

PreserveWine

**Non-thermal process to replace use of sulphites and other chemical preservatives
in European wines to meet new European Directive**

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Seminar: ALLERGENS IN WINE: WHAT LIES AHEAD?
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Website: www.preservewine.eu



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PRESERVEWine

"Non-thermal process to replace use of sulphites and other chemical preservatives in European wines to meet new European Directive"

PreserveWine is a partnership of European SMEs that has identified a promising non-thermal process to extend wine shelf life while avoiding the use of chemical preservatives and keeping high wine quality. Pressure Change Technology (PCT) is a low cost process with minimum energy use that has potential with further development and validation to be of significant commercial benefit to wine producers by providing them an alternative to the use of sulphur dioxide in the winemaking process. This will help them to align to current European regulations that have dramatically reduced the minimum levels of application of sulphur dioxide in wines due to the health concerns.

PCT is a novel non-thermal technique that involves charging a liquid product with pressure and an inert gas and then rapidly releasing the pressure. The sudden pressure release causes microbial cell walls to rupture, inactivating microorganisms.

This has been demonstrated on a small pilot scale batch process; in the current project PreserveWine the PCT process will scientifically validated. A further objective is the development and scale-up into a continuous in-line pre-industrial demonstrator to test the PCT with wine and other liquid foods.



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the Seventh Framework
Programme

Project Partners



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Background

Current situation in wine industry:

- Extended use of SO_2 → antimicrobial & antioxidative activity
- Health concerns (e.g. allergic reactions, asthma)
- EU Regulations limit use of SO_2 → alternatives are needed!
- Physical methods to reduce / avoid use of SO_2 are preferred

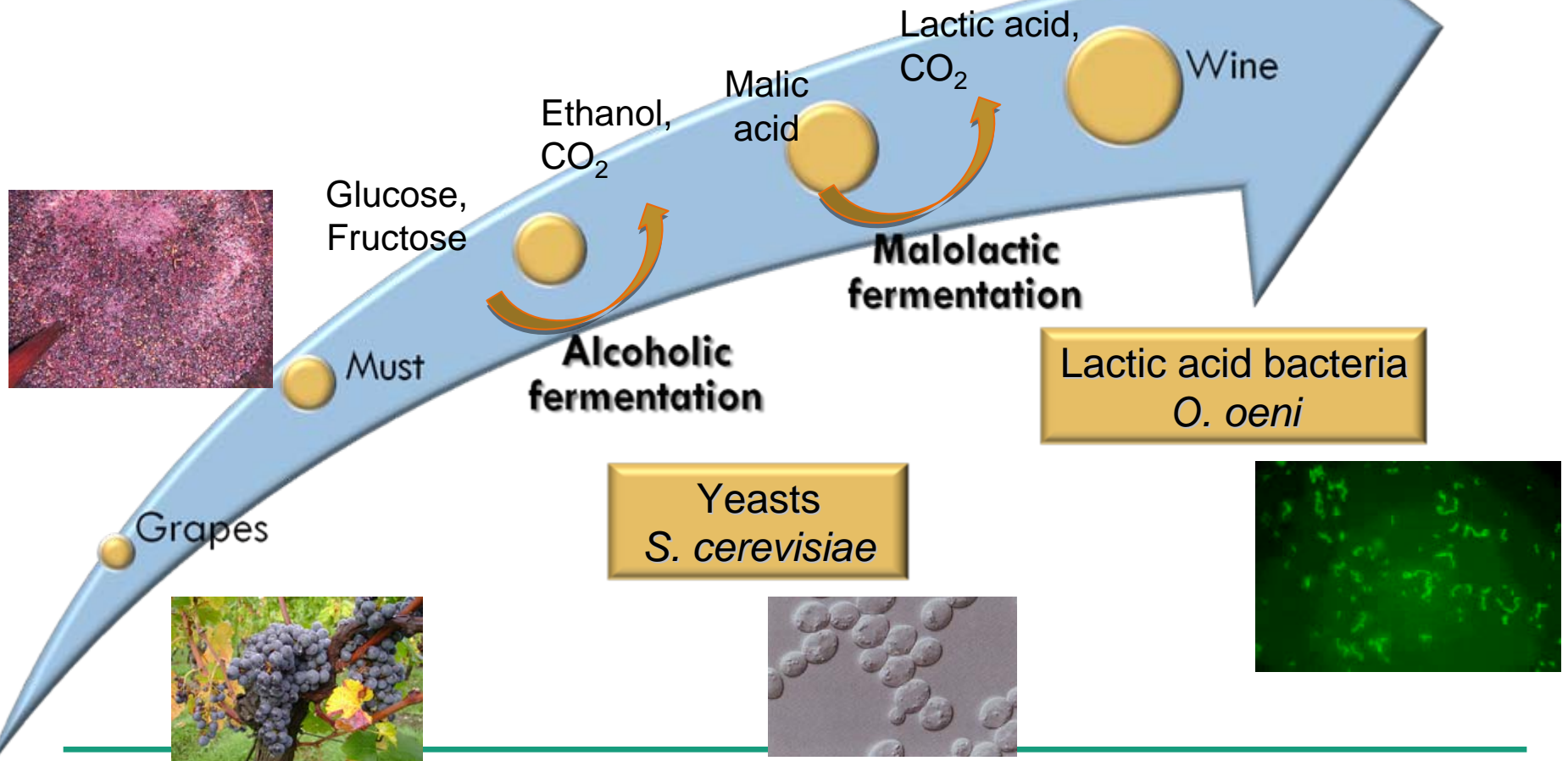


Pressure Change Technology (PCT) is a new physical process that has the potential to control microbial growth and reduce oxidation

