OAK SHAVINGS AND CUBES: HOW TO USE THEM RATIONALLY

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This article presents a summary of the current knowledge regarding the numerous parameters for the utilization of oak chips. Rather than offering recipes our purpose is to provide you with the keys to help you reach your objectives within given technical constraints.

These elements are not only based on the results of more than 100 trials carried out since 1991 at the experimental winery of the ICV R&D department, but also on the studies and observations realized in the cellars of our French and foreign customers.

Review of regulations and terminology

Currently, the utilization of oak chips in France is only authorized for experimental purposes after a special authorization from the DGCCRF is granted. Shavings have to be supplied by an approved producer and can only be used with Vins de Pays and table wines sold within France.

NB: Current discussions seem to indicate that, if shavings were authorized, a minimum size would be imposed, which should prevent the utilization of powders.

There is no official terminology for these oak chips. Practice and the weight/surface area ratios allow the establishment of a factual distinction according to size. In this document, particles visible to the naked eye and without a distinct shape are called **shavings**. If the particle shape is homogeneous and distinct they are called **cubes** (often cubes the size of a dice, or dominos the size of a match box), and if they are wooden planks to be installed inside a tank they are called **staves** (generally, they are over 10 centimetres wide with a thickness of 1 to 3 centimetres, and a length adapted to the tank).

Methods

As for the definition of the vinification procedures, the rational use of oak shavings or cubes relies at least on 4 major points:

1. **Identification of objectives**: what sensory profile is desired? Does it correspond to an objective to be reached at the end of the ageing process, after blending or for commercialisation? Do you want to imitate the barrel or produce a different wine? In the latter case, oak shavings and cubes become traditional oenological tools. It should be remembered that, above all, oak shavings or cubes are to be used with different grapes than those reserved for barrel ageing, and should produce a different kind of wine (cp. below).

2. **The business specific technical-financial context**: What are the volumes authorized for a vinification with oak shavings and cubes? Is the winery capable or required to blend wines aged with and without oak shavings? Are the regulations followed? Are the tools available to realise value from the use of shavings (extractions, temperatures, oxygen,…)? What is the maximum time of maturation possible based on the work schedule and commercial constraints? What is the **added value** generated by the optimum utilization of oak shavings? Generally, and leaving regulatory aspects aside, the **core area** that is

targeted is the reduction of the cost per barrel of wines at price levels where even the utilization of staves may be too costly. Besides, the positive effects of oak shavings or cubes are often too difficult to realise with wines produced from standard grapes.

3. **Selection of raw materials and consideration of quality**: The “wine matrix” effect is as important as the other technical factors. Even though the utilization of oak shavings and cubes may aim at imitating barrel ageing, the most remarkable improvement of the sensory profiles appears with mid range wines: decreased vegetal characters, improved complexity and aromatic softness, increased volume and mid-palate tannin intensity …are among the most frequent objectives.

   Moreover, wines produced from medium range grapes generally are not very suitable for barrel ageing: camphor- menthol notes appear quite rapidly (but are sometimes desired), small increase of palate volume compared with the increase of dryness and astringency.

4. **Blending management:** the vinification or maturation with oak shavings can be carried out within a blending strategy.
   Generally, the tasting of individual treatments does not allow the assessment of the quality of the final blend. Thus, it is recommended that regular **tasting of the different possible blends** is carried out during the entire maturation process.

Criteria for the selection of oak shavings

Apart from the factors listed above, 4 aspects should be considered from a technical point of view for the selection of oak shavings: botanical origin, size, toasting and producer.

- **Botanical families of oaks**

US oaks are generally the richest in β-methyl-γ-octalactone (also called Whiskey lactone). They are characterized by a more pronounced development of coconut aromas relative to French oaks.

Compared with European oaks, their utilization is more challenging and has to be **regularly and rigorously controlled**. Indeed, the rapid impact of US oaks on the organoleptic profile of wines can lead to excessively intense aromas: too intense wood sap or roast aromas, strong volume in the attack followed by strong dryness.

