

## 1 GRAPEWINE

### 1.1 Introduction

Wine is fermented grape juice. Wine can be made from grapes, fruits, berries etc. Most wine, though, is made from grapes. And no matter what the wine is made from, there must be fermentation, that is, that sugar be transformed into alcohol. If the amount of alcohol is relatively low, the result is wine. If it is high, the result is "distilled liquor," like gin or vodka.

Red wine result when the crushed grape skin pulp and seeds of purple or red varieties are allowed to remain with juice during fermentation periods. Pink / rose wine can be produced by removing the non-juice pumace from the must during fermentation. White wines can be made from pigmented grapes by removal of skins, pulp and seeds before juice fermentation.

Wines might be "fortified," "sparkling," or "table." In fortified wines, brandy is added to make the alcohol content higher (around 14 to 30 percent). These are less perishable and may be stable without pasteurization. Wines are termed still or sparkling depending upon the amount of CO<sub>2</sub> they contain. The carbon dioxide may be formed naturally during fermentation or may be added artificially.

Both table and sparkling wines tend to have alcohol contents between 7 and 14 percent. Sparkling wines are the ones with bubbles (greater CO<sub>2</sub>), like Champagne. Table wine (which can also be called "still") are the most "natural". The alcohol concentration itself is not sufficient to preserve natural wines, they are pasteurized. The term light wine is also used to describe wine having alcohol content from 5 - 10 %. The best wine grape is the European *Vitis vinifera*. It is considered optimal because it has the right balance of sugar and acid to create a good fermented wine without the addition of sugar or water.

### 1.2 Objective

The primary objective of the model report is to facilitate the entrepreneurs in understanding the importance of setting up unit of grapewine. This model report will serve as guidance to the entrepreneurs on starting up such a new project and basic technical knowledge for setting up such a facility.

### 1.3 Raw Material Availability

The major raw material required for the processing and making of grapewine is grapes. The production of grapes in MP is 2500 MT (2004-05). The productivity of the unit is 25MT/Ha.

## 1.4 Market Opportunities

India is a large market for wine. As against per capita consumption of European countries of 55-60 ltrs. every year, the per capita consumption in India is few spoons. It has been proved that Indian grapes (wine quality) are very good and some wineries are already catering to the quality-conscious USA and European markets.

Wine consumption in the country is still at nascent stage. Wine is now accepted as a health or social drink and its consumption is increasing gradually. Quality wines were mainly imported till couple of years back and hence they were very expensive. Availability of good quality Indian wine at half the price has resulted in continuous increase in demand. Gradual awareness about basic difference between wines and hard drinks is also helping the wine industry. Thus, India provides a large virgin market for wine.

## 1.5 Compliances

Certification under PFA Act and FPO is necessary. Requisite permission from the state and Central Govt. is also required.

## 1.6 Project description

### 1.6.1 Applications

There are various types of wines available in the world like white wine, red wine, dessert wine etc. Red wine is popular in India. It is increasingly being promoted as health drink as against other hard liquors like whisky or rum.

