

Making Wine in the Cellar

If in the vineyard nature is ultimately in charge, man takes over in the winery or cellar. Winemaking consists of a series of decisions dictated by the grapes and their condition, and by the style of wine the winemaker has set his or her heart on or has been asked to produce. Occasionally these conflict. The diagrams opposite and overleaf respectively show the steps involved in making a relatively inexpensive unoaked white and a high-quality, traditionally made, barrel-aged red wine.

HARVESTING THE GRAPES

The winemaker's first and possibly most important decision is when to pick. He or she should have been monitoring the sugar and acid levels in the grapes and their general health, appearance and flavour in the weeks leading up to harvest.

Decisions on harvest date need to be taken in conjunction with the weather forecast. If, for example, the grapes are not quite ripe enough but rain is predicted, the decision is whether to leave the grapes on the vine and hope that there will be sufficient warm, dry weather afterwards for them to ripen fully. Some varieties are much more sensitive than others to the exact date of harvest. Merlot, for example, can easily lose a certain liveliness if kept too long on the vine, whereas Cabernet Sauvignon is much more tolerant of a few extra days. If the grapes are already suffering from fungal disease (see p.15), the rain will exacerbate this so it may be best to pick the grapes just slightly less ripe than ideal. White wine is much more forgiving of a few rotten grapes than red, in which the colour is rapidly lost and the wine tainted by a mouldy taste.

The winemaker, in conjunction with whomever is in charge of labour, also has to decide at what time of day to pick. In hot climates grapes are generally picked either at night (easier by machine, with big spotlights) or very early in the morning in order to deliver the grapes to the winery as cool as possible, typically – if the winemaker aspires to quality – in shallow, stackable crates so that the grapes are not crushed before arriving at the winery. All the greatest wines in the world are still picked by hand, no matter how expensive and elusive the pickers, because they can both snip whole bunches off the vine (machines shake off the berries) and also make intelligent decisions about which fruit to pick.

Once the grapes arrive at the winery, they may be deliberately chilled – some hot-climate wineries even have cold rooms where grapes may be kept for hours or days (in rare cases even

weeks) until a fermentation vat is available. Even more likely at a top-quality winery in any climate is that the grapes are subject to further selection. One of the most obvious winery innovations in the 1990s was the installation of sorting tables, typically a slow-moving belt onto which grapes are tipped to be minutely examined by human eye before arriving at the destemmer and/or crusher. Mechanical crushing releases the juice, which is 70-80% water, and replaces the human foot – still used for some high-quality port. The latest time-saving and quality-oriented technology for well-funded producers is an optical sorter comprising a computerized camera plus air jets that blow away debris and unripe berries after destemming.

PREPARING WHITE WINE GRAPES

Most white wine grapes are destemmed before they are pressed because stems can be astringent and would spoil a light, aromatic wine. For some full-bodied white wines, however, and most top-quality sparkling and sweet white wine, the winemaker may choose to put whole bunches into the press. This is because the stems can help drainage – and in any case only the first portion of it, the “free-run” juice, may be used.

For white wines, winemakers must decide whether they are going to protect the juice as much as possible from oxygen, preserving every ounce of fresh fruit flavour (preventing oxidation and stunning ambient yeasts at the start with added sulphur dioxide; complete destemming; low temperatures throughout, and so on), or to adopt deliberately oxidative techniques, exposing the grapes to oxygen and aiming for secondary, more complex flavours.

Riesling, Sauvignon Blanc, and other aromatic varieties tend to be vinified protectively, while most top-quality Chardonnay, including white burgundy, is made oxidatively. Oxidative handling may include a period of deliberate “skin contact”: not as exciting as it sounds, but a few hours either in the press before it is turned on or in a holding tank, during which further flavour will be leached into the “must” (the pulpy mixture between grape juice and wine) from the skins. If the skins are allowed contact with juice for white wine for too long, however, they tend to impart astringency – which is why grapes for most white wine, unlike red wine grapes whose skins are needed for colour and tannin, are pressed before fermentation. However, wines fermented with the skins in clay amphorae or in Georgian *qvevri* buried underground have deliberately prolonged the skin contact throughout and beyond

fermentation to produce “orange wines” that are deliberately astringent and highly distinctive.

