wine is fully protected, no light coming in. The combination of the tap system, with a contracting bag, makes it impossible for the oxygen to get in. The aftermath is that the wine in a Bag-in-box can be consumed in optimal conditions, with all its properties intact (colour, aromas, flavours) weeks after it was opened.

Easy to transport and store. Bag-in-box are normally box shaped (although there are interesting and imaginative variations), meaning that they fit perfectly well taking all the space of the outer cases. At home this is also useful, as it fits effortlessly in any fridge. Bag-in-box are way lighter than bottles, and strong and robust, thus, the possibilities of breakage are minimal.

Picture 23: Different sizes and types of Bag-in-box packaging

Versatile and cheaper: Bag-in-box can be found in different formats, to cater for different types of customers. From 1,5L to 5L for consumption at home, up to 20L for Horeca. This means there are scale efficiencies in the production and packing lines, which translate to the final consumer price. Without altering the quality of the wine inside, of course! Be sure that for any brand, the quality of the wine in the bottle is exactly the same than the one in the Bag-in-box.

Sustainability: lighter, easier to transport, economies of scale and efficiencies in the production line… all these things combined translate in a lower carbon footprint for wine in Bag-in-box compared to the bottles. Moreover, the outer box and the bag are fully recyclable, and easier to recycle than glass.

Branding: from a purely Marketing perspective, the Bag-in-box allow the producers to differentiate and expose their brands in a more efficient and creative manner. The whole surface of the package can be used to display the brand, its values, making them very engaging and creative

- Source: (Five advantages of “bag-in-box” wine you didn’t know, n.d.)

c. Disadvantage of Bag-in-box wine:

Boxed wine can’t be aged.
If you are looking for a wine that you can age, don’t get a box of wine. Most boxed wines can only last for about two years if left unopened.

The selection is poor.
When you’re at the grocery store in the wine section, you will notice that there are not as many boxed wine options as there are for bottled wine.

They give you less variety.
If you only get boxed wine, you get more wine. However, you get more of only one kind of wine. You probably do not have enough room in your refrigerator to store several different kinds of boxed wine, leaving you stuck with one kind until you finish it.

They are not compatible with wine coolers.
Boxed wine cannot be stored in a wine refrigerator. They end up taking up a lot of space in your normal refrigerator.

Prejudice:
Having to forego that most hallowed ritual of popping a cork from a glass bottle of wine just seems to take all the romance away. Some argue that boxed wine provides a cheap and inexpensive means for people to become inebriated and could lead to binge drinking.

- Source (Doman, 2015)

d. Investigation into Bag- in-box wine and shipment transition.

The born of Bag-in-box
The first commercial Bag-in-box system was invented by American chemist William R. Scholle in 1955 for the safe transportation and dispensing of battery acid. Scholle's invention inspired a "packaging revolution.” In 1991, Scholle was inducted into the packaging hall of fame for his invention.

High demand of Bag-in-box in Covid-19 Lockdown
Box wine – or ‘bag in box’ – has enjoyed a recent surge in demand, which suggests that consumer habits and perceptions may be changing.
In 2020, supermarket Sainsbury’s reported that sales of bag-in-box wines jumped by 41% year-on-year for the lockdown period. 28% of those buying them were aged between 25 and 34 years old.
‘Lockdown gave bag-in-box wine a real opportunity to shine,’ said Sainsbury’s wine buyer Hugh Browne. Not restricted to the value end of the market, we are also seeing an increasing number of premium wines which tick boxes such as organic, biodynamic and natural. Whilst you’re unlikely to find the world’s finest wines in pouches or boxes any time soon, some bag-in-box wines present good value. They also preserve wines longer than open bottles and are more portable – making them great picnic wines.

How is Demand from Wine Industry Affecting Bag-in-Box Sales?
According to International Organization of Vine and Wine in 2019, the global wine export market increased in comparison to that of 2018 both in terms volume, which was at 105.8 million hectoliters, and in value, which reached US$ 37.7 billion. The rising demand for bag-in-box packaging solutions from the wine packaging producers is one of the key growth drivers.
Wine producers from Europe and North America are largely inclined to bag-in-box for final packaging purposes because of various benefit sit offers in comparison to bottle packaging. Moreover, bag-in-boxes are easy to distribute in more economical way.