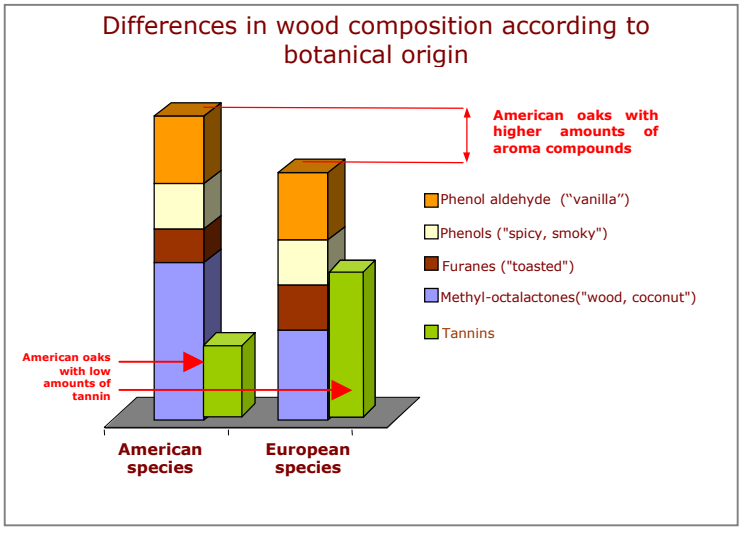

Figure 1: Differences in wood composition according to botanical origin

- **Type of shavings**



There are numerous types of shavings available: powders, shavings, cubes or very big sticks.

The size affects the **wine/wood contact surface** and has to be considered for the desired dosage and contact time (from a few days to several months): Figure 2 (below) shows the differences between oak shavings in terms of "quantitatively equivalent" doses compared with a traditional 225 l barrel.

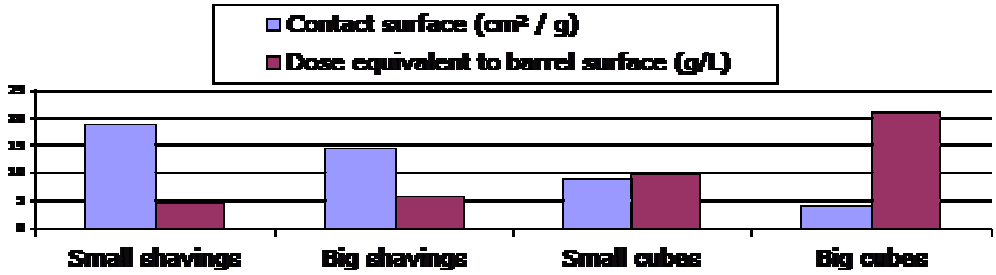

Figure2: Impact of shavings type on wine/oak contact

Powders (which should not be allowed) and **small oak shavings** rapidly lead to excessive sap and smoky aromas after prolonged contact. Their utilization should be reserved with grapes or musts at the beginning of the AF and the contact time should be limited to a few days (15 days maximum).

Sticks or **cubes** should be favoured:

1. To achieve less intense woody aromas (traditional woody notes like vanilla and low tannin intensity)
2. If the final blending with wines matured without oak is limited or impossible: the room for mistakes is smaller and, in this case, cubes allow to work more "cautiously".

- **Toasting**

Dried but untoasted oak is often recommended by producers in order to emphasize fruit aromas – something which in practice can only be confirmed with very concentrated and perfectly ripe red grapes.

However, this effect has been found only rarely when compared to controls in our studies. On the other hand, we regularly observed the development of excessive "herbaceous", "sap – sawdust" aromas with untoasted oak.

These effects can be reduced (within reasonable proportion!) by simultaneous addition of toasted oak shavings.

Often, the addition of untoasted oak goes together with increased astringency, dryness and bitterness, which are more pronounced if:

- The addition is late and staggered,
- The wine is too thin,
- The contact time is prolonged.

However, in the cellar, well managed microoxygenation is a powerful tool that allows the reduction of the sometimes coarse edge of untoasted oak shavings – specifically within a blending strategy.

Medium to strong toasts confer vanilla, toasted and sometimes sawdust - sap notes in proportions and at levels of intensity, which - among others – depend on the dosage, the contact time and the producer. In order to avoid the development of overpowering sawdust - sap notes, this contact time has to be controlled by regular tastings.

Of course, medium to strong toasts are preferred for blending strategies. It is recommended to apply **rather high** doses in order to limit the development of coarse notes (please, see the paragraph "Application rate").

Heavy toasts sometimes reinforce sulfur odours of the burnt match – rubber type, which have to be controlled by applying the usual preventive methods (management of: fermentation risks, biomass management and oxygen additions). Medium toasts pose less risks with regards to the development of sulfur odours.

