OENODIA

INRA

STARS®
Stab

Eurodia's Enology Department
Membrane Solutions

- STARS Stab – STARS pH (ED membrane)
- Paired XF Filtration
- Water saving (RO)

230 units worldwide

More than 1 billion bottle of wine stabilized per year

Proposed design – Semi-Automated Units

- 1,500 up to 12,000 l/h capacity
- Possible upgrade
- Crossflow filtration pairing option
- Automated processing / Manual CIP

Proposed design – Full-Automated Units

- 6,000 up to 24,000 l/h capacity
- Tank management
- Crossflow filtration pairing option

Mobile Service

Water saving

- Dedicated RO system
- On-line permeate recovery
- Minimum 50% recovery up to 80%
- 2019 R&D Project: Zero Waste

Cold stabilized
via
100% membrane process

Wine Tartrate Stabilization: Conventional Methods

- Bulk Refrigeration *(most common)*
  - at low temperatures: precipitate & filter bitartrate, possible addition of cream of tartar
  - Wine must be clarified: affects its nature
  - Oxygen pick up, unreliable, time consuming, high energy & water consumption
  - Very long holding times
  - Wine losses (~1% to 2% of total volume treated)
  - Average pH shift of 0.03 to 0.08
- Chemical additives (e.g. metatartric acid, mannoprotein *low efficiency*, CMC *not approved in many countries and not efficient for rosé and red wine, technical issues for sparkling,* KPa *same as CMC*)
  - **All additives remain in the wine after bottling (consumers?)**
- Ion exchange resin (not efficient, important pH drop, flavor impact)

STARS (Selective **TAR**taric **R**emoval **S**ystem**)**
How does work?

Continuous operation, controlled by reduction of conductivity from tartrate removal, subtractive method, no additives, 100% reliable

System consists of three steps/processes:

- Determine reduction of conductivity to achieve stability via STABILAB
- Pass wine between the membranes to reduce conductivity by removing tartrates, potassium and calcium via STARS.
- Monitor conductivity to ensure stability via onboard conductivity meter

Right Technology, Right Time

STARS/Electrodialysis helps resolve current issues

- Increase production without increasing infrastructure
- Wine-just-in-time… (Centrifuge-STARS$_{Line}$-Bottling)
- Inventory depletion of hot-selling whites
- Red wine instability issues due to reduced barrel count and shortened release dates
- Manage pH and TA issues
- Eliminate juice loss when stabilizing grape juice for grape concentrate
- Environmental sustainability “California - Flex Your Power” award

What is STARS

STARS/Electrodialysis clockwise from top left

- **STABILAB** predictive & verification test (DIT test /ISTC50 test)
- **STARS unit** 6 to 12,000 l/hr
- **RO** for water saving

STARS – DIT -> STARS -> ISTC50
A comprehensive approach to Tartrate Stabilization

STABILAB

DIT test to predict tartrate instability, STARS processing rate

ISTC50 test, confirmation test post STARS treatment

(DIT- Degree of Tartaric Instability)

(ISTC50- Critical Tartaric Stability Index)

STARS

Full-automated operation system

Can run 24 hours per day with 2 CIP's each taking about 1.5 hrs. (~20hrs/day)

