

# MEMSTAB<sup>®</sup>

A Unique, Important and Logical Evolution in Wine Processing



**OENODIA**, EURODIA Industrie's global wine division provides membrane processes to the wine industry, including Tartrate Stabilization and pH Adjustment via STARS/Electrodialysis, water reclamation via Reverse Osmosis, Ceramic Crossflow Microfiltration and Alcohol

Adjustment via Memstar. OENODIA now introduces a complete treatment process for wines before bottling - **MEMSTAB<sup>®</sup>**.

MEMSTAB<sup>®</sup> allows continuous Crossflow Microfiltration and Tartrate Stabilization of wine without requiring an intermediate tank or multiple control functions, facilitating fast and automated processing. By coupling these technologies, MEMSTAB<sup>®</sup> combines all the well-known advantages of both technologies in a single package, improving oenological quality and operational aspects, saving time, increasing operational flexibility, saving water, saving energy and minimizing wine losses by up to 3% of total wine processed.

MEMSTAB<sup>®</sup> is offered exclusively by OENODIA and allows winemakers to continuously filter and stabilize their wines. MEMSTAB's cutting edge automation requires only one (1) operator to run the two technologies. MEMSTAB<sup>®</sup> operates best at room temperature. It does not require an additional filtration step and reduces wine loss from approximately 3% to an astonishing minimum of < 0.3% (Crossflow Microfiltration & STARS/ Electrolysis). MEMSTAB's configuration options are:

- MEMSTAB<sup>®</sup> – combined Ceramic Crossflow Microfiltration & STARS/Electrodialysis for Tartrate Stabilization
- Stand-alone Ceramic Crossflow Microfiltration
- Stand-alone STARS/Electrodialysis for Tartrate Stabilization

OENODIA's years of investment in Research & Development to minimize fouling of various membranes used in pre-bottling wine has provided breakthrough results. Crossflow Microfiltration, applied to wine for many years, has become the preferred technology for pre-bottling wine filtration and STARS/Electrodialysis. However, until OENODIA's involvement, none of the Crossflow equipment was able to be adapted to STARS/Electrodialysis.

STARS/Electrodialysis works at a constant and continuous flow rate, compared to Crossflow



Microfiltration, which has a flow rate that always decreases due to membrane fouling. OENODIA's newly chosen ceramic crossflow membrane was selected specifically because of the low affinity for wine compounds (phenolic compounds, sugar, proteins). Since the selected membrane is not affected by wine composition, particles and wine compounds will not stick to the membrane and thus greatly reduce membrane fouling. The combination of the two technologies and a specially designed control system allowing the two technologies to communicate, making MEMSTAB a highly effective winemaking tool.

# MEMSTAB<sup>®</sup>

## In-line Crossflow Microfiltration and Tartrate Stabilization via STARS/Electrodialysis

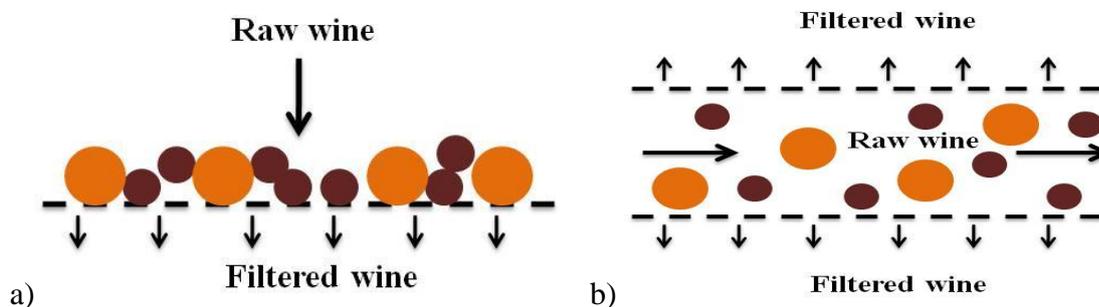
### Introduction

Wine is naturally rich in particles and can be tartrate unstable. Musts naturally contain micro-organisms (yeasts, bacteria, fungi) coming from the grapes. Yeasts, better adapted to growth in grape must, will grow rapidly and allow alcoholic fermentation. Depending on the type of wine, the development of lactic bacteria will be favored or inhibited (malolactic fermentation). Acetic bacteria are always present at a very low concentration and are responsible for the formation of acetic acid and other volatile components. In addition to the micro-organisms and the products of their autolysis, we can find some remains from the grape, some colloidal aggregates, and tartrate crystals. Wine naturally contains an excess of tartrate and potassium ions that tend to precipitate together to form Tartrate crystals. Traditional techniques for clarification and stabilization of wines involved a series of successive separation processes: to remove particles (Diatomaceous earth filtration, membranes, centrifugation) and to avoid crystallization in the bottle (cold treatment and or additions of chemicals).

The MEMSTAB<sup>®</sup> process developed by OENODIA is a 100% membrane-based process, which couples Ceramic Crossflow Microfiltration and Tartrate Stabilization via STARS/Electrodialysis. MEMSTAB's continuous treatment, without need for intermediate storage, can be fully automated and allows the simultaneous clarification, microbiological stabilization and tartrate stabilization of wines. MEMSTAB's two main components (Ceramic Crossflow & STARS/Electrodialysis) can also be used as stand-alone units. MEMSTAB brings major advantages to wine processing, not only for oenological quality considerations but also for all its operational aspects, , saving water, saving energy and minimizing wine losses by up to 3% of total wine processed.

