HYGIENIC STANDARDS IN WINEMAKING

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General notions on hygiene

In order to offer consumers wholesome and acceptable food and drink certain hygiene rules need to be put in operation. These rules will determine the cleaning-disinfecting processes that should be carried out:

- Start off with a good quality raw material: the treatments that need to be applied to the raw material itself will largely depend on the considered foodstuff.
- Clean and disinfect the equipment and/or the surfaces:
  - For surfaces that come into or could come into direct contact with foodstuffs, the cleaning-disinfecting methods must meet precise criteria.
  - For surfaces that do not come into direct contact with foodstuffs (floors, walls, ceilings, etc.), they must be permanently kept clean in order to avoid any cross-contamination between poorly maintained zones and surfaces in direct contact with foodstuffs or even the foodstuff itself.
- Assure good hygienic conditions of the surroundings. For many industries, treating the surroundings and ambient air has become a necessary complement to conventional hygiene measures that are applied to surfaces. Micro-organisms are conveyed by dust in the ambient air and they might settle on surfaces that come into contact with foodstuffs after having been cleaned and disinfected.
- Do not neglect staff hygiene?
- Comply with standards for foodstuff transformation and preservation operations.

Hygiene is therefore a series of measures and actions that apply at all times. The better designed the premises in which one works, following a suitable process using the correct equipment along with trained and well-informed personnel, the easier it will be to maintain good hygiene.

Hygiene in oenology

Hygiene in oenology is different to other food processing industries where an insufficient level of hygiene or incorrectly applied hygiene measures can lead to outbreaks of food-borne diseases.

Wine, on account of its composition (low pH and high ethanol content), is a hostile medium to many pathogenic germs. Nevertheless, lack of hygiene in oenology can lead to the alteration of the product (growth of micro-organisms) or instead a development of unwanted micro-flora. These are mainly yeasts (oxidative and some fermentative yeasts), moulds, acetic acid bacteria and lactic acid bacteria.

In oenology, concern for hygiene means applying measures linked:

- To existing regulations:
- Compliance with European Directive n° 93-43 CEE of the Council dated 14/06/1993 (known as the Hygiene Directive).
- Compliance with analytical wine standards. Such standards may be issued by the OIV (International Organisation of Vine and Wine) in the form of recommendations, before being definitively adopted by the European Commission.

- Compliance with the Directive knows as the Machinery Directive, n° 98/37/CEE, which concerns requirements in terms of hygiene for food processing machinery.
- Respect of the environment.
- Compliance with the procedures to follow concerning water intended for human consumption.
- Compliance with labour code with respect to staff safety during the preparation and use of chemicals.

• To the quality of the product:
- To limit chemical contamination (heavy metals, pesticides, etc.).
- To limit oxidation of the must.
- To favour micro-organisms which are useful during fermentations?
- To contribute to attaining and maintaining low microbial populations during stabilisation and bottling.
- To avoid or limit thermal treatments or additions of chemical stabilisers.

• To commercial commitments:
- Elimination of possible contaminations, linked to aestheticism (particularly with respect to direct sales).
- Compliance with standards or, more specifically, explicit requirements linked to commercial contracts.

Application of hygiene in wine cellars

The application of hygiene measures required in oenology depends on the fluctuating activity of the wine cellar or the wine storehouse over the course of the year (activity peak during grape harvesting), the diversity of the products that may be involved (red wines, white wines, sparkling wines, stabilised and non-stabilised wines, filtered or unfiltered wines, etc.) and the materials involved (wood, stainless steel, concrete, etc.).

For the wine industry, as in all food processing industries, a hygiene plan must be drawn up in order to optimise the planning of cleaning-disinfecting operations in terms of procedures, frequencies and controls. However, in oenology, it is conceivable and even reasonable to define hygiene levels (table n° 4) given that, in oenology, the closer the wine is to the bottling step, the stricter the hygiene conditions should be.

