

A GUIDE TO A SPARKLING WINE PRODUCTION UNIT

1 - PRESENTATION

1-1 Nature of the Activity

The manufacturing of sparkling wine is part of the classical industrial processing of white wine. After its first fermentation, the wine can be consumed as is (classic white wine) or it can go through a second fermentation which raises the alcohol content slightly and produces carbonated gas which gives the wine its "sparkling" aspect.

1-2 Alternatives

Finished products : two levels of quality can be distinguished which correspond to the various methods of processing.

* High Quality Products : these sparkling wines are made using the "champenoise" method. A basic wine is made, then, after blending to determine its vintage, sugar, yeasts and some additives are added ; the wine is then put in bottles where it undergoes its second fermentation. The period that the wine is kept in the bottles with lees is at least 9 months (ideally 3-4 years). This is what distinguishes the "champenoise" method from other methods : yeast autolysis allows certain compounds to develop (especially amino acids), which are the origin of tertiary flavours or fine aging unique to this method.

The bottles then undergo a process of stirring and clearing, after which the liquid is brought up to the same level in all bottles. An expediting liqueur can be added according to the final result desired ("brut", extra dry, dry, semi-dry, sweet).

* Medium Quality Products:

Closed vat method :

The second fermentation takes place in pressure-resistant vats. Once the bubbles have formed, the wine is transferred with filtration into other vats before it is bottled.

Expediting liqueur is added in the first or second vat.

This is a much faster process than the "champenoise", lasting only a few weeks to a few months. The difference in quality is related to the absence of aging with lees. The immobilization costs are lower, stirring is eliminated and the constraints of industrial wine processing lighter. The technique is less delicate and cheaper and used especially for flavoured sparkling wines.

Transfer or "German" method :

Intermediate method : stirring and clearing are eliminated, but the second fermentation in bottles is retained.

This method is being replaced by the closed vat method.

Ultimately, CO₂ can be added directly to the wine but the organoleptic qualities are very different from those obtained when the CO₂ results from fermentation with yeasts. This is a low quality product which suits only a few specific uses.

1-3 Types of Possible Units

The "champenoise" method (a specific example of French know-how which has already been used in numerous developing countries) will be considered. For the sake of example, a closed vat variation is presented for one of the units.

Unit A : small capacity (50,000 bottles/year), adapted for a vine grower. Bottling in standard 75 cl bottles.

Unit B : medium capacity (500,000 bottles/year), for local markets. 2 types of bottles : 75 cl and 35-37.5 cl (adapted for restaurants).

Unit B' : the same as B, but with closed vat fermentation.

Unit C : large capacity (4,000,000 bottles/year). For domestic market and export. Numerous bottling options to respond to different openings (75 cl, 35 cl, magnum 1.5 l, and eventually 10 cl for airlines).

2 - TECHNICAL AND ECONOMIC GUIDE

2-1-1 Finished Products

LINE	A 50 000 bottles/yr	B - B' 500 000 bottles/yr	C 4 000 000 bottles/yr
Packaging	glass bottles one size	glass bottles many sizes	glass bottles many sizes
Packaging size	75 cl	75 cl (90%) 35 or 37,5 cl (10%)	75 cl (80%) 35 cl (15%) 1,5 l (5%)
Annual production	50 000 bottles/yr or 37 500 l/yr	450 000 b. 75 cl --> 337 500 l 50 000 b. 35 cl --> 17 500 l ----> 354 500 l/yr	3,2 M b. 75 cl --> 2,4 Ml 600 000 b. 35 cl --> 210 000 l 200 000 b. 1,5 l --> 300 000 l ----> 2 910 000 l/yr

2-1-2 Technological Choices

OPERATIONS	TECHNOLOGICAL OPTIONS	SOLUTIONS			
		A	B	B'	C
Receiving	grapes or must (= unfermented grape juice)	grapes (self-supplied)	grapes (partially self-supplied)		must
Pressing		yes	yes		no
Vat area Cleansing	Vats (stainless, steel, enamel or plastic)	stainless steel	stainless steel	stainless steel	stainless steel
Temperature control fermentation	optional	no	necessary (large vats)	necessary	necessary
Cold treatment filtering	Filters or centrifuges	Kieselguhr filter or plates	Kieselguhr filter or plates	heat insulated vats	cold set
Bottling	depends on method used	yes	yes	no (2nd vat)	yes
Storage - 2nd fermentation	in bottles or vats	in bottles	in bottles	in vat	in bottle
Stirring	manual or automated	manual	semi automatic automatic	no	automatic
Clearing Stoping Addition of syrup Dressing Capping					automatic
Placing in boxes Storage	binder or caser	binder	binder		caser