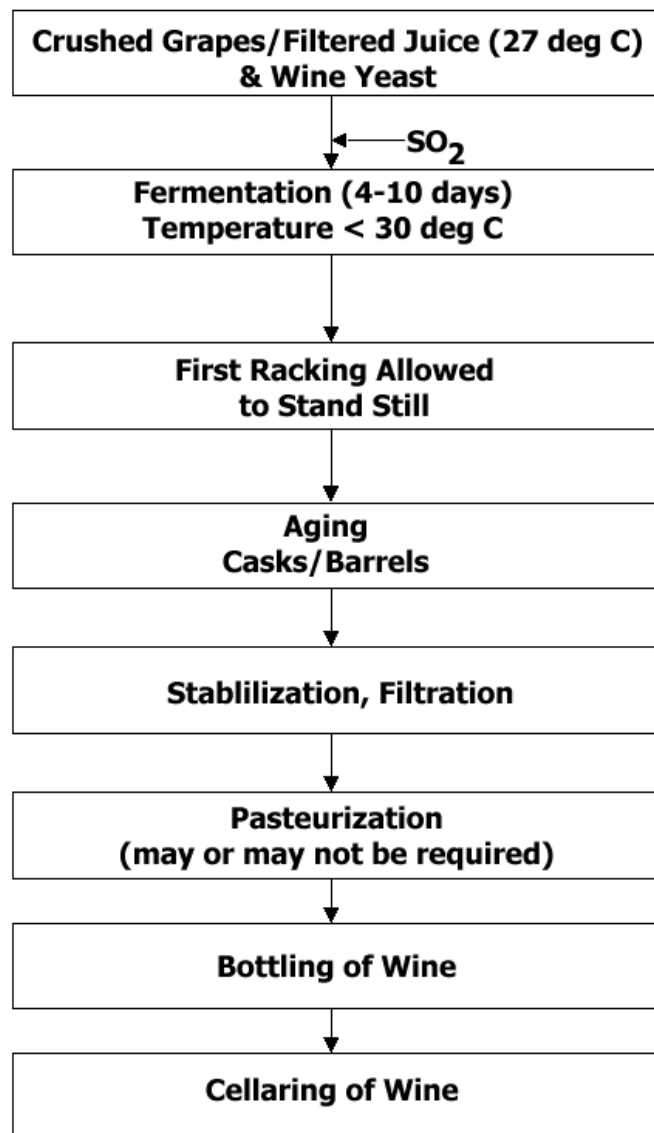
### 1.6.2 Manufacturing process

- **Crushing:** The grapes are hand picked and transferred to the crusher. The crusher punches the grapes and transfers it to a de-juicer which separates the pulp from the juice. While the skin, the stems and other remains from the crushing are used as manure, the juice is sent for fermentation. Grapes can (and might still) be **crushed** by stomping on them with your feet in a big vat. But a more practical way is to use a machine which does the job (and at the same time, removes the stems).

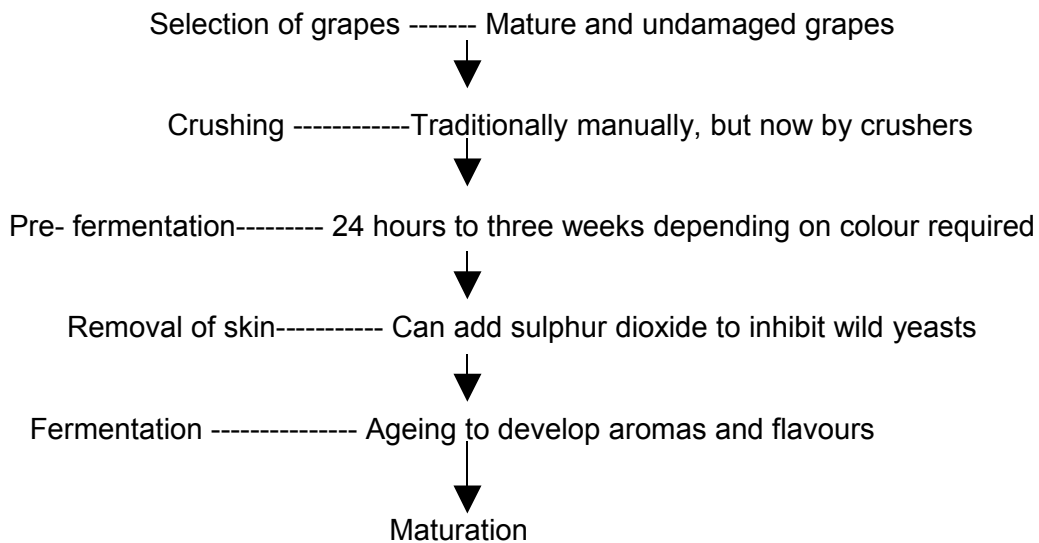
Separation may not immediately occur (especially for red wines), since skins and stems are an important source of "tannins" which affect wine's taste and maturity through aging. The skins also determine the color of the wine. **Maceration** (the time spent while skins and seeds are left with the juice) will go on for a few hours or a few weeks. Pressing will then occur. One way to press the grapes is to use a "bladder press," a large cylindrical container that contains bags that are inflated and deflated several times, each time gently squeezing the grapes until all the juice has run free, leaving behind the rest of the grapes. You can also separate solids from juice through the use of a centrifuge.