Oxygen Transmission Rate (OTR) is a key factor in defining the inclusive quality of the wine packaging. Bag-in-box offers a low oxygen diffusion rate over glass bottles and is thus extensively favored by wine makers across the globe. The wine packaging business accounts for approximately half of the global demand for bag-in-box.
In 2019, Italy, France, and Spain have dominated the international trade of wine and are anticipated to capture highest market share in terms of the consumption of bag-in-box for wine packaging.

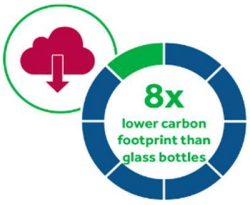
What are the Factors Causing High Sales of Bag-in-Box?
Bag-in-box ensures easy transportation of large volume of liquid products, which could weigh more than 20 liters. The rise in demand for hygienic, cost-effective, and convenient packaging solutions in comparison to traditional liquid packaging choices such as glass and metal containers is a chief factor enabling solid growth in the bag-in-box consumption. In addition to this, the lightweight characteristics of bag-in-box helps in reducing the overall transportation and handling costs.
As per FMI analysis, higher yield margin is estimated with the prolonged use of higher value and large sized reusable bag-in-box which are cost effective over smaller ones having shorter life spans. Driven by increasing awareness about numerous advantages of the packaging solution, the global bag-in-box market is estimated to increase at a CAGR of 5.7%, during 2021-2031.

e. Consideration of sustainability development goals when using bag-in-box

Best-in-class carbon footprint according to LCA studies
In multiple studies conducted, Bag-in-Box clearly shows the best results in terms of global warming potential with an 8 times lower carbon footprint than glass bottles.
This is especially important as an increase in greenhouse gas emissions is the primary factor associated with global warming leading to the rise of sea level, mass species extinction, extreme weather, etc.

Picture 24:: Transport and storage savings.

Bag-in-Box prevents food waste
By optimally protecting the product before and during use to maximise the shelf life and enable consumption by glass, Bag-in-Box prevents the contents from being wasted.
It is a major global problem, as a third of food is wasted according to the Food and Agriculture Organisation.
As 90% of carbon emissions come from the food packaged (vs 10% packaging), it is extremely important to fight against food waste!



Picture 25: lower carbon footprint

Picture 26: Prevent food waste.

Packaging weight reduction
According to Flexible Packaging Europe, 26 million tonnes of packaging materials would be saved if all food was packed in flexible packaging.
We have compared our bags with different rigid plastic containers usually used for the same product and the plastic reduction is huge - between 54% and 86% according to different packaging types compared.

Transport and storage savings
Empty packaging is delivered flat using very little space and, after filling, is easy to palletise. This leads to substantial savings in logistic costs and CO_2 emissions.
Bag-in-Box occupies a limited amount of space when stored thanks to its rectangular shape. For example, one truck transporting 5 litre bags and boxes is equivalent to more than 7 trucks transporting 75cL bottles.

Picture 27: Plastic reduction.

75% corrugated cardboard
More than 75% of a 3-litre Bag-in-Box package is corrugated - fully recyclable, renewable and biodegradable - and only 25% is plastic.
85% of corrugated packaging is currently recycled in Europe. The box and the bag are easily separable, facilitating the recycling of the corrugated box. The recyclability of the bag depends on the country and its collecting/sorting and recycling infrastructure. We are working together with our suppliers on new recyclable mono-material film structures to substitute plastics for which there are no recycling solutions today.

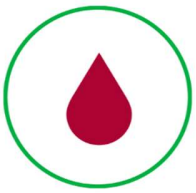
Picture 28: High percentage of corrugated cardboard.

Does not become litter
Bag-in-Box is not among the plastic products frequently found on beaches or in the environment, such as PET bottles or snack packs.
In fact, Bag-in-Box is usually consumed at home and disposed in a dustbin after use. It is not individual packaging consumed on-the-go, therefore the risk of polluting a forest or a beach is limited.


Picture 29: No litterring.

Limited water and energy
Compared to other packaging types, the water and energy consumption for Bag-in-Box production is relatively low.
In a study conducted in 2010 by BioIntelligence, Bag-in-Box clearly shows the best results in terms of water and energy consumption.

- Source: (Bag-in-Box: a sustainable packaging solution , n.d.)