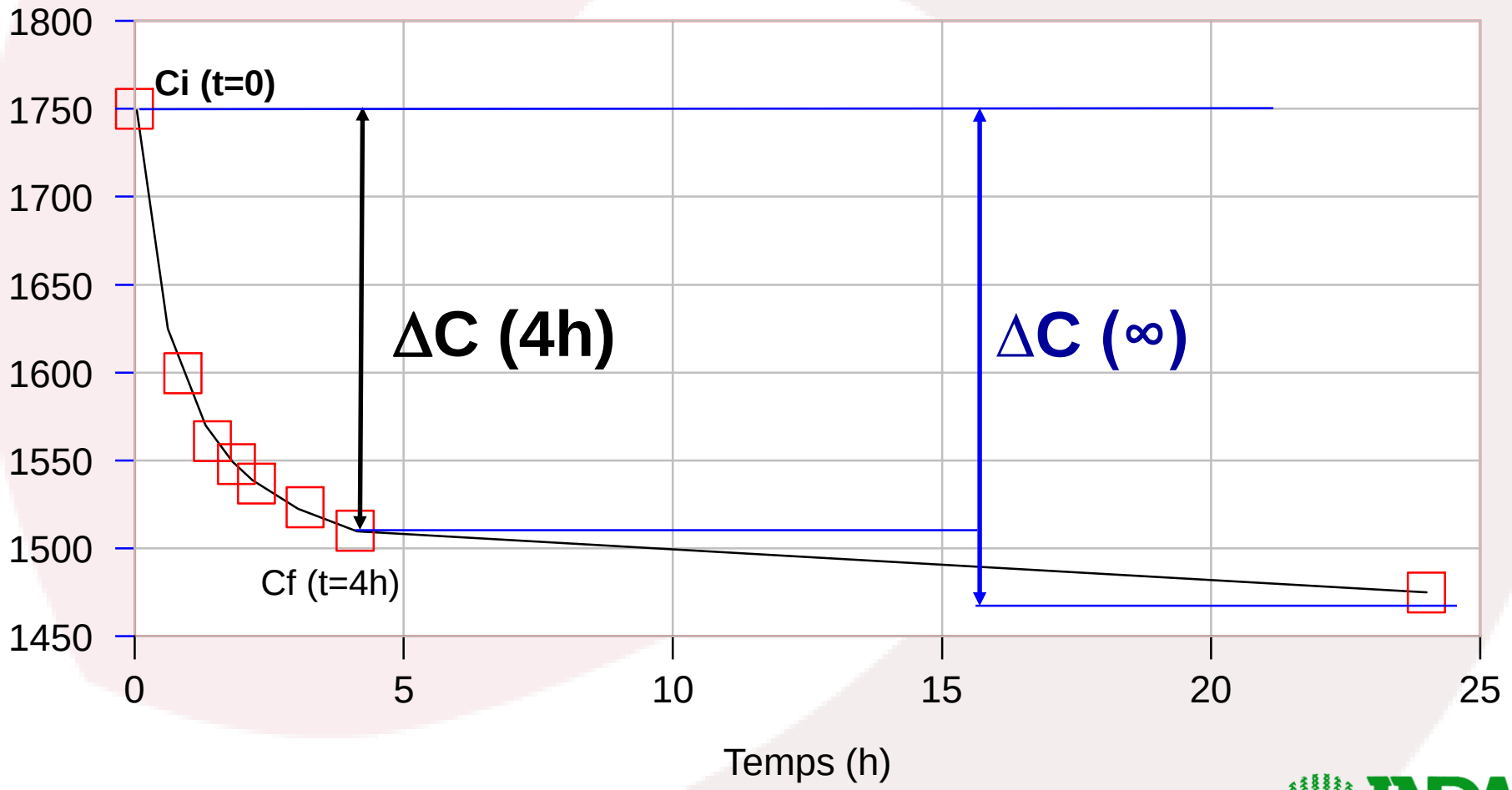
Reverse Osmosis for STARS System

An Optional Reverse Osmosis unit (RO) can reduce total water consumption from 50% to 90%.

Reverse Osmosis unit is linked to STARS unit during processing (auto-stop function)

