CLEANING IN THE CELLARS AND ENVIRONMENT

World congress of the Vine and the Wine, OIV; 1996

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Key Words: Reduction of the polluting load, descaling, drains, hygiene, environment.

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Abstract

Reduce the polluting loads and the volume of the winery wastewater is the first schedule before treating the effluent.

The hand washing, in relation with the environmental aspect, are described and specially two technologies, developed in Champagne, butt the washing of near-drain-pipes and butt the detartrating of the tanks.

INTRODUCTION

Any industrial activity contributes to rejections which can represent a source of pollution. For the viticultural sector, the operations of cleaning essential to the maintenance of the hygiene of the wine storehouses and hardware, are at the origin of rejections organic, and punctually chemical.

Very often, the installation of a device of processing of the rejections imposes internal measures intended to reduce to the source the polluting load and to decrease the volume of the rejections without to carry damage to the hygiene, which must remain the priority concern of the elaborative ones.

Vis-a-vis this problem, the Interprofessional committee of the Wine from Champagne carried out investigations within the framework of action ŒNO 2000, to develop technical solutions integrating the concept "environment" throughout the chain of development of Champagne.

This action is conducted since June 1994 in partnership with the TECHNICAL Institute of the VINE and wine (ITV), the REGIONAL ORGANIZATION of CHECK OUT and TECHNICAL ASSISTANCE for WATER (ORCATE), within the framework of a financing of the agency of water Seine-Normandie.

It is not possible in this communication to detail the whole of the related aspects to hygiene concerning the environment so much the subject is vast.

After having briefly presented the principal stages of cleaning, two aspects will be the object of a particular development: the descaling and the cleaning of the drains of pneumatic press.

I. PRESENTATION

To Clean with less important and less polluting rejections is a requirement which can be reached by taking into account at the same time the organization of work, the choice of the hardware of cleaning and the design of the wine storehouses.

The training and the sensitizing of staff possibly associated with regular statements with water meter are an essential precondition to any policy of water management. In Parallel, the installment of stopping devices automatic makes it possible to reduce the water losses.

The tweaking of the phases of cleaning utilizes several factors:

- type and concentration of the product of cleaning;
- time of contact;
- temperature;
- nettoyability of the support;
- mechanical effect.

Thus, according to the type of cleaning to be realized, it is possible to get an equivalent result, sometimes even higher by using less water and often by rejecting less pollution.

In connection with the *products of cleaning*, parallel to better information of the manufacturers, it is advisable to improve our knowledge on ecotoxicity of the commercial specialities and the incidence of these products within the framework of biological processing of the effluents. From a point of view set up in work, cleaning and recycling, already operational for soda solutions of descaling, should develop in the medium term especially for the production structures important.

The device of foam gun, by increasing the *time of contact*, in particular in the case of the vertical zones, contributes to improve the performances of the devices of cleaning.

In the same way, the generalization *of the warm water circuits* goes in the direction of a tweaking of cleanings with less water.

A support is all the more easy to clean it has a smooth surface. The coating of cement surfaces with epoxydic resins, the electropolishing of stainless apply to all the operations of cleanings of the tanks. With respect to the grounds, parallel to the *facility of cleaning*, the risk of drags must be taken into account. Very often, a compromise depend on the slope, frequency of cleanings or passages, must be found between these two constraints. Until Now, there did not exist objective test making it possible to optimize the choice of floor coverings (standard of tiling, content and characteristic of the non-skid aggregates contained in the resins) according to the variety of application. A test of drags dynamic developed by the National Institute of Search and of Security (Mr. Tisserand and Mr. Saulnier) was confronted, thanks to a specific measuring equipment, with the terms of service of the grounds in the wine storehouses. In the medium term, the value of drags measured by this test will make it possible to the user

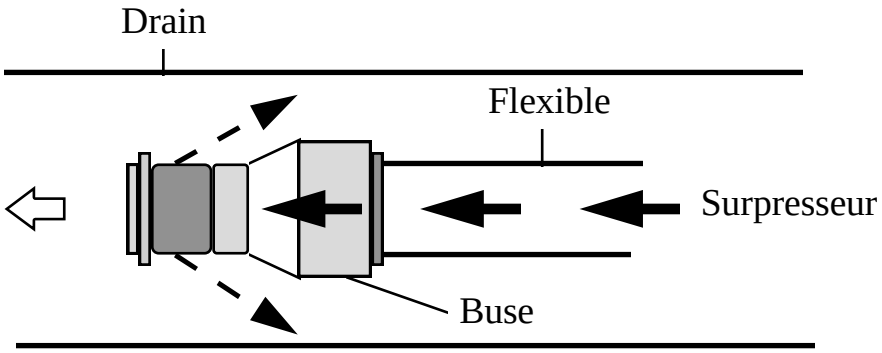
to choose the coating more adapted to each situation, thus facilitating the operations of cleaning, while respecting the requirement security related to drags.