Table 1: Hygiene levels in oenology

Hygiene level	Why?	How?	Where?
Minimum	To eliminate heavy contamination : earth, leaves, marc	Pre-washing	Floors Harvesting equipment
Elementary	To eliminate contamination	Pre-washing Cleaning (with brush or detergent) Rinsing	Crushers Wine presses Wine-making and tank storage areas
Thorough	To eliminate contamination and to limit the proliferation of micro-organisms	Pre-washing Cleaning Rinsing Disinfecting Rinsing	Collecting heads of grape harvesting machinery Surfaces in contact with the must and the wine Pipes, pumps, valves
Very thorough	To lower the population of germs below a predetermined threshold	Pre-washing Cleaning Rinsing Disinfecting Rinsing Control	Surfaces in contact with wine in the case of specific seeding Bottling chain

Source: Guide practique de l'hygiene en œnologie (Practical guide to hygiene in oenology) – ITV, 1985

It is possible, in this way, to adapt a hygiene plan to each critical stage of the wine making process.

The means available to the oenological industry are chemical, physical and/or mechanical.

Chemical measures are approved cleaning-disinfecting products that are used to scale and decolourise materials in contact with the must or the wine.

Physical measures are heat, or more specifically steam (in the form of damp heat, steam or hot water), but also processes such as microwave treatments, ultraviolet treatments, etc..

Mechanical measures are mainly means that reinforce the action and/or facilitate the application of cleaning-disinfecting products (brushes, foam guns, scrapers, foam balls for closed circuits, etc.). Mechanical measures also include high pressure water, which also enables thorough pre-washing and efficient rinsing.

Hygiene aims to the elimination of contaminations. For this, both cleaning and disinfecting phases are indispensable and complementary:

- Cleaning removes visible or microscopic contamination adhering to surfaces, rendering them clean.
- The aim of disinfecting is to reduce in a significant but temporary manner the population of micro-organisms harmful to the quality of the wine. Since contamination can be favourable to micro-organisms, disinfecting must always be preceded by cleaning.

Whatever the type of contamination, nature and surface condition of the material, all hygiene procedures proceed in the following steps: pre-washing, cleaning, rinsing, disinfecting and, last but not least, final rinsing (sterile water).

The steps differ depending on whether two agents (a cleaning agent followed by a disinfecting agent) or a single mixed agent (cleaning and disinfectant) are used.

The choice of detergent or disinfectant must take into account the nature of the contamination, the properties of the surfaces to be cleaned, particularly the chemical, mechanical and thermal stability of the material, as well as the risks of corrosion.

Another parameter that is often neglected but which is very important is the quality of the water, particularly its hardness. It is worth recalling that water composition can vary widely from one region to another.

Hygiene and Environment

Nowadays, respecting the environment is a priority. Past incidences of pollution abuses now means that industrial or farming activity is closely monitored In the wine sector, the cleaning operations indispensable to maintaining the hygiene of wine storehouses and equipment may be the source of organic and chemical discharges. Before attempting to deal with such discharges, it is important to try to reduce at source the polluting load and to reduce the volume of discharges without having an adverse effect on hygiene, which should remain the priority concern of the wine-maker.

Cleaning with lower amounts of discharges and less polluting discharges is an imperative that can be attained by taking into account the work organisation, the choice of the cleaning products, the equipment and the design of the wine storehouses themselves.

The most relevant example is water management. Training and awareness of personnel, combined if necessary with regular readings of water meters, is an indispensable prerequisite to any water management policy. In parallel, the installation of automatic shut-off devices enables water losses to be kept to a minimum.

Thus, depending on the type of cleaning that needs to be carried out, it is possible to obtain an equivalent result by using less water and often by discharging less pollution. With regard to cleaning products, in-place cleaning (IPC) and recycling, already operational for soda scaling solutions, are in the development stage, especially for large production facilities.

Foam guns, by increasing contact time, particularly in the case of vertical surfaces, contribute to enhancing the performance of cleaning devices.

In the same way, the generalisation of hot water circuits helps to optimise cleaning operations using less water.

Operations linked to hygiene represent a prominent part of the pollution originating from wine cellars. Environmental issues are being developed within legislation and which reflect on the image of wines. These operations justify the development of cleaning technologies that are less polluting, that consume less water and that offer recycling possibilities. This imperative must also be taken into account in training and in the research orientations of the wine industry.

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