

## WINESITY - Automatic sensor to continuously measure density during the wine fermentation

**Summary**

The Winesity project will develop a density measuring system for the continuous control of fermentation processes during wine-making, given that must density decreases during its transformation into wine.

In the wine industry, fermentation control is essential to ensure the optimal quality of the product: quick fermentations may adversely affect the quality of the wine, while longer fermentation periods delay subsequent processes and increase the risk of affecting the quality of the end product and incurring higher energy costs.

Moreover, monitoring fermentation curves can help detect potential issues during the wine-making process so they can be quickly solved, preventing irreversible problems and the loss of hundreds or thousands of litres of product.

This sensor is placed inside the fermentation tanks, its position and protection being important issues to be tested, given that it has to withstand the work conditions inside the tank: gas bubbling, grape skin movements, recirculations, tartrate deposits, etc.

The density results are sent to a computer, where the Winesity software displays the density and temperature values continuously for each tank.

**Objectives**

The general objective is to design and produce a prototype automatic density meter to continuously control the evolution of fermentation during winemaking. The project will build prototypes of the device, which will be installed in several of the cooperative's tanks to verify their operation.

Secondary objectives:

- A reduction in the time technical experts spend measuring density during fermentation.
- Detect fermentation delays or stoppages in the winemaking process more quickly. Detect the point at which fermentation ends more quickly and accurately in order to optimise the use of the tanks and the reception of grapes at the winery during the harvest.

**Description of the actions carried out in the project**

- Define the specifications and requirements of the WINESITY system for red wine and white wine/cava.

- Definition of the design for constructing prototypes.
- Perform laboratory tests on wine samples in order to optimise it.
- Placement of three prototypes in different tanks during the harvest season.
- Monitor the density measurements and curves and compare them with those of the traditional control system in order to verify correct operation.
- Validation of the anchoring system and installation in the tank.

### Final results and practical recommendations

The installation of the pilot units of the Winesity density meter in the Agrícola Falset Marçà cooperative winery will allow verification of the objectives that are hoped to be achieved by implementing this automatic sensor.

The results are easily transferable, as the size of the Falset-Marçà Agricultural Cooperative and Credit Section, Afalma, SCCL are reasonably representative of the cooperative wine production sector as a whole, hence the pilot study can be easily extrapolated to other facilities.

The main benefits that are hoped to be obtained from the Winesity sensor are:

- Continuous registration will enable the point at which density stabilises at the end of the winemaking process to be immediately detected.
- It simplifies detection of stoppages, problems or irregularities in the fermentation process, allowing timely measures to be taken to avoid losses in production.
- Free up the fermentation tanks more quickly, due to quicker detection of both the end of the fermentation process and the appearance of any problems that may slow down the process.
- Changing the system from manual to automatic will lessen the workload of the operators during the harvest period, and this device will enable density to be controlled by any operator, in contrast to the traditional aerometry method, which requires qualified personnel.
- Shorter use of the tanks will enable optimisation of the use of the cooling equipment, resulting in energy savings and a consequent reduction in CO<sub>2</sub> emissions.
- The continuous transmission of data via Wi-Fi will enable the centralisation of all the readings of the various tanks in a single computer, in addition to a record of the evolution of this parameter thanks to these ongoing readings.

### Conclusions

The tests carried out in the winery and the Wine Technology Centre (VITEC) validated the design of a sensor capable of continuously monitoring density during fermentation in compliance with wine sector specifications. Winesity has been further developed since then, enabling connectivity of fermentation tanks to a computer display, and improvements have been included in both the mechanics and electronics for implementation in 33,500-L tanks.

By introducing this WINESITY automatic sensor in the winery's fermentation tanks, the following improvements are expected in the management of the wine-making process:

Firstly, the sensor will greatly reduce the amount of time technical staff need to spend on the process, as it is now automatic. This will free up the wine-maker from work required at one of the busiest time of the year: harvest. Another very important point is that any of the operators can carry out the control, freeing up technicians for crucial tasks during the grape harvest.

Problems or irregularities in the fermentation process can be detected quickly, allowing measures to be taken in time, thereby avoiding production losses.

It will also free up the fermentation tanks more quickly. This will reduce or avoid the need for subcontracting other wineries to process excess grape stock (due to lack of resources or space) and could increase wine production by up to 15%.

### Leader of the Operational Group

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### Subject area(s) of application

- Agricultural production system
- Agricultural practice
- Agricultural equipment and machinery
- Livestock farming and animal welfare
- Vegetable production and horticulture
- Landscape / Territorial management
- Pest and disease control
- Fertilisation and nutrient management
- Soil management
- Genetic resources
- Forestry
- Water management
- Climate and Climate Change
- Energy management
- Waste and by-product management
- Biodiversity and environmental management
- Food quality/processing and nutrition
- Supply chain, marketing and consumption
- Competitiveness and agricultural and forestry diversification
- General

**Geographical area(s) of application**

PROVINCE(S)	REGION(S)
Tarragona	Priorat

**Dissemination of the project (publications, seminars, multimedia, etc.)**

During execution of the project, the following conferences were organised:

- INNOVATION Conference in Lleida by the Catalan Federation of Agricultural Cooperatives (FCAC), where the WINESITY project was presented to inform the wine and cava cooperatives in the federation.
- Online conference (due to the pandemic) at project end, organised by the FCAC and the Falset cooperative, with the participation of the Wine Technology Centre (VITEC) and the Institute for Research in Organisations and Society (IRIS) to disseminate the results and present the sensor to wine cooperatives, members, students at the wine-making vocational training centres in Espiells (Penedès) and Falset (Priorat) and oenology degree students at the University Rovira i Virgili.

**Project website**

[www.etim.cat](http://www.etim.cat)

**More information on the project**

PROJECT DATES	TOTAL BUDGET
Starting date (month-year): June 2018	Total budget: €200,000.00
Completion date (month-year): September 2020	DARP funding: €79,800.00
Current status: Executed	EU funding: €60,200.00
	Own funding: €60,000.00

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*Order ARP/133/2017 of 21 June, approving the regulatory bases for grants for cooperation for innovation by promoting the creation of European Association for Innovation operational groups in the areas of agricultural productivity and sustainability and the execution of innovative pilot projects by those groups, and Resolution ARP/1868/2017, of 20 June, announcing the call for the grant.*