The mechanical effect can be obtained various ways: hardware with high pressure, feeder system equipped with a booster, rotary tubes, brushing. All these technologies can be used in condition however of not deteriorating surface to be cleaned by a too marked mechanical effect.

II. WASHING OF THE DRAINS OF THE PNEUMATIC PRESSES

The passage of must inside the pneumatic drains of presses leads to the formation of a deposit, source of development of moulds, prejudicial with the quality of the wines. Until Now the technique of cleaning consisted in injecting water with strong flow, at the end of the drains. However, this process led to an important water consumption for a quality of random cleaning.

Figure 1: Principle of the washing of the drains by reactive tube



We developed starting from the principle of the tube reactivates (Fig. 1) a technique of cleaning which clearly improves the performances because of the mechanical effect while reducing consumption appreciably of water (Tab.1). This kind of cleaning can be carried out manually or via an automatic device managed by the electronic console of the press.

Methods of washing	**Weight of residual deposit (g/m ^{2} /marc)**	**Water Consumption (L)**
Absence of washing	13.2	/
Washing by scrubbing	7.6	350
Washing by reactive tube	1.8	80

Table 1: Comparison of various systems of washing of the drains

III. DESCALING OF THE TANKS

The tartaric acid exists in a natural state in the grape. In concentration saturating in musts and the wines, it precipitates during the development and of the conservation under the influence in particular of the fall in the temperature and the increase in the alcoholic strength.

The descaling of the cement tanks was carried out a long time mechanically thus making it possible to recover the tartar in the form of crystals. But, the evolution of the viticultural fermenting room (stainless steel, food resin coating) contributed to override this traditional process by a descaling with soda with for corollary a contribution to viticultural pollution.

In order to reduce the incidence of descaling on the environment, various research tasks were implemented.

III-1. Characteristics of the solutions of descaling

Chemical descaling with soda rests on a solubilization of bitartrate of potassium (or acid tartrate of potassium) with formation of a double sodium and potassium tartrate: the salt of seignette. The soluble potassium bitartrate is thus eliminated in the solution from descaling which is generally rejected directly with the sewer.

The organic load (loads polluting) of the effluents of descaling is particularly high (Tab.2). Indeed the contents of DBO5 are often higher than 50 000 Mg O2/1 while the level of DCO exceeds usually 100 000 Mg O2/l.

Analyses	1	2	3	4	5	6
pH	12.05	12.30	12	11.9	11.95	11.6
MY mg/l	15,807	2,300	18,780	4,220	-	1,096
DBO5 Mg O2/l	50,000	19,900	77,000	132,000	67,500	122,000
DCO Mg O2/l	121,500	51,000	176,500	218,000	120,700	205,900
NTK mg/l	735	266	630	735	245	420

PT mg/l	192	96	740	1,000	653	1,046
K mg/l	48,500	20,000	58,750	93,500	41,000	78,750
Fe mg/l	15.2	5.8	4.9	6.1	3.0	5.3
Cu mg/l	3.5	1.2	13.9	17.2	6.8	17.0

Table 2: Composition of various solutions of descaling

Table 2 fact also of appearing a great variability of the contents of DBO5 and DCO according to the solutions. Indeed from a practical point of view, staff carrying out descaling often uses a constant quantity of soda for each tank whatever the quantity of tartar to eliminate, which leads to a level of variable dissolution of bitartrate, in correlation with the organic load expressed in DBO5 and DCO.

The juices of descaling are also characterized by a raised pH, likely to disturb the operation of the biological sewage treatment plants.