Over the years, presses used for the vast majority of white wines have been designed with increasing ingenuity to squeeze out the juice as gently as possible, without breaking the pips or extracting astringency from the grape skins. Pneumatic presses, some of them completely insulated from oxygen for protective juice handling, are the gentlest and the most common. Winemakers are increasingly careful to separate different portions of juice from the press, the earliest being the least astringent.

At this stage, particularly protectively made white wines may be clarified: cleared of all the little grapey fragments still in suspension, usually by letting the solids settle to the bottom of a holding tank and then running off the clear juice into the fermentation tank. It is important at this stage that fermentation still hasn't started, which is why low temperatures and sulphur additions are crucial. Oxidatively made whites, however, are treated more like reds.

Red wine grapes are usually destemmed and crushed, although winemakers are experimenting more and more with fermenting whole bunches, as has been traditional in Burgundy. This works only in climates with growing seasons long enough to ripen the stems as well as the fruit, otherwise the stems would make the wine taste horribly tough. Some winemakers deliberately sulphur the grapes and chill them for up to a week to delay fermentation, extracting colour and primary fruit flavours.

THE FERMENTATION PROCESS

The winemaker then has to make decisions about fermentation, the miraculous transformation of sweet grape juice into much drier, more complex-flavoured wine. If yeast (naturally present or added) is put into contact with grape sugars, it converts them into alcohol, heat, and carbon dioxide. The riper the grapes, the higher the sugar level, the stronger the resulting wine. Fermentation vats naturally warm up as the process gets under way, so in warmer climates they may well need cooling jackets or internal cooling elements to keep the must, below the temperature at which precious flavour compounds may be boiled off. The gas that is generated can make a winery a heady – and dangerous – place at harvest time, where the smell is an intoxicating mixture of carbon dioxide, grapes, and alcohol, especially if the fermentation vats are open-topped, as for many traditionally made red wines. Although white wines are fermented in sealed vats so as to protect the must from damaging oxidation and avoid browning, a vat full of red must has its own protection: the thick “cap” of skins that floats on the surface.

Yeasts and their behaviour continue to provoke scrutiny and heated debate. The winemaker's initial choice is whether to use specially selected and prepared yeast, so-called cultured yeast, as opposed to relying on the strains of yeast that are naturally in the atmosphere of the vineyard and winery.

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Yard nature is ultimately in the winery or cellar. It consists of a series of decisions about the grapes and their condition, and how the winemaker has set his own or has been asked to produce. These conflict. The diagrams and overleaf respectively show the process in making a relatively inexpensive wine and a high-quality, traditionally aged red wine.

THE GRAPES

The winemaker's first and possibly most important decision is when to pick. He or she should have a good idea of the sugar and acid levels in the grapes at their general health, appearance and ripeness, weeks leading up to harvest.

Harvest date need to be taken into account along with the weather forecast. If, for example, the grapes are not quite ripe enough at the time predicted, the decision is whether to wait for the grapes on the vine and hope that there will be a milder, warmer, dry weather afterwards, or to harvest them before they ripen fully. Some varieties are much more sensitive than others to the exact date of harvest. For example, Pinot Noir can easily lose a lot of its colour if kept too long on the vine, while Cabernet Sauvignon is much more forgiving. If the grapes are suffering from fungal disease (see p.15), the winemaker may exacerbate this so it may be best to harvest them just slightly less ripe than ideal. In some cases, such as with Pinot Noir, the colour is rapidly lost, and the wine is tainted by a mouldy taste.

The winemaker, in conjunction with whomever is doing the picking, also has to decide at what time to pick. In hot climates grapes are often picked either at night (easier by machine, and with fewer lights) or very early in the morning in order to deliver the grapes to the winery as cool as possible – typically – if the winemaker aspires to make the greatest wines in the world are picked by hand, no matter how expensive and labour-intensive, because they can both snip the grapes off the vine (machines shake off the grapes) and also make intelligent decisions about when to pick.

