

New Technologies & Unefficiency In Winemaking
Mark Strobl
Hochschule Geisenheim University, Germany
mark.strobl@hs-gm.de

Abstract:

Production of wine is separating into industrial and hand crafted wines. Wine production is getting more projectable and constant compared to the proceeding 5000 years, but in some cases it gets more and more complicated. Depending on the demands of the customers, wine making should be done simple and safe. The winery equipment ideally supports the aims of the wine producers and the consumers or customers. The targets yield, efficiency, blank wine and safe products and their influence on the complexity in wine production are discussed. As wine taste is judged by the consumer and not that important for the acquisition of wine at the point of sale (Szolnoki 2007), taste is not respected in this article.

- Purpose: less tools, additives and machinery for handcraft wine making, more security for mass production
- Approach: historical development, technical alternatives, customer needs
- Findings: comparing wineries
- Practical implications: less technique, courage to unfiltered, unpumped wines

Key words: process equipment production efficiency security

Introduction

Winemaking was physical strain for more than 5000 years. Wine was a side product to a self supplying agricultural population in Europe which was not very secure in harvest, quality and taste. The struggle in the vineyard was often destroyed, by weather or pest. As the harvest and the fermentation was not safe, the remaining wines were valuable - no matter how they tasted - and kept for bad times, as long as they were stable, stabilized by alcohol, pH, acetic acid, anaerobic conditions. It was consumed for nutrition, or to disinfect the water with alcohol and low pH (Dolara 2006).

1. TOOLS IN WINE MAKING

Labour, jars, barrels & amphoras were the only valuable production tools for thousands of years. The containers were produced and used for - not only wine - and - if capacities were rare - they were used together for wine and other fruits, herbs or water-. Diluted wine - ore wine addition to water - was necessary to make dirty water safe by suppressing pathogenic germs with alcohol and low pH (Speth 2006). On the other hand water was used to fill up barrels for transport or sale (Rhein 2012).

Really needed to make a wine are since the middle ages:

- one container (amphora, pottery, barrel) - and
- time.

Modern wine making since 130 years needs:

- presses
- tanks
- finings, additives and preservatives
- filters, filter aids
- pumps, pipes & hoses
- bottling machines, corks, labeling machines,

Modern wine making since 40 years needs:

- traction engines, harvesters, grape wagons, fork lifters,
- filter presses, flotation, decanters, centrifuges, flash détente, gulf stream
- lots of tanks, rotary tanks, chilled tanks. for the steps between
- finings, additives and preservatives
- filters, filter aids
- heat exchangers,
- pipes & hoses
- piston-, membrane-, impeller-, peristaltic-, rotary lobe-, progressing cavity centrifugal pumps
- temperature, pressure, CO₂ contents measurement & control
- CPUs, Bus systems
- nitrogen, carbon dioxide, pressurized air,
- cooling - & heating systems,
- CIP cleaning,
- waste water treatment
- rinsing machines, bottle inspectors, bottling machines, corks, filling level detectors, labeling machines, x-ray inspection (Heuft 2014), packers, palletizer...
- Management systems, ecological agreeableness, warranty, product security

Nowadays harvest are safe in a certain range, production methods are calculable and the wine is cheap. 2,84 [€] is the average price for a bottle, that is payed in Germany 2013 (Dierig

2014).- But wine can't be produced for that price in a classical way.

As we know from meat industry it is possible to use the entire animal, even bones- and skin. Pork meat is at 1,60- [€/kg] (BLE 2014) at the moment, the price for the consumer is down to 4,- €(Kneser 2013)-. To produce cheap wine means to extent yield in the vineyard with fertilization and pesticides. Then all residues are extracted, like the bones of the pigs, skins, gut.... (Alfa-Laval 2004), but prices will decline.

Naturally or technically excreted wine substances are recovered and treated to a certain wine quality, blended back to the wine, or sold in cuvées as cheap wines.

2. YIELD & FIELD: HOW EFFICIENT WINE MAKING CAN BE?

Although worldwide wine growers reduce their yield from the vineyard (Trought, Mike; Neal, Sue 2013), wine makers in the cellars extract the remaining wine to a high extend.

Why not use the grapes of the vineyard and extract less in the cellar?

