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Introduction of the Wine Making Process by Gravity and the Château Designed by this Concept

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Abstract:

The wine making technology by gravity and the process design full using gravity were summarized. It focuses on the process types of the wine making by gravity, and fully displays the perfect combination of the making design by gravity and the architectural design of the model Château, and provides a reference for the design and construction of the Château full using making process by gravity.

Keywords: Making Process by Gravity, Wine, Château

The construction of wineries in China's wine producing areas is in full swing recently. The appellation of winery in some countries and regions is slightly different and meanings is different.¹ The Château is castle originally, and focuses on architecture. The Domaine also

mainly means manor or estate, but focuses on orchard. The Bodedas is a place for wine such as cellar or hotel.² The winery is a company that produces wine. In this paper the Château is an wine production unit which includes vineyards for viticulture, wine production related buildings, and cellars for wine storage.³

The design of Château building should meet the requirements of wine production technology. Wine making by gravity is a traditional dynamic process, and it refers to wine making under the action of potential energy, so pumps are used little or not at all in the process of wine making. At the beginning the grapes are broken at the top of the tank, then under the action of gravity flowing of the juice and wine mash is completed automatically and the severe mechanical treatment is reduced. The natural flavor of the wine is to be kept maximally. Under the concept of gravity making the Château buildings was designed easily on the local terrain in many hilly areas, otherwise it can also be achieved through artificial mountain terrain.⁴ Therefore, The Château building which was designed more perfectly under the concept of gravity making will also become the persistent pursuit of many architects and wine engineering technicians.

Introduction

Usually the wine making process includes preprocessing, fermentation, ageing, post-processing and filling. The preprocessing mainly includes picking and choosing, breaking, crushing. The wine grapes are processed into fruit juices (like peach and white wine) or mash with skin (like red wine) during preprocessing, then transferred into fermentor.

Fermentation management is a key step in wine making. For white wine fruit juice can be fermented in a fermentor in case of no control. While the thick mass of pulp and skins will appear on the surface in fermenting tank of red wine, this mass known as the cap should be controlled for extracting more of its colour. The controlled methods includes pumping over, rack and return that need pumps.⁵

When fermentation is over the crude wine is pumped from one tank to another, and wine during postprocessing is also pumped from tank to oak barrel or from oak barrel to tank or

from oak barrel to another barrel. These process require power, and the most use of pump includes centrifugal pump, a piston pump, a diaphragm pump or a cubage pump. Oxidation and loss of aroma will occur in wine under the action of the shear force of the pump.

No-use or Reducing use of the pumps during wine making is beneficial of the sensory quality of the aroma of wine, or using peristaltic pump of less shear force.

Process design and classic Château by gravity making wine

Fully considering the application of gravitational potential energy is the key in the wine making process. And Integration of gravity into wine making needs the design from architectural. According to the different means of dynamics, three ways of wine making process by gravity design are listed as follows.

Process design using natural or artificial terrain

In this kind of design grapes are transported to the highest level of workshops through transport vehicles, that is to say, to the above of the crusher. This kind of making design by gravity can make full use of the potential energy, the grape mash flows into the fermenting tank through pipe or funnel-shaped mobile tank after the grape after the grape is destemmed and crushed, and the wine flows into oak barrel after the finish of the fermentation, and no pumps are used in these processes. While pumps are needed in pumping over, or rack and return so this is part of the making process by gravity design.

Quintessa winery (Figure 1) in St. Helena of California in USA is an artwork, the building is the perfect combination of architecture, making technology and nature. This beautiful crescent-shaped building of winery is built on a small hill with the surrounding topography. A road that is hidden above the building leads to the visitor center, and through this road all grapes are also transported to the highest level of workshops where grape starts on a journey to change into wine, and finally the wine will be mature in the cellar dug in the deep of the hill.⁶



Figure 1. Quintessa winery in St. Helena



Figure 2. Petra winery in Tuscany

The same wonderful design as Quintessa is Petra (Figure 2) winery in Tuscany of Italy. Petra winery is also built on the foot of a mountain, and the horseshoe-shaped cylinder of its main body resembles the Chinese century altar and in the middle of cylinder the staircase steps to the lookout table at the highest point. The winery building is the symbol of the combination of the three elements of heaven, earth and man and is the representative of traditional culture.⁶

Faustino winery (Figure 3) likes a three wing spacecraft lying in vineyards on the outskirts of the Duro river in Spain. The tip of the two wings of the building is embedded underground, one is the bottle storage area, another one is the oak barrel storage area, and the third wing is the fermentation area. and the fermenting pot is connected to the roof of the center of the building by the pipe, and the vineyard is formed from the top of the two wings. Through the two wings embedded in the ground, the way to carry the grapes is all the way to the top of the wine fermentation workshop. So when the grapes are harvested, all grapes from all sides of the garden can be transported to the roof of the winery along the two wings. After being destemmed and crushed on the roof, the grape mash flows into the fermenting tank by gravity and becomes wine, then transferred into tank or barrel in storage area.