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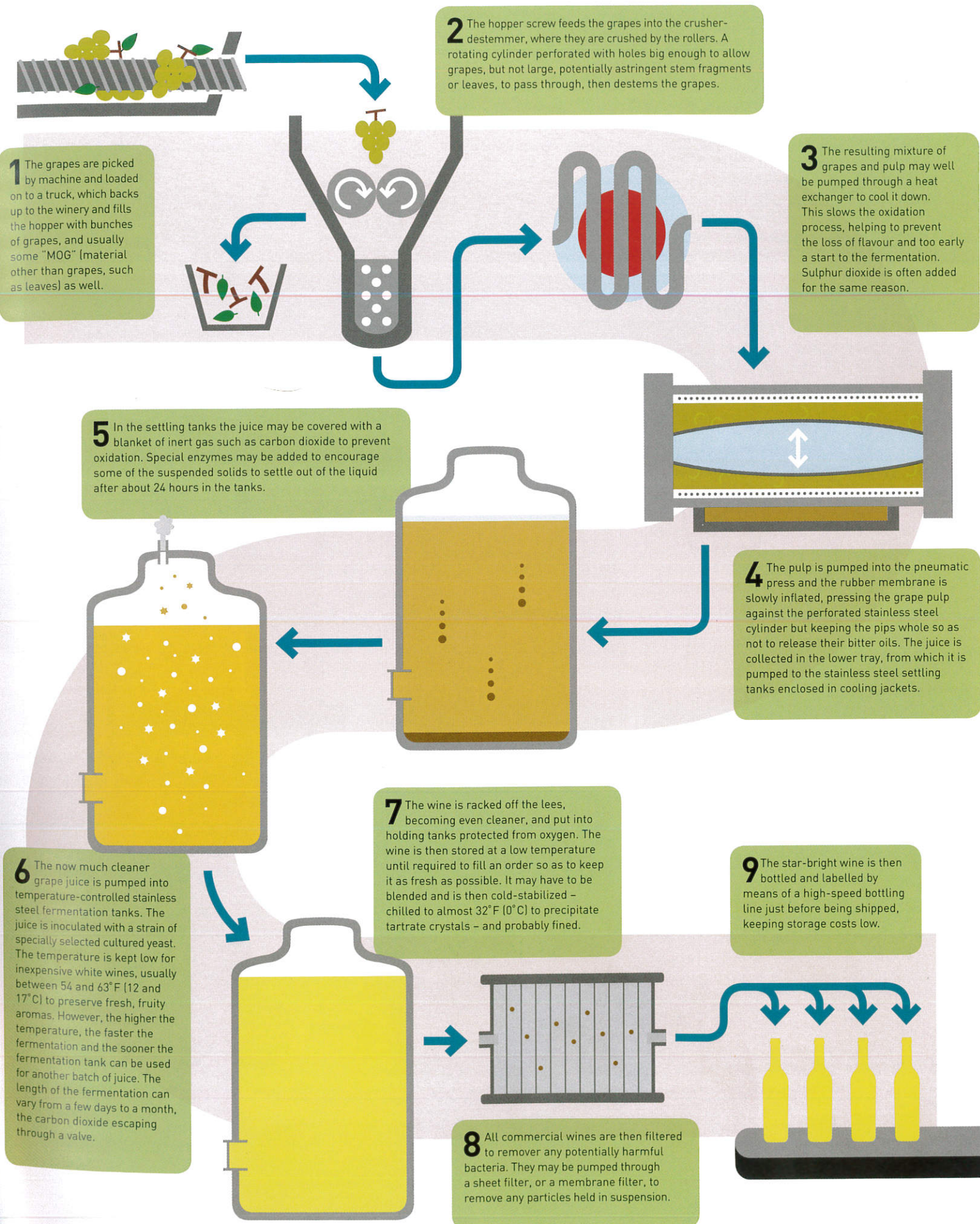
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HOW MASS-PRODUCED WHITE WINE IS MADE

This diagram shows an inexpensive white wine made in a well-equipped winery in a warm region.



