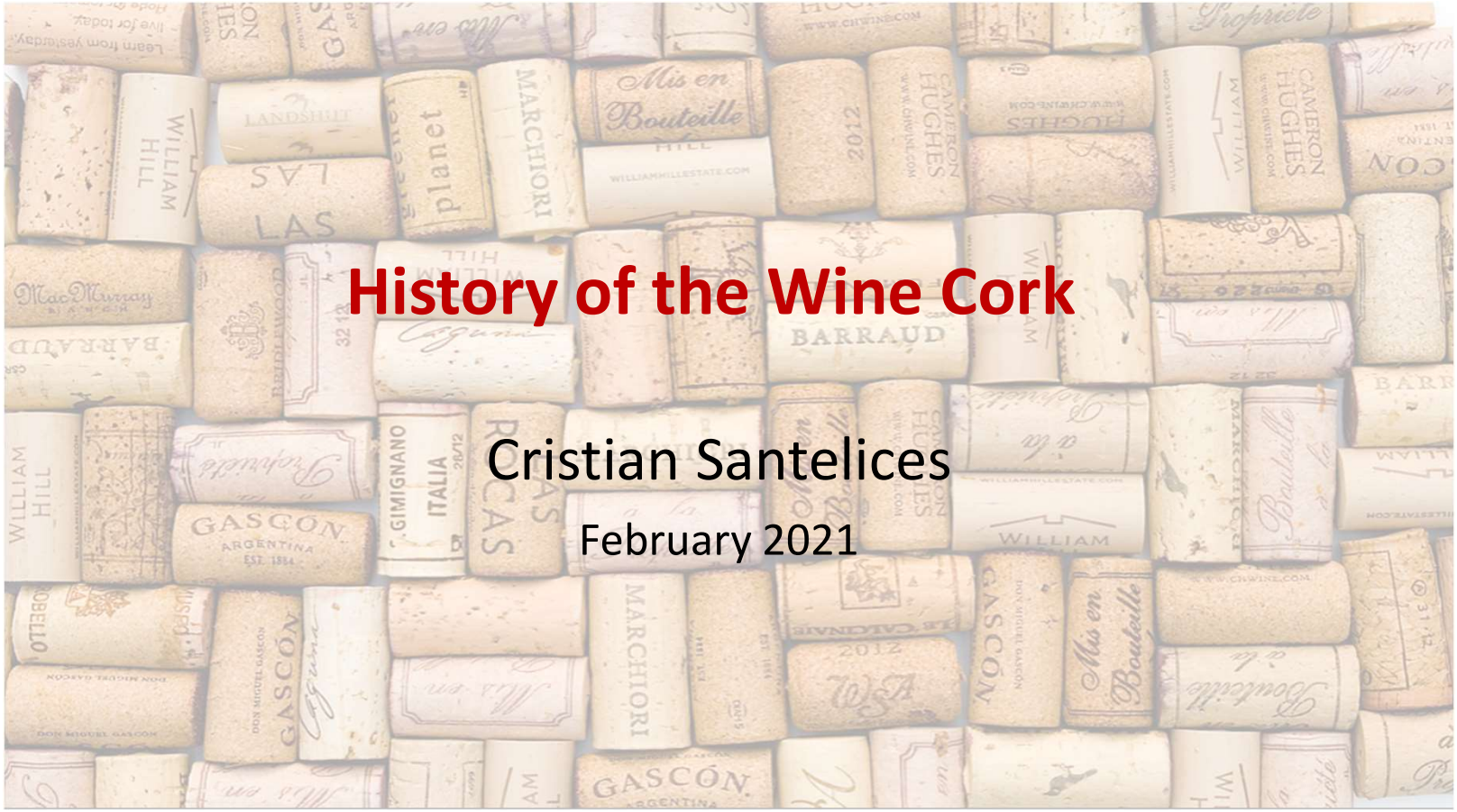


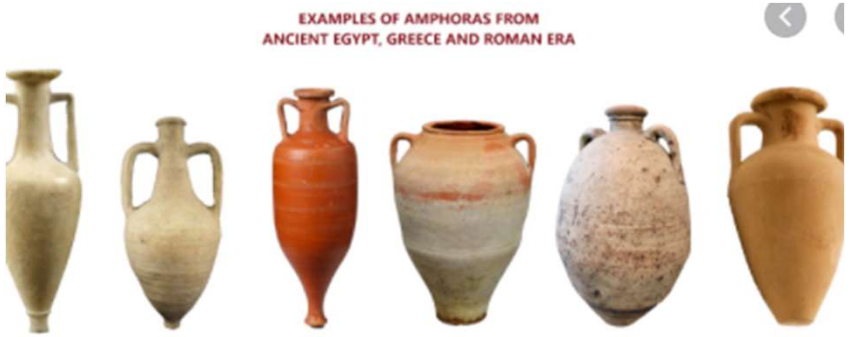
History of the Wine Cork

Cristian Santelices

February 2021

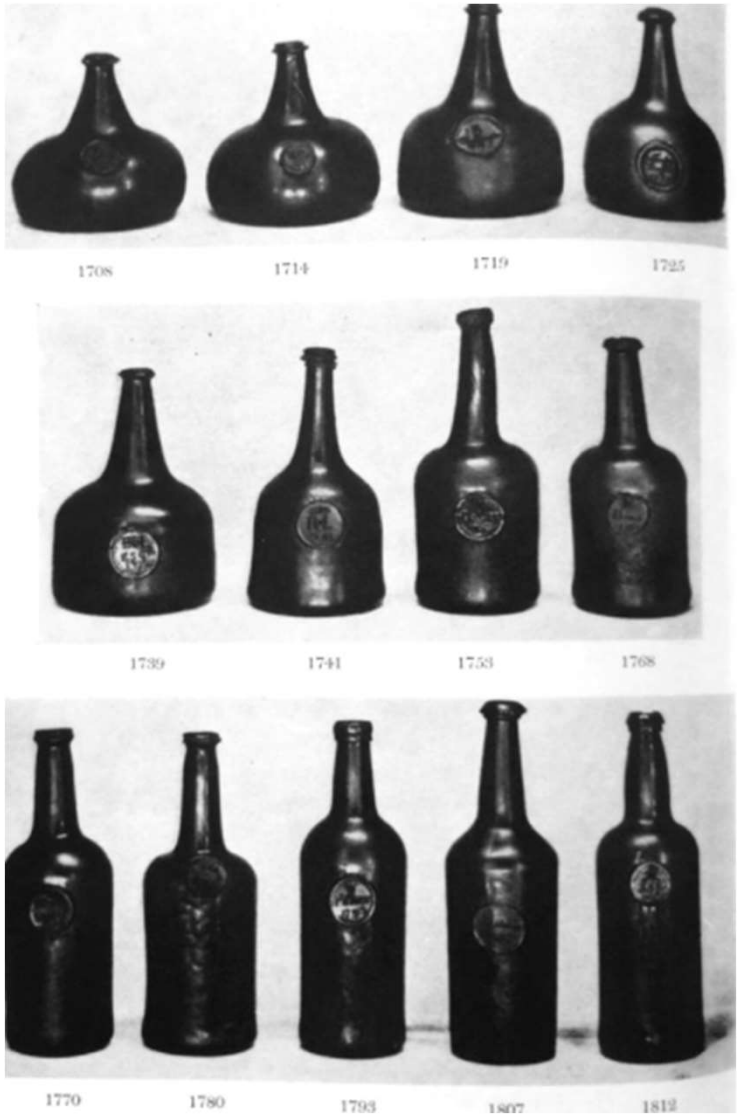
Historical context

- Corks have been found in Roman shipwrecks dating from the fifth century BC.
- Wine was mostly shipped in barrels and served to the customer in decanters.
- Several materials were used as bottle sealants, cloth or leather was the primary choice, later followed by clay and sealing wax stoppers. Glass was used a sealer by the 1500's



Historical context

- Cork started to become the sealing material of choice in the late 1600's after Kenelm Digby in 1632 introduced a bottle-making technology that was able to produce strong and inexpensive glass containers
- At that time wine it was quickly discovered that corks could seal the wine in the bottle, severely retards the oxidation process, allowing the wine to age and evolve slowly over time.