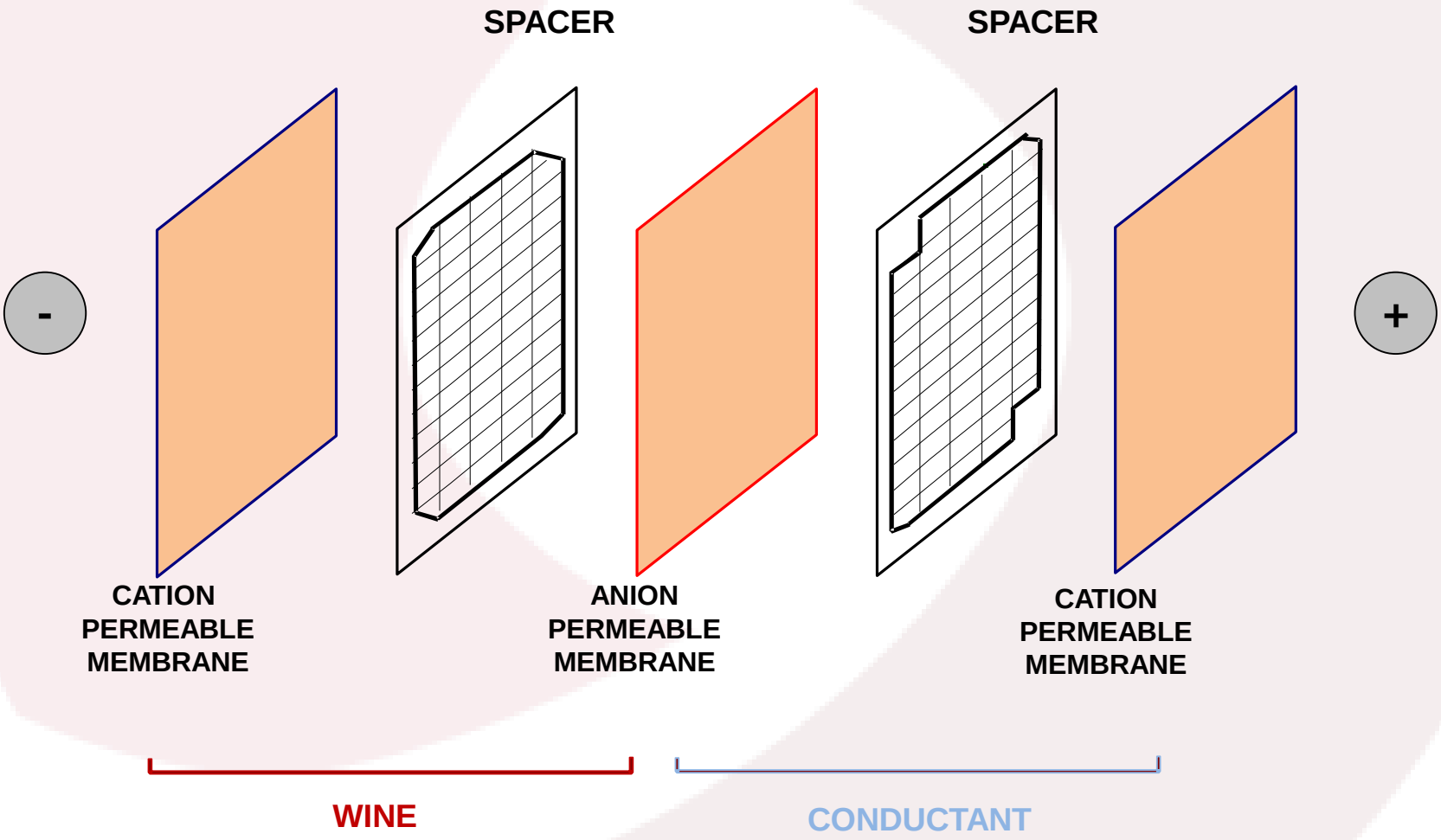
DIT test

Test INRA - 4C° / 4 h

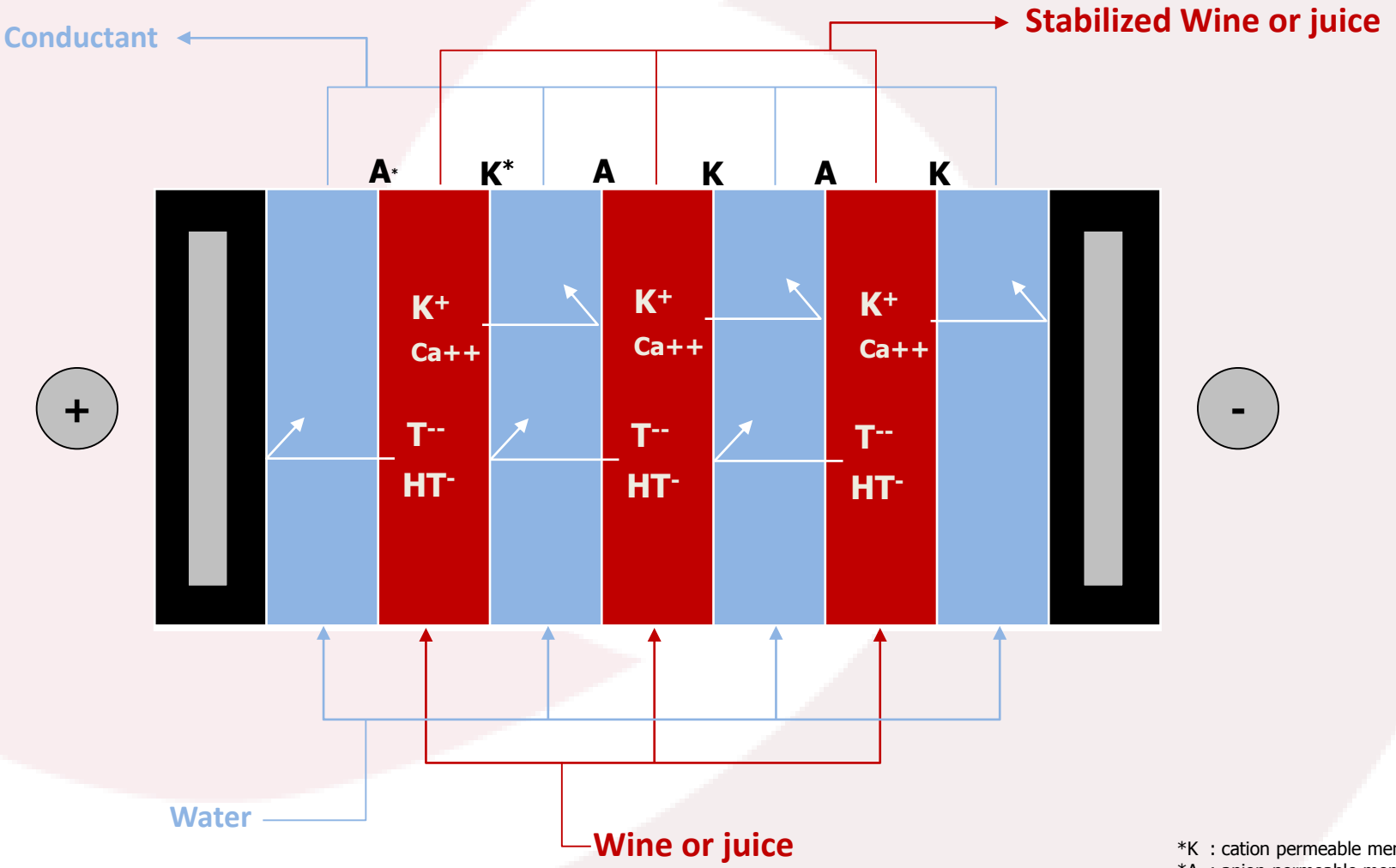


STARS Tartaric Stabilization

Two-Chamber Membranes



STARS Tartaric Stabilization: How it works?



*K : cation permeable membrane
*A : anion permeable membrane

STARS - 20 years experience - What has Changed?