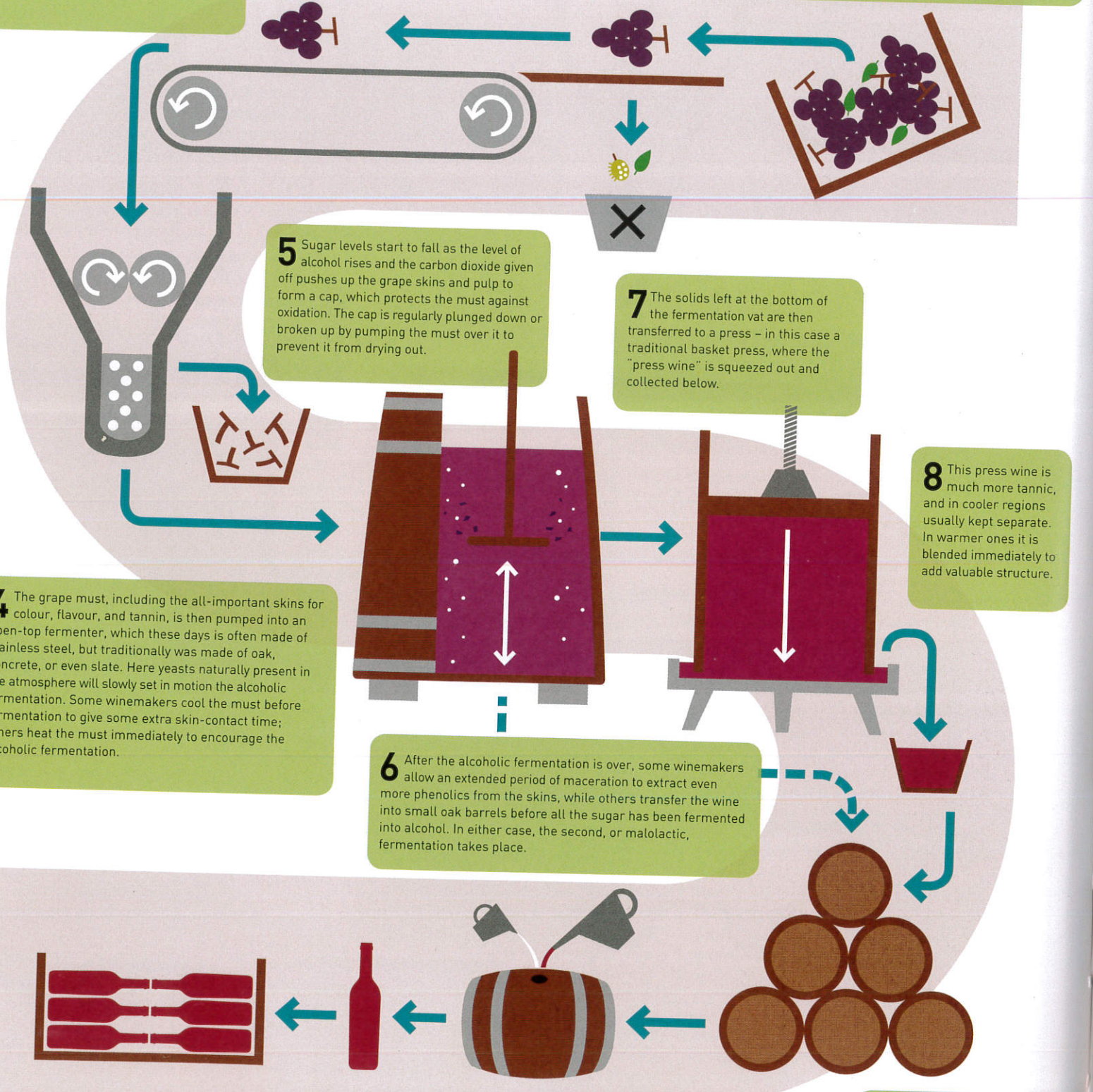
HOW TOP-QUALITY RED WINE IS MADE

This diagram shows how a typical fine red wine is made in the most traditional way possible.

3 In the crusher-destemmer the stalks are removed and most of the grapes are crushed. The settings can be adjusted according to how many stems and whole grapes are required. For less tannic grapes such as Pinot Noir, some or all of the stems may be retained at this stage to give the wine structure.

2 The conveyor belt carries the bunches to the crusher-destemmer.

1 Hand-cut bunches of grapes are gently transferred from small containers, designed to prevent the grapes being crushed in transit from vine to winery, on to a sorting table. Any unripe, damaged, or mouldy grapes are cut out and any other matter removed by hand.



5 Sugar levels start to fall as the level of alcohol rises and the carbon dioxide given off pushes up the grape skins and pulp to form a cap, which protects the must against oxidation. The cap is regularly plunged down or broken up by pumping the must over it to prevent it from drying out.