- **Fermentation:** The grape juice is first chilled in a combination of stainless steel tanks and oak barrels and then fermented by adding yeast. This process is called the first fermentation of wine and it takes about 8 weeks.
- **Maturation:** The first fermentation wine is further stored in tanks and/or oak barrels for 6-8 months for maturation.
- **Bottling:** On'ce the mature wine is ready, it is stabilized through cold treatment. After testing the stability of the wine, it then is filtered to screen the balance fine particles. The filtered wine is then packed in bottles, which are washed internally and externally with double filtered water to remove bacteria and germs

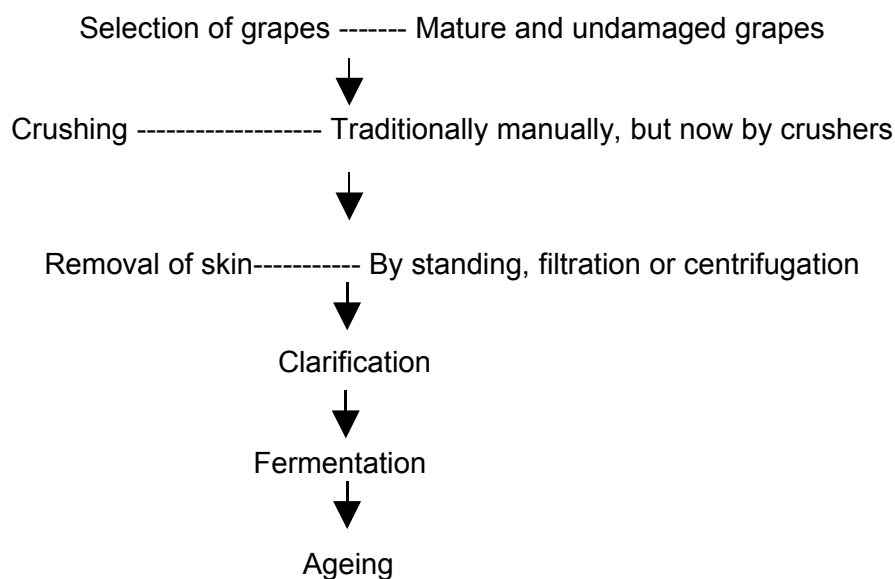
Figure 1 Operations in a winery



**Figure 2 Flow diagram of Red Grape Wine**



**Figure 3 Flow diagram of White Grape Wine**



**Fermentation**

Yeast also gives flavor to the wine. But the yeast that is on the grape skin when it is harvested may not have the desired flavor. Other things on the outside of a grape are not good for wine (for example, acetic bacteria on the grapes can cause the wine to turn to vinegar). The winemaker can eliminate unwanted yeast's, molds and bacteria, most commonly by using the "universal disinfectant," sulfur dioxide. Unfortunately, the sulfites which remain in the wine may cause a lot of discomfort to some wine drinkers. Some winemakers prefer NOT to do this, and purposely create wines that are subject to the vagaries (and different flavors) of the yeast that pre-exist on the grapes ("wild yeast fermentation").

The winemaker has many different yeast strains to choose from (and can use different strains at different times during the process for better control fermentation). The most common wine yeast is *Saccharomyces*.

A less modern, but still widely used way to ferment wine is to place it in small oak barrels. "Barrel fermentation" is usually done at a lower temperature in temperature controlled rooms and takes longer, perhaps around 6 weeks. The longer fermentation and use of wood contributes to the flavor (and usually expense) of the wine.