### Crossflow Microfiltration

Unlike depth filtration, where particles gradually accumulate on the membrane surface (Figure 1a), Crossflow Microfiltration (Figure 1b) limits the formation of deposits. The wine circulates in a loop, part of which is composed of membrane. Wine and particles are moving tangentially to the membrane. Part of the liquid goes through the membrane under the low pressure gradient (permeate) while the liquid and particles that have not crossed the membrane continue their way in the circulation loop (retentate).



*Picture 1: Particles deposit a) Depth filtration, b Crossflow Microfiltration*

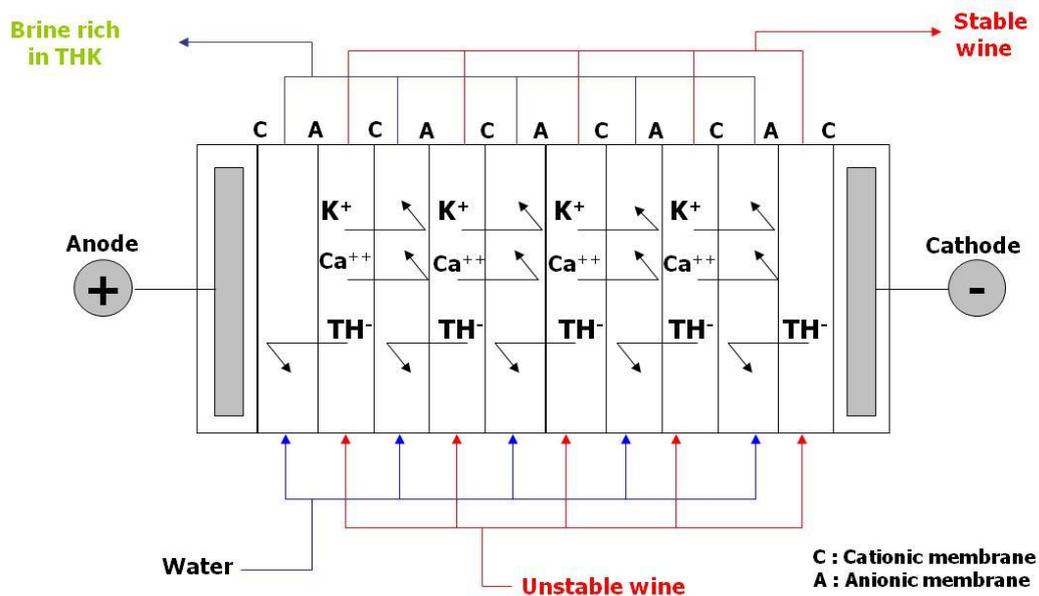
The wine crossflow velocity in the retentate loop limits the deposit of particles on the membranes' surface. Particles are concentrated in the circulation loop. By its implementation, crossflow microfiltration can achieve, in one step, the clarification and the microbiological stabilization of the wine. It does not require the use of consumables, essential to conventional filtration methods (pads,

cartridges Diatomaceous earth, Crossflow Microfiltration reduces the amount of waste generated during filtration, as well as its large product losses.

The selection of membrane materials that are suitable for wine - with very little affinity for dissolved compounds (phenolic compounds, polysaccharides) - and the optimization of hydrodynamic conditions led to the development of a technology that works at constant flow and can be easily coupled with STARS/Electrodialysis.

### STARS/Electrodialysis

STARS/Electrodialysis (ED) eliminates the need for bulk refrigeration or any chemical additions. It is a membrane-based process that uses an electric field and selective ion exchange membranes to remove ions from a solution. The ED stack used for the tartaric stabilization of wines consists of alternating cationic and anionic membranes (Figure 2). An electric current applied between two electrodes allows the extraction of the tartrate anions, as well as the potassium and calcium cations from the wine. This happens because the tartrate anions (TH<sup>-</sup>) with a negative charge migrate toward the positive electrode (anode) into the brine/condutant loop. They cross the anionic membrane and are rejected by the cationic membrane. Similarly, potassium (K<sup>+</sup>) and calcium (Ca<sup>2+</sup>) cations that are positively charged migrate towards the negative electrode (cathode) by crossing the cationic membrane and are rejected by the anionic membrane and carried away by the brine/condutant. The concentration of tartrate, potassium and calcium is reduced in the wine making it tartrate stable.



**Picture 2: Tartaric Stabilization of wine via Electrodialysis**

*ED wine application has been jointly developed and patented by INRA (the French National Institute) and Eurodia Industrie SA.*

### Conclusions

Coupling STARS/Electrodialysis and Ceramic Crossflow Microfiltration is a unique, important and logical evolution in wine processing. It is the only automated single pass and single treatment to get the wine bottle ready. Cellar and bottling schedules are optimized; requirements for tank storage greatly decreased, wine movement reduced, oxygen pick up eliminated, water consumption lowered and 96% of your energy for cold stabilization saved. MEMSTAB operates best at room temperature. It does not require an additional filtration step and reduces wine loss from approximately 3% to an astonishing minimum of < 0.3% (Crossflow Microfiltration & STARS/ Electrodialysis).