Interreg
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Quality Control of fresh Agro Products
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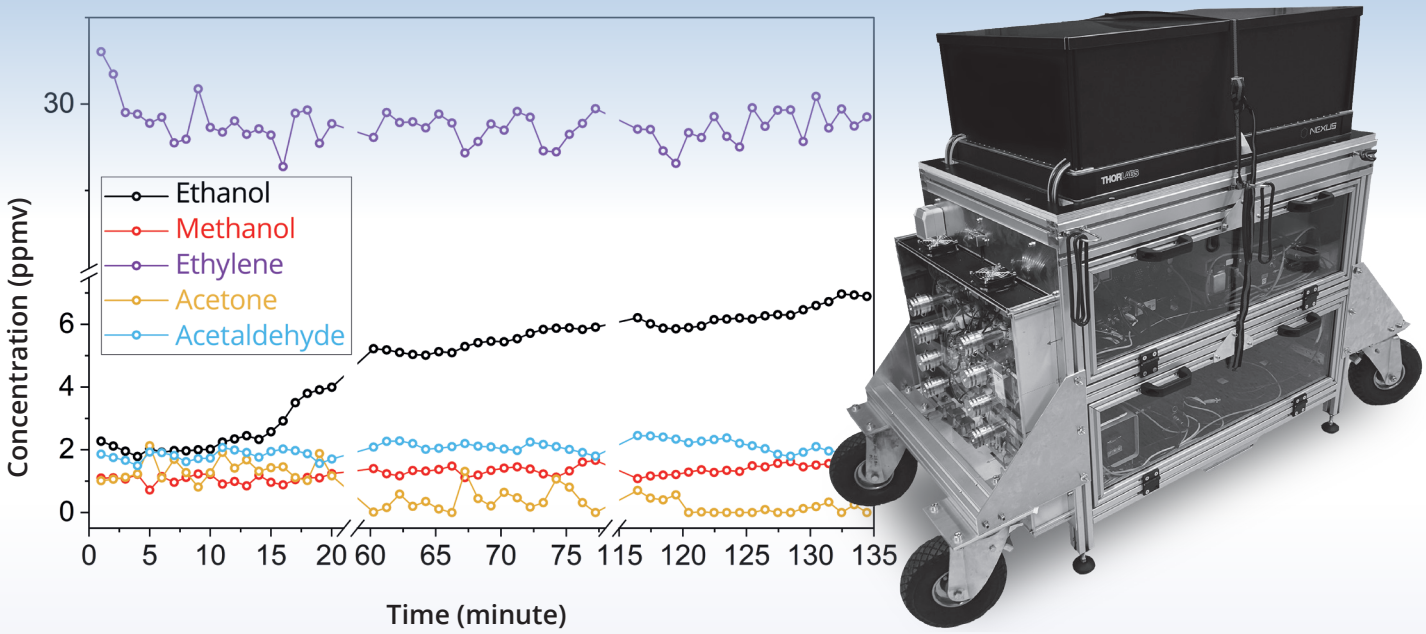


QCAP monitoring system validated in lab and industrial setting

The QCAP partners successfully cooperated in the completion of three sensor prototypes for monitoring fruit and potatoes in storage areas. The monitoring systems have been tested in both laboratory and industrial environments in Jork, Cranfield, and Leuven; demonstrating the high potential of QCAP in monitoring fruit emitted volatile species.

QCAP started in 2017 to build a low-cost, portable, and fully integrated gas sensor that can detect eight chemical volatiles simultaneously. These compounds are related to fermentation, ripening, damage and spoilage during storage. An essential requisite for the project was effective teamwork and cooperation among the partners.

The sensor consisted of many individual components, gas treatment system, electronics, and the software. Therefore, the development of the complete system was expected to be challenging from the beginning. For the simultaneous detection of multiple gas species, a new laser with broad-spectrum and high intensity was required. The fast detection of multiple gas species at the sub-ppmv level was another challenge. Thus, a new, fast, and low-cost spectrometer capable of measuring gas absorption over a broad spectral range had to be developed. Furthermore, user-friendly integrated software for controlling the system and on-line analysing the data was needed. But perhaps, the most challenging aspect was the constraint time-frame and budget.

Due to the complexity of the system, the development of the sensors initially took more time than anticipated. The first sensor prototype was shipped to Leuven in January 2019. Afterwards, prototypes were fabricated and shipped to Jork and Cranfield. So far, the gases released from stored potatoes, apples, pears and blueberries have been measured. The field tests allowed to improve the system hardware and software iteratively.

Effectively achieving the project goals, QCAP is currently at its final stage. At the moment, one sensor system is performing measurements on blueberries stored in Jork, while the other will finish studying emitted gases from potatoes in Cranfield. After preparing the final reports and remarks, the project will be followed up by a next project called Max-Fresh to mature the QCAP sensor into a commercial product.

Fresh Produce Centre reflects innovation in daily practice

Daco Sol

As a QCAP associate partner, the Fresh Produce Centre bridges the gap between research and practice. Daco Sol, Programme Manager for Logistics, Supervision & Supply Chain, explains exactly what this role entails and what steps he believes are still needed for a successful market launch of the monitoring system. We also ask him about his vision as a potato grower – would he buy the QCAP system for his harvest?