The recovered wine out of layers (Fig.:1 Mass flow in wine making) has to be treated afterwards, to clarify the extract from turbid substances, that already had been settled down with lees or yeast. Economic calculations respect the

- depreciated value of recovered wines,
- additional expenses for bentonite, PVPP and other maturation aids
- additional steps need additional labour costs.
- for the filtration extra efforts have to be respected, as recovered wines never enhance filtration
- higher risks for stability and taste during shelf life of the wines.

The value of the recovered wine is often rated as the value of normal wine of the winery, although it will never taste and behave like the original wine. It should be compared to overproduction Wines, that spoil the prices.

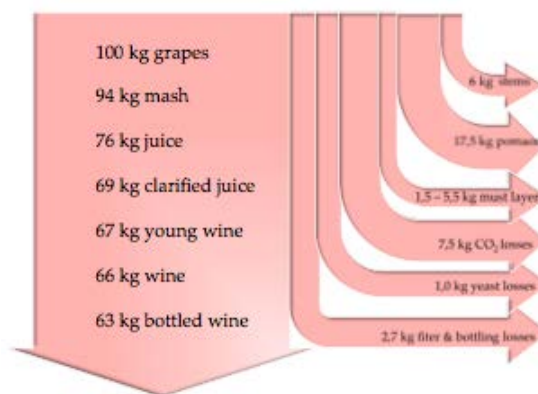


Fig.:1 Mass flow in wine making (Freund 2013)

2.1. Machinery to recover wine:

Machinery in wine industry is very poorly used, compared to other beverage and consumer goods sectors. Presses and must treatment is done 5 - 7 weeks a year, compared to 50 weeks in brewing - or food industry. Return on investments are 10 time slower than in the consume food production. Not used machinery suffers from the influence of gravity, shafts bend, and, when



Fig.: 2. Equipment of a modern minimalist in wine making - press & mash tanks

used again, the eccentric forces of pump shafts damage the mechanical seals. Vacuum rotary filters for instance tend to modify from the cylindrical form in direction of droplet shape just by gravity, if not used for a long time.

Stainless steel lasts for an long time, if treated well. But, technical progress goes on, and often a stainless steel machinery is kept,

although it is hardly used anymore, just for an extraordinary harvest, where it might be useful. These assets are dead capital, that block space, ideas and new technologies often for two or three generations of wine makers.

The tools to win back wines are:

- filter presses,
- vacuum rotary filters,
- decanters,
- centrifuges
- tanks

usually in combination with pipes and hoses and filters. Each step needs at least one more tank.

2.2. Hazards of recovering wine from layers

Recovered wines run hazard to

- spoil the taste by microorganisms,
- polyphenols, that might be extracted from the layers,
- from proteins, that may form turbidity and haze, as the sedimented substances are less soluble than the supernatant.
- Pesticides and heavy metals (copper) usually settle with the yeast. Recovering the wine may bring them back into the fluid phase, and increase chemical hazardous values.
- In times of food safety investigations by the state and the retailers an increased risk has to be respected for economic efficiency calculation.
- Finally: A good wine was never improved by recovered wines
- A winery is often judged by its worst wines and not by its top products. This means, that second or third level cuvées can harm the image of the main brand.

3. CLARIFICATION: HOW BLANK A WINE SHOULD BE?

Clarification was getting important, since wine glasses and glass bottles got affordable for the average wine consumer. Industrial bottle production (since the middle of the 19th century) made wine sellable in small portions, also exportable beyond the villages to far away customers (by train, ship, later lorries). Quality in some cases got visible through the transparency of the bottles. Turbidity is a hint for microbiological spoilage or not enough time during maturation. So filtration came up and fining with additives.

Besides Cleaning, and bottling the fining and clarification of the wine is a big part of the work in the cellars nowadays.

3.1. Tools for clarification:

- chemical additives, SO₂, isinglass, egg albumines, PVPP, bentonite, kieselguhr...
- flotation, centrifuges, decanters
- filter presses, frame filters, horizontal filters, cardboard filters, candle filters, membrane filters, cross flow filters,
- photometers

3.2. Hazards & chances of unfiltered wines

Although the wine consumer usually accepts deposits in a wine bottle, and drinks the wine at candle light illumination.