Picture 30: Limited water and energy.

9. Health Benefit of having one glass of wine a day.

a. Weight Loss

A recent study, published in the *Journal of Physiology*, found that one glass of red wine could be equivalent to one hour of exercise.

Jason Dyck, the lead researcher of the study, discovered that the natural compound *resveratrol* — found in red wine — could actually "enhance exercise training and performance."


Picture 31: Weight loss.

b. Freshening breath.

Toss out your breath mints and gum. Instead? Drink a glass of vino!

According to Leah Kaufman, a registered dietitian, red wine is not the most calorie-friendly alcoholic beverage (weighing in at only 100 calories for a typical five-ounce pour) — but it *can* act as a mouthwash, because the flavan-3-ols in it can reduce "bad bacteria" found in your mouth.


Picture 32: Freshening breath.

c. Reducing allergies.

Here is a little something for all white wine lovers: certain types of white wine can actually help reduce allergies.

When we have allergies, we often take anti-histamines to feel better. Histamines are what a cell releases that give us allergies.

Laura Foster, “The Wine Coach” and sommelier, recently talked to Dr. Oz about


Picture 33:Preducing allergies.

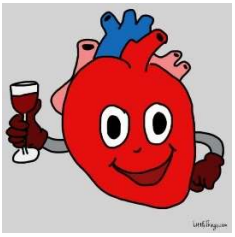
how wines like non-sweet Sauvignon Blanc are low in histamines and can actually relieve allergy symptoms.

d. Reducing heart disease..

Laura Kaufman also says that wine contains antioxidants and can help prevent heart disease.

One glass of wine a day can reduce you risk of having a heart attack by lowering LDL (bad cholesterol) levels. It can also help prevent blood clots.

But be careful: Too many glasses of wine a day can be detrimental to your health.



Picture 34: Reducing heart disease.

e. Lowering bad cholesterol.

A healthy heart and good cholesterol go hand-in-hand. You can't have one without the other.

Research as shown that alcohol can raise levels of good HDL cholesterol by as much as 5 to 15 percent.

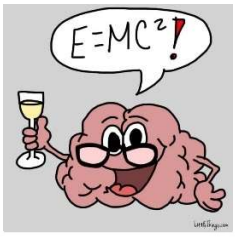
Wine is particularly helpful because its polyphenol antioxidants could also lower LDL levels.

Picture 35: Lowering bad cholesterol.

f. Preserving memory.

Because wine helps prevent blood clots and reduce vessel inflammation, it can also help you retain your memory.

According to Tedd of the University of Arizona School of Medicine, when he and his researchers gave memory quizzes to women in their 70s, those who drank one drink every day scored much better than those who drank less or not at all.



Picture 36: Preserving memory.

g. Boosting your immune system.

According to one British study, those who drank a glass of wine a day reduced their risk of infection by 11 percent.

This is because the flavan-3-ols in wine helped them ward off helicobacter pylori bacteria, which causes gastritis, ulcers, and stomach cancers.

Just half a glass may also prevent food poisoning caused by germs like salmonella, according to a Spanish study.

Picture 37: Bosting immune system.

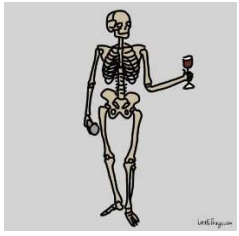
h. Building strong bones.

It has been found that on average, women who drink wine moderately seem to have higher bone mass than people who do not.

The reason? Alcohol boosts estrogen levels, which slows the body's destruction of old bone.

Wine is also rich in phytochemicals, which also may benefit bones.

- Source: (Wanshel, 2015)



Picture 38: Strong bones.

10. Oxidation suppression tools

a. Vacuum Pump:

Picture 39: Vacu Vin Pump.

The mechanism of the rubber stopper and pump works in sync to get rid of any possible air that slides into your wine bottle. Since it prevents your wine from oxidizing, you will still enjoy the same quality - taste and smell wise, even after several days. This is an affordable option commonly used in restaurants and bars.

Vacu Vin is the best-known brand – this company invented the vacuum pump wine preservation system. They promise up to two weeks extra life for an opened bottle of wine.
Length of storage: up to two weeks.