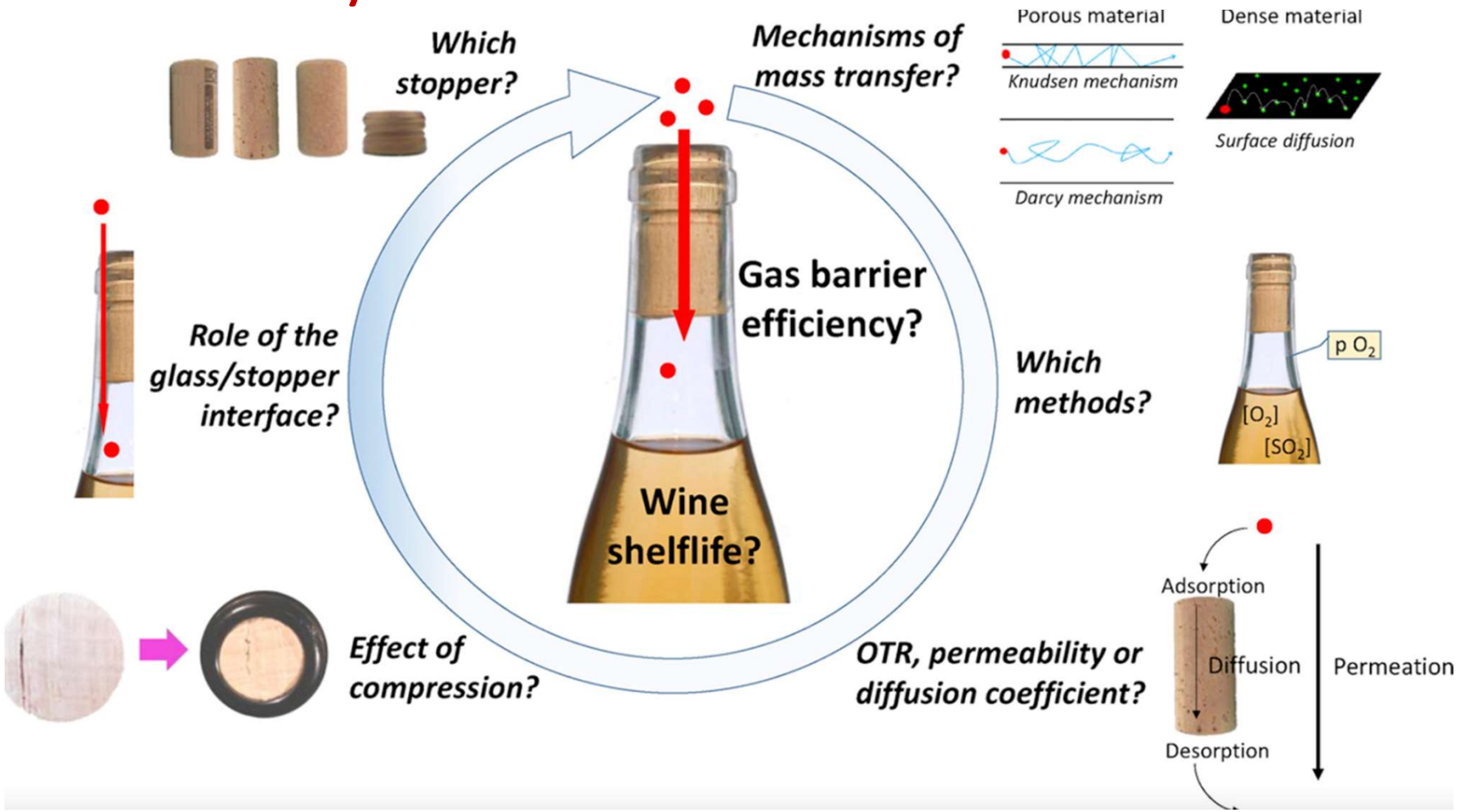
Historical context

470 *This cork idea of yours is great! How do you get it out?*

Cork Physical Attributes

- Natural cork provides unique physical properties that are perfectly suited for **preservation and development** of fine wine
- Best corks allow close to **1 milligram of oxygen to enter the bottle each year**. This is just the right amount of air to **remove the sulfites** that were added in the bottling process to keep the wine fresh and to avoid the harmful effects of oxidation. This small amount of air is perfect for helping age-worthy wines develop their complexities **while the tannins are busy softenin**g.
- Cork's intricate cell structure, joined together like minute "honeycombs", creates a material that is compressible, resilient and impervious.

