# Mixing ferments using gas: past and present


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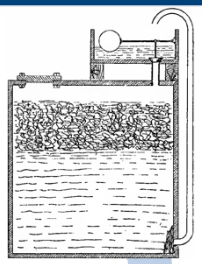


### Cambon

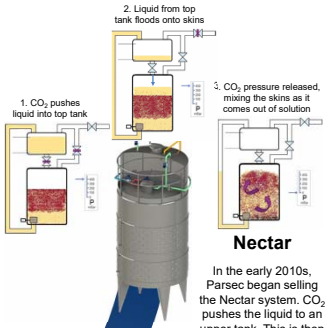
In 1891, Cambon proposed a system with a closed vessel, from which fermentation $CO_2$ would drive liquid up and into a basin. When the basin level rose enough a float valve would allow liquid to pass back over the cap. A criticism made of this and other similar devices was that all the liquid in the basin was not quickly and completely returned to the tank when the valve was triggered.



Grape sugar ⟶ Ethanol + Carbon dioxide

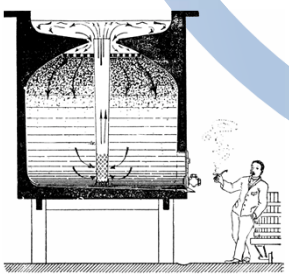
### Harnessing the carbon dioxide from fermentation

At a time before rural areas had electricity and steam-powered pumps were not mobile, carbon dioxide from fermentation was an obvious energy source to use to mix ferments.



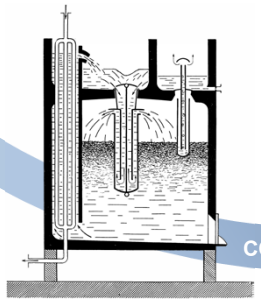

### Nectar

In the early 2010s, Parsec began selling the Nectar system. $CO_2$ pushes the liquid to an upper tank. This is then released back over the skins, while still under pressure, and then in a final stage additional mixing is achieved by releasing the system pressure, and $CO_2$ coming out of solution.



### Decaillet

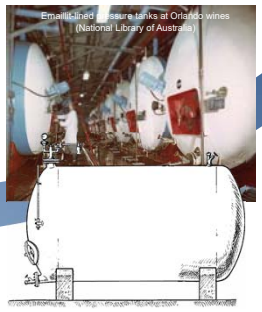
In Algeria in 1905, Decaillet began using tanks fitted with a tube with holes at the bottom. As $CO_2$ was produced, liquid was pushed up the tube and over the cap (which was kept from rising too far by a rack). Some argue that this technique only really worked well early in ferment when there was lots of $CO_2$.



### Ducellier-Isman

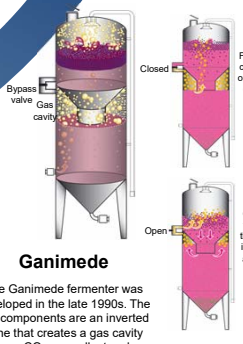
In Algeria in 1937, Ducellier and Isman designed an improved system for $CO_2$-driven fermentations that facilitated cooling and had no moving parts. Pressure would build up in the tank, pushing liquid up past a water-filled heat exchanger into the upper basin. As pressure built up in the tank, the water in the small hydraulic trigger valve was gradually pushed down until finally it reached the bottom lip, breaking the equilibrium, blowing the water out of the trigger valve, releasing the pressure from the tank, and allowing the entire contents of the upper basin to flood in over the cap. This system was effective at dissipating heat that might kill the yeast (a major issue in hot climates like Algeria), because the amount of pumping over past the heat exchanger is directly related to the speed of fermentation and associated heat produced. These systems were ultimately used quite extensively in Australia. Ron Potter noted that they resulted in much lower VAs than had typically been achieved in open-topped fermenters, which in turn led to a series of closed fermenter designs for his company, beginning with the Potter drainer/fermenter.

$CO_2$ from ferment




### Pressure tank $CO_2$ release

Gas mixing was used in the 1950s in pressure tanks. Mixing was by rapid releasing the tank pressure, causing $CO_2$ to come out of solution and mix the tank. This was practised at Orlando wines on one tank with a larger hatch from which skins could be removed and therefore red ferments could easily be performed in.

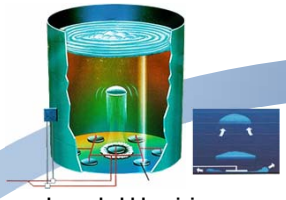



### Ganimede

The Ganimede fermenter was developed in the late 1990s. The key components are an inverted cone that creates a gas cavity where $CO_2$ can collect and a bypass valve that allows this to be rapidly released to agitate the tank.

**French colonial Algeria:**

- The largest wine exporter in the world in the first half of the 20th century.
- High alcohol (12-14%), highly coloured wines were produced that were suitable for blending with low alcohol (7-10%) wines from highly cropped Aramon vines in Southern France.
- Some industry experts have hypothesised that Algerian independence in the 1960s and the decline in their wine industry led to the development of techniques like thermovinification in France in an effort to extract more skin colour and replace the Algerian blending wines.



### Large bubble mixing

In the early 1980s Pulsair introduced large bubble mixing for lubricant blending with accumulator plates and pulses of air, which then spread to other applications. For wine applications they quickly moved to configurations without the accumulator plates.

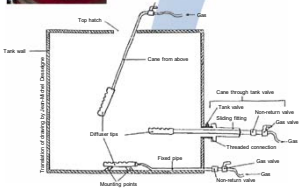
Gas injection


### Portable pulsing system

In the early 2000s, portable pulsing systems were released for wineries.

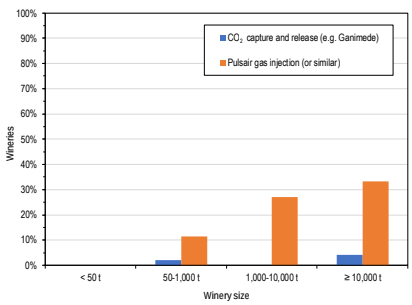

### Recycling $CO_2$ for mixing

In Spain a couple of manufacturers are now selling systems for gas mixing based on the use of recycled $CO_2$.




### Gas rummaging in France

Initial work in France in the 1980s looked at the use of compressed air/bottled $N_2$/recycled $CO_2$ from ferments (pulses are not mentioned) via lances or fixed multi-point systems for larger tanks.




**Fraction of Australian wineries using gas mixing techniques for red ferments in 2016 (www.awri.com.au/survey)**

### $CO_2$ is commonly recovered in beer production

The circumstances are of course different. Breweries use a smaller number of tanks and have greater requirements for $CO_2$.


**Acknowledgements:** Winery staff and suppliers that provided information and the AWRI library.


**Article:** This poster is a summary only - a more detailed article may be written in the future.

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