Microorganisms and wine

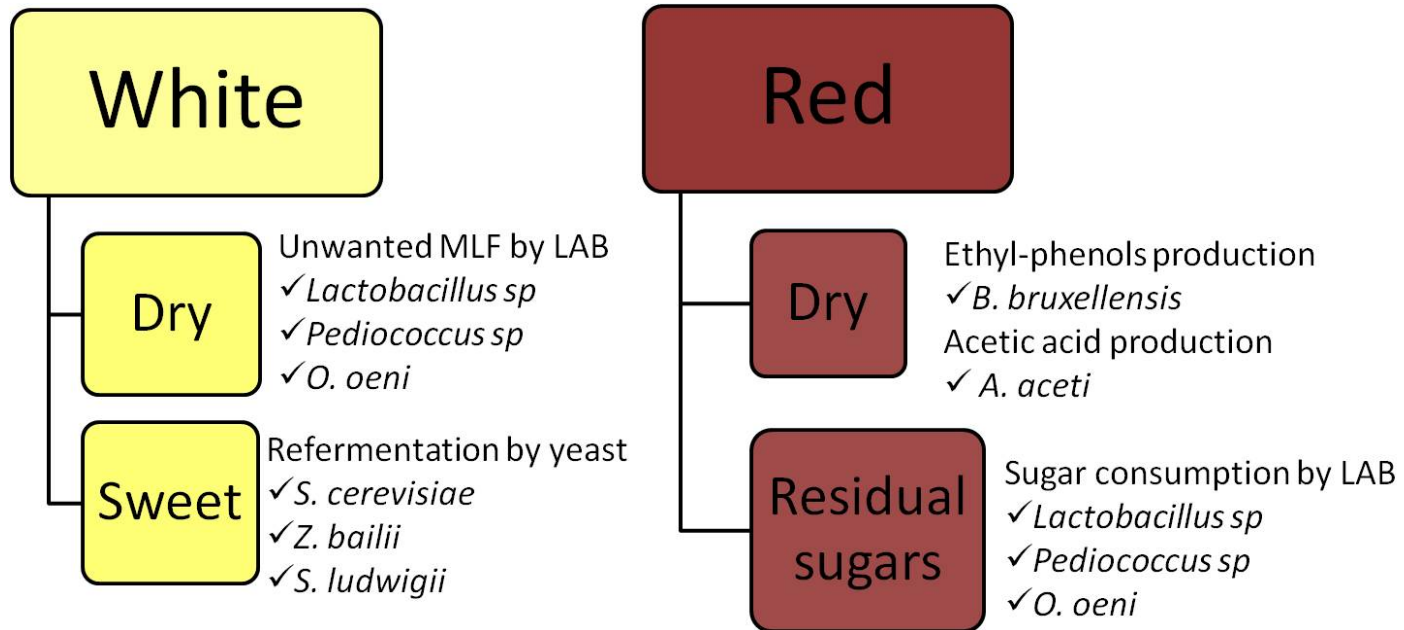


□ Fermentations by wine microorganisms



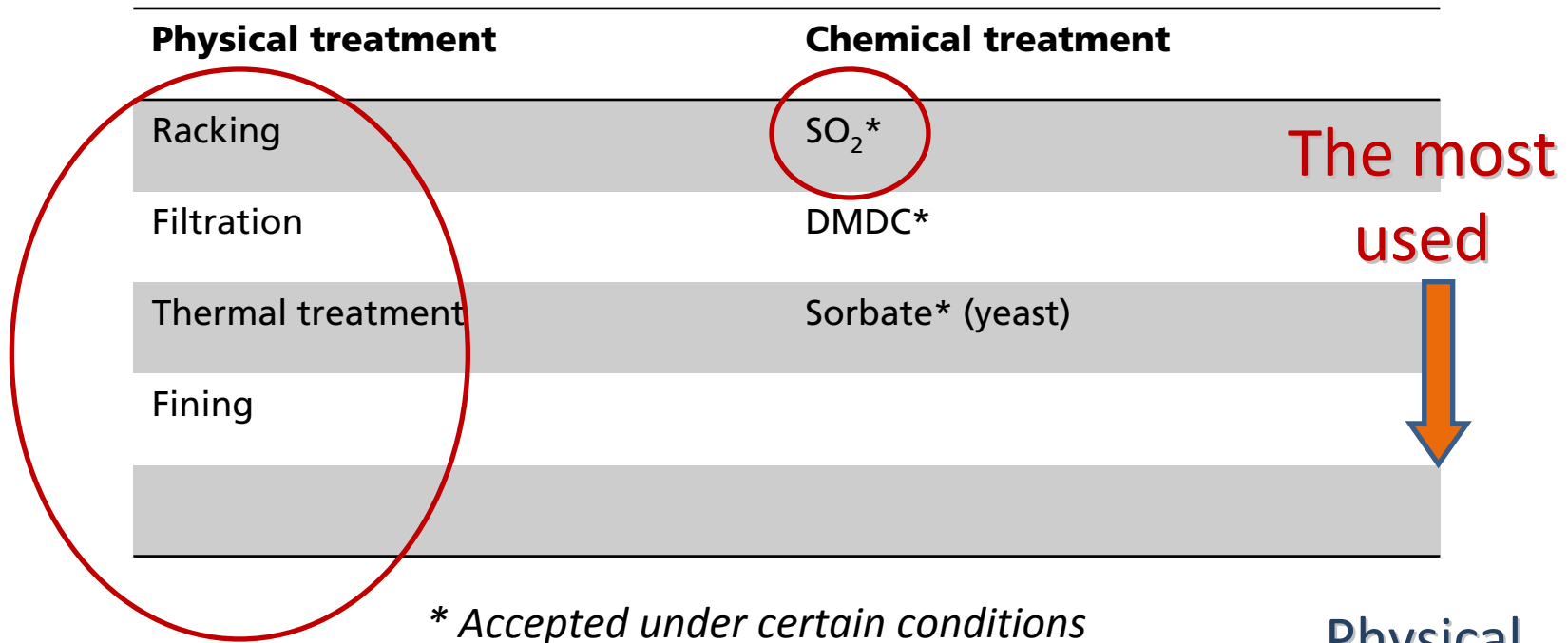
Microorganisms and wine

Spoilage risk by microorganisms according to the type of wine and type of microorganisms