Often, untoasted and toasted oak contributions are complementary. Additions performed during the maceration produce a style characterized by original aromas (intense red fruit such as pomegranate syrup, and liquorice).

- **The Producers**

Our experiments showed that even with equivalent oak shaving type (size, toast) and application conditions, **the results obtained with oaks from different producers were often very different**. Thus, results obtained for each supplier should be assessed systematically: consistency between results obtained and those stated by the retailer, reproducibility of effects observed.

The sensory style produced by the different oak shavings studied at the experimental winery over the last three vintages can be grouped into 2 main trends:

- Suppliers with a "traditional" impact similar to the evolution observed during maturation in new barrels: development of vanilla-oaky, grilled-torrefied aromas, increase of volume followed by development of sap-sawdust notes, increase of tannin sensations, even astringency and dryness
- Others present very rapidly intense sap-sawdust aromas and a strong gustatory harshness. Sometimes, after several months of contact (which would be unfavourable for more traditional oak style suppliers), the contributions of these oak shavings seem to be more integrated. The management of these suppliers is more delicate if the experiences acquired with barrels are used as reference.

Please note that these observations are really limited to a certain kind of oak shavings, certain application methods and to certain wines. Moreover, these results were obtained with wines that were not blended. Blending with unoaked wines may lead to wines with a final profile that would be clearly different from that of the oaked wine…

Application Factors:

- **Time of addition**

Generally, **early additions allow better integration of the sensory impact of oak shavings.** Thus, additions during maceration for reds or at the start of the AF for whites and rosés should be favoured if the winery does not wish to risk an overpowering oaky aroma.

However, it is important to apply a flexible working practice: for example by using food grade bags, which allow the removal of oak shavings before the end of the AF or the maceration if it is necessary.

Late additions should be considered for their strong aroma impact and their "structuring effect" accompanied by a higher risk of astringency and dryness.

- **Application rate**

Generally, application rates are between 1 to 5 g/l and sometimes up to 20 g/l.

Most often, dosage increases go hand in hand with an increased contribution of oaky notes.

However, please note that **the oak contribution is not regular**: lower doses (2 g/l and less) generally lead to an intensification of dryness without increase in aroma volume. Also, a tendency towards "sap – sawdust" aromas rather than "vanilla" or "grilled – torrefied" notes can be observed. The same trend could be noted after a larger addition of 4 g/l staggered to 2 additions of 2 g/l during AF and 2 g/l during MLF.

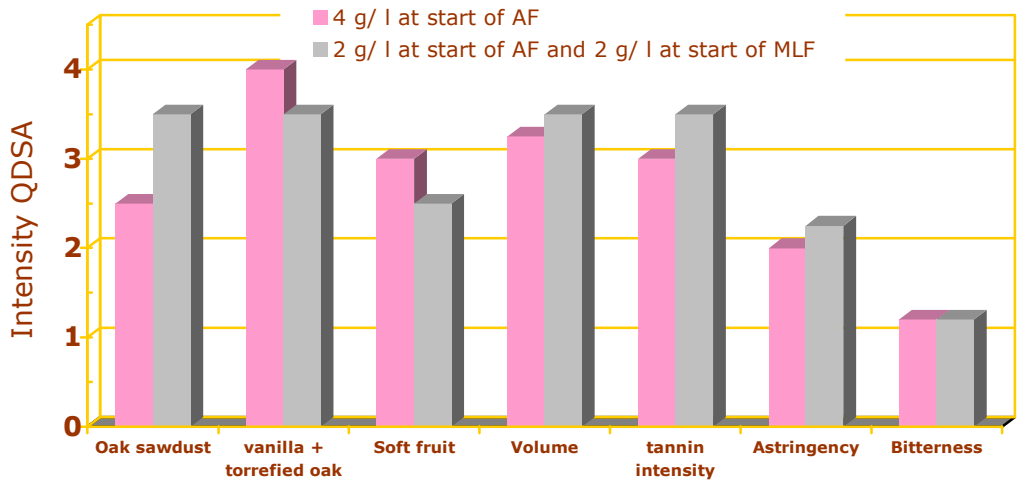

Figure 3: Results of the Quantitative Descriptive Sensory Analysis- 2004 trial with an AOC Syrah

- **Contact time**

The contact time can vary from a few days to several weeks, or even several months depending on the objectives.