The skins and pulp which remain in a red wine vat will rise to and float on top of the juice. This causes problems (if it dries out, it's a perfect breeding ground for injurious bacteria), so the winemaker will push this "cap" back down into the juice, usually at least twice a day. In large vats, this is accomplished by pumping juice from the bottom of the vat over the top of the cap.

Eventually the yeast is no longer changing sugar to alcohol (though different strains of yeast, which can survive in higher and higher levels of alcohol, can take over and contribute their own flavor to the wine-as well as converting a bit more sugar to alcohol.

After all this is completed what you have left is the wine, "dead" yeast cells, known as "lees" and various other substances.

### **Malo-lactic fermentation**

The winemaker may choose to allow a white wine to undergo a second fermentation which occurs due to malic acid in the grape juice. When malic acid is allowed to break down into carbon dioxide and lactic acid (thanks to bacteria in the wine), it is known as "malo-lactic fermentation," which imparts additional flavor to the wine. A "buttery" flavor in some whites is due to this process. This process is used for sparkling wines.

### **First racking**

After fermentation completed naturally or stopped by addition of distilled spirit, first racking is carried out. This involves the wine to stand still until most yeast cells and fine suspended material settle out. The wine is then filtered without disturbing the sediment or the yeast.

### **Winery aging**

The winery may then keep the wine so that there can be additional clarification and, in some wines, to give it a more complex flavors. Flavor can come from wood (or more correctly from the chemicals that make up the wood and are taken up into the wine).

The wine may be barrel aged for several months to several years. No air is allowed to enter the barrels during this period.

Ignoring any additional processing that might be used, you could empty the barrels into bottles and sell your wine. However, during the winery aging, the smaller containers may develop differences. So the winemaker will probably "blend" wine from different barrels, to achieve a uniform result. Also, the winemaker may blend together different grape varieties to achieve desired characteristics.

### **Stabilization, filtration**

Stabilization is carried out to remove traces of tartaric acid. These tartarates present in the grape juice tend to crystallize in wine and if not removed completely can slowly reappear as glass like crystals in final bottles on storage.

Stabilization with respect to tartarates may involve chilling of wine that can crystallize tartarates and these crystals can be removed by filtration.

### **Pasteurization**

If the wine has an alcohol content less than 14% it may be heat pasteurized or cold pasteurized through microporous filters just before bottling.

### **Bottling wine**

Producers often use different shaped bottles to denote different types of wine. Colored bottles help to reduce damage by light. (Light assists in oxidation and breakdown of the wine into chemicals, such as mercaptan, which are undesirable). Bottle sizes can also vary.

### **Storing wine**

For wines that should be aged, a cellar should have proper :Temperature which does not have rapid fluctuation. 55 degrees Fahrenheit is a good, but you can live with 50 to 57 degrees Fahrenheit (10 to 14 degrees Centigrade). Wide swings in temperature will harm the wine. Having too high a temperature will age the wine faster so it won't get as complex as it might have. Having too low a temperature will slow the wine's maturation. Humidity. About 60 percent is right. This helps keep the cork moist. The wine will oxidize if the air (and its oxygen) gets to it. If the cork dries out, it can shrink and let air in. This is another reason to keep the bottles on their sides. The wine itself will help keep the cork moist.

- Lack of light.
- Lack of vibration.
- Lack of strong odors. Whatever it is that is causing the odor stands a good chance of getting through the cork and into the wine

### 1.7 Critical Aspects

Yet another critical feature of this industry is services of a qualified and experienced wine maker. There was a dearth of such specialists in the country and services of foreign consultants were engaged by paying hefty fees. But this expertise is now available in the country and they should be engaged. Thus, now-a-days it is possible to set up a grape wine making plant of appropriate capacity depending upon the financial strength of the promoters.