- Alteration could be organoleptic, physico-chemical...

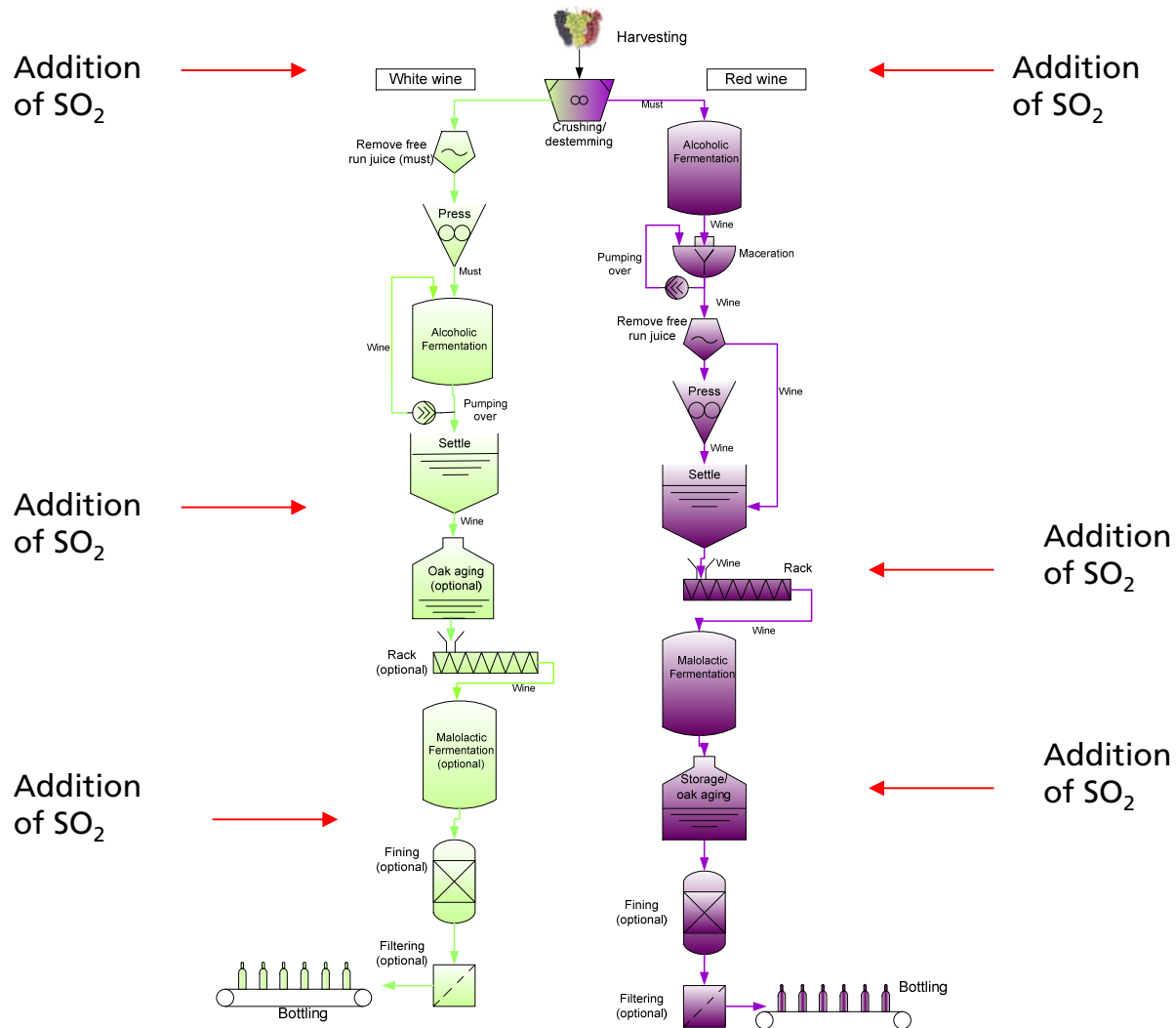
Microbial Stabilization Tools



Cannot be used at all wine stages
Incidence on wine organoleptic
properties?