III-2. Recovery of the tartar

In order to decrease the quantity of soda to be used, to even remove chemical descaling, various sectors were tested:

Devices of cleaning

Before carrying out chemical descaling, it is possible to consider a cleaning with water, in order to ensure the unhooking of part of the crystals fixed at the walls of the tank. This unhooking is all the more easy as washing intervenes quickly after the racking of the wine, that the temperature of water is high, and that the mechanical effect related to the device of cleaning is important. The characteristics of the principal hardware of cleaning are presented in the following table.

Apparatuses of descaling	**Mechanical Effect**	**Capacitance of the tanks**	**Cost H.T.**
Swell perforated	Weak	Weak < 100 hl	500 to 1,500 F
Swell rotary	Rather weak	Average 100 to 300 hl	1,800 to 3,000 F
Fixed Jet	Mid-sized	Important > 300 hl	1,500 to 3,500 F
Rotary Jet	Good	Important > 300 hl	18,000 to 25,000 F

Table 3: Characteristics of the principal systems of descaling of the tanks

Tests were also carried by the CIVC on the technique of ultrasonic cleaning. The laboratory tests are very conclusive, but unfortunately, the industrial application of this technique appears not easily possible taking into account the electric outputs settings concerned and of the need for filling of water the totality of the tank before carrying out cleaning.

The recovery of bitartrate in the form of crystals also poses problems of logistics, rollout and storage. Various studies are in hand in order to find solutions adapted, thus limiting the practical constraints.

Nettoyability of the supports

The fixing of the tartar whose theoretical bases are little known, is closely related to the roughness of the support. The use of food resins contributes to facilitate the crystal elimination of tartar, with however an effectiveness which decreases with time.

With respect to the stainless steel, the electrolytic polishing, which contributes to obtain a very smooth surface, appreciably decreases the fixing of the crystals of tartar.

Electrolytic polishing or electropolishing consists in removing part of the metal of surface of a stainless part in the form of cations by the combined effect of a D.C. current and a bath of electrolyte. It results a very smooth surface from it, near to that of a mirror which presents a very good nettoyability (Tab.4).

Type of stainless steel	**Weight of tartar before washing**	**Type of washing**	**Presence of residual bitartrate**
traditional	5.58 kg	Fountain heat during 40 minutes that is to say 640 liters	YES obligation to scale with soda
electropolished	0.94 kg	Fountain heat during 1.10 minutes that is to say 18 liters	NOT

Table 4: Example of descaling of a heat exchanger standard "flag" of 1.5 m2

The mechanical technique of descaling was also tested. It is carried out by the action of a rotary disc on the surface of stainless coated beforehand with an abrasive

paste. This principle applicable to the internal walls of the tanks has a good effectiveness. But taking into account the risk of diffusion in the wine of the residual abrasive paste retained in the microcavities of surface, this technique was not retained.

Other surface treatments, which could apply to the tanks in place are in the course of experimentation.

III-3. Recovery of the juices of descaling

For most fermenting rooms, whatever the efforts of recovery of bitartrate in the form of crystals, chemical descaling remains essential. An important reduction of the polluting load can be obtained by a recovery of the solution of descaling, associated with a recycling of the tartar.

This method consists in using a solution of descaling, especially developed, in order to obtain an important dissolution of bitartrate. Indeed, the cost of transport reported to the quantity of recycled tartar must be weakest possible so that the solutions of descaling can be assumptions of responsibility without financial participation of the cellars.

From a practical point of view, the concentration of the bitartrate solution, inversely proportional to the potential of dissolution, is followed by density (Fig.2). When this solution reaches a level close to saturation, the container in which is stored soda, is recovered by a specialized company.

An automatic system of descaling was also tested. Automation is managed by the measurement of conductivity. However the cost of this apparatus did not allow, for the moment, a diffusion with large-scale.