### 1.8 Conclusions

Consumption of wine is gradually increasing in the country. Reportedly, the world wine market is growing @ 12% annually whereas the Indian market at more than 20%. The government has also realised potential of this industry and state as well as central governments have announced number of financial incentives and administrative reforms. Some first generation entrepreneurs or progressive grape farmers may like to plunge into this sunrise industry. This is the most appropriate time to venture into this technically feasible and financially viable industry.

### 1.9 Project component and cost

Major components of the projects and their costs are described in the table hereunder:

PARTICULARS	AMOUNT
LAND	20.70
BUILDING	41.40
PLANT & MACHINERY	83.84
MISC. FIXED ASSETS	8.05
<b>TOTAL FIXED ASSETS</b>	<b>153.99</b>
SECURITY DEPOSITS	4.80
PRE-OPERATIVE EXPENSES	4.87
MARGIN MONEY FOR WORKING CAPITAL	5.91
<b>TOTAL</b>	<b>169.56</b>

#### 1.10 Building

The main production block will cost around 41.40 lakhs.

#### 1.11 Plant and Machinery

The total cost of plant and machineries is 83.84 lakhs.

<b>Machinery &amp; Equipment For Winery</b>	
<b>Particulars</b>	<b>Unit/Qty</b>
Boiler	1
Washing Tanks(Steel) with jet washing system	2
Screw Type Juice extractor	2
Hydraulic Press (Rack & Cloth Type)Cap. 5 Tones pressure,2 racks and 2 Trays	1
Fermentator (SS) along with coling and heating systems	1
Filter Press Complete with gear pump size 8*6 ft cap	2
Air Condition	3
Semiautomatic Bottle Washing Plant	1
Automatic Bottle Filling and Crown corking	1
Carbonator	1
Empty CO2 Cylinder	20
Water Storage Tank Cap.	1
Bottle Pasteurization Tunnel	1
Semiautomatic Labelling Machine	1
Maturity Tanks/oakwood Barrels,	45
Yeast Culture Room	
Steam Pan Tanks	2
Misc. equipments such as trays, wooden working tables,Different types of Knives,slicer,punches,crates,baskets,drums,weighing scales with measure of different capacities etc.	-

### 1.12 Miscellaneous Assets

A provision of Rs. 8.05 would take care of all the requirements.

### 1.13 Preliminary & Pre-operative Expenses

A provision of Rs. 4.87 would take care of pre-production expenses like establishment, professional charges, security deposits etc.

### 1.14 Working capital assessment

<b>ITEMS</b>	<b>Year 1</b>	<b>Year 3</b>	<b>Year 5</b>
PROCUREMENT	5.25	13.13	13.13
PACKING MATERIAL	5.25	13.13	13.13
SUNDRY DEBTORS	13.13	32.81	32.81
<b>TOTAL</b>	<b>23.63</b>	<b>59.06</b>	<b>59.06</b>
<b>MARGIN</b>	5.91	14.77	14.77
<b>MPBF</b>	17.72	44.30	44.30
<b>INTEREST ON WC</b>	1.95	4.87	4.87

### 1.15 Means of finance

<b>EQUITY</b>				
PROMOTOR			48.00%	<b>81.39</b>
<b>SUBSIDY-CENTER</b>				
MOFPI	25%	200.00	25.00%	<b>42.39</b>
<b>TERM LOAN</b>				
FINANANCIAL INSTITUTIONS		10.00%	27.00%	<b>45.78</b>
-Payable half yearly Installments	10	4.60		
<b>TOTAL</b>			100.00%	<b>169.56</b>

### 1.16 Cash flow statement

PARTICULARS	Year 1	Year 3	Year 5	Year 7
<b>SOURCES OF FUNDS</b>				
INCREASE IN SHARE CAPITAL	-	-	-	-
SUBSIDY				
NET PROFIT	1.90	54.69	52.94	34.31
(INTEREST ADDED BACK)				
DEPRECIATION	10.62	10.62	10.62	10.62
PRELIMINARY EXP.W/O	0.70	0.70	0.70	0.70
INCREASE IN TERM LOAN	-	-	-	-
INCREASE IN BANK BORROWINGS-WC	17.72	17.72	-	-
<b>TOTAL</b>	<b>30.94</b>	<b>83.72</b>	<b>64.25</b>	<b>45.63</b>

