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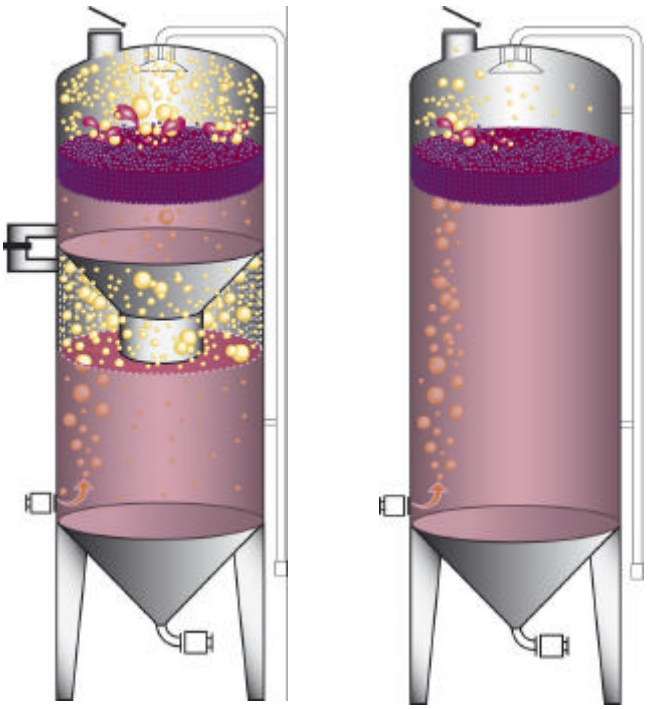

“BRIEF REMARKS ABOUT THE USE OF THE OXYGEN AND THE TECHNICAL GASES DURING VINIFICATION”

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BRIEF REMARKS ABOUT THE USE OF OXYGEN DURING VINIFICATION

Much has been said about using oxygen during vinification and this practice has been used extensively lately, both during fermentation (to encourage yeast proliferation and colour fixing and stabilisation) and during the subsequent stages of refining.

The topic is very interesting and I think attracting your attention on some **essential aspects** will be useful and convenient to understand the topic clearly.

SCIENTIFIC ASPECTS
PRACTICAL ASPECTS

Knowing the physical-chemical characteristics of gases and their behaviour (SCIENTIFIC ASPECT) helps using oxygen (PRACTICAL ASPECT) in a safe and repeatable way.

Before examining these aspects, we should remember that fermentation is essentially a reduction process.
Oxygen addition must be carefully assessed in terms of how much gas should be added, for how long, when it is more convenient to add it, with an eye to the raw grapes one is processing, the end product one wishes to obtain, and the conditions one is working with.

SCIENTIFIC ASPECTS: the properties of gases.

The properties of gases that have a great impact for winemaking purposes are as follows.

Solubility of gases in fluids.
When a gas gets in contact with a liquid, they form a solution at different rates.
The amount of gas dissolved in the liquid is measured depending on its concentration, and namely:

- **Chemical solubility** (the gas reacts chemically with the fluid)
- **Physical solubility** (the gas does not interact with the fluid)

Henry's Law can help understand this property better.
"A gas putting pressure above a liquid dissolves in the liquid below until the solute gas reaches the same pressure as the one of the gas above the liquid."
Moreover, **"the rate at which a gas dissolves in the liquid will vary depending on the difference of pressure (external or internal) and on its molecular composition and the type of solvent liquid."**

Decompression is another characteristic of gases. If decompression takes place in a short time (because of a sudden fall in the external pressure of the gas), it is called turbulent because it causes many bubbles to form (e.g. when a sparkling wine is uncorked).

PRACTICAL ASPECTS: the use of oxygen in winemaking.

When dealing with oxygenation of must-wine, the key factors that will influence the end result are as follows:

- **Pressure** at which the gas interacts with the liquid.
- **Time of contact** between the gas injected in the liquid and the liquid itself.
- **Surface of contact** between the gas and the mass of the liquid.
- **Temperature** of the must-wine.

The **ideal conditions to cause the gas introduced in the must-wine to interact** and to guarantee that what we are doing will be effective, are as follows:

1- Pressure is high enough to help gas solubility

2- Time of contact is long enough to guarantee the interaction of gas with must-wine

3- Surface of contact will be large enough, so as to affect the whole product

4- Temperature will be ideal (low temperature helps increase gas solubility).

An important factor which may hinder heavily the dissolution of a gas into the must-wine is the presence of a large number of small bubbles of CO_2. These are generated (at a rate of 40-50 litres of gas per litre of must) at every point of the fermenting mass and, by rising rapidly in a vertical column to the surface, they drag along (**stripping action**) any possible added gases, so that their effects are virtually vain.

For a winemaker, it is very important to determine with **certainty** both the amount and time of introduction of a technical gas.
Only this way can the addition of a gas be carried out in a **quantifiable** and above all **repeatable** way.

For instance, when making an experiment with small vats, one will have to be sure that the results obtained in the test will be perfectly reproduced at an industrial scale.
Only if these conditions are met can experimentation be considered as valid and interesting.

Using oxygenation with the fermenters available in the market.

The introduction of air/oxygen in the must-wine with the systems commonly used (pumping over with air, direct gas injection, aspiration of air from the atmosphere, etc.) in the fermenters currently available is very empirical and difficult to measure.
None of the methods listed above and currently used in traditional fermenters meet the fundamental requirements (**pressure, time, surface of contact**) guaranteeing the dissolution of the gas (air/oxygen) introduced in the must-wine, because:

- The gas introduced at the bottom of the tank rises in a vertical column and escapes outside immediately (**just a few seconds**) after.
- The **amount of must** affected by the gas is **very little** (especially if the vat is quite large) and therefore the effect is only local and scarcely efficient, also because a huge amount of bubbles of CO_2 are generated.
- Moreover, in this case a very little amount of the oxygen will interact with the cap of marcs, considering this is very compact and layered.
- If the gas is introduced through the pumping-over pipes, it will have little time (**just a few seconds, with little pressure and little contact surface**) to interact with the liquid. Then, in this case too, the requirements mentioned above are not met and a considerable amount of CO_2 will hinder the process further.
- Also, when the must-wine falls on top of the marc, the gas introduced will be dragged outside with the large amount of CO_2 bubbles bursting. What is more, as the liquid will fall following a preferential path, the cap of marcs will be affected only trivially and the mass below even less than that.
- In conclusion, it is impossible to obtain a good distribution guaranteeing a homogeneous contact of the gas with the whole mass. Moreover, the liquid below the cap of marcs is affected by a considerable rising current which, because of the stripping action caused by the constant flow of CO_2 bubbles, will make the action of the gas useless.

The remarks above make it clear that the systems most commonly used **do not meet the fundamental conditions helping the solubility of a gas in a liquid** (i.e. **pressure, time of contact and surface of contact**). Moreover, the huge amount of gas bubbles causes such a sizable stripping that the result of any possible addition of gas will be virtually none and/or difficult to measure.

So, one can safely say these systems are not efficient enough, because they will not cause the gas to interact with the must-wine.
In fact, they cannot operate in a scientific way: **gas dosage is difficult to measure and actually very empirical.**

Using oxygenation with Metodo Ganimede® patented fermenter.

When speaking of the addition of a gas in must-wine – particularly if a vat is very large (up to 5 metres) and high (up to 16 metres) – **Metodo Ganimede®** guarantees a careful distribution and a scientific application of this practice, because:

- If we think that the gas (air-oxygen) is injected soon after the by-pass is opened to let all the CO_2 escape outside, it is evident that the **time of contact** of the gas stored in the gap with the liquid below is of **several minutes**, because it continues long after the gap is filled completely.
- The gas is introduced below the diaphragm at a high **pressure (0,2 - 0,4 bar.)** so that the solubility of the gas in the must-wine is encouraged.
- The **area of contact** of the gas with the must-wine is **very large (80-85%)**.
- Moreover, as soon as the room below the diaphragm is filled up completely, the mix of air/CO_2 in excess will rise to the surface and pass through more liquid until it reaches a large part of the cap of marcs, which will be flooded more thoroughly and efficiently in every point.
- The stripping action is far less heavy, since the pressure of the gas stored below the diaphragm will reduce it and encourage the injected gas to dissolve better in the liquid.
- When the by-pass is opened, the gas will suddenly escape and rise **upwards**, and stir thoroughly and efficiently the whole cap of marcs.
- This effect is amplified further by the phenomenon of **decompression** which is generated because the pressure of the gas below the diaphragm will fall suddenly and cause a large amount of bubbles to form.
- The control panel can run 2 independent gases at the conditions listed above. This way, an efficient, quantifiable and repeatable distribution of the gas is guaranteed at the same conditions in a 100 hl vat or in a 2,000 hl vat.

A video of all these stages is made available to help understand what has been said above and to stimulate ideas about further possible applications of the system.

Thanks to the way it is built, only **Metodo Ganimede®** helps a winemaker to run the addition of technical gases directly (unlike the other systems currently available in the market) in a precise and efficient way.
In fact, the possibility to have a gas interact under pressure, for a time relatively long and with a very large area of contact with the must-wine makes **Metodo Ganimede®** an efficient tool unique in its genre.

Moreover, with **Metodo Ganimede®** the use of technical gases (CO_2, N_2) helps an ideal protection of the must during prefermentation phase, because the saturation of the vat before filling and the saturation of the diaphragm after it causes CO_2 to remain under pressure below it. This way, the gas is encouraged to dissolve in the liquid and its antioxidant and solvent properties are amplified (protection of anthocyans, dynamic skin contact).

By introducing an external gas, again from below the diaphragm, a winemaker can run at a prefermentation and postfermentation stage a soft but efficient stirring to obtain a greater homogenisation of the whole mass of marcs. This way, all the product will be ideally protected.

I hope these simple remarks will help you understand better the extraordinary potential offered by **Metodo Ganimede® patented fermenter.**

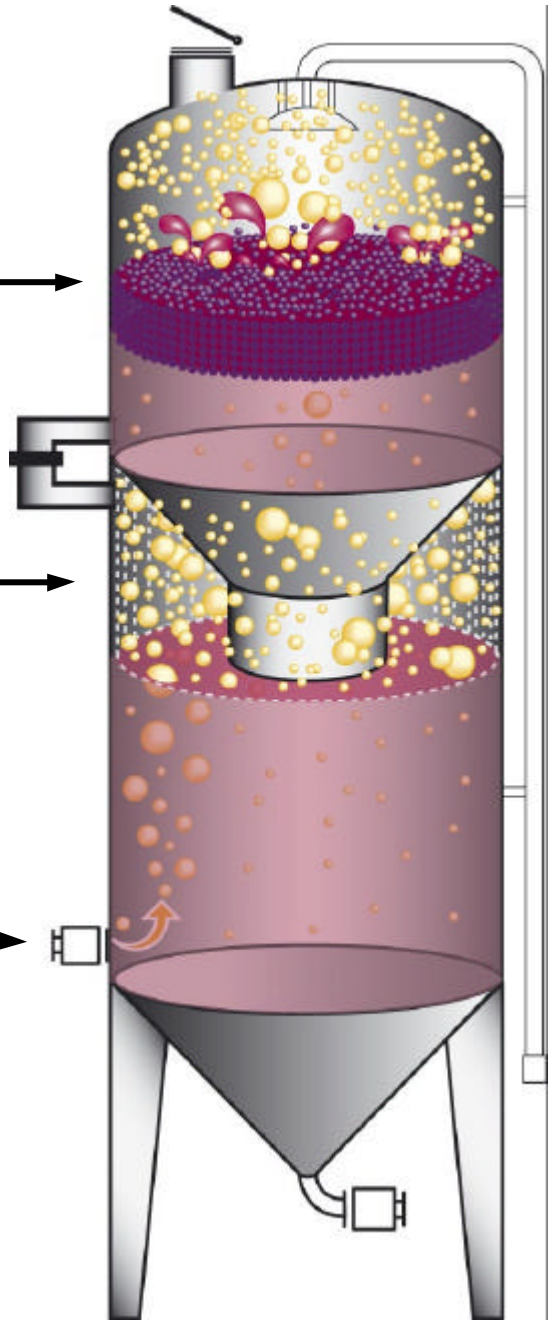
Francesco Marin

Note The use of oxygen in wine implies a less troublesome application, because there are no large amounts of CO_2 (stripping action) and its use is consequently easier. The application of this practice, then, will have to be assessed carefully case by case, depending on the characteristics of the processed wine.

The excess gas escapes through the neck of the diaphragm, stirring the product and guaranteeing **homogenisation**

The **surface of contact** of the liquid and the **gas under pressure** (0,2-0,4 Bar) below the diaphragm is equal to 80-85%

The injected gas gathers below the diaphragm, and remains under **pressure** for a long **time**.



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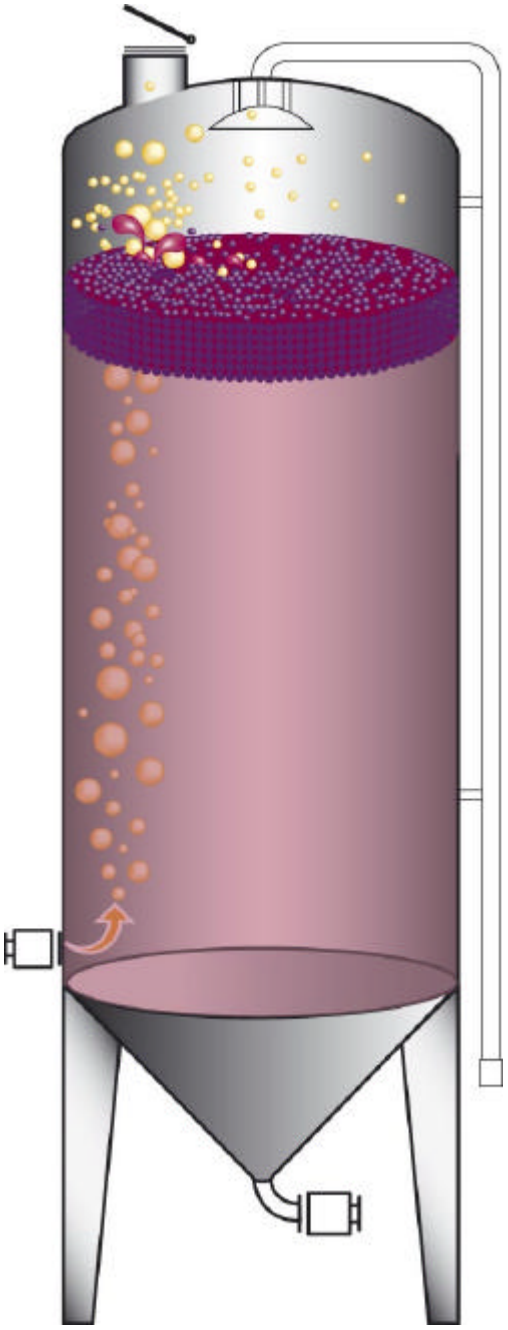
The injected gas rises to the surface **rapidly**, in a small **vertical** column affecting only a **marginal amount** of the product



TRADITIONAL

"DYNAMIC SKIN CONTACT"
Effectivness of technical gases with Metodo Ganimede®

Only six years since it was born and the **Metodo Ganimede®** is today well known by wineries all over the World, for the red vinification as well as the white vinification, thanks to the great versatility offered to the oenologist during the different phases of maceration and fermentation.

To appreciate the great versatility of the **Metodo Ganimede®** it is necessary to analyse the different solutions offered to the oenologist

1- **Pre-fermentative "Dynamic Skin Contact"**
2- **Fermentation**
3- **Post-fermentative Maceration**

1. Pre-fermentative "Dynamic Skin Contact"

The extractive process can be influenced in a positive way by the "Dynamic Skin Contact" technique. Only **Metodo Ganimede®** is able to exploit this technique in a delicate and effective way, thanks to its characteristic diaphragm which creates those essential "dynamic" conditions that permit to involve, during the "Skin Contact", the whole product and not only a part of it. Furthermore with **Metodo Ganimede®** the entire process take place in a controlled environment.

The input of technical gases in the most of the vinification systems is empiric and it is difficult to quantify. An external gas, when it's put inside a liquid, it's not able to distribute itself on the whole mass of liquid at disposal. The gas takes out quickly coming up in a vertical column (that is a gas physical feature) affecting in this way only a marginal portion of the product.