7 The solids left at the bottom of the fermentation vat are then transferred to a press - in this case a traditional basket press, where the "press wine" is squeezed out and collected below.

8 This press wine is much more tannic, and in cooler regions usually kept separate. In warmer ones it is blended immediately to add valuable structure.

4 The grape must, including the all-important skins for colour, flavour, and tannin, is then pumped into an open-top fermenter, which these days is often made of stainless steel, but traditionally was made of oak, concrete, or even slate. Here yeasts naturally present in the atmosphere will slowly set in motion the alcoholic fermentation. Some winemakers cool the must before fermentation to give some extra skin-contact time; others heat the must immediately to encourage the alcoholic fermentation.

6 After the alcoholic fermentation is over, some winemakers allow an extended period of maceration to extract even more phenolics from the skins, while others transfer the wine into small oak barrels before all the sugar has been fermented into alcohol. In either case, the second, or malolactic, fermentation takes place.

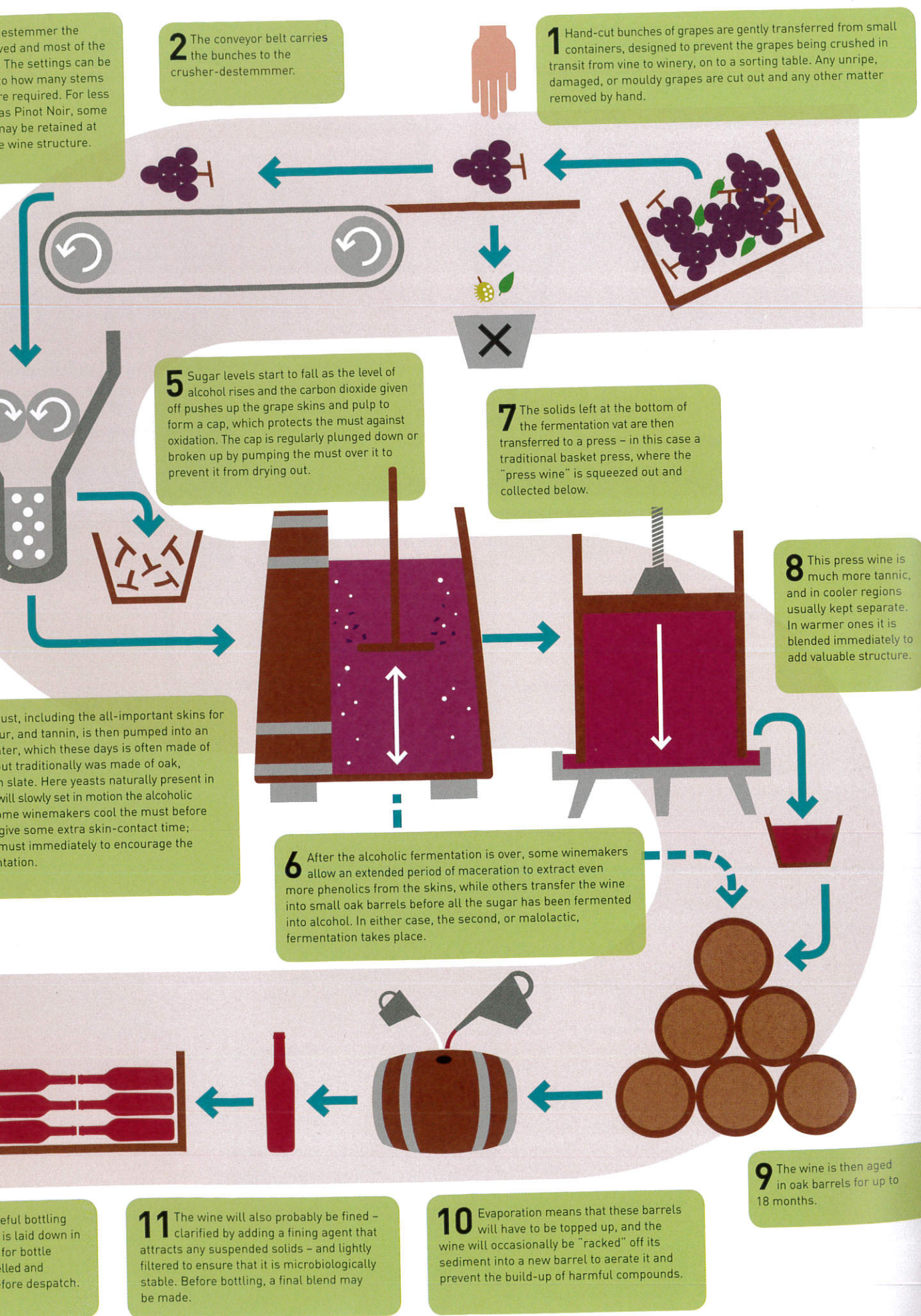
9 The wine is then aged in oak barrels for up to 18 months.