### 1.17 Projected balance sheet

PARTICULARS	Year 1	Year 3	Year 5	Year 7
<b>LIABILITIES</b>				
SHARE CAPITAL	81.39	81.39	81.39	81.39
RESERVES & SURPLUS	37.76	97.54	181.40	214.48
TERM LOAN	41.18	22.78	4.38	0.00
BANK BORROWINGS-WC	17.72	44.30	44.30	44.30
<b>TOTAL</b>	<b>178.05</b>	<b>246.00</b>	<b>311.47</b>	<b>340.16</b>

### 1.18 Projected profit and loss account

Particulars	Year 1	Year 3	Year 5	Year 7
Capacity Utilization	40%	100%	100%	100%
<b>INCOME</b>	78.75	196.88	196.88	196.88
<b>EXPENDITURE</b>	65.53	130.87	132.62	134.43
<b>VARIABLE</b>	41.58	97.77	97.77	97.77
<b>FIXED</b>	23.96	33.11	34.86	36.67
<b>GROSS PROFIT</b>	13.22	66.00	64.25	62.44
<b>PROFIT BEFORE TAX</b>	(4.63)	46.85	46.94	46.25
<b>PROFIT AFTER TAXES</b>	(4.63)	46.85	46.94	29.44
<b>RETAINED PROFIT</b>	(4.63)	46.85	37.01	14.55

### 1.19 Key Indicators

NET PRESENT VALUE at current Inflation (Rs. in lakhs)	<b>220.45</b>
INTERNAL RATE OF RETURN %	<b>22.17</b>
AVERAGE DSCR	<b>3.99</b>
BREAK EVEN POINT %	<b>53.33</b>
PAY BACK PERIOD ( YEARS)	<b>3.84</b>

## 1.20 Manpower Requirement

PARTICULARS		NO.
<b>ADMINISTRATIVE STAFF</b>		
	Admn Staff	3
<b>WORKERS</b>		
	PRODUCTION SUPERVISOR	2
	SKILLED WORKERS	6
	UN - SKILLED WORKERS	12

## 1.21 Assumptions

<b>Project &amp; Financing</b>			
Contingencies on Building			15%
Contingencies on Equipment			15%
Term Loan			50%
Rate of Interest on Term Loan			10%
Subsidy Considered	Subject to ceiling		25%
Expected time of Installation		Months	12
Moratorium		Months	12
<b>CAPACITY</b>			
Rated Capacity Per Annum	80% of Installed capacity	TPA	80
Number of Operational Days	DAYS		45
<b>CAPACITY UTILIZATION</b>			
Year I			40%
Year II			60%
Year III			100%
<b>SALES PRICE</b>			
W S Price			250000
<b>OTHER EXPENSE</b>			
Marketing Expenses			5%
<b>POWER</b>			
Connected Load	HP		60
<b>DEPRICIATION AS PER COMPANY'S ACT</b>			
BUILDING			3.34%
PLANT & MACHINERY			10.34%
MISC. FIXED ASSETS			7.07%
LAND & SITE DEVELOPMENT			1.63%
<b>MAINTENANCE</b>			
BUILDING			1.00%
PLANT & MACHINERY			3.00%
MISC. FIXED ASSETS			2.00%

### 1.21.1 Sources of technology

- Wintech Engineers, MIDC Estate, Ambad, Nasik 422 010
- United Heat Transfer Pvt. Ltd, MIDC Estate, Ambad, Nasik 422 010
- SSR Wine Engineers & Consultants Pvt. Ltd, MIDC Estate, Ambad, Nasik 422 010

**The actual cost of projects may deviate on change of any of the assumptions.**