With **Metodo Ganimede®**, on the contrary, the oenologist can introduce the technical gases directly under the funnelled diaphragm, making the gas action valid and effective because:

1- The inserted gas is held under the diaphragm and rests in strict contact with a large amount of the mass (aroud 85% of the liquid surface is in contact with the gas)
2- The pressure applied by the liquid that is above the diaphragm (more or less 0,2/0,4 bar, it depends on the Ganimede size) help the gas dissolution in the liquid (physic characteristic of the gases)
3- The gas melted in the liquid, together with the typical homogenization and mix action of the **Metodo Ganimede®**, is thus able to perform its own action (extractive, solvent, antibacterial and antioxidant) affecting the whole mass (100% of the product) and doing that in a effective way.

Compare to traditional systems, with **Metodo Ganimede®** we can obtain **assured** (controlled environment) **evident** (soft action) and **quantifiable** (100% of the product involved) results.

What are the real applications of the pre-fermentative "Dynamic Skin Contact" that only with **Metodo Ganimede®** can be effectively conduct ?

A- Effective and soft mix of the mass

Thanks to the introduction of external CO_2, through the specific valve, we can obtain an effective mix of the mass without using pumps which usually break the solid parts of the must (skins and seeds) causing the subsequent production of undesirable aromas that could compromise the end product quality.

B- Cold "Dynamic Skin Contact" for aromatic white wines, clarets and particular red wines (such as Pinot Noir)

Through the introduction of the CO_2, we are able to obtain a quick and secure extraction (being the environment completely saturated of CO_2, it's definitely controlled) thanks also to the intimate exchange between liquid and solid parts that determines a rapid and considerable extraction of anthocyanins and aromas.

With **Metodo Ganimede®** we can saturate the fermenter with CO_2 before filling it. Compare to traditional fermenters, with **Metodo Ganimede®** the gas that remain under the funnelled diaphragm (by-passes closed) during the filling of the tank, is compressed and trapped under the diaphragm performing an useful action in a effective way. A part of the gas is dissolved in the liquid applying a solvent action while another part, coming up and accumulating under the diaphragm, escape from the neck of the diaphragm through big bubbles that mix and homogenize the liquid and the skins in a delicate but effective way.

With **Metodo Ganimede®** we can produce aromatic white wines which, particularly sensible to the oxygen, they are always in an environment full of CO_2 and consequently protect from the risks of oxidation and bacteria proliferation.

This opportunity offered by **Metodo Ganimede®** has been effectively adopted with great satisfaction by numerous clients who, thanks to a cold maceration of only 6-12 hours, has obtained an effective extraction of the desirable components, putting in evidence the great delicacy and selectiveness of the system, able to get the process faster with a considerable savings (a single tank can be utilised for more than one filling in this way)

The wines produced with this technique are: Bianco di Custoza, Chardonnay, Trebbiano, I.M. 6 0 13, Sauvignon, Vermentino, Tocai, Viognier, Gamay, Pinot Nero, Carignan, Grenache, Syrah, Cabernet, Merlot, Refosco P.R., Raboso.

2. Fermentation

The effective mix of the whole cap (100% of grapes) obtained with **Metodo Ganimede®** thanks to the enormous quantity of CO_2 produced during the fermentation (40-50 litres of gas for every litre of must), is by now well known over the World.

The **Metodo Ganimede®** offers to the oenologist, at the beginning of this phase, the possibility to introduce filtered air, creating the optimal conditions for the yeasts to multiply. The controlled use of the oxygen can be useful, during the central phases of the fermentation, to help the polymerisation of tannins and confer to wines more softness and gentleness. The time of refine in this way is shortened.

3. Post-fermentative maceration

In this phase the skins tend to sink in fact they are not push upwards by the CO_2 action because of the absence of fermentation. All the options of **Metodo Ganimede®**, described in the pre-fermentative phase, can be exploited also in the post-fermentative one. The oenologist can leave the skins in contact with the liquid when the fermentation is finished, and he can proceed with soft and delicate mix, always keeping the product in a controlled environment. In this way he can avoid the risks related to the use of pumps which can cause serious damages to the end product and also those risks related to the stay of the product in a non controlled environment (risk of exposure)

Metodo Ganimede® gives to the oenologist some opportunities that till now were conducted approximately and they were not precise with conceivable risks. With **Metodo Ganimede®** instead, the quantities are preestablished and the times are planned with precision thanks to the effectiveness of the method.

All these things can be obtained in a simple and personalized way.