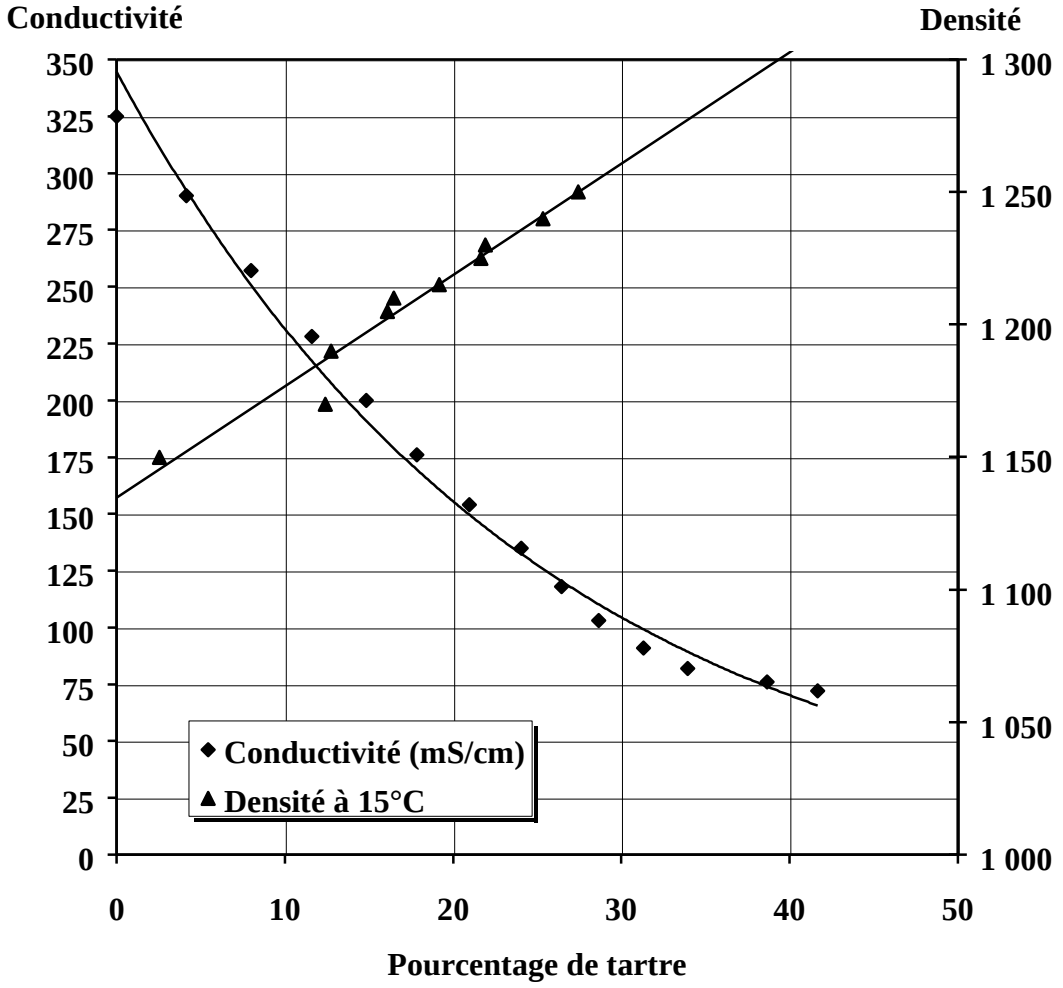


Figure 2 :Courbes de conductivité et de densité d'une solution de soude

The recycling of bitartrate is carried out according to a method developed by J.P. Faure.

The first precipitation in the form of potassium tartrate acid is carried out by acidification of the medium to the sulphuric acid until pH 3.56. The solution to be treated is placed in a tank of agitation during 1 hour, then follows a 12 hours decantation. The crystals then are recovered and dried. The supernatant which contains even more than 20 grams of tartaric acid per liter is treated in a distilling with a mixture of water of diffusion of marc according to the method developed by J. MOURGUES.

These juices are acidified until pH 2.5 per addition of a sulphuric acid solution, then a calcium carbonate milk is added until a pH of 4.9.

The acidification of pH 3.6 to 2.5 makes it possible to form calcium sulfate essential to the recovery of half of the tartaric acid not precipitated by calcium carbonate.

The crystals of tartrate of calcium recovered are dried then dried.

In 1995, approximately 4400 hectolitres of solution of descaling could be recovered and treated according to this process, which made it possible to develop a quantity of approximately 100 tons of potassium bitartrate. This recovery poses relatively little problems in the cellars of big size, put except for some practical aspects related to the transport of the containers. For the small units, it appears desirable to create manifold centres per village or small area in order to reduce the transport costs. This aspect currently makes, the object of a feasibility study within the framework of a globalized concept of wine waste collection center.

CONCLUSION

The operations related to hygiene represent a dominating share of pollution resulting from the cellars. The increasingly important taking into account of the environment in the legislative field and the image of the product justifies the development of less polluting technology of cleaning. This requirement must also be taken into account in the formation and the orientations of the search of the viticultural sector.

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