Physical
treatments are
preferred

State of the Art in Wine Processing



Overall Objectives of PreserveWine

- To verify the suitability of **PCT as a replacement of sulphur dioxide in shelf life stabilisation of wine** by controlling microbial spoilage and preventing its oxidation.
- New technology approach to provide wine makers an option to adapt to consumer's health concerns and align with current EC regulations that reduced the accepted limits of SO₂ in wines
 - ✓ The current PCT system will be further developed into a continuous process

Pressure Change Technology (PCT)

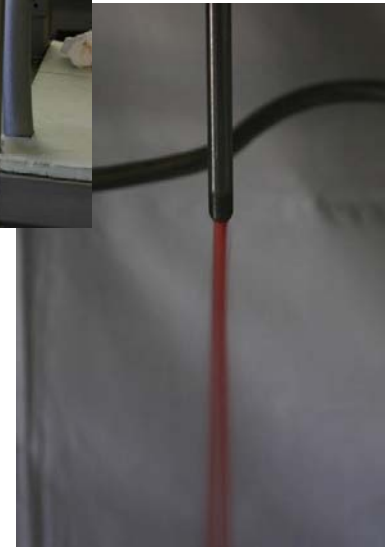
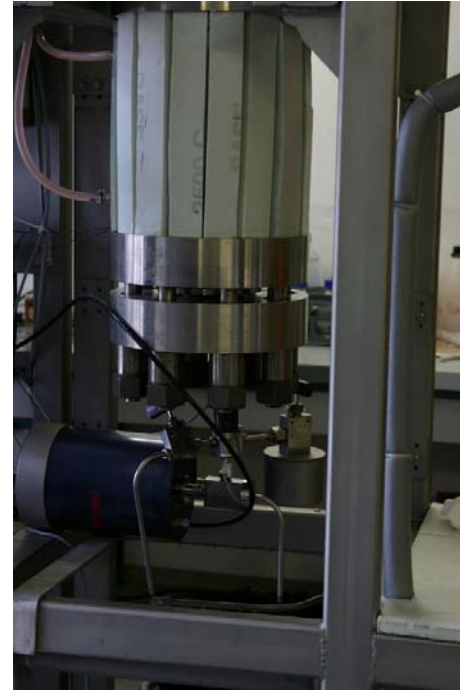
- PCT is a novel non-thermal technique that involves charging a liquid product with pressure and an inert gas and then rapidly releasing the pressure.
- The sudden pressure release causes microbial cell walls to rupture, inactivating microorganisms.



Process validated for fruit juices :
needs validation in Wine making!

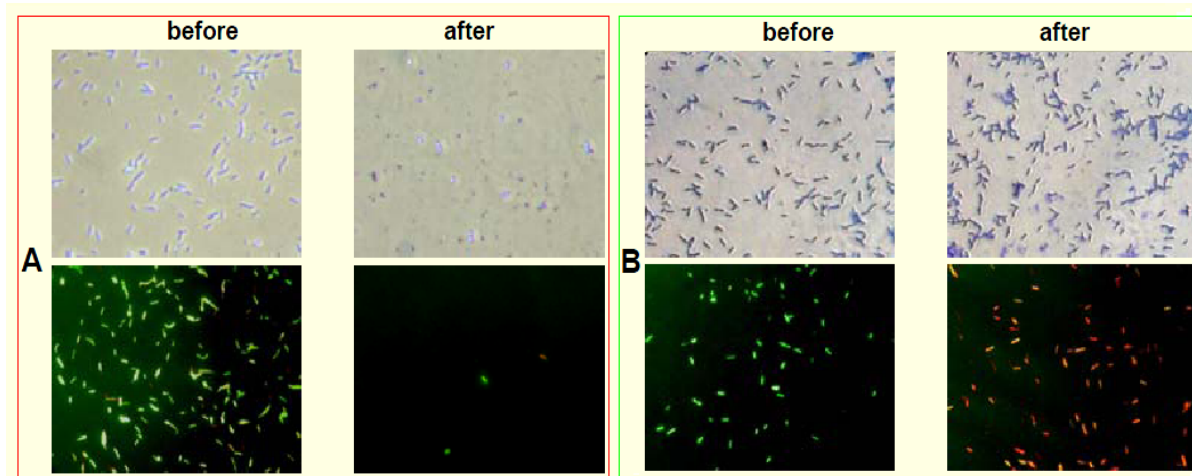
PCT: Previous Results

- PCT was demonstrated in lab-scale in semi-continuous flow
- Inactivation and/or Pasteurisation-like hygienisation of liquids can be reached with pressure up to 500 bar and temperature under 40 °C
- Sterilisation can not yet be reached according to spores
- Resistant of microbes against treatment varies with genus of contaminants
- Inactivation of enzymes has to be investigated for each product
- Results have been demonstrated with inoculated liquids as well as with fresh apple juice



Microbiological results of the previous works in batch process

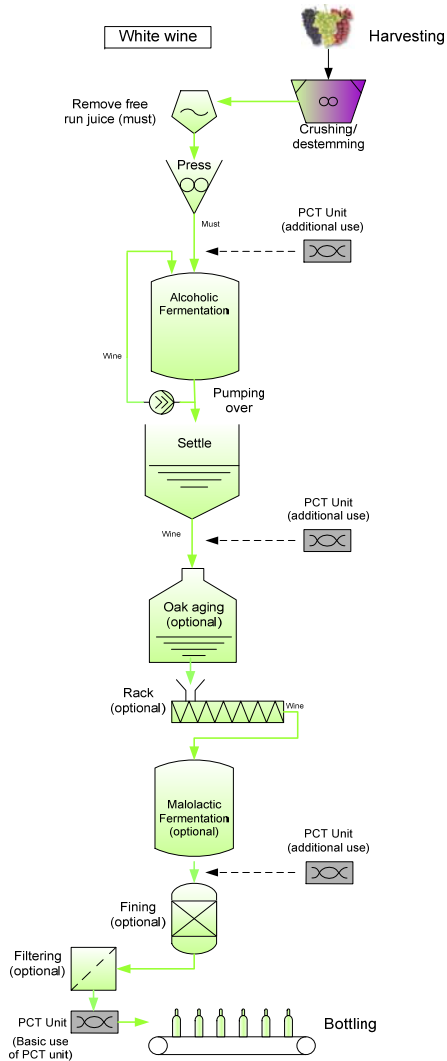
Comparison before and after treatment using a methylene blue and live/dead stains of *P. fluorescens* with (A) nitrogen and (B) carbon dioxide



Scientific objectives

1. Understand PCT wine treatment and effects of process parameters on wine quality
2. Define optimum PCT process significantly reduce spoilage microorganisms (lactic bacteria and yeasts) and to prevent wine oxidation (discoloration and off-flavours) in test red wines and white wines (sweet)
3. Define suitable wine processing stages, e.g. during storage in tanks, barrels or bottles.
4. Compare the organoleptic quality (aroma and taste) of the wines subjected to the PCT process by a trained taste panel

PreserveWine Unit in Wine Processing (e.g. White wine)



Demonstration of benefits in a pilot-scale

→ alternative preservation via PCT

- reduction of energy consumption in comparison to thermal treatment
- flexible use throughout the process

Demonstration of benefits for product quality

→ avoiding chemical preservatives (SO₂)

- health benefits
- improved organoleptic quality
- conservation of oxygen sensitive ingredients

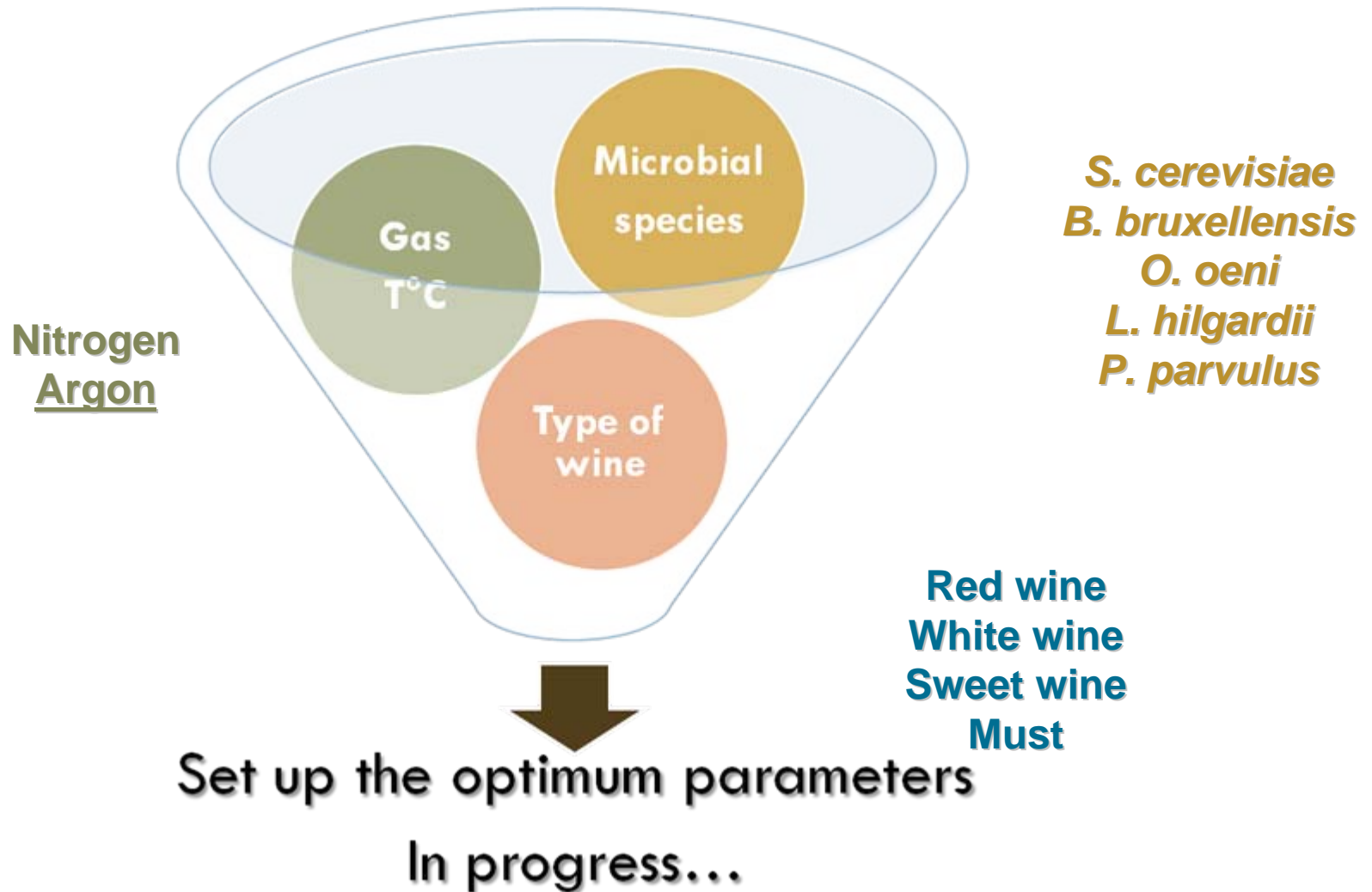
Technical objectives

1. To develop a continuously working high pressure pump (up to 50MPa pressure) appropriate to food industry hygienic standards.
2. To identify minimum pressures required to dissolve gases rapidly and optimize in-line mixing system
3. To develop a continuous PCT process in laboratory scale (2 l/min) and define the optimum in-line processing conditions (e.g. retention time, pressure level)
4. On-line monitoring of the wine treatment by PCT.
5. To scale-up the laboratory process into a pilot scale prototype unit (20 l/min).
6. To achieve wine bottling in an inert gas atmosphere with controlled reduction ($\pm 5\%$ tolerance) of the amount of dissolved oxygen (less than 1 mg oxygen / L wine).
7. To validate the microbiological and organoleptic quality of the wine, as compared to the conventionally produced wines
8. Compliance with full HACCP (hazard analysis critical control points) and GMP (good manufacturing practices).