Fig.: 3. Equipment of a modern minimalist in wine making - the cellar

Why have wines to be filtered blank to stand a halogenic bulb light to values under 0,5 NTU, and stay blank for 2 years & longer?

Beer drinkers accept unfiltered beer, accept a certain haze, if declared as wanted or as speciality. Filtration removes healthy substances from the wine, like fibre or yeast. Not filtered wine can be advertised as a more healthy and natural product.. Production of non filtered wines certainly needs more hygienic efforts, flash pasteurization or a pasteurization. This assumes to check, control and avoid oxygen uptake before (& after) pasteurization.

As filtration is rather labour and cost intensive, combined with lots of pumping and oxygen uptake, non- filtration should be an alternative production method. Sparkling wines with bottle fermentation are usually not filtered and have their market shares on a higher price level. Some American wine makers propagate unfiltered wine, but in some cases with the addition of Velcorin (dimethyldicarbonate) which needs dosing equipment that complicates the process again and has to be explained to the consumers.

4. PRODUCT SECURITY: HOW SAFE A WINE HAS TO BE?

Brands & retailers need product security. Effects of contaminated products by microorganisms, broken glass, disinfectants and chemicals in the wine are the worst cases for the bargains with wine. As products are delivered all over the country, Europe or world wide, the consequences of deviations in quality and safety are in the end expensive. Calling back of products will cause a loss of customers, which have to be won back with high expenses in marketing activity. Price levels have to be built up again. Companies might be threatened in their existence.

4.1. Tools for product security

- kieselguhr filters, sheet filters, cross flow filters, membrane filters
- batch tracing systems
- automatic cleaning systems (for mass production)
- laboratories (for mass production)
- cleaning disinfection agents detection
- flash pasteurization, chamber- or tunnel pasteurizers (for mass production)
- best before indications (for mass production)
- inspection machines (for mass production)
- x-ray inspection of each bottle (for mass production & brands)
- logistic systems with tracing, data loggers (for mass production)

4.2. Hazards & chances of product security

Product security enables wine producers, to sell their wine world wide. It is necessary to minimize the risk, of losing the efforts for packaging, logistics, transports, building up a clientele, an image, a name. Certainly it confronts with new competitors and rules in other regions, and price levels, which tend to be lower, the farther away the wine is delivered. Product security is e important for consumers, who might be harmed physically. Retailers as customers loose economically, if bad products are indicated by the newspapers, by internet. Risks and consequences can be calculated and have to have an assessment of the products, if wines, tools, production methods, additives, package materials, customers, supply chains or even employees change.

Certificated quality systems and reviews of the organization might help to reduce risks. In the end investigations have to assure and prove safe products. If wine is produced just for a small region, or the wine maker knows all his customers, things are much easier, and false products

can be replaced by an other - hopefully good bottle - of wine.

Conclusion:

Recovered wines are in competition to the cheap wines, that spoil the market, which come in tank lorries ready to be racked on bottles for 0,20 - 0,60 €/l.

In case of investing in centrifuges or decanters the amount of recovered wines must be enormous, to get an break even point for expensive machinery and extra treatment. A big amount of wine decreases the price and the value of the product wine. Lots of recovered wines are gained with big effort and quality losses. Costs for gaining recovered wines should be calculated properly, and related to the real value of the yielded wine and the altered risks before entering with that wine into a low price competition. Blending recycled wines with valuable wines will reduce the quality, prices, images!

The clarity of wine causes big efforts. It can be achieved with time and hygiene. Unfiltered wines are possible, and can supersede filtration and even pumping, if gravity is respected in the construction of the winery. If the distribution range gets bigger, the consumers are only reached via retailers as customers. Product security will get more and more important, and efforts go more in direction safe products & costs, than in consumer demands, taste or healthiness.

Wineries will be more and more divided in traditional wineries with grape until consumer contact. They should keep their processes simple, the wines interesting and different from the discounter wines - and the prices high. The mass production of wine will not be able to keep prices high, but has to assure a constant product quality at low production costs.

Production of wine can be very simple, if it is done in favor of the wine consumers, and if they will be able recognize the advantage of manual crafted wines, they are willing to pay for labour and quality instead of yield, super blank wines or constant boring taste.

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