10 Evaporation means that these barrels will have to be topped up, and the wine will occasionally be "racked" off its sediment into a new barrel to aerate it and prevent the build-up of harmful compounds.

11 The wine will also probably be fined - clarified by adding a fining agent that attracts any suspended solids - and lightly filtered to ensure that it is microbiologically stable. Before bottling, a final blend may be made.

12 After careful bottling the wine is laid down in racks and stored for bottle maturing; it is labelled and bottled just before despatch.

HOW RED WINE IS MADE This diagram shows how a typical fine red wine is made in the most traditional way possible.



In new wine regions there may be no choice; wine yeasts need time to build up a population and in the early years the only ambient strains available are more likely to be harmful than benevolent. With admittedly an increasing number of exceptions, most wines are therefore made by adding specially cultured yeast to the must. (Once one vat has started, the addition of fermenting must from it will kick-start a second.)

Cultured yeasts behave predictably. Particularly powerful strains can be chosen for high-sugar musts, those which encourage coagulation of sediment may be useful for sparkling wines. The choice of cultured yeasts can also have a significant influence on the flavour of the wine: for example, enhancing particular aromas. Traditionalists, however, prefer to leave everything to ambient yeasts in the belief that they add more interest to the wine's flavour, even if they are less predictable. It is not going too far to regard them as an aspect of terroir, and indeed proprietors can be very proprietorial about them.

HELPING FERMENTATION

The winemaker's nightmare is a “stuck fermentation”, when fermentation stops before all the sugar has been converted into alcohol, leaving a dangerously vulnerable mixture that can all too easily fall prey to oxidation and nasty bacteria. The level of alcohol in a finished wine is an effective weapon against many bacteria.

The exact pace of a red-wine fermentation is critical to the sort of wine that results. The warmer the fermentation (up to the dangerous flavour-evaporation limit), the more flavour and colour will be extracted. Long, cool fermentations tend to result in light, fruity wines, but if a fermentation is too short and hot, the wine will also be low in body and flavour. The temperature rises during fermentation, but is generally between about 72 and 86°F (22 and 30°C) for full-bodied red wines, and cooler, sometimes as low as 54°F (12°C), for aromatic white wines.

To extract tannins, flavour, and colour from the grape skins during red-wine fermentation, the cap and the must need to be encouraged to commune with each other. This is generally done by either pumping the must over the cap or by physically punching it down into the liquid, although there is an array of mechanical and computerized ways of submerging the cap. The science of this process, and any post-fermentation maceration designed to extract and soften tannins, has become extremely exact, and is a key factor in how much more palatable many young red wines are today.

Fashions in fermentation vessels come and go. Stainless steel is easy to clean and control but some winemakers currently prefer wood or a return to cement.

Gentle handling of the grapes, must, and wine is generally, though not universally, considered to be a factor in ultimate wine quality. Where money is no object, or if a winery is conveniently built into a hillside, winery design and equipment

harness the force of gravity to avoid the use of pumps (as shown on p.35).

It is at the fermentation stage, red or white, that the winemaker decides whether or not to add or remove acid or add sugar, or concentrated grape must. French winemakers, apart from those in the far south, have been adding sugar to fermentation vats to increase the alcohol content (not sweetness) of the final wine for 200 years, ever since this process, “chaptalization”, was proposed by the agriculture minister Jean-Antoine Chaptal. The AOC laws generally restrict such “enrichment” to the equivalent of no more than an additional 2% of alcohol. In practice, thanks to warmer summers, better canopy management (see p.25) and anti-rot strategies, growers are now able to pick grapes riper and riper so that less and less additional sugar is needed.