2-2 Economic Analysis

2-2-1 Investments

EQUIPMENT	A	Price FOB US \$	B	Price FOB US \$	sub B	Price FOB US \$	C	Price FOB US \$
	Description		Description		Description		Description	
Operations								
Pressing	1 press (4000 kg)	\$ 50 000	2 presses (8000 kg) + infrastructure	\$ 200 000				
Vat Cleansing	4 (20 hl) enamel or plastic vats	\$ 6000	8 (50 hl) enamel or plastic vats	\$ 23 000		\$ 60 000		\$1 600 000
Fermentation	2 (50 hl) stainless steel vats with accessories refrigeration	\$ 35 000	temperature controlled vats	\$ 130 000				
Cold treatment filtering	Kieselguhr filter	\$ 16 000	Regulated cold production system	\$ 65 000	Closed vat fermenta- tion			
Bottling	Bottler, capping machine	\$ 25 000		\$ 65 000	5 stainless steel vats pressure resistant, 100 hl (9 kg)	\$ 650 000		\$ 160 000
Storage	Pallet boxes (100) to contain 500 bottles	\$ 6000				\$ 635 000		
Stirring	85 manual stands 120 bottles/m2	\$ 14 000	35 automatic or semi-automatic stands (1 for 1500 bottles)	\$ 55 000	Filtering Centrifuge	\$ 80 000	200 automatic machines	\$ 1 000 000
					Plate filters	\$ 10 000		
Clearing	Ice tub, dosimeter, "muzzler", closing machine	\$ 25 000	Automatic clearing entire group	\$ 240 000	Cold treatment Isobarometric bottles Closing machine	\$ 25 000		\$ 400 000
Packaging Capping	Washing machine, capping machine Labeller	\$ 16 000	Washing + drying machines, capping machine, labeller	\$ 100 000		\$ 160 000	Packaging machine	\$ 160 000
Placing in boxes			Binder	\$ 80 000				\$ 80 000
Other costs (equipment) :								
handling		\$ 10 000		\$ 20 000		\$ 25 000		\$ 50 000
detached parts		\$ 3000		\$ 16 000		\$ 30 000		\$ 30 000
Total equipment		\$ 0.3 M		\$ 1 M		\$ 1.2 M		\$ 3.5 M
Buildings :								
Building area	450 m2		1500 m2		1000 m2		8000 m2	
Other investments								
Canalization	250 m3/yr		2500 m3/yr		same as B		20 000 m3/yr	
TOTAL INVESTMENT	\$ 0.4 to 0.5 million		\$ 1.7 to 2 million		\$ 2.1 to 2.4 million		\$ 5.6 to 6.5 million	

2-2-2 Functioning

	UNIT A	UNIT B	UNIT B'	UNIT C
Labour (outside vineyards)				
Unskilled	0,5 (2 : 1/4 time)	2,25 (9 : 1/4 time)	2,75 (same B + 2) (1/2 time)	5 (10 : 1/2 time)
Skilled	1	3	3	5
Consumption Raw materials : wine	3% loss 38 600 l	3% loss 365 000 l	5% loss 372 500 l	2% loss 2 970 000 l
Packaging : - bottles - corks "muzzles" labels caps and boxes	approx. \$ 0.4/ea approx. \$ 0.3/ea			

3 - KEY FACTORS TO THIS PROJECT'S SUCCESS

3-1 Supply

The base wine should be neutral (actually, a strong flavour would be made worse by the CO₂) and have a high fixed acidity (> 4.50 g/l).

In the case of a unit with its own vineyards (Unit A and partially Unit B), a detailed study should be made (by a qualified agronomist) of the soil, the micro-climate, in order to select the grafting base and the variety of vines (white grapes : Chardonnay, Pinot Noir, etc.). An error in the planting of a vineyard can have consequences for 30 years. Foresee : 20-30 hectares for unit A, 50-100 hectares for unit B and 300-400 hectares for unit C. If the owner doesn't possess vineyards (unit C), foresee contracts with producers with orientation of the planting of the vineyard.

3-2 Technology and Equipment

- Pressing : well executed pressing is essential to obtain good quality must.
For the "champenoise" method, whole grapes are pressed to avoid maceration (and staining of the white pulp by the skin).
The yield is low : an average of 150 kg of grapes for 1 hl of must. Must fractioning is optional and depends on the desired level of quality.

3-3 Personnel

The "champenoise" method is a delicate technology which requires highly developed know-how : staff should be trained by specialists.

3-4 Quality Control

This consists more of analytic tests which lead to decision-making than real quality control tests :

- raw material tests (grapes),
- fermentation temperature tests.

Hygiene is critical in industrial wine processing because each step calls for micro-organisms (bacteria, yeasts).

The vats should be cleaned right after use. (This calls for sufficient water supply).

3-5 Distribution and Commercialization

Alcoholic beverage legislation varies greatly from one country to another (state monopoly, customs policies, etc.)

4 - INDUCED ACTIVITIES

These concern mainly viticulture : significant manual labour for the cutting and processing, many seasonal workers for harvests.

This work force could be used temporarily at the processing unit.