It is very difficult to determine the contact time beforehand. The following factors should be taken into account:

1. the type of oak: US oak has a faster impact than European oak,
2. the size of the oak shavings: the evolution of wines over time is faster with smaller oak shavings,
3. the aroma and gustatory profiles desired: it is recommended to limit the contact time for less oaky results where astringency and dryness are unwanted.

The contact time allowing to reach the objectives can change depending on the producers. Without previous experience or sufficient room for taking risks, the winery should stop the contact as soon as astringency, dryness or bitterness increase. Thus, regular tasting of wines is necessary.

- **Management of oxygen additions and process integration**

Oak additions contribute to increased wine oxygen needs (the addition of tannins and other macromolecules reduces the redox potential of wines). Often, after addition of oak shavings, wines become more closed and sulfur aromas may even appear.

Preventing the development of sulfur aromas is essential to gain full value from the utilization of oak shavings and cubes. Their application only makes sense within a tight integration into a global vinification strategy (yeast selection, nitrogen additions, maceration time, racking, wine and lees stirring, oxygen additions, etc.)

Oxygen additions by macro- or microoxygenation are key elements for a successful vinification with oak.

These oxygen additions by microoxygenation can be performed before MLF in order to ensure aroma development and increase in volume of wines vinified with oak shavings, and to reduce the risks of dryness due to the utilization of oak.

After MLF, microoxygenation becomes a very interesting tool to “smooth” the palate and to amplify fruit aromas.

Larger air additions (by aerated racking or cliquage) are to be used carefully after MLF in order to avoid affecting the fruit aromas permanently, which would change the olfactory balance towards more intense oaky aromas.

- **Staves: the other “oak tools”**

In 1999, the ICV and the Tuchan winecellars were the first to experiment with staves in Europe.

These experiments allowed us to validate the significance of this tool provided that the methodology presented in this document is considered.

The impact of staves is similar to that of barrels (the diffusion kinetics are slower than with oak shavings) but it is easier to adjust the contact surface. Labour and space requirements are lower compared with using barrels, even though the cost of these oak products is close to traditional barrels.

The utilization of oak shavings has to be monitored **according to a protocol similar to the one used for managing maceration times**: clear idea of product objectives, consideration of the raw material (grapes + vinification), utilization of defined sensory indicators (vegetal, intensity and style of oak, astringency, dryness,…), the experience of the oenologist gained in the field with similar procedures and objectives.

Examples of application strategies for different product objectives

Numerous combinations are possible according to the several factors previously mentioned. Within the studies of the ICV Oenological Committee, several strategies were successfully implemented. Based on these, your oenologist can suggest adaptations to fit your equipment and specific objectives.

The following Table illustrates **2 examples**.

These 2 examples (one regarding white wines, which is also appropriate for rosés, and the other regarding reds) are described in more detail in the online version of this article, which can be found on the ICV website at www.icv.fr

Product objectives		Perception of oak (torrefaction, vanilla and sap) notes below level of candied fruit, powerful mouthfeel. Astringency and dryness are acceptable if below volume.	No apparent oaky aromas. Increased intensity of fresh fruit aromas. Increase in volume.
Raw material		Medium concentration Chardonnay, Grenache blanc or Viognier, grape at complete pulp maturity (potential Alc. (vol.): 13,5%), direct pressing, must< 150 NTU, fermentation between 14 and 18°C.	Medium concentration Merlot or Syrah, grape at pulp maturity (potential Alc.(vol.): 12.5%), maceration 5-8 days.
Possible options	FR oak shavings medium toast	5 g/ l at end of AF: finish contact as soon as syrupy-fruit notes disappear and candied fruit aromas emerge	4-6 g/kg (FR with grapes) or 3-5 g/kg (US with grapes) + 4 g/l of FR at the end of AF in 10 – 20% of total volume: in this latter batch, finish contact as soon as oaky notes are perceived.
	US oak shavings	6 g/l HT at start of AF + 3 g/l HT into 15 – 25% of total volume after AF: with the latter batch, duration should be monitored / blending simulations carried out.	2 g/kg untoasted oak (US with grapes) + 3 – 4 g/l HT FR at end of AF: duration should be monitored / maximum volume
	Big FR cubes medium toast	10 g/l at end of AF + MLF for “buttery” and soft fruit with 50 – 100% of total volume	10 g/l at end of AF (contact limited to a few weeks)

FR = French oak
HT = heavy toast
US = American oak
Medium toast unless otherwise stated