Figure 3. Faustino winery on the outskirts of Duro river

Process design of lifting grape by belt conveyer or hoist

The conveyor belt which provided with an angle of 45° or more baffles has the ability to increase conveying materials. A panicle of grapes can be transported onto the preprocessing platform at high level such as Changyu winery (Figure 4), or the whole basket of grapes is lifted onto the high platform like the Treaty Port Vineyard in Penglai city of Shandong province (Figure 5) . Thus way, the grapes can get higher potential energy, and then the potential energy to be converted into the power of grape pulp, and then into the crusher or the fermenter.

The special containers and containers lifting system are used to carry out and transfer of grapes, grape berries, grape mash and wine, which is another design making by gravity in the winery. The classic example of the above design is Château Reifeng-Auzias in Penglai city of Shandong province. In this Château workshop, a special huge crane is used for lifting the material container of grapes, mash and wines (Figure 6). Through the crane that can move up and down, after being destemmed and crushed, the grapes in the container are lifted and placed into the fermentor; being released from the bottom of fermentor, the fermenting juice are lifted and placed onto the thick cap of pulp and skins, or the fermented wine are lifted and placed into the oak barrels.⁷



Figure 4. Inclined conveyer belt from Changyu



Figure 5. Vertical hoist from Treaty Port



Figure 6. Special huge crane in the wineshop of Château Reifeng-Auzias

Process design aided by natural or artificial terrain and using hoist

Unlike the gorgeous Quintessa, Petra and Faustino winery, the Bodega Baigorri in Spain looks like a glass pavilion surrounded by a lush vineyard around the top of the hill(Figure 7). The visitors pick up the order along the wooden steps and reach the highest point of the winery where the glass pavilion the operating platform is connected to a huge workshop. This open workshop with a height of about 20 meters is divided into four layers, from top to bottom in turn preprocessing area, fermentation area and ageing area, and each area is connected with ramp or elevator.

On the other side of the pavilion wooden base is the entrance to the grapes from around the hills. From here, grapes are sorted, destemmed, crushed, fermented, aged and other processes arranged in descending layers in turn. The grape mash after being destemmed and crushed is

transported and dumped into the conical fermentor through a funnel-shaped tank driven by the crane (small picture from lower left of Figure 7). The conical fermentor can promote extraction in the process of fermentation very well, and after the end of fermentation the wine can flow by itself through the pipe into the oak barrel in ageing area and mature and age quietly (Figure 7).^{6,8}

Unlike using crane of Bodega Baigorri and Château Reifeng-Auzias, the artificially hopper with a wheel is used for transshipment of destemmed grapes. During the fermentation process, the pumps are used to break up the cap in pumping over, rack and return for extracting more of its colour. The machine is used to press the cap into the mash of Château Junding in Yantai city (Figure 8), and in the workshop of Bodega Langes in Qinhuangdao city the elevator is used to transfer and dump grape mash for breaking up the cap from the bottom of the fermentor to the top of the fermentor (Figure 9).



Figure 7. Exterior, interior(lower left) and model (lower right) of Bodega Baigorri in Spain



Figure 8. Machine that presses the cap into the mash of Château Junding in Yantai city



Figure 9. Elevator in the workshop of Bodega Langes in Qinhuangdao city

Summary

In addition to grape planting and wine brewing, the wineries also integrate more and more other functions, such as wine collection, appreciation, entertainment, leisure and tourism,^{9,10} the winery construction is considered with the combination of local human and landscape factors to create design of winery with regional characteristics.¹¹ However, the core function of the winery or Château is to make high quality wine, and integrating the making technology and architectural design scientifically and perfectly should be the unremitting pursuit of many architects and wine makers. Some people say that the architecture is a solidified music. The exquisite Château designed by gravity making has turned grapes into wine, like beautiful music giving people the beauty of the senses and enjoyment.

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