Current laboratory batch system



Selection of the best set parameters



Monitoring wine oxydation

- Does the batch system treatment have any effect on the wine dissolved oxygen concentration ?
- Is there any oxidative phenomenon ?
- **Monitor** the wine dissolved oxygen concentration **before** and **after** the PCT treatment
- Non-intrusive and non destructive luminescence Oxygen sensing method



Dissolved O₂ before the system



Dissolved O₂ after the system

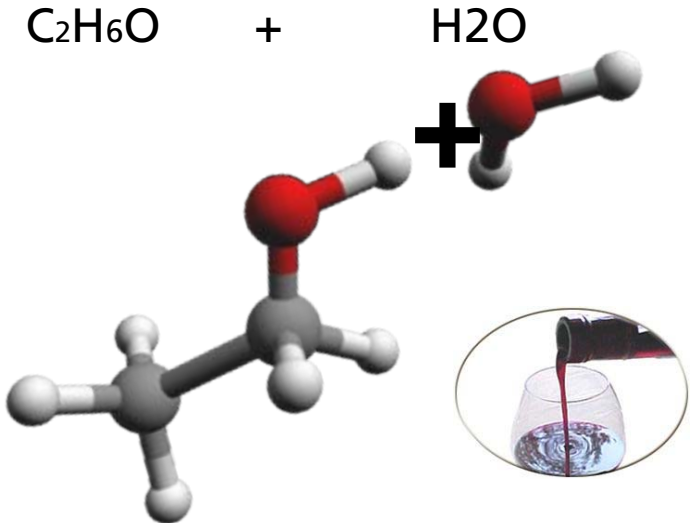
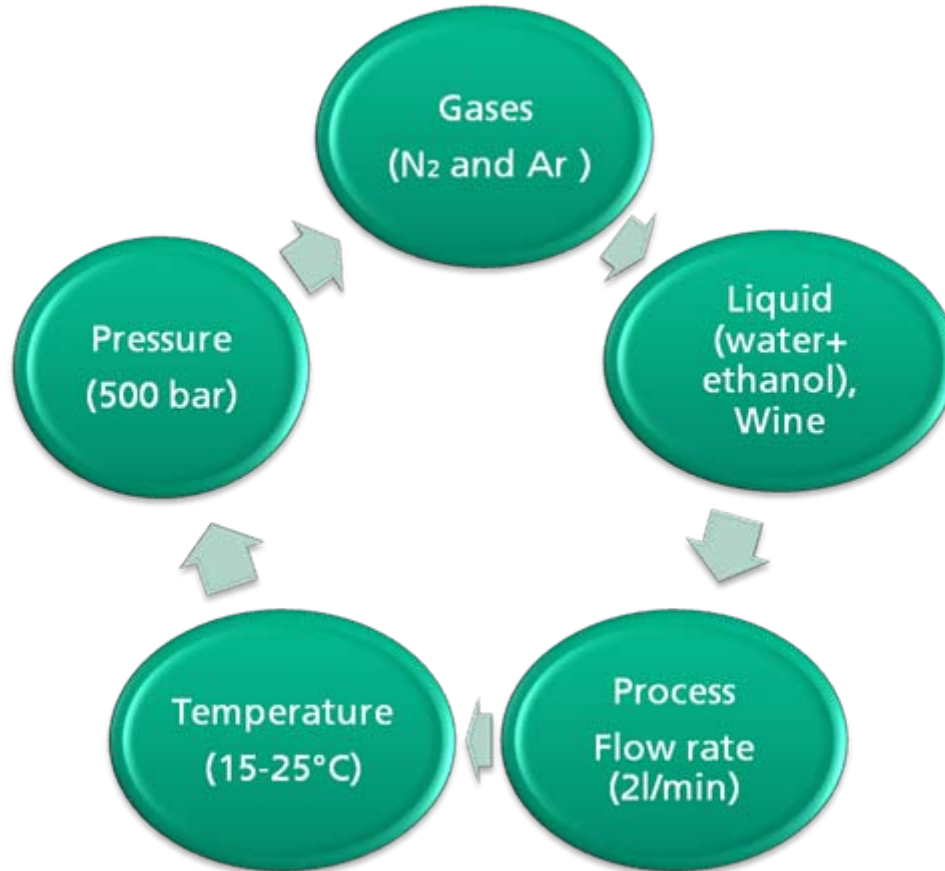
Wine tasting sessions

Evaluation of the potential organoleptic changes induced by the batch system

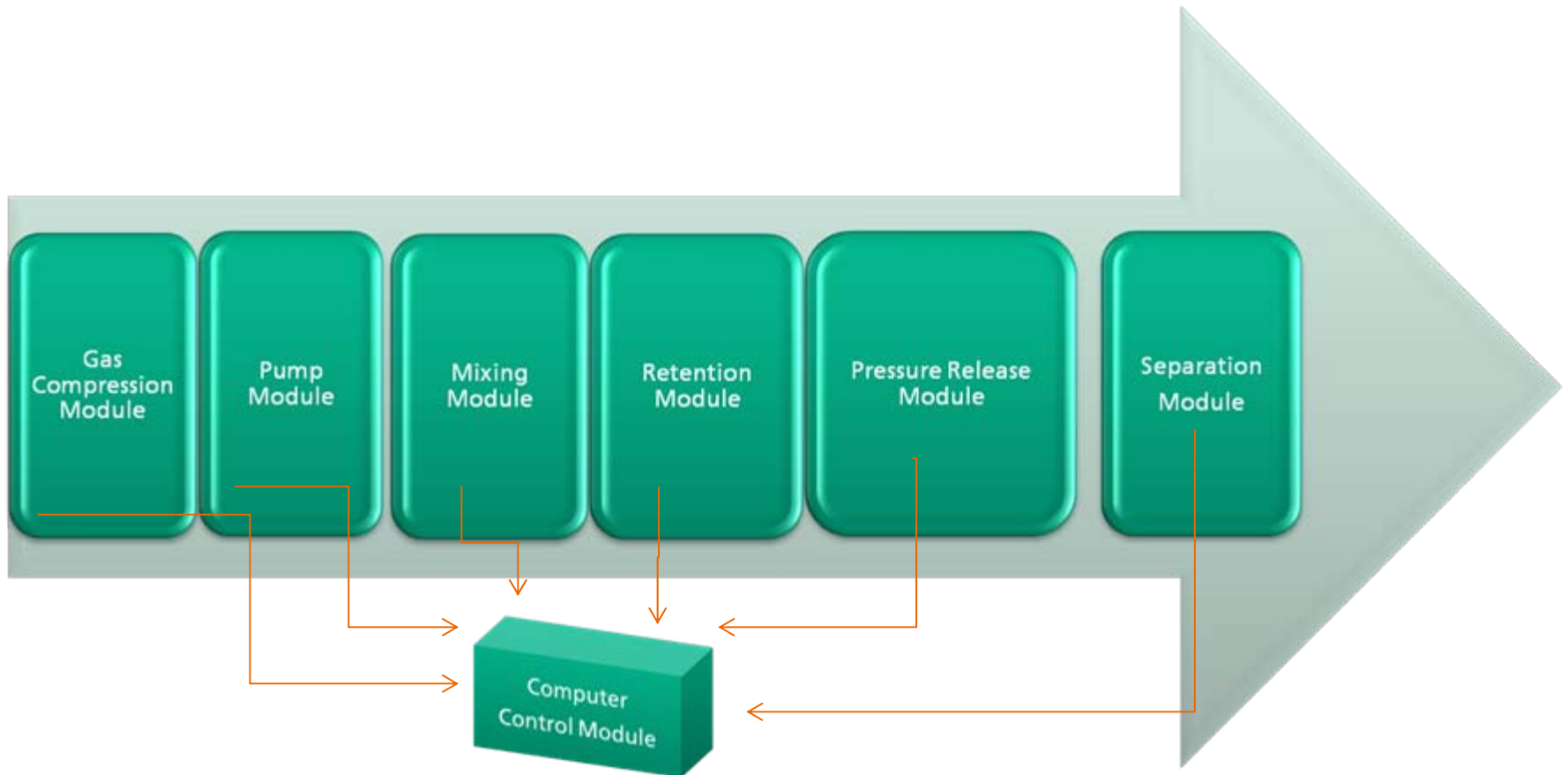


- ✓ Tasting sessions performed on real wines with the best set parameters

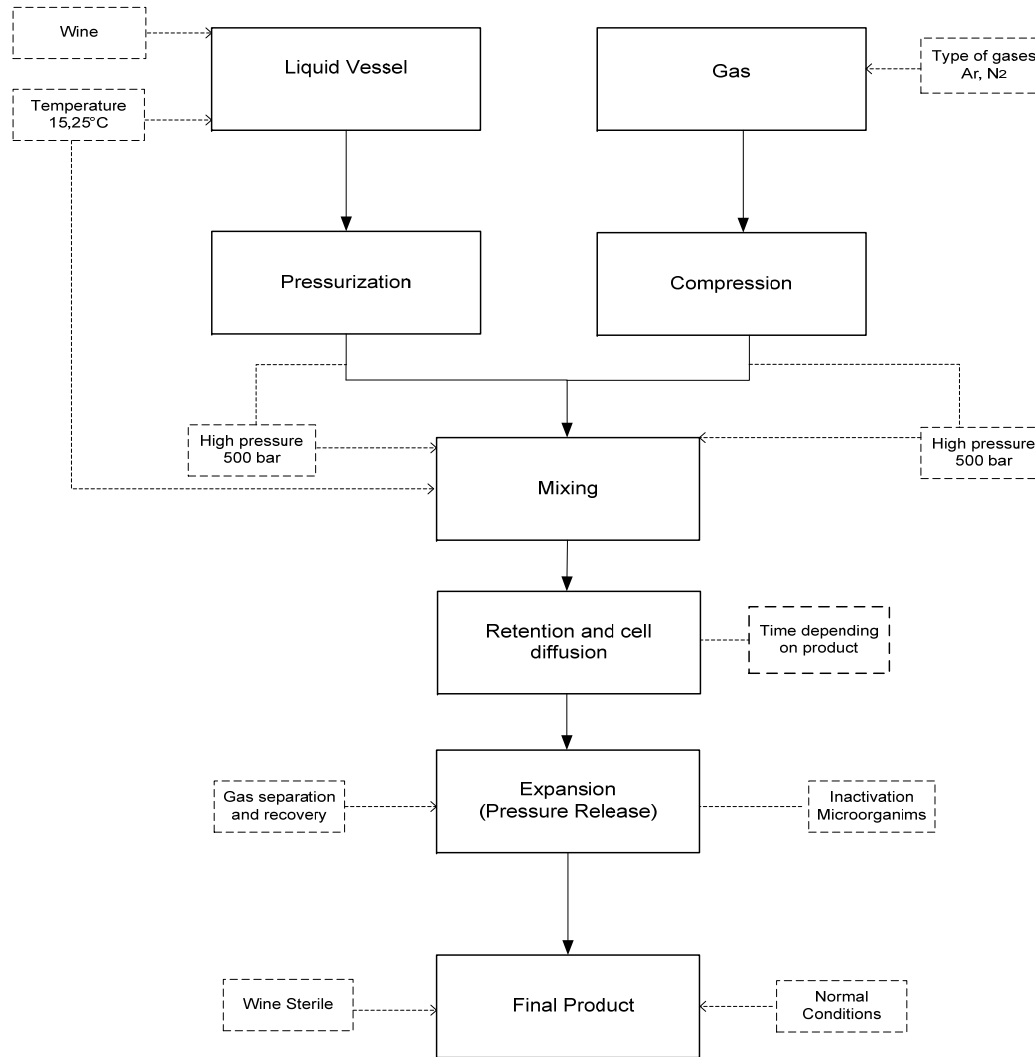
Continuous PCT: Process Conditions



Modules of the process



Block diagram of the continuous process



Continuous System under construction



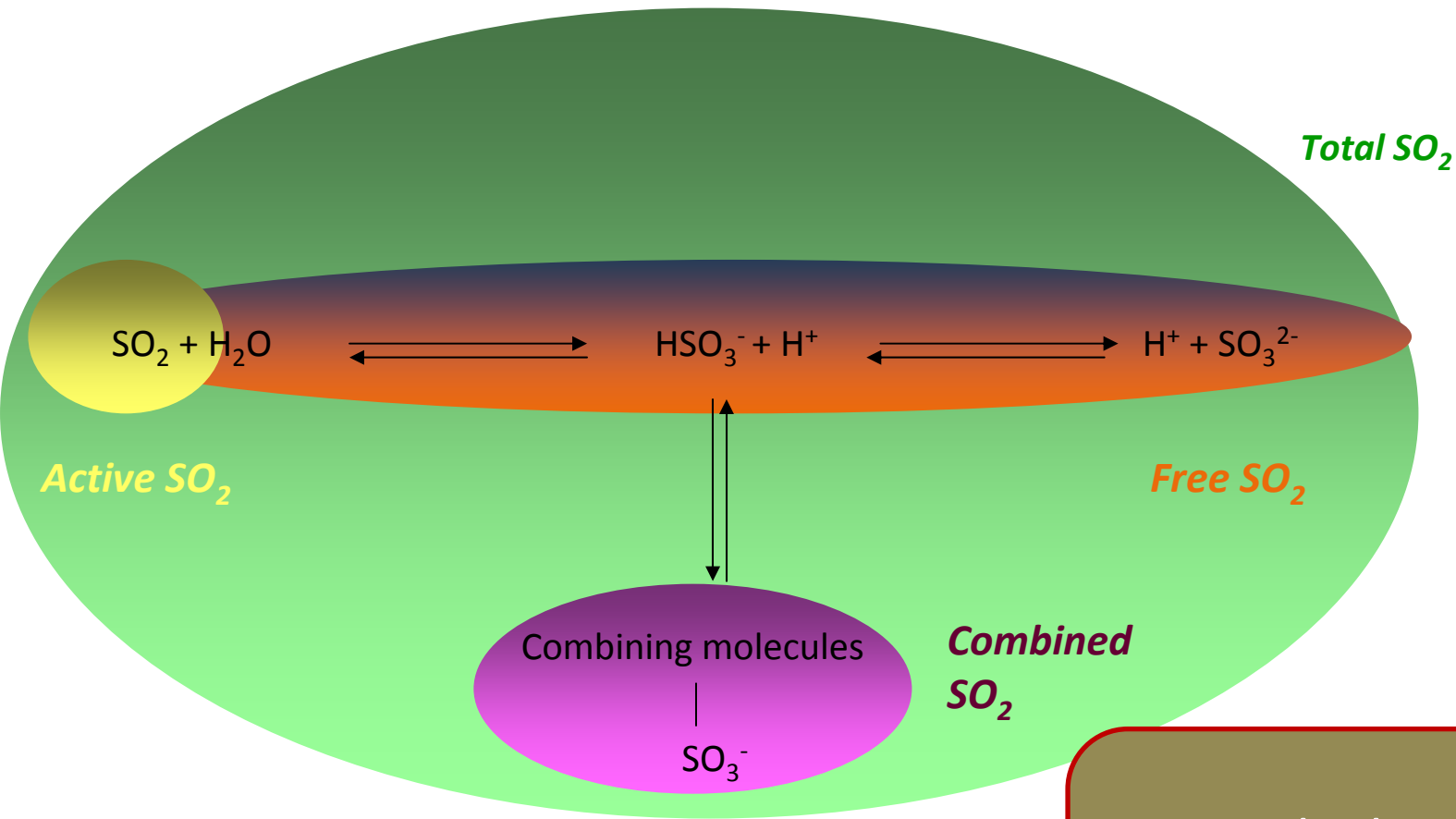


PreserveWine Impressions.....

Acknowledgements

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Microbial Stabilization Tools



SO₂ total = SO₂ libre + SO₂ combiné

SO₂ free = SO₂ active + ion bisulfite + ion sulfite (negligeable)

- Microbial stabilization
 - Anti O₂
 - Anti oxydase (enzyme)