Cork Physical Attributes



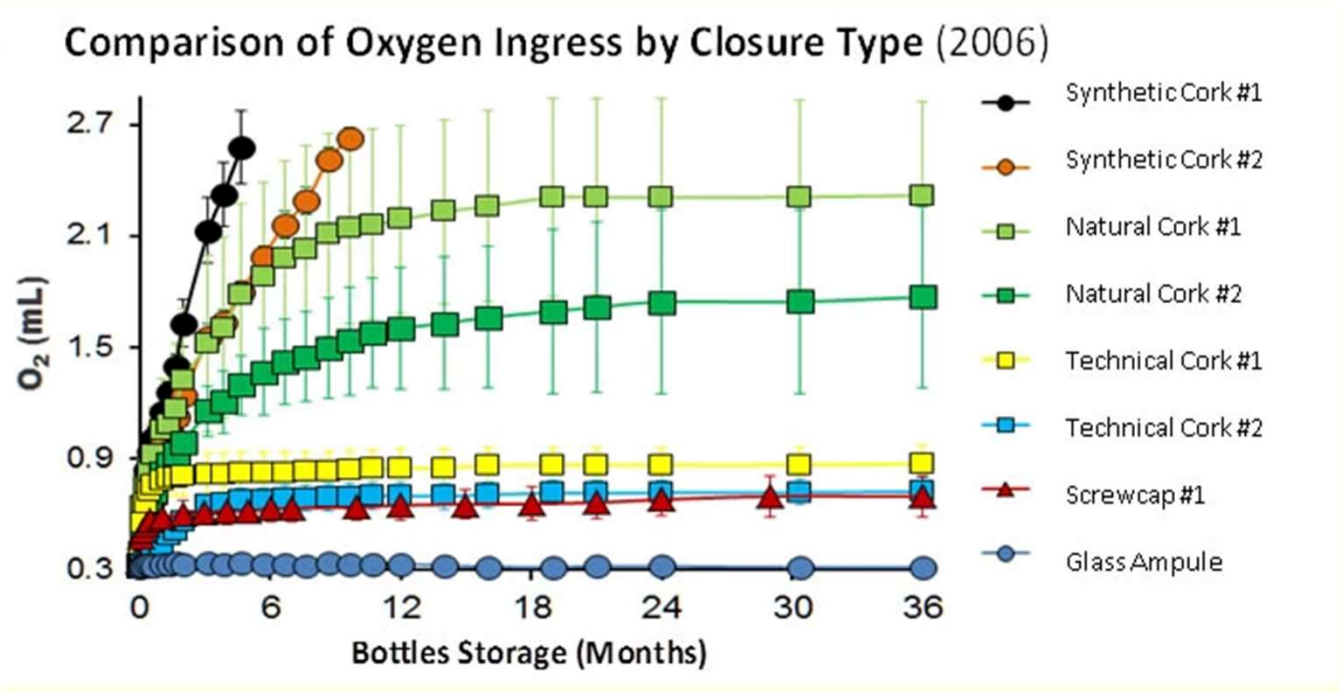
Cork Physical Attributes

- Oxygen ingress with **natural corks is primarily a result of diffusion**. A typical 44mm cork contains an estimated at 3.5ml of oxygen. When the cork is compressed the internal air pressure increases to between 6 and 9 atmospheres. This establishes a pressure imbalance that is solved by the gradual equalization of gasses between cork and headspace.

- Studies of oxygen ingress show that bottles with natural cork "pick up" a small amount **of oxygen over the first 6-9 months of aging**. After the initial diffusion period, additional variation of oxygen ingress was not observed.

- **Artificial closures** provide oxygen ingress primarily through **permeation**. Oxygen passes directly through the closure from the outside air. This can happen at a controlled rate, but unlike diffusion, the permeation does not stop. Oxygen continues to enter the bottle at whatever rate is determined by the closure.

Cork Physical Attributes



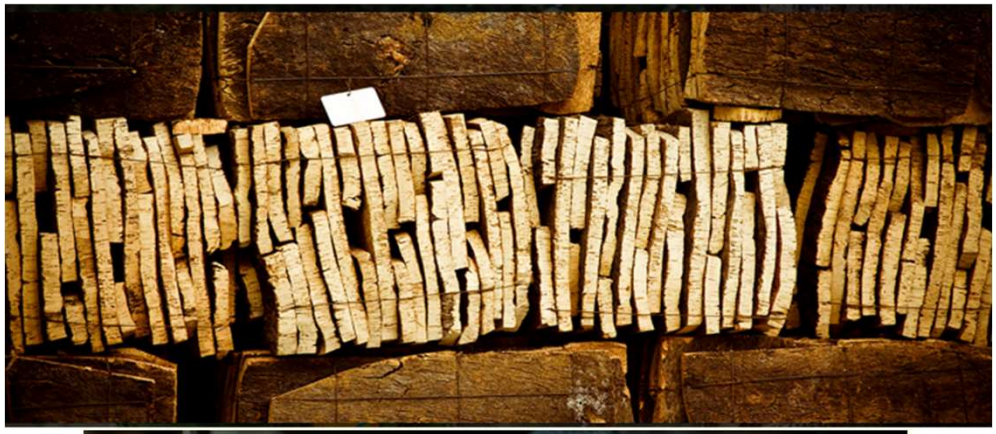
How Wine Corks are Produced

- Cork is produced from the sponge like material taken from cork oak trees, also known as *Quercus Suber,* with a lifespan of between 150 and 250 years. The trees are quite tall, reaching up to 60 feet high, and 12 feet in circumference when fully grown.
- Cork oak trees are grown primarily in Portugal and Spain. Cork oak trees are also planted in Morocco, Algeria, Tunisia, France and Italy
- The tree reaches maturity after around 25 years of growing. Once maturity has been reached, specially trained cork harvesters will begin to strip the bark. Cork bark is only harvested once, every 9 years or so. Cork continues to regrow after the bark has been harvested
- The whole process of removing the bark is done by hand. Together they can strip a tree in 15-30 minutes, totaling 15-30kg of bark worth around 25 euros

How Wine Corks are Produced

- The bark will be left outside for a few months to cure (up to 6 months). The planks of cork will be loaded up on palettes and taken to a processing facility to be cleaned
- Firstly they will be boiled, which helps to both clean the cork and soften it up. The water it is soaked in will also contain a fungicide to ensure that the cork is free of any bad fungus or mold
- Each plank is then graded based on quality and cut into smaller strips. The best cork is sent to be hand punched into corks, while the rest will be ground up to make technical corks. The top grade cork will be the most expensive, and will be used to make the best wine bottles
- After the three-week resting period, the trimmed planks are sliced into strips along the length of the plank. Corks are punched from the cork strips with a sharp, cylindrical knife. The knife determines the corks width. The height of the strip determines cork length

How Wine Corks are Produced



Cork industry Statistics

- Of the 340,000 tons of cork that is gathered each year, only 15% of that gets made into wine corks. The wine industry brings over 70% of the cork industry's revenue from that amount!
- Worldwide cork production is estimated to be slightly less than 13 billion wine stoppers per year
- The cork industry employs an estimated 100,000 people throughout the Mediterranean region.

Country	Forest Area Hectares	% of Worlds Forest Area	Production Tons (000)	% of Total Production
Portugal	737,000	34%	100	50%
Spain	574,000	27%	62	31%
Morocco	383,000	18%	12	6%
Algeria	230,000	11%	10	5%
Tunisia	86,000	4%	7	3%
France	65,000	3%	5	3%
Italy	65,000	3%	6	3%
TOTAL	**2,119,000**	**100%**	**201**	**100%**

Industry Segment (Portugal)	Value in Euros (millions)	% of Total Value
Wine Stoppers	€ 711	72%
Building Materials	€ 247	25%
Raw Materials	€ 12	1%
Other Products	€ 17	2%
TOTAL	**€ 987**	**100%**

Cork Taint

- **Cork taint is an absolute wine fault**. The primary compounds responsible for cork taint are trichloroanisole (TCA) or tribromoanisole (TBA), the compounds form through the interaction of plant phenols (from the breakdown of lignin) chlorine and mold
- Though modern studies have shown that other factors can also be responsible for taint including wooden barrels, storage conditions and the transport of corks and wine, the cork itself is commonly considered to be responsible.
- To ensure that the **cork doesn't dry out** and allow harmful oxygen into the bottle, humidity in a wine cellar should be between 50% and 80%. And while such high levels of humidity are beneficial for the corks, they're just as helpful to mold spores
- Corked bottles of wine remains a serious problem in the wine industry as many people think that it effects between 5% to 10% of all wine undrinkable.

Cork Taint


CORKED WINE
TCA or 2, 4, 6, Trichloroanisole
HOW TO DETECT IT
YOU CAN SMELL IT.
STRONG TCA:
Musty
Wet Cardboard
Wet Newspaper
Wet Dog
FAINT TCA:
Lack of aromas
Very little taste
Not as promised
CAN I FIX IT?
NOT REALLY.
A plastic called PVDC is known to bind to TCA and pull it out of wine, but it's no longer easy to find. PVDC used to be the polymer in plastic wrap.
the culprit.
WINE FOLLY

Alternative Non-Cork Closures for Wine Bottles

- Alternative closures to cork are being tested in many different wine producing countries. Perhaps Australia has embraced screw-caps more than any other country. The practice of using aluminum screwcaps to seal wine bottles began in Australia and New Zealand in the 1970's
- Studies have shown that not all screwcaps enclosures are applied correctly. The lack of a perfect seal causes the wine to experience premature oxidation.
- Synthetic corks created from plastic have made vast improvements since they were first introduced. Today they are created to look exactly like natural corks. The problems with synthetic corks is the lack of a perfect seal. In turn that allows more unwanted air into the bottle, causing the wine to oxidize.
- Because the plastic corks allow air to integrate at a faster pace than normal corks, some winemakers actually prefer it.

Alternative Non-Cork Closures for Wine Bottles

DIAM

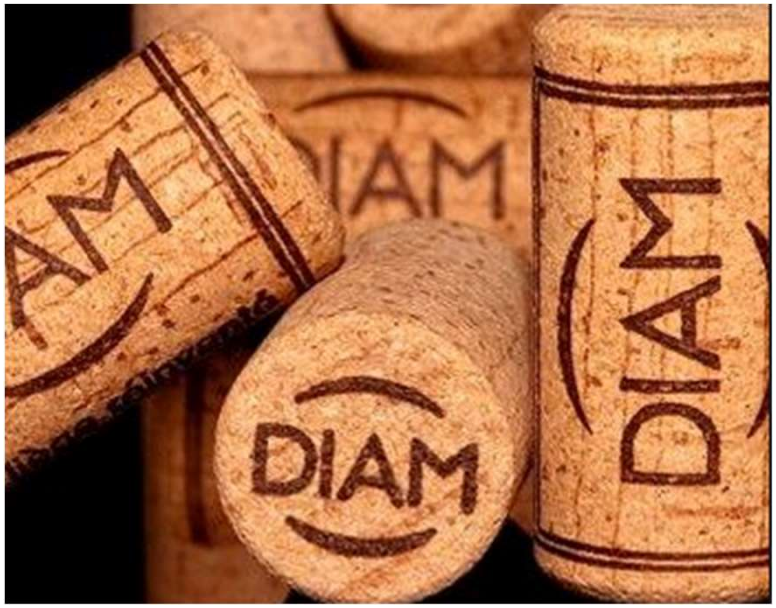
- Some producers that prefer cork, and want to further reduce their risk to TCA infected bottles have been using DIAM. DIAM is made from natural cork, but instead of using large sheets of cork bark to make the cork, the cork is produced from small pieces of cork particles that have been glued together to form a cork

- DIAM is in a sense an 'alternative' closure, but it fundamentally remains a cork product. After cork is break down down into tiny particles is treated using their patented supercritical Co2 DIAMANT technology. The Co2 can penetrate deeply into the cork and remove any compounds of TCA.

- As a result of the DIAMANT technology, the cork Diam uses is free of flavour, void of TCA, and many other substances causing flavour modification known as scalping.

- Diam is currently run by Dominique Tourneix, a former food processing engineer who was responsible for assessing the best and most efficient way to manage food. Diam's patent is near expiration, meaning theoretically competitors will be able to enter the market

DIAM


DIAM
DIAM
DIAM


Guaranteed without cork taint
and other flavour modifying factors
Tailored permeability
to match every wine's requirements
Batch consistency
Identical ageing from one bottle to the next
DIAM
The nobility of cork
Consumers love cork best
Eco-accountable manufacturing
Environment-friendly
Protects flavour and aroma

Champagne Cork

- The most significant development occurred in the 1600s, when Dom Pérignon, developed his methode champenoise. The wooden stoppers used to store still wines had considerable disadvantages when applied to sparkling wine. Dom Pérignon successfully adopted cork stoppers and cork soon became essential for wine bottling.

- According to legend, a French monk named Dom Pérignon realized that a cork could seal in the fizz and flavor of Champagne after he saw Spanish travelers using tree bark to plug their water gourds.

- Historians do know a good deal about how corks were used in the 18th century, in part because King Louis XV issued an edict governing Champagne bottling. Back then, workers wedged corks in by hand, yoking them with three pieces of twine to keep them in place. Even so, these corks could erupt without warning, giving Champagne a risqué reputation and the nickname “devil’s wine.”

Champagne Cork

The Future

- Portuguese closure manufacturer Cork Supply has unveiled new TCA extraction technology that it claims can achieve a success rate of 99.85% in eliminating the risk of cork taint in cork-sealed wines provide an alternative for those who question the efficacy of DIAM
- Alternative closures will continue to grow in prevalence in the near future, that corks will remain a fundamental form of closure for many years to come.
- Many consumers, rightly or wrongly, associate cork with quality, there is also the romantic notion of opening a bottle under cork, and additionally, producers show a preference for ageing under high-quality cork
- But with all the alternative enclosures available these days, by 2016, it is estimated that only 70% of all wine bottles today are sealed with natural corks.

Other uses of Cork…

Other uses of Wine Cork…

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