Country: Netherlands

Characteristic:

The Wine Saver pump extracts the air from opened bottles and reseals it with a reusable rubber stopper. The vacuum slows down the oxidation process to store wine for a longer period of time. Place the vacuum stopper in the bottle and pump until it makes a ‘‘click’’ sound.

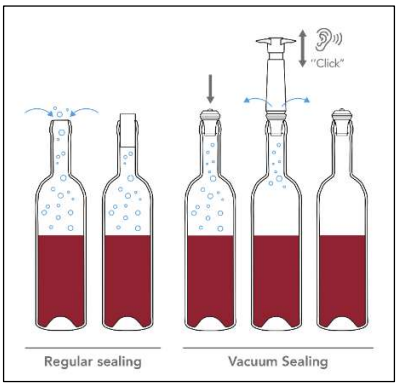
Models:

- Wine Saver originates from the first version ever created in 1986
- Wine Saver Concerto is designed with an ergonomic and stylish grip
- Wine Saver Stainless Steel is the premium edition of the original

How to use:

Just pop the stopper onto your wine bottle, place the vacuum pump over it and vacuum out the air! (Think backwards basketball pump.)

Stop when it makes a clicking noise. It works on most standard-sized bottles whether they have a cork or screwcap closure.



Picture 40: How to use Vacu Vin

Strength:

- It's easy.
- It's inexpensive.
- The pump lasts years and years.
- It works on any wine bottle, regardless of its original closure.
- You can return the bottles to your wine fridge or place it in your refrigerator on their sides.

Weakness:

- The vacuum created in the bottle is not complete. This means that even though the rate of deterioration of wine in bottles will be significantly reduced, bottles sealed with this system still contain more air than when they were full.
- Many experiments show that the vacuum pump is less efficient than normal screwcap because of the high leak rate.
- The pump system should not be used for sparkling wines.

Length of storage: 7 days

- Source: (Cesano, n.d.)

- Source: (Kevin, 2017)

Inert wine gas preservation systems:
It can keep your opened wine fresh for even longer, but this is usually more of an enthusiast option since they can be quite expensive. This system is based on inserting an inert gas – usually argon - into the bottle. This gas, being heavier than oxygen, creates a protective layer on the surface of the wine.

b. CORAVIN

Country: USA

Characteristic:
This brand offers a device with a needle which punctures a hole in the cork to extract wine without pulling the cork out thus avoiding any contact with oxygen. The wine is then replaced with argon gas and the cork naturally re-seals as if the bottle had never been opened.

Picture 41: Coravin Model 3.

Models: 4 main model available including Model 3, Model 5, Model 6 and the latest one: Model 11.

- Model 3 is the most basic, and is only sold as a base system.
- Models 5 and 6 are a step-up in quality. 5 is a basic version, intended for restaurants and wine sellers.
- Model 6 is an elegant version for the home user, available in different colors with good accessories.
- Model 11 is the highest quality – an automated version that efficiently controls pouring and gas use – connected via an app on your phone.

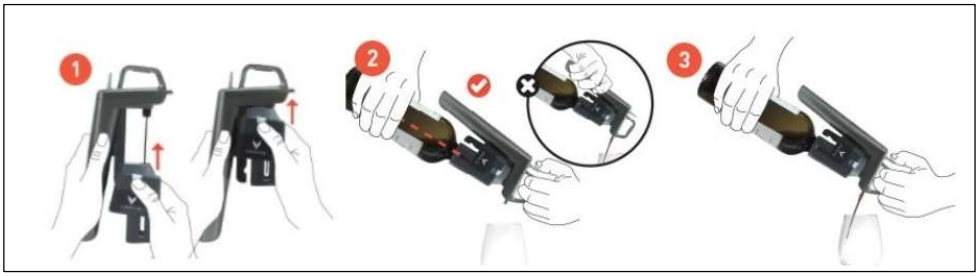
How to use CORAVIN (Installing):

- While pushing the Clamp Release up, slide SmartClamps™ all the way up.
- Unscrew Capsule Cup.
- Insert round end of Capsule into Capsule Cup.
- Quickly screw Cup back onto System until there is no gap and Cup is aligned. This ensures a tight seal and no gas loss.
- Slide SmartClamps down until locked into place.
- Quickly press the trigger to release a short burst of gas. If there is no hissing sound, see Troubleshooting.

Picture 42: How to install Coravin Saver.

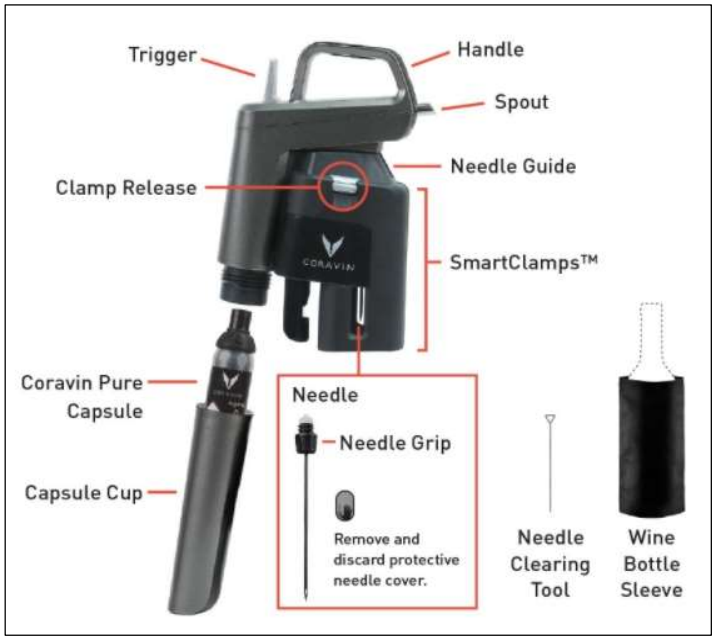
Pouring Wine:

- Align SmartClamps™ over neck of bottle and push down firmly on Handle in one fluid motion, until Needle is fully inserted into cork and no longer visible. SmartClamps™ are designed to fit snugly around bottle neck.
- To pour wine, quickly PRESS AND RELEASE Trigger. Wine will pour when Trigger is released. Repeat until desired amount of wine is poured.
- To stop wine from pouring, tip bottle upright while keeping Spout over glass. Any remaining gas in bottle will be released and a hissing sound may be heard.
- To remove System, hold bottle with one hand. With other hand, hold Handle and firmly pull System straight up and off in one fluid mot
- ion.



Picture 43: How to pour wine.

Feature:



Picture 44: Feature of Coravin.

Strength:

- Completely suppressing oxidation
- Coravin Moment app which help to connect via Bluetooth(TM) to Coravin Model Eleven providing a dashboard for the device.
- Variety of models ranging from cheapest to most expensive, from standard to advanced.

- Using a Coravin allows you to assess how age-worthy bottles are drinking without opening the entire bottle. If a wine is still too young, you've saved it for later. If it's in its drinking prime, it won't go downhill before you pop it open.
- There is no limit on the number of bottles you can access.
- Coravin's compact format that is easy to store and transport offers the ultimate flexibility in the luxury wine storage range.

Weakness:

- Coravin is expensive.
- High running cost.
- It takes time to install and clean the device.
- This does not work on sparkling wines.
- Older bottles should be opened only when zipped into the neoprene Coravin sleeve in case the bottle's glass is weaker or has been damaged over the years.
- If not cleaned properly and primed, the Coravin needle can introduce oxidized wine or oxygen into an unopened bottle.
- Cartridges must be changed frequently.
- The needles pour slowly.

Length of storage: 4 weeks.

- Source: Coravin.com

c. Private Preserve:

Picture 45: Private Preserve.

Country: USA

Characteristic:

100% Green Gas Based

Suitable for all wine, port, sake, cognac, whiskey, fine oil, and vinegar.

- Freshness Preservation
- Safe and Simple
- Professionally Recommended
- Re-cork and Store
- Incredible Value

Model: one version available

How To Use Private Preserve

- Use each time you pour and store.
- Put the tip of the extension tube inside the neck of the bottle against the glass. Tube use insures maximum protection.
- Spray one long (1 sec.) and 3 short bursts into 750ml bottle. Larger bottles require additional sprays—add one long spray for each larger size.
- Recork immediately & store upright.

Strengths:

- It's easy to use.
- It works on all wine bottles.
- It can be used for sparkling wines.
- Private Preserve is inexpensive.
- It is handy travel size!

Figure 6: How to use Private Spray. Source:

Weakness:

- The bottle reseal must be tight for best results. This works best when paired with a VacuVin.
- It is possible for added CO2 to dissolve in wines, but all wines naturally have some dissolved carbon dioxide left over from their fermentations. The effect of additional dissolved CO2 can give white wines accentuated freshness, but it could emphasize the tannin-acid duo in red wines. In very structured reds, this could be could unpleasant. However, the risk of an adverse effect is low for most wines, especially those stored for short time periods. In my experience, the cost-to-effectiveness ratio is overwhelmingly advantageous for Private Preserve.

- Source: (The best ways to preserve wine after opening, 2020)

d. Savino Wine Saving Carafe:

Country: USA

Characteristic:

This wine preservation system keeps an entire bottle of red or white wine crisp for up to a week at half the price of other systems. It looks like a simple glass carafe, but the additional high-quality, floating stopper seals off all airflow to your wine to prevent oxidation. This slim device also doubles as a decanter when you remove the stopper.

Picture 46: Savino Wine Saving

Model: 2 versions- Glass and Plastic.

How to use Savino Carafe

- Pour the contents of your open wine bottle into Savino.
- Insert the float to minimize oxygen contact with the wine.
- Insert the lid to help prevent spills.
- To serve from Savino, remove the lid and pour the wine with the float still in Savino.

Picture 47: How to preserve wine in Savino Carafe.

Feature:

- The float in Savino rests on top of your wine creating a physical barrier between your wine and the air. This process slows down the transfer of oxygen to the wine, thereby limiting the oxidization process and keeping your wine fresh for up to a week.
- The Savino carafe and lid are made of flint glass, which is recognized for its high transparency and is commonly used for optical lenses. Flint glass can be consistently manufactured to the specific tolerances needed to ensure the wine preservation effectiveness of Savino. The Savino float is made from the highest quality food-grade and BPA-free plastic, designed to hold up under years of use while not discoloring or imparting any taste onto your favorite wine. Designed to very stringent dimensions, the float is durable enough to withstand repeated use including being dishwasher safe, yet light enough to float effortlessly while allowing you to pour from a Savino.

Picture 48: Features of Savino Carafe.

Strengths:

- It works on for any still wine.
- It's relatively inexpensive.
- It seals well for transportation.
- Elegant design.

Weakness:

- Two days is the maximum preservation utility - whether in the fridge or on the counter, which is as good as putting a cork back in a bottle.
- The lid isn't easy to unscrew to pour. With no pourspout, you must rely on the flared lip to pour cleanly.

Length of storage: 3-4 days.

- Source: (Hannah, 2019)
- Source: (Savino – a new way to preserve wine, 2014)
- Source: Savino.com

e. VinEdge:

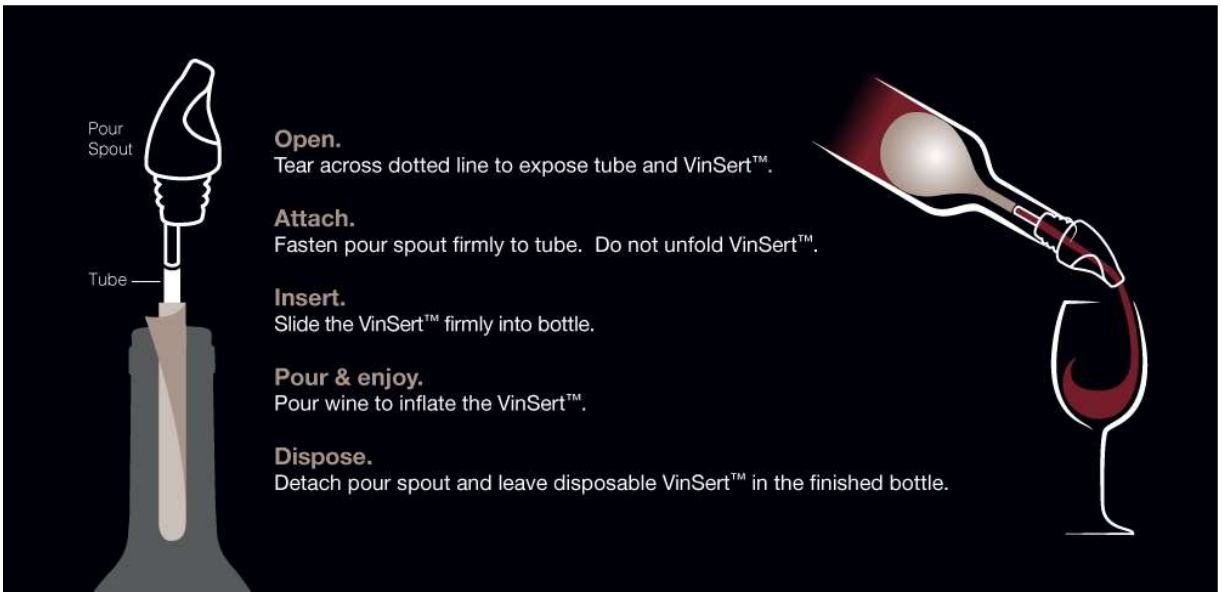
Country: Poland

Charateristic:

The VinEdge takes a unique approach to wine preserving. There are two parts to this nifty little tool: the VinEdge and the VinSert. The VinEdge is the spout the wine is poured from. The VinSert is a small plastic bag that plugs into the VinEdge which acts to seal off the empty space left in your bottle, protecting the remaining wine from oxygen. As you pour your wine through the VinEdge, air flows into the VinSert, rather than into the bottle, protecting the remaining wine and keeping it preserved. In other words, it vacuum seals your wine as you drink!

Picture 49: VinEdge.

How to use VinEdge:



Picture 51: How to use VinEdge.
Source: VinEdge.

Features:

The VinEdge uses disposable inserts, similar to the Wine Shield, to cover your wine. But, you also get a pour spout and delivery system that makes it unique. This system incorporates a straw like delivery tube that delivers wine from under the cover, eliminating the oxidation that would normally occur over time.

Strengths:

- No expensive device that is difficult to attach
- No vacuum device to attach
- No pumping needed to pump air from the bottle
- No sprays with argon, nitrogen, and carbon dioxide needed to remove oxygen

Weakness;

- It is hard to clean the device
- Takes time to exchange the disposable bags after using

Length of storage: 7 days.

- Source: (Katz, n.d.)
- Source: (VinEdge – a life preserver for your favorite bottles , 2014)
- Source: VinEdge

Picture 50: The features of VinEdge.

f. AntiOx Pulltex

Country: Spain

Model: 1 version

Characteristic:

This soft, silicon bottle stopper is equipped with a carbon filter that is placed over the bottle neck. The company asserts that the filter reduces oxygen contact—something of a surprising claim given that no air is removed from the bottle—and the filter minimizes the effect of bacteria on the wine.

Picture 52: AntiOx Pulltex.

How to use AntiOX Pulltex:

You only need to close the bottle with the stopper. The active carbon filter will keep the wine in perfect condition for more than a week. Suitable for use by wine lovers at home and for bars and restaurants to serve wine by the glass.

Feature:

The active carbon filter inside the stopper interrupts oxygen interacting with the wine. The volatile components that accelerate the oxidation are neutralized, and therefore the oxygen left in the bottle will not damage the wine.

Picture 53: Features of AntiOX Pulltex.

Strengths:

- It's inexpensive if you can keep a wine fresh with just one stopper.
- No special maintainance is requiered. There is no need to replace the filter.

Weakness :

- Not fully limit oxidation

Length of storage: 3-4 days

g. Eto:

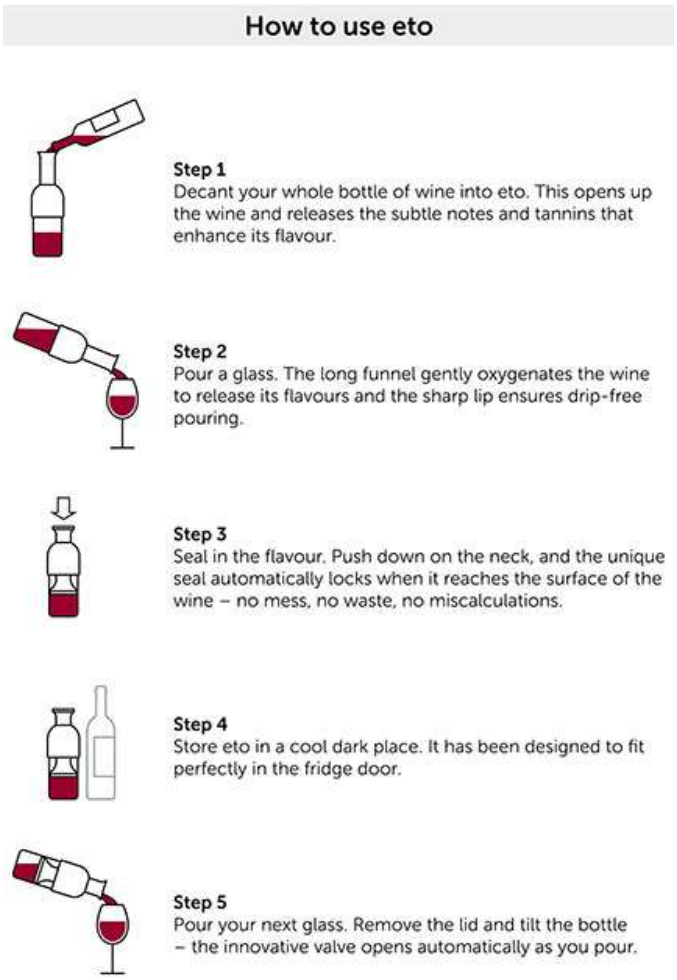
Country: UK

Model: 1 model with 3 colors

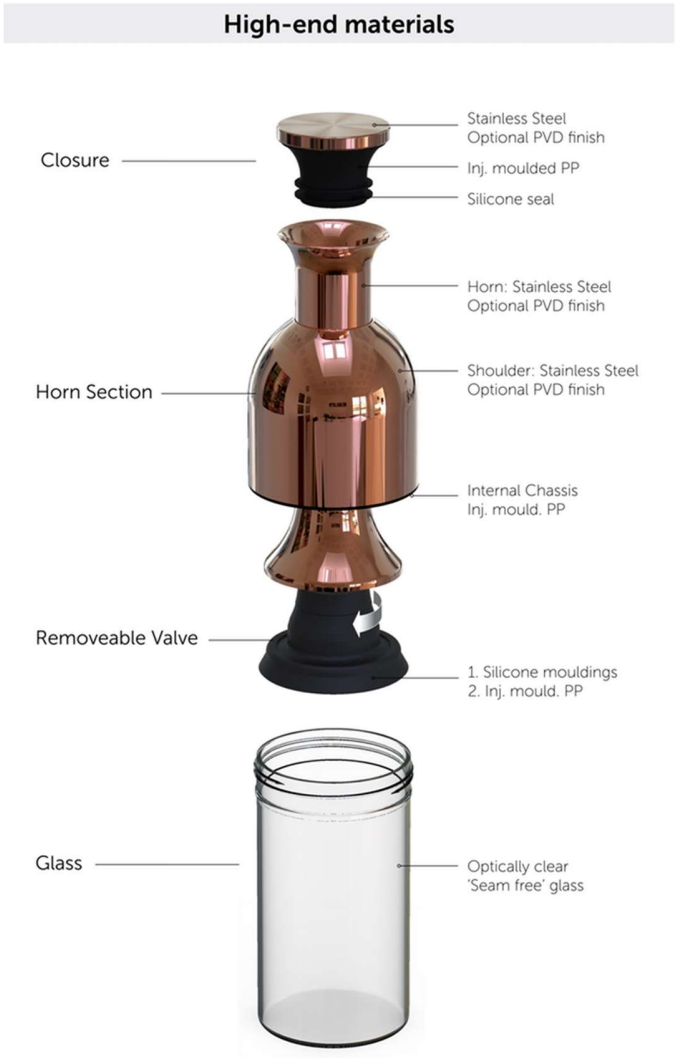
Characteristic:

A clever valve design allows the wine to be poured straight out of the neck, allowing for efficient serving. Also, the process of pouring the wine into the eto means that no other decanting is required – the idea being that a whole bottle is poured into the eto, then whatever remains can be kept fresh.

Picture 54: eto cooper version.



Picture 56: How to use eto wine saver.
Source: Decanter



Picture 55: Structure of eto wine saver.
Source: Indiegogo

Strengths:

- Suitable for any wine
- Easy to use
- Practical function and elegant design

Weakness:

- Solubility and durability of liquid shield packing

Length if storage: 7-10 days

- Source: etowine.com
- Source: (Cotton, n.d.)

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