"As Fresh Produce Centre, we'd like to support the QCAP project in achieving the best possible product quality for our members"

What role has Fresh Produce Centre played so far in the QCAP project?

"We're looking critically at the development of the monitoring system, based on practical requirements that we are aware of. For example, during the project meetings, we discuss the accuracy of the measurements, how they correlate with the product status, and how the system can be linked to current measurement systems. By working together we can align the product as closely as possible to the needs of the sector. At a later stage, we can also establish contacts between the project partners and climate-controlled storage companies."

In what area do you think the QCAP monitoring system adds the most value?

"A new monitoring system for climate and product behaviour is attractive if it enables better control, or the quality is the same, if it is more user-friendly or cheaper. QCAP's strength lies in the use of sophisticated technology that offers added value by increasing the quality of products and reducing losses."

What requirements does the system have to meet in order to ensure a successful market launch?

"While an advanced sensor and adequate software are important, so is the industrial design. Ideally, the system should be compatible with existing systems and should be low-maintenance. Another essential part is the controls. You want to be able to easily adjust and set where the measurements are taken and at what interval. If quality deteriorates, you need to be able to spot this quickly so that you act in time to prevent problems spreading or worsening. A combination of good measurements and a correct interpretation of the data means the

difference between top quality or unwanted quality losses."

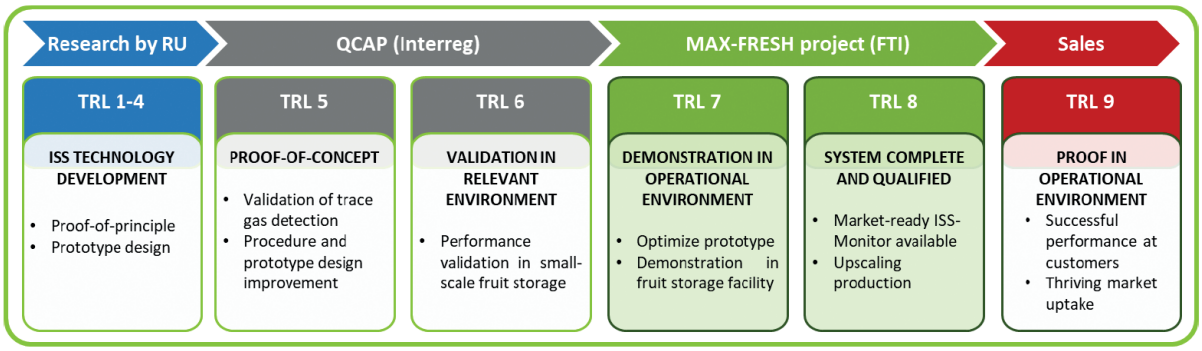
How do you expect this market launch to go?
"I expect the system to have an impact on major preservation products, such as apples and pears, as well as other products with an advanced ripening process. As eight gases are measured at the same time, the system could provide the required sophistication for that as well."

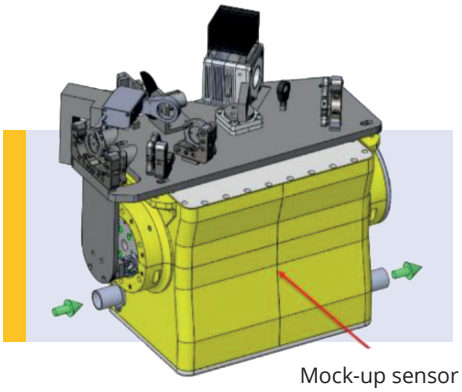
Being a grower yourself, would you be interested in using the system?
"The QCAP monitoring system is a fantastic, innovative product. But I'll make the same calculations as other growers before using it, which means comparing the investment against the expected returns. The yields would need to be equal to the losses I can prevent, both in weight reduction and quality. I can't yet tell the result of this calculation; the project should give some practical data on this over the coming weeks and months. In the next few years, the new technology will be brought in line with actual practice and preparations will be made for the market launch. I'm sure fruit and vegetable preservers will be closely following these developments."

MAX FRESH project brings QCAP system to market

QCAP partners Storex, NKT and Radboud University join forces with Senseair in a new 'Fast Track to Innovation' project called MAX-FRESH. The monitoring system meets all requirements for an FTI programme: it is beyond state-of-the-art innovation with considerable socio-economic value and a strong business case. That is why the new project has been granted 2.2 million euros by the European Commission to prepare the QCAP monitoring system for market launch.

The QCAP project resulted in a unique ISS-Monitor: world's first automated multi-species trace gas sensor that can simultaneously and in real-time detect low levels of 7 volatile gases that indicate ripening, fermentation, damage or rotting of stored fruit. Once unfavorable conditions are detected, the ISS-Monitor will provide automated alerts to enable timely and effective interventions by its customers. Once on the market, this ISS-Monitor has the potential to reduce losses of stored fresh food by 50%, extend storage life with 20%, and reduce post-harvest chemical treatments with 50%. During the MAX-FRESH project, the final steps required to actually launch the ISS-Monitor on the market will be taken. The MAX-FRESH project will be performed by a complