



CHANGING *the* PARADIGM

*press*BOOK





*press*BOOK

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SIX GENERATIONS *of* COOPERS



ABOUT *the* COMPANY

1

PRODUCTION SITE
LOCATED IN COGNAC

85%

OF PRODUCTION IS
EXPORTED

15 000

BARRELS PRODUCED
EACH YEAR

SIX GENERATIONS *of* COOPERS



As the sixth generation of Vicard coopers, my passion for this profession and my contact with winemakers from all around the world made me quickly realize innovation is how future generations of Vicard coopers will lead the industry.

My goal is to produce homogeneous and reproducible high quality barrels, that will meet the expectations of our winemaking partners.

My ambition is to work alongside you in the signature of your wines, sharing my know-how to find the triangular balance between oak, toasting and wine. And my biggest challenge is responding to a requirement of excellence while maintaining an eco-responsible approach.

Thank you for your trust. I hope to offer you, through our different lines of products, the best foundation for your wine.

JEAN-CHARLES VICARD
CEO *of* Vicard Generation 7



2012

COMPANY
CREATION DATE

1 200 m³

ANNUAL STAVE
PRODUCTION

150

CASKS & TANKS
PRODUCED EACH YEAR

· THE COMPANY ·



· COMMITMENTS ·
toward the environnement

ANOTHER APPROACH *to* BARREL-MAKING

CHANGING *the* PARADIGM

Part of the Vicard Group and named in honor of the 7 generations of Vicard coopers, Vicard Generation 7 uniquely combines over 100 years of artisan knowledge with cutting edge technology. Jean-Charles Vicard founded Esprit de Dryades in 2010 to focus his research team on techniques and innovative methods to combat the variations found in traditional coopering. After 3 years of intensive research and trials, he launched Vicard Generation 7 Tannin Selection barrels in Europe and the USA. Based in Cognac with 8 hectare park dedicated to maturation, the company produces 15 000 barrels per year and more than a hundred casks and tanks (85% of production is exported).



100% VERTICAL INTEGRATION

The Vicard Group owns and operates 2 stave mills. Our primary mill, Merrains du Périgord is PEFC certified. Incorporation of stave mills at the Vicard Group is a strategic choice and is essential for ensuring a fully traceable, consistent and reliable supply chain for the future.

the TANNIN POTENTIAL

The key component of Generation 7 is the Tannin Potential (TP) technology which provides a quick and reliable measure of ellagitannin content in untoasted oak wood. When combined with molecular toasting, the resulting barrels not only deliver specific flavor and texture profiles, they are reproducible and homogeneous.

a UNIQUE TOASTING PROCESS

With our unique molecular cooking system, Vicard Generation 7 offers a selection of two categories of consistent and reproducible toasts (Gradual and Innovative). The different toasting profiles were developed with the goal of mastering the expectations of our clients regarding precision and is based on the equation of "selection of raw material · toast · wine · aging period".

This new system utilizes computerized technology and radiant heat for the purposes of providing homogeneity, reproducibility and precision.

ITS EXPERTISE AND INNOVATIVE SPIRIT ELEVATES VICARD
GENERATION 7 AS AN INTERNATIONAL REFERENCE.

100% REPURPOSING *of* RAW MATERIAL LOSS

Material loss is an integral part of the manufacturing process of barrels. Green losses from stave production account for 70% and dry losses during barrel coopering make up 30%. Vicard Generation 7 upgrades 100% of these losses into other products.

SIGNIFICANT WATER CONSERVATION

Vicard Generation 7's eco-responsible strategy includes reducing water consumption using innovative strategies:

- Pressure testing using steam instead of water allows conservation of more than 20L of water per barrel produced.
- Molecular toasting of barrels by radiant heat uses 98% less water compared to traditional toasting methods.



ECO

to PROGRESS FARTHER

Vicard Generation 7 has implemented a range of sustainably resourced barrels developed to utilize the previously unused parts of traditional cooperage oak.

70%

OF RAW MATERIAL LOSSES
FROM THE LOG TO THE BARREL
REDUCTION

100%

OF THESE LOSSES ARE
UPGRADED AND USED BY
VICARD GENERATION 7

98%

WATER CONSERVATION
ACHIEVED WITH THE
TOAST



· VICARD GENERATION 7 ·
tannin potential & molecular cooking



· ECO RANGE ·
sustainable alternatives



CHANGING *the* PARADIGM

With the introduction of the Vicard Generation 7 range, the group utilized innovative solutions in their search for homogeneity and reproducibility of barrels. Although the molecular cooking process made significant advancement in the precision of our products, we realized we had not fully mastered the variation of raw material. The research into this variation, initiated in 2008, was focused on the classification of staves based on their ellagitannin content. This breakthrough allowed us to reach our goal and launch the Vicard Generation 7 range.



THE TANNIN POTENTIAL (TP)

A reliable and quick measurement methodology of the ellagitannin content in unheated oak. Innovative wood selection process yields homogeneous TP barrels with no variation.



SELECTION
OF STAVE
WOOD

The ellagitannin content is measured after machining and before assembly, using near-infrared spectroscopy. Each stave is analyzed and sorted by tannin level and barrels are then cooper by tannin level yielding homogeneous barrels with characterized and reproducible tannin potential.

MOLECULAR COOKING

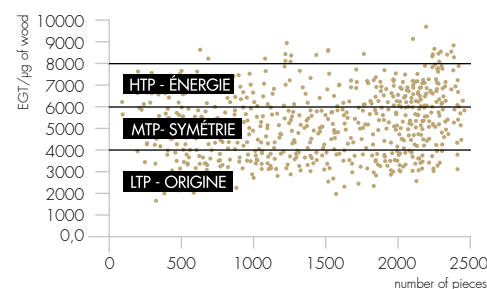
An innovative and unique process leading to a precise, homogeneous, reproducible and respectful toasting of the wood. Offers the possibility of adapting the toast to every class of tannin potential.



A
UNIQUE
TOAST

Toasting begins with brief 4-minute steam bending in which the barrel is bent but not chemically altered. The toasting system, using radiant heat, is unique in the cooperage industry. The fully automated process provides winemakers with a range of exciting toasting options which are precisely matched to the tannin level of the barrel.

THREE CLASSES of TANNIN POTENTIAL



ORIGINE /
LTP - THE TERROIR

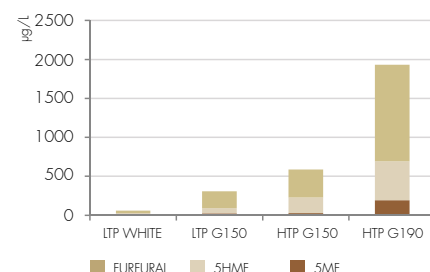
Low Tannin Potential Selection (LTP). **ORIGINE** adds minimal tannins while offering all the benefits and complexities of oak aging. Characterized by fruity, bright notes with a focused palate.

EGT/μg of wood 2,000 to 4,000

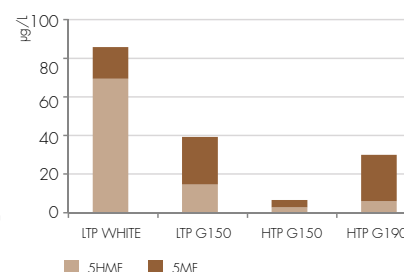
TECHNICAL CHARACTERISTICS

SENSORIAL IMPACT

FURANIC ALDEHYDES



WHISKEY LACTONES



SYMÉTRIE /
MTP - EQUILIBRIUM

Medium Tannin Potential Selection (MTP). **SYMÉTRIE** offers an intermediate profile combining structure and tension while respecting the fruit.

EGT/μg of wood 4,000 to 6,000



ÉNERGIE /
HTP - STRUCTURE

High Tannin Potential Selection (HTP). **ÉNERGIE** works on the register of volume with a contribution of structure and full bodied fruit.

EGT/μg of wood 6,000 to 8,000

Capacities: 225, 228, 300, 350, 400, and 500 L · Toast: please get in contact with us. Each profile is available in Staves version.

A RANGE of BARRELS *for the* BENEFIT of SUSTAINABLE DEVELOPMENT

Complying with the technical restrictions of the grain during processing generates 70% of our raw material losses. Vicard Generation 7 transforms these losses by 100%. The ECO Range of barrels play a key factor in the repurposing of this wood while proposing highly competitive products.

ECO 3

ECO RESPONSIBLE BARRELS

The ECO 3 main feature is in its composition which consists of an assembly of micro stave remnants (narrow stave width but standard thickness and respect for the wood fiber thread). During construction, two small, non-standard width staves are joined together using the Patented slotsaw assembly process to obtain a standard dimension stave.



Patented slot-saw assembly process

BENEFITS

OPTIMIZATION OF THE OAK

The use of discarded stave remnants during the manufacture of staves, allows us to recover an additional 3% of the wood.

MORE MICRO-OXYGENATION THANKS TO THE SLOT-SAW ASSEMBLY PROCESS® TECHNIQUE

- Highlights the fruit and volume in the mouth
- Optimization of the colloidal stability
- Early elimination of reductive aromatic notes
- Reduced maturing period

AWARDS

Citation **VINITECH 2014** / Coup de Cœur **AGROVINA 2016**

to SUMMARIZE



IDEAL SHORT AND
MEDIUM -TERM
MATURING



INNOVATIVE
ALTERNATIVES



ECONOMICAL



RE-EVALUATION OF
WOOD WASTE

ECO 27

ECONOMIC ALTERNATIVE

ECO 27 : an innovative product providing economic and oenological benefits

USE OF STAVE WOOD

Staves fabricated using previously unused upper parts of the oak for barrel manufacturing.

MASTERY OF WOOD SAWING AND TIGHTNESS

Using laser guided technology, our stave mill follows the wood fiber to cut the staves. At the cooperage, patented injection technique of food paraffin under pressure into the wood fibers optimizes the tightness of the product.



SPECIAL TOAST PROFILES

ECO 27 is offered with four toast profiles for a short and medium-term maturing objective (Traditional Medium/ Medium +, Long Medium/Medium +).

AWARDS

INNOVATION+QUALITY AWARDS 2016

ECO SELECT

ECO27 TANNIN POTENTIAL SELECTION

Special selection from the best staves ECO27, available in two tannin potential (low & mix medium/high). Gradual toast available.

GOOD to KNOW

ECO 3, due to its manufacturing process, available in limited quantities.

our PRESS RELEASES



UNITED STATES

04/2014 – VINEYARD & WINERY MANAGERMENTS
02/2015 – WINES & VINES
05/2016 – WINE BUSINESS MONTHLY
12/2016 – WINE BUSINESS MONTHLY
02/2017 – WINES & VINES

Cooperages such as Vicard are rethinking the way traditional barrels are made.



Wooden barrels and tanks appear to look the same as they did centuries ago, yet so much has changed inside and out. One of the oldest vessels for holding liquid is still in use, and continues a rapid evolution as cooperages strive for greater environmental sustainability, cost savings and consistency. Some coopers adopt materials such as steel and Plexiglas, seeking better performance. Others change how barrels are made as they work toward greater consistency. The conventional toasting process – putting a nearly complete barrel over a fire – has been enhanced by computerized toasting and carefully controlled

fires that apply a consistent heat to the wood and reduce blistering. One the newest barrels comes from Esprit de Dryades, the research and development arm of the Vicard Group. Jean-Charles Vicard, head of the Cognac-based company, has been obsessed with attaining barrel consistency. So for the Vicard Generation 7 barrel, released in September 2013, Esprit de Dryades abandoned the conventional method of coopering barrels by forest and grain and instead relies on sampling that reflects the actual tannins in the wood. Then coopers make the barrel in a process Vicard developed to control for variables in the process.



The Vicard Generation 7 barrel was created to deliver consistency year after year.

"How many winemakers have ordered 30 fine-grain, medium-toast barrels and ended up with their favorites, the middle and the outliers?" asked Christy Thomas of Esprit de Dryades. "Jean-Charles feels he is on a path to deliver the

holy grail to winemakers: the same barrel year after year."

Vicard found that customers could not quantify the difference in the outcome among wine from barrels made from the nine oak forests of France. Even if they could, those differences would be impossible to replicate, he found. Even within a forest, one would find barrel-to-barrel and year-to-year inconsistencies. But the actual measurable tannins in the wood, rather than the tightness of the grain, proved the most consistent measure. Wide grain is considered less tannic and tight grain more tannic. But Esprit de Dryades learned the correlation is accurate just 70% of the time. Now, it tests for ellagitannin levels, then sort and cooper barrels accordingly.

Mirco-perforated staves are steam-bent for no more than four minutes, the point after which the hydrosoluble tannins in the wood are extracted. The tiny slits are no more than a millimeter deep, shallow enough to prevent contamination.

The fire is fueled by a spaghetti-like wood waste agglomerate fed by an auger and an air vent governed by a computer programmed to the toast level. The fires burn within a double cone shaped like

a fat cigar that extends to the top of the barrel. The barrel itself rotates around the stationary cone so heat, rather than fire, toasts the barrel. Vicard calls this process "molecular toasting."

The G7 red-wine barrel goes through a gradual toast, starting at 180°F and increasing 10 degrees every 20 minutes, resulting in a toast that nearly goes through the stave. The entire toast process takes place in a box that controls for ambient air, and has a 2-degree margin of error.

"Coopers will tell you barrels toasted at 7 a.m. are different than those at 3 p.m.," Thomas explained. "The toasting box is another piece of the process that controls for variables."

When a customer finds a barrel that works for him or her, the profile is saved and that barrel can be produced again and again, Thomas said, with consistent results.

AT A GLANCE

- + Economic demands are driving wineries to look for new barrel options.
- + Innovations include steel barrels fitted with oak staves and barrels with transparent staves that allow for a view of fermentation in action.
- + With high-tech assays of oak quality and more tightly controlled manufacturing and toasting, barrels become ever more consistent within brand and even year to year.
- + Among conventional barrels, the range of options available to winemakers continues to grow.

"We aren't saying these are the best barrels on the market," she said. "We are saying that if you can find what you want in a G7, you can get the same effect year after year."

The G7 barrels are categorized by tannin level: Symetrie, low tannin, Originie, medium tannin and Energie high tannin. High-tannin barrels are popular in Burgundy, Thomas said, where wineries pair them with neutral barrels to get more bang for the buck. Last year, Vicard sold several thousand of the barrels, mostly in Italy and France.

Prices range from 680 euros for a Burgundy barrel to 870 euros for a Bordeaux chateau style.

PROVING ITS METTLE

Vista, Calif.-based Modern Cooperage wants to do away with some oak barrels, offering a metal barrel with an inner stave assembly



The Modern Cooperage barrel is made from steel and features an interior stave system.

that makers say saves money and gets results at least as good as a wood barrel with inner staves.

To prolong the life of neutral wood barrels, a winery may pay \$50-\$70 to have the head removed, plus the cost of the staves. Even those staves will lose their ability to impart character to the wine and the process will have to be done again.

"A wood barrel loses the ability to impart flavor rapidly and the longer you have it, it becomes a money pit," said Patrick Pickett, a winemaking consultant with Modern Cooperage. "You keep putting money in and getting less out."

In early 2013, Modern Cooperage released a steel barrel with an inner stave system accessible through the top of the barrel that requires no special skill to maintain or use. Modern's goal was to have a steel barrel that works seamlessly with existing cellar equipment.

The barrel's profile is similar

to an American or Bordeaux import barrel. It will sit easily on a Western Square or similar rack. The bung-hole is in the conventional place. It accepts standard staves available from a number of manufacturers. The barrel has a capacity of 79.5 gallons before accepting as many as 25 staves that clip onto the assembly. Every 10 staves displace about a gallon and Pickett said between 10 and 14 staves offers the extraction one would get with a new barrel. With the range of staves available, winemakers' options are infinite.

With a life of 30-40 years, the Modern Cooperage barrel cost amortized over time, including French oak staves, works out to about \$100 annually.

"This allows you to get an equal contribution of oak at a lower price," Pickett said.

While the barrels can be used for reds and even as fermentation vessels, the initial interest has been from chardonnay makers, Pickett said. The stave assembly has a paddle that serves as an integrated lees stirrer. With a crank handle with two rotations, cellar workers can stir the lees without opening or moving the barrel, reducing the risk of oxygenation and the need for sulfite additions. Like changing staves, stirring doesn't require any special skill. Also, the barrels don't lose wine to evaporation, so they won't need topping off.

Modern Cooperage is also marketing the sustainability of steel barrels – saving trees – to combat a persistent industry stigma around steel barrels and staves. (An oak tree takes more than a century to reach maturity to yield two to four barrels.) While several wineries are using the steel barrel with good results, Pickett is hesitant to share their identities because they are worried about image, and fear a steel barrel and staves may be viewed as inauthentic or taking a short cut.

"When you are using staves, you confront a perception issue because it is nontraditional. I compare it to the feelings people had about Stelvin closures 10 years ago," Pickett said. "Winemakers fall along similar lines as the general public: Some want to attach to tradition and others are interested in new technology that promises better quality."

An oxygen delivery system is the works that will allow micro-oxygenation in Modern Cooperage barrels.

INSIDE FERMENTATION

Once wine is in a barrel or tank, the winemaker doesn't have much chance to see inside the fermentation. Checking through a bung-hole or tank top can offer some information about what is going on, but a surface glimpse isn't the same as a top-to-bottom view.

The idea for a transparent-stave vessel sprang from Seguin Moreau's participation in a design competition for the new cellar at Château Mouton Rothschild. One of the specifications called for oak tanks that gave winemakers the ability to see inside the fermentation process. Six years of research and prototypes yielded the Seguin Moreau Transparent Stave

Tank which looks conventional at first. One could miss the two see-through staves running top to bottom, made of food-quality Plexiglas. In 2011, Seguin Moreau delivered 44 vats fitted with transparent staves and retrofitted some others at Mouton.

The new cellar and tanks were unveiled in June 2013, after which, according to an agreement with the winery, Moreau may offer the transparent-stave option more broadly. Christopher Hansen, general manager of the cooperage's Napa, Calif., division, said the stave option is now offered on upright tanks between 20 and 220 hectoliters, for 1,000 euros. A version was set to be unveiled in the United States at the 2014 Unified Wine & Grape Symposium in Sacramento, Calif.

"Coopers have been putting Plexiglas heads into barrels for many years," Hansen said. "We and Mouton wanted to do this for upright tanks."



Seguin Moreau created tanks with transparent staves for Château Mouton Rothschild. The see-through staves allow winemakers to view fermentations in action.

Tanks need to have a minimum of two transparent staves to allow enough light into the closed vessel to be able to see into the wine, especially a red wine. The clear

staves allow a top-to-bottom view of the fermentation to enable winemakers to see the range of activity at a glance – from filling of the tank and the vigor of fermentation to the

formation of the cap and the efficacy of punchdown and pumpover.

BEYOND CURIOSITY

Jason Moulton, an associate winemaker at Brassfield Estate in Lake County, Calif., said he isn't sure being able to see into a fer-

mentation would do much more than satisfy winemaker curiosity.

Seeing the turbidity of the must would help him better determine what valve would yield clear juice for pumpover, he said, but most of what he needs to know he can find out from testing.

"Transparent staves are interest-

ing and fascinating from an aesthetic and educational perspective," Moulton said. "Having the ability to see into a tank isn't something I'd consider critical to a winemaker or to wine quality."

Hansen said hospitality played into Mouton's plan with its cellar renovation and agreed that the stave option is not for everybody.

LESS-OAKY OAK

Cooperage 1912 of Napa Valley recognized the increase in cool-climate wine production and the conundrum faced by its makers: They want the influence of barrels but hesitate to put juice with beautiful varietal character and zingy acidity into vessels that could flatten the fruit and shave down the acids.

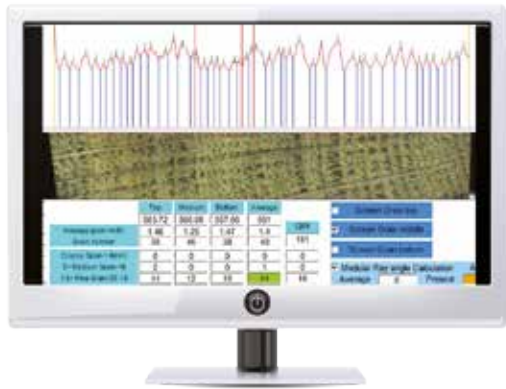
"Cool-climate wines tend to be very fruit-focused, with higher acidity and delicate overall tasting notes," said Cooperage 1912 sales director Jason Stout.

In response, the company added a Cool Climate series to its T.W. Boswell line of barrels, for winemakers who want all the benefits of oak barrels – micro-oxygenation, polymerization of tannins, wine-making tradition – but with less obvious wood character.

The barrels, set to debut at the 2014 Unified Wine & Grape Symposium, are made with extra-fine-grain French oak which Boswell grades by scanning growth rings. The wood is dried for 36 months before being coopered into what the company calls "low-impact" barrels. The Cool Climate line includes three different options, each designed for a different set of varieties.

David Falchek is a regular contributor to trade publications such as Vineyard & Winery Management and Beverage Media. He also writes a regular consumer wine column for The Scranton Times-Tribune, in Scranton, Pa.

Comments? Please e-mail us at feedback@vwmmmedia.com.



T.W. Boswell grain recognition technology

Tonnellerie Radoux OakScan



PRODUCT FOCUS

Barrel Stave Analysis

A few coopers are using specialized equipment to ensure barrel staves meet certain parameters for quality and consistency.

By Andrew Adams



Vicard Generation 7 barrel by Esprit de Dryades



Seguin Moreau Icone barrel

ESPRIT DE DRYADES

The Vicard Generation 7 barrel by Esprit de Dryades, which was founded by Jean Charles Vicard, was introduced to the North American market in 2013. The manufacturer scans barrel staves for their tannin content and then sorts based on low, medium or high levels of tannin. The cooper then assembles barrels with staves that have the same amount of tannin or with a blend of staves of varying tannin levels. The staves are then toasted using a computer-controlled process that applies an even level of heat to add another level of consistency.

vicardg7.fr

TONNELLERIE RADOUX

Tonnellerie Radoux's OakScan system was the market's first stave-scanning technique. It was introduced in 2009 and incorporated into the cooper's full production process in 2012. The system scans each stave as it enters the production chain and uses a proprietary algorithm to assign each piece of wood a tannin rating of 0 to 100. Staves are then sorted into three separate "selections" based on tannin level. Radoux is now using the system to sort high-tannin wood chips for fermentation and lower tannin wood for wine aging chips, as well as to sort its oak alternative staves by tannin level.

tonnellerieadoux.com

T.W. BOSWELL

T.W. Boswell uses "grain recognition technology" to calculate the exact number of rings per inch, which equates to the grain tightness. The machine can be set to certain parameters and will reject any staves that don't meet them. The process enables the cooper to ensure it is only making barrels with fine-grain staves that provide more desirable compounds and play a major role in the rate of oxygenation. The scanning helps ensure each barrel is produced with the maximum potential grain, and the grain parameters also provide consistency.

twboswell.com

SEGUIN MOREAU

For its premium Icone barrels, Seguin Moreau doesn't use a scanning system but rather applies representative sampling for chemical analysis through gas and liquid chromatography. The cooper says this system provides data for the full "enological characterization of wood," which it claims is more detailed and accurate than scanning.

seguinmoreaunapa.com

Product Focus is a regular feature about a certain type of product or technology. Send comments and suggestions to edit@winesandvines.com.

New Barrel Technology Uses Science to Produce More Consistent Product

A look at Dr. Marie-Laure Badet-Murat’s research on wood tannin potential and wine quality at the second annual Innovation+Quality conference

Curtis Phillips

AS READERS OF THE past several issues of *Wine Business Monthly* might have noticed, I’ve been thinking a lot about barrels. Like any natural product, the chemical composition of a barrel, or more specifically the wood used to make barrels, can vary a great deal. As winemakers we were taught, or learned from experience, that there is a considerable enological difference between oaks of significantly different species, although this is usually expressed as a simple and inaccurate dichotomy between American and French oak.

At *Wine Business Monthly*’s second annual **Innovation + Quality** (IQ) conference, which took place March 2 in the Napa Valley, Barrel Stave Selection by Phenolic Chemistry was chosen as an Innovative Product Category for the Innovation Awards, which honor those companies and products pushing the boundaries for new winemaking technologies. We recognized **Demptos Napa Cooperage** (Essencia), **Seguin Moreau Napa Cooperage** (Icône Concept), **Taransaud** (PureT), **Tonnellerie Radoux** (Oakscan) and **Vicard Generation 7**. This is also one of the reasons we invited Dr. **Marie-Laure Badet-Murat**, owner of **Enologie by MLM, Bordeaux**, to speak about the relation between wood tannin potential and wine quality at IQ 2016. Badet-Murat joined **Corey Beck**, president and director of winemaking at **Francis Ford Coppola Winery** as well as **Jeffrey Stambor**, director of wine-making at **Beaulieu Vineyard** and **Justin Seidenfeld**, winemaker at **Rodney Strong Vineyards**, to speak in the “Achieving Barrel Consistency” session.

The specifics of a single company’s method are less significant than the fact that by these various methods, coopers are trying to produce more consistent barrels that have a more predictable sensory impact on wines aged in them. What is significant is that multiple cooperages are using science to produce a natural product (e.g., barrels for winemaking) that is still natural yet gives predictable and reproducible results for the winemaker.



Curtis Phillips, an editor for *Wine Business Monthly* since 2000, is a graduate of UC Davis, and has been a winemaker since 1984 and an agricultural consultant since 1979.



Dr. Marie-Laure Badet-Murat, owner of Enologie by MLM, Bordeaux, spoke about the relation between wood tannin potential and wine quality at IQ 2016.

New Barrel Technology Uses Science to Produce More Consistent Product



SCOTT SUMMERS

The Many Sources of Variability

The task of minimizing barrel-to-barrel variability is not an easy one. Beyond the obvious differences in the starting wines and aging processes, Badet-Murat noted that differences in the raw material (oak), seasoning and toasting (This sentence looks like it was cut off). Each of these have their own multiple points of variance. For example, the raw material (the oak) can be a source of variability due to it’s species, intra-species genetic variability (i.e., genetic variability within a single species), geographic origin and silviculture.

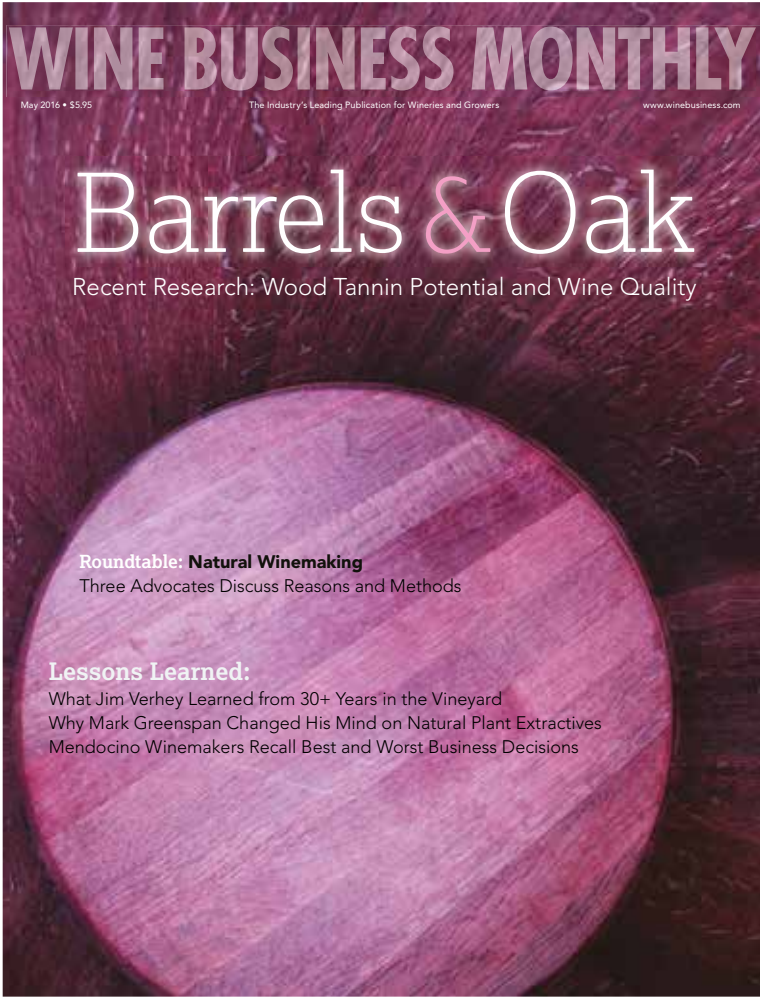
OAK

American oak (*Quercus alba*), or more properly American white oak since there are multiple oak species in the Americas, is certainly different from French oak, but “French oak” is not a single species, but rather at least two related and hybridizable species: European sessile oak (*Quercus petraea* AKA *Q. sessiliflora*), and European pedunculate oak *Quercus robur* AKA

Q. pedunculiflora). Both sessile and pedunculate oak are used in barrel-making under the French oak, Hungarian oak and European oak monikers.

One might expect that there are noticeable sensory difference between oaks of different species. French oak barrels have been traditionally sold as made from wood from a particular forest without noting if the wood used was *Quercus petraea*, *Quercus robur* or a mix of the two. Of course, *Q. petraea* and *Q. robur* are likely closely related enough that they can produce fertile hybrids; that it is just within the realm of possibility that the environmental differences between two different forests may end up being a bigger cause of stave-wood chemistry than the slightly differing genetic heritage between the two.

As it turns out, variability in the oak wood occurs at even smaller scales than between the two European oak or between any one forest versus any other. Even if we eliminate inter-specific variability and took only a single species from a single forest we’d still find a appreciable amount of variability in the resulting stave-wood. Worse yet, even staves cut from a single individual tree can have differing compositions.



New Barrel Technology Uses Science to Produce More Consistent Product

Variability Beyond the Forests
No matter the forest or the species, after the oak tree has been harvested there is still a great deal that happens during “seasoning” and toasting that alters the chemistry in the wood. If one were to take the same uncharacteristically homogenous log and split them into rough staves and season one third in southwestern France, another third in Missouri, and the final third in Chile, I would expect that there would be at least some slight differences between the three groups simply due to the differing climates of the respective seasoningyards.

Exercising Control
A cooper is a rare example of a true craftsman. One can’t really study how to raise and toast barrels at university, or even at a vocational college. Instead, a cooper usually learns the trade via an apprenticeship that is not all that different from being in a medieval guild. Bending staves and driving hoops is the easy part. The part of being a cooper that relies upon years of experience is the eye for choosing staves so that the wood-grain is consistent and the eye for monitoring the toasting level on the toasting floor. I have seen more than one cooperage that has large clerestory windows above the toasting floor so that the coopers don’t have to rely on color-shifting artificial light while they are performing this crucial task.

Control the Toast
We’ve seen plenty of research over the past 20 to 30 years that points to the dramatic role toasting plays in altering the chemical composition of the barrel-staves (see Swan, James, *AJEV*, 50:4:495-502 (1999) and Chatonnet, Pascal, *AJEV*, 50:4:479-494 (1999)). Sensorially important compounds like vanillin are composition products that are made from the thermal decomposition of lignin. Too little heat and/or time and little vanillin is produced. Too much heat and/or time and the vanillin itself can be “cooked” away. This, and other, research seems to have caused several cooperages to look into ways to exert more control over toasting and produce more replicable barrels.

As we gain a better understanding of the underlying chemistry, the obvious next step would be to control the process to a greater degree. Better control needs better measurement. The eye, even the highly skilled eye, is an indirect measurement at best. In short order, most coopers were using infrared thermometers to track the process. World Cooperage linked thermometers to computers that control the toasting fire for the infinitely repeatable, and customizable, Profile Series line. Other cooperages have taken approaches that differ in the details, but the goals are the same degree of control on the toasting floor.

Control the Source, Control the Process
Absolute control over toasting barrels won’t eliminate barrel-to-barrel variability. Even with stave wood of the same species, there is variance due to differing climate, soils and silviculture. Even the natural variability within a forest, within a single tree means that the chemistry for any given stave can differ a great deal from that of any other stave. The solution, then, is to analyze the staves and each company may have a differing set of criteria that they’re analyzing. Badet-Murat uses near-infrared spectroscopy (NIRS) to measure the ellagitannin content. Ideally, the end result would be that staves are grouped with other staves that have a similar chemistry.



SCOTT SUMMERS
Control on the toasting floor is something cooperages strive for.

New Barrel Technology Uses Science to Produce More Consistent Product

- Dr. Badet-Murat concluded her presentation at IQ 2016 with the following bullet points:
- The heterogeneity of oak wood composition, combined with irregular toasting protocols, can lead to substantial variation in wine perception after aging.
 - Oak selection by forest should be used with caution as it doesn’t reflect the heterogeneity of oak wood chemical composition.
 - Selection by grain allows some control of this heterogeneity, but variability remains high.
 - To achieve homogeneity, as well as take advantage of the high diversity in chemical composition, sorting by tannin potential at the stave level will yield better outcomes.
 - Rationalization of cooperage oak wood selection by tannin potential, combined with precise toasting management, is evidenced both by sensory and chemical analysis.
 - We expect this rationalization of wood sorting will play an increasingly important role as natural resources are more effectively utilized and the demand for a consistent product increases.

As I noted above, the exact specifics of any particular barrel company’s method or stave selection process are less significant than the fact that by these various methods coopers are trying to produce more consistent barrels that have a more predictable sensory impact on wines aged in them. [WBM](#)

Top Products

Vicard Generation 7
ECO 27

The ECO 27 barrel, made from the upper branches of 200-year-old French oaks, is a cost-effective option for winemakers who would like the oenological and marketing benefits of French oak barrels in their programs but at a dramatically lower price point. The ECO 27 technology uses multiple patented processes, including laser detection of high risk porosity areas in the medullary rays while the barrel is under high pressure and liquid paraffin injection targeted at leak points. The pressure is then reversed to a vacuum that pulls the paraffin into the leaks, effectively sealing them. Launched worldwide in 2014, the ECO 27 has quickly become a valuable alternative to the increasingly high cost and scarcity of American oak, not only with large wine groups but also with smaller high-end wineries that benefit from using “100 percent French oak barrels” on their second-tier wine marketing materials.



WHAT’S COOL: These barrels are made from the upper branches of oak trees that have already been harvested for traditional cooperage. This means more barrels can be produced from each individual tree.
For more information contact Vicard Generation 7, www.vicardg7.fr or www.vicardg7.com.

Impact of Oak Tannin on Red Wines

Trial at first-growth château examines effects of geographic origin, grain and tannin on sensory profile

By Marie-Laure Badet-Murat, Frédéric Desamais and Jean-Charles Vicard

For many years, the cooperage industry developed tools to select and classify oak with the goal of ensuring quality, precision and reproducibility in their barrels. Selection on the basis of geographic origin dates back to the early 19th century.^{1,2}

Selection according to morphological criteria such as the width of growth rings (grain), closely linked to forestry management methods and botanical species, was first applied about 50 years ago.^{3,4,5,6} In recent years, the market for fine-grain oak has grown dramatically. Some forests are so sought after that sourcing has become difficult, which in the long term could lead to the total depletion of large-diameter (60-80 cm) fine-grain wood resources.

The challenge for winemakers is to obtain barrels of known, homogeneous, reproducible quality. Therefore, it is necessary for cooperages to control the concentration of extractable compounds in oak.

Recent extensive research in the variability of the chemical composition of oak has highlighted an alternative selection criterion. Indeed, while selection by forest and/or grain is useful for controlling barrel quality, it does not reflect the tremendous variations in composition, both on an inter-^{7,8,9,10,11,12} and intra-individual level.^{11,13,14,15}

Barrel quality control and reproducibility are key concerns for winemakers, as barrel aging forms an integral part of each wine's

distinctive signature, and the choice of barrels can result in significant changes in a wine's sensory profile. For example, one experiment on four lots of 10 barrels revealed that a single barrel was capable of inducing a 50% variation in concentrations of major volatile compounds from oak in the final blend.¹⁶

Given this new data, the challenge for winemakers is to obtain barrels of known, homogeneous, reproducible quality. Therefore, it is necessary for the cooperages to control the concentration of extractable compounds in oak. In 2009, Groupe Vicard launched a research program aimed at controlling variability factors during barrel making.

This research led to the development of a specific range (Vicard Generation 7) based on wood selected according to its ellagitannin content.¹² Ellagitannins represent the majority of extractable compounds and contribute significantly to variations in composition and quality during *élevage*.^{17,18,19,20} Analysis using near-infrared spectrometry identified three main classes of tannin potential corresponding to distinct ellagitannin contents in untoasted wood.

This analytical approach to wood selection was accompanied by other innovations aimed at controlling the factors responsible for variability in cooperage: scarification of the staves (blister-free process consisting of micro-slits to allow water locked in the wood to escape naturally during the toasting process), short, automated steam-bending, and a unique process for toasting not previously

used in cooperage. Toasting using radiant heat in a fully automated and computer-controlled, closed system guarantees homogeneity, reproducibility and precision.¹²

This system also makes it possible to adjust toasting according to the tannin level of the oak. Because thermal degradation of ellagitannins varies according to toasting time and temperature,^{9,21} it is necessary to adapt toasting parameters to different tannin potentials. This is a fundamental aspect of this approach, because without complete control of the toasting process, the upstream classification of oak on the basis of its tannin content would be meaningless.

Combining this new oak selection and classification criterion with the toasting system described above produces barrels with known, homogeneous, reproducible tannin levels and has opened up avenues for further research.

What follows are the results of an experiment made from a single estate in two different vintages, with the objective to study the impact of geographic origin within French oak forests as well as grain width and potential tannin level of oak used in barrel making on the sensory profiles of red wines.

The results indicated for barrels with the same geographic origin and grain width, a considerable variation of major oak aromatic compounds was attributable to the tannin potential of the wood, which in turn had a significant impact on the sensory profile. With this new analytical method of oak stave selection and classification, winemakers are assured greater consistency and uniformity. However, this selection criterion must be combined with an automated toasting process capable of controlling thermal degradation of the oak tannin to achieve consistent and reproducible results.

Two-year trials in a Bordeaux first-growth château

The trial was conducted using Bordeaux barrels at a first-growth chateau in France's Pauillac appellation during the 2013 and 2014 vintages of the estate's flagship wine (majority Cabernet Sauvignon). For both years, the same wine was put into different trial barrels after malolactic fermentation (January after the harvest), and each trial was duplicated. The experiment included 16 barrels (3,600 liters) in 2013 and 32 barrels (7,200 liters) in 2014. *Élevage* was conducted according to the château's usual procedure, including racking and returning to the same barrel every three months.

Wine from each barrel was analyzed after 15 months of *élevage*, following fining with egg white and removal of sediment. Wines from duplicate barrels were blended in equal quantities for sensory analysis.

GEOGRAPHIC ORIGIN OF OAK STAVES USED

2013 Trial: Fontainbleau, Loches, Tronçais and Orléans forests

2014 Trial: Bercé, Darney, Loches and Tronçais forests

Geographic origin of the wood and experimental parameters

The Vicard Group's wood buyer was responsible for ensuring traceability. The trees were felled in winter, when the sap level was low. Stave wood for barrel production was selected after 30 months of natural seasoning at the Vicard Cooperage woodlot in Cognac.



The 2014 trial involved logs from the Bercé forest.

Every barrel in each protocol was built by assembling wood from 30 trees, using one stave per tree for the body. The two heads were built from 14 pieces, each taken from a different tree from among the 30 sourced for the staves.

For the 2013 vintage trial, a ranking by tannin potential (TP) was performed for six geographic origins. For the 2014 vintage trial, the barrels were initially sorted by grain and then ranked by TP.

Sorting by grain and tannin

Two types of grain were selected: fine grain (f)

and medium grain (m), corresponding to growth rings less than 2 mm wide and between 2 and 3 mm, respectively. The oak was sorted by grain prior to TP analysis.

After machining, the untoasted staves were analyzed by near-infrared spectrometry using an acousto-optic tunable filter crystal detection system. Only two TP levels were selected for the experiment: low TP (LTP), or less than 4,000 µg/g, and high TP (HTP), between 6,000 and 8,000 µg/g (values expressed in µg ellagic acid equivalent/g dry wood).



A tree growing in a French oak forest is designated for harvest by loggers.

Oak toasting method: concept of molecular cooking

The patented Vicard toasting system has a steam chamber to bend the staves into a barrel shape in four minutes without changing the chemical composition of the staves, plus a separate closed, radiant-heat toasting chamber controlled by computer to within $\pm 3^\circ \text{C}$. An infra-red probe measures the temperature on the inside of the barrel during toasting (see “Innovative Tools for Stave Selection and Toasting” in the February 2016 issue of *Wines & Vines*).

In addition to its precision and total reproducibility, this technology made it possible to develop innovative toasting profiles including gradual toasting, in which the temperature is gradually increased in four stages. This unique profile modulates the temperatures that affect the formation, development and degradation of various aromatic compounds in the oak.

All barrels used for both vintages in this research had exactly the same toasting profile (gradual toasting).

Chemical and sensory analysis of the wines

The major aromatic compounds extracted from oak in each type of barrel used in both trials were assayed by stir bar absorption extraction/gas chromatography/mass spectrometry and liquid chromatography/mass spectrometry.

The château’s technical personnel conducted a blind sensory analysis of the 2014 vintage wines. The panel evaluated the following criteria on a six-point scale (from 0 = absent to 5 = maximum intensity), with olfactory: overall aromatic intensity and descriptors related to the contribution of the oak; flavor: balance, tannin quality and length, and an overall quality assessment. Analysis of variance was used to detect any significant differences that emerged from the sensory analysis.

Impact of geographic origin, grain and tannin level on chemical composition of wines

For both vintages, when the concentrations of major oak aromatic compounds found in the wines after *élevage* were grouped according to wood origin, no statistically significant difference was

detected between six geographic origins, while there were tremendous variations within each forest. Only wines aged in barrels from Darney forest (vintage 2014) contained noticeably higher concentrations of furanic aldehydes and guaiacol, but lower concentrations of *cis*-whisky lactone.

Grouping concentrations of major aromatic compounds from oak according to grain only produced a small effect. Once again, variation within both types of grain was higher compared to variation between the two grain widths.

The only factor that clearly discriminated among concentrations of certain major aromatic compounds in wine was the TP of oak (see “Impact of Tannin Potential” below). For both vintages studied, wines aged in HTP (high tannin potential) barrels contained significantly higher concentrations of furanic aldehydes, while the wines aged in LTP (low tannin potential) barrels had a higher *cis*-whisky lactone content. Other differences identified were not consistent in both vintages: higher guaiacol concentrations for 2014 wines aged in HTP barrels;

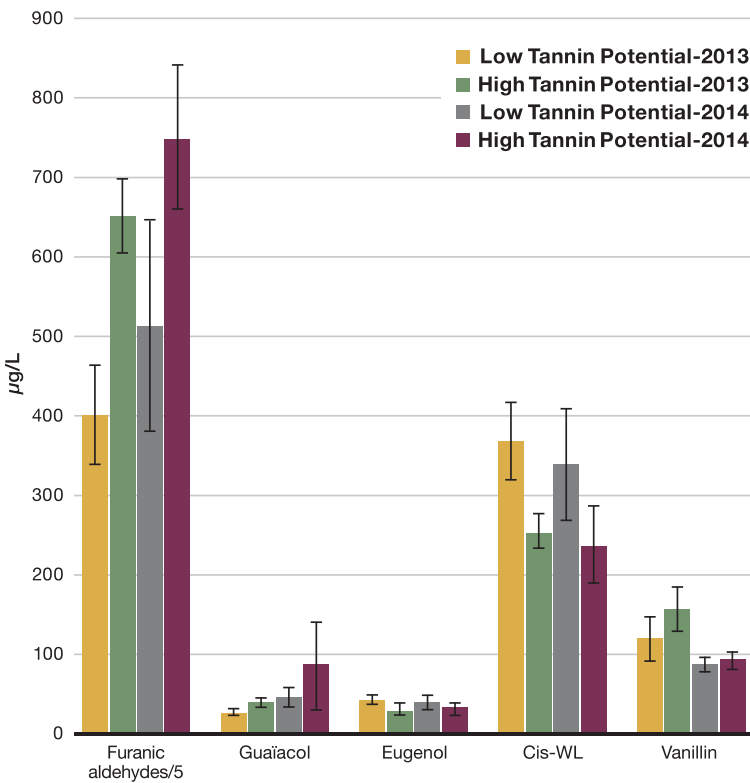
higher vanillin for 2013 wines aged in HTP barrels.

A wine aged in wood from the same forest with the same grain may have a different aromatic content, depending on the tannin level of the oak. It is important to note that the differences observed cannot be attributed to toasting levels because under the experimental conditions, all barrels were toasted using the Vicard system, which produced an identical toasting profile for all barrels ($\pm 3^\circ \text{C}$ for an initial temperature of 170°C).

This confirmed the major aromatic impact of TP selection highlighted in recent research.^{11,12} These results further revealed other variations in the oak’s composition, which indicate the tannin levels correlated with the level of lactones, lignins and hemicelluloses. During the toasting process (thermal degradation), vanillin is released from lignins and furanic aldehydes from hemicelluloses. Both lignins and hemicelluloses are non-extractable compounds.

Geographic origin alone was not a discriminating factor, as already determined in previous

IMPACT OF TANNIN POTENTIAL



DISTRIBUTION OF TANNIN POTENTIAL BY GRAIN SIZE

	Low TP	Medium TP	High TP
Fine grain	69%	17%	14%
Medium grain	17%	33%	50%

TP stands for tannin potential.

research.^{7,11,15,22} By contrast, the absence of a significant “grain” effect was more surprising, and to understand this, it was necessary to examine the TP distribution in each type of grain. In “Distribution of Tannin Potential by Grain Size” (above), 14% of the fine-grain oak usually associated with LTP was actually HTP, while 17% of the medium-grain oak (usually associated with HTP) was LTP. Thus, under our research conditions, “atypical” wood (fine-grain with high tannin levels and medium-grain with low tannin levels) negated the differences between the two grain widths.

Impact of geographic origin, grain and tannin levels on sensory profile

Sensory analysis of the 2014 vintage trial wines clearly discriminated among the sam-

ples on the basis of aromatic criteria. Independent of the geographic origin and grain, wines aged in HTP barrels exhibited significantly more intense empyreumatic notes related to toasted register (toast, caramel, coffee and chocolate), nuances and correspondingly less marked fruity aromas.

However, aging in LTP barrels gave a more intensely fruity aromatic character with more discreet empyreumatic notes. (See “Sensory Analysis: Intensity of Empyreumatic and Fruity Notes” on page 47.) In other words, the sensory profiles of wine aged in oak from the same forest with the same grain differed significantly, depending on the tannin level of the oak.

For example, this was the case of the Tr-HTP-f protocol, which had one of the most markedly empyreumatic characters compared to Tr-LTP-f which was radically different with more intense fruity aromas. These differences in fruity perception between the two TP levels were due to their chemical composition. The higher furanic aldehyde content of wines aged in HTP barrels diminished their fruity characters,²³ whereas the whisky lactones enhanced the fruity impression to varying extents, depending on the balance between the concentrations of these compounds and the molecules responsible for fruity aromas in the wine itself.^{24,25,26}

In agreement with the chemical analysis results, the tannin level of the oak was apparently a more discriminating factor for sensory qualities than simply geographic origin or grain.

Among the other criteria assessed during the sensory analysis, only the overall assessment of the wines identified marked differences between the different series of barrels. However, these differences were not statistically significant. It is, nevertheless, interesting to note that the panel tended to prefer wines with less obvious empyreumatic character such as Be-LTP-f and Lo-LTP-m.

Wood selection by tannin potential has the strongest impact on wine sensory profile


The objective of this research was to assess the impact of geographic origin, grain and tannin levels of oak wood used in cooperage on the sensory profile of red wines. The results indicated that for barrels with the same geographic origin and grain width, a considerable variation of major oak aromatic compounds was attributable to the tannin potential of the wood.

This new analytical method of oak selection and classification offers the possibility of better exploiting the natural variability of oak and thus assuring precision and repeatability. This

is not the only decisive parameter: It must be combined with an automated toasting process capable of controlling the thermal degradation of oak tannin. The combination of these cutting-edge technologies constitutes a crucial tool for adapting *élevage* to the specificity of each wine and winemaker goals.

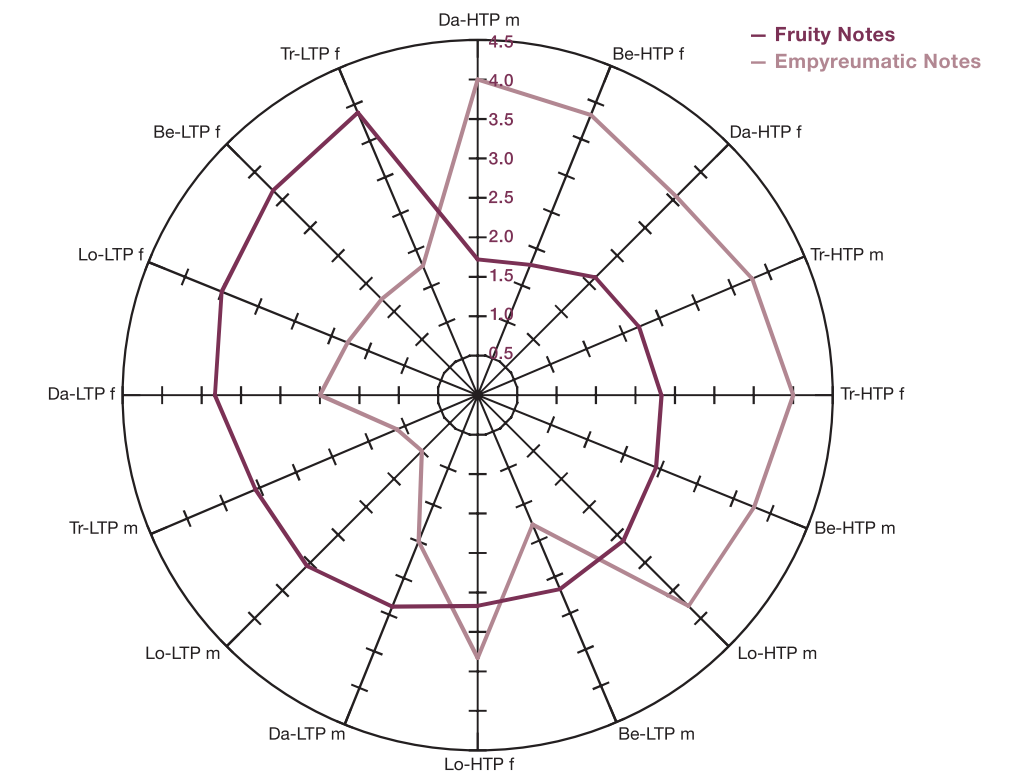
In addition to its implications for wine-making, this new approach will contribute to a more rational management of forestry resources in the future.

Thanks to the trial, the château has increased its knowledge regarding what barrel style contributes to a final blend. Trials continue at the château, especially those focused on how to match barrel style to grape ripeness.

The authors thank H  l  ne Genin, technical director; Agathe Moly, quality manager; Pierre-Henri Chabot, cellar master, and all the Ch  teau Latour staff for the setup and following of the trials. 

Marie-Laure Badet-Murat is a research consultant at OEnologie by MLM in Bordeaux, France. Jean-Charles Vicard is chairman and technical director of Vicard Generation 7, and Frédéric Desamais is purchasing director of wood for Vicard Generation 7 in Cognac, France.

The references for this article are available online at winesandvines.com



Tr: Tronçais; Be: Bercé; Lo: Loches; Da: Darney. HTP: high tannin potential; LTP: low tannin potential.
m: medium grain; f: fine grain.



· CERTIFICATIONS ·
Vicard Group



ORGANISMS WHICH CERTIFIED *the* VICARD GROUP



PEFC

All VICARD Group entities are PEFC certified.

The main objective is to contribute to the sustainable management of forests by concrete actions surrounded by international rules.

The PEFC program integrates with the philosophy of VICARD GENERATION 7 which always acts as an eco-responsible company and attaches itself to the compliance with wood, especially with its revaluation system for the totality of wood falls generated by the manufacture of quality barrels.

In addition this recognized commitment allows to clearly display the rigorous work carried out for many years on the origin of the wood, the mastery of purchases and traceability.



HACCP

In order to adapt to the new regulatory and food-safety requirements, Vicard Generation 7 is committed to a HACCP procedure.



BUREAU VERITAS

Certificate of recognition of French oak origin.

CONTACT US

HEAD OFFICE Vicard Generation 7

–
1832 Soscol Avenue
Suite 108, Napa 94559
United States of America

P: +1(707) 927 3168
office@vicardg7.com
www.vicardg7.com

GEORGES MILCAN General Manager

–
P: +33 (0)6.16.70.23.20
georges.milcan@vicardg7.com

CHRISTY THOMAS Business Development Manager

–
P: +1 (707) 228.5982
christy.thomas@vicardg7.com

EMILIE FAUGÈRE Marketing & Communication

–
P: +33 (0)6.28.96.05.83
marketing@vicardg7.com

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1370 Trancas St #141, Napa CA 94558 - USA · 707 - 228 - 5982 ·
christy.thomas@vicardg7.com · www.vicardg7.com