- **Compact design**
  - Reduced foot print
  - Facilitates handling and use
  - Reduced overall cost
- **Corrected pH drop – Now equal to Cold Stability pH shift**
- **Reduced overall water consumption < 5%**
- **Confirmed flavor neutrality / improvement**
  - By independent tasting panels
  - On whites – neutral to favorable
  - On reds – preferred

STARS in Operation

- Automated operation, regulated by conductivity or pH
  - Onboard / Inline conductivity meter
  - Hand-held conductivity meter for verification (included)
  - 12hr run cycle after which a CIP is required
- Single pass, tank to tank processing
- Pre-filtration at <5 µm required, preferably via XF
- Wine should be at cellar temperature
- No wine loss
- No oxygen pick up
- Time saving: 6,000 l/hr, 20 hr processing = ~ 120,000 l
- Power consumption: 0,002 KW/l
- Water consumption: 2% to 5% of total wine volume

STARS Quick overview

Sustainability & Cost Savings:	• Lowest energy use: 0.002 KW/l vs. 0.03 to 0.04 KW/l for Cold Stabilization • No wine loss – saves at least to 1% of total wine volume • Low water consumption – 2% to 5% of total wine volume processed • Save Tartaric Acid / Eliminate use of Cream of Tartar
Comprehensive:	• Predict, Stabilize, Confirm – create a standard for tartrate stability **(STABILAB-DIT Test -> STARS -> ISTC50 Test -> Bottling)**
Guaranteed:	• STARS stabilized wines cold stability for 6 days at -4°C **(DIT at -4°C) / Achieves Calcium stability**
Reliable:	• In-line conductivity probe & continuous verification of target Conductivity based on DIT test result.
Flexibility:	• 1,500 to 24,000 l/hr. - larger units available • No tank holding time • Immediately bottle ready

Learning from 20 years experience & current STARS owners

- **pH drop too high (between 0.05 and 0.20)**
  - STABILAB-DIT test was performed at -4°C to guarantee high stability (6 days at -4°C). Wineries don't Cold Stabilize to -4°C. Most common temperatures are between -2 and -1°C.
  - STABILAB DIT now mimics the winery's CS temperature e.g., -2°C, -1°C, 0°C etc., resulting in substantially lower drop in conductivity achieved during processing
  - A highly unstable wine tested at -4°C produced a DIT rate (STARS treatment rate) of 28%. Changing the temperature to -1°C dropped the DIT rate to 22%. pH shift changed from 0.2 to 0.08
- **Wines treated at a reduced DIT rate can be managed by conductivity or pH, resulting in equal or less pH drop compared to CS and with higher stability**
- **Water consumption too high (up to 15%)**
  - Water consumption used to be 10% of total wine volume
  - Using a Reverse Osmosis unit, water consumption has been reduced to 2% to 5% of total wine volume

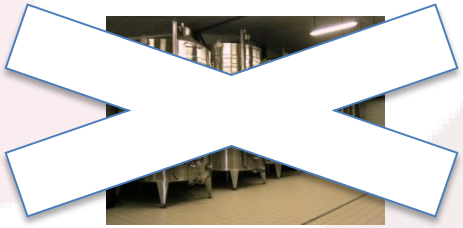
The additive free solution

STARS® LINE

STARS® XF

STARS® Stab

STARS® RO



Continuous process / the wine just in time

WINE-JUST-IN-TIME

Ready for bottling

Cross flow filtration

BRIGHTNESS

MICROBIOLOGICAL STABILITY

Electrodialysis

TARTARIC STABILIZATION


OENODIA
STARS
OENODIA
STARS
WINE-JUST-IN-TIME
STARS® LINE

GENERAL CONCLUSIONS

"Electromembrane" processes

- Electricity as driving force ≠ chemicals
- Substractive technology: NO chemical addition to your feed
- Maintain feed structure: high quality
- Perfect control: high precision treatment
- pH adjustment: accurate technology
- Continuous process: saving time and manpower

IF YOU ARE LOOKING FOR ECO-FRIENDLY METHODS, THINK STARS!

1,500 L/h

18,000 to 24,000 L/h

STARS design
6,000 to 12,000 L/h

KEEP IT NATURAL !
Cold stabilized your wines without chemical additives with

ADDITIVE FREE SOLUTIONS

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