Winemakers may also decide to exclude a portion of juice from the red-wine fermentation vat so as to improve the all-important ratio of flavour- and colour-filled skins to juice. This traditional practice, known as *saignée* in France, is sometimes replaced by more mechanical manipulation: concentration based on evaporation under vacuum or reverse osmosis.

Winemakers in warm climates, on the other hand, routinely add (or “adjust”) acidity to musts from grapes that have ripened to sugar levels only dreamt of in northern France, but whose natural acidity has dropped to an unappetizingly low level on the way. Tartaric acid, grapes' natural acid, is the acid of choice. There is another, arguably more natural, way in which winemakers can influence the acidity of a wine. Alcoholic fermentation of any wine is often followed by malolactic fermentation, in which the grapes' harsher malic (apple) acids are naturally converted into softer, lactic (milky) acids and carbon dioxide. Understanding and mastery of this process, sometimes warming the wine and/or adding cultured lactic acid bacteria, was the key factor in the mid-20th century in making red wines drinkable younger by lowering the overall acidity and adding some extra flavours as well.

But those extra flavours may not be desirable in an aromatic, protectively made white wine, and if the malolactic conversion is deliberately suppressed (by temperature control, sulphur addition, or filtering or fining the necessary yeasts and proteins out of the wine), the effect is to make the wine taste crisper. In practice, malolactic fermentation is generally encouraged in most good-quality Chardonnay to add texture and flavour, and in warmer climates it is compensated for by added acidity.

Malolactic fermentation is invariably good for red wine, and in recent years a fashion has emerged for conducting it not in large tanks, but in individual barrels. This is much more labour-intensive and is warranted only for high-quality wines, but the short-term result at least is a perceptibly smoother, more seductive texture, a characteristic that some wine tasters have come

to associate with quality. Increasingly, therefore, winemakers who wish their wines to show well in youth run red wine out of the fermentation vat just before the end of fermentation into barrels, where the wine will finish its alcoholic and then its malolactic fermentation.

A controversial issue, particularly in warmer climates such as California and parts of Australia, is high alcohol levels in wine, generally the result of picking grapes later to get more flavour and riper tannins. As with must concentration, various mechanical methods, again based on evaporation or reverse osmosis, may be used to reduce the alcohol level of the finished wine. However, some producers prefer to find alternative strategies in the vineyard so that the raw material is in better balance to begin with.

While some top-end red wines finish their alcoholic fermentation in barrel, full alcoholic fermentation in barrel has become de rigueur for many full-bodied whites with aspirations to a high price. By the end of the 20th century, oak had become The Other Ingredient in wine, such a high proportion of good to great wine both red and white being matured if not fermented in oak barrels. Indeed, practically all serious red wine undergoes the smoothing process of maturation in oak, and all but the most aromatic and lively whites are both fermented and matured in oak barrels. A more recent trend is towards using larger barrels, or barrels that are not new, so that the wines benefit from aeration through the wood but are not marked by oak flavour.

BOTTLING AND THE BUILD-UP

However a wine is matured after fermentation, it will have to be bottled. Before a wine is subjected to this often rather brutal process, the winemaker has to be sure it is stable: that it does not contain any potentially dangerous bacteria and will not do anything inconvenient if subjected to extreme temperatures. It must be clarified, for the wine is still likely to be cloudier than the consumer has come to expect. Inexpensive white wines are often therefore put into a tank and fiercely chilled so that any tartaric acid that remains in solution is precipitated before bottling and won't reappear as (completely harmless but worrying-looking) crystals in the bottle later on. Many wines are filtered in some way so as to remove any danger of refermentation, and fined so that any remaining particles drop out of the wine. Although there is a growing interest in so-called “natural wines” with minimal or no additions, most wines contain small amounts of sulphur to keep them fresh. “Contains sulphites” must be declared on the wine label. Such is the no-risk culture.

Filtration is a heavily political subject among wine folk. Overdone, it can remove flavour and the potential for ageing; underdone, it can leave the wine prey to harmful bacteria and refermentation, particularly if the bottle gets too warm. Wines that spend a long time in oak barrels are likely to become clear by the natural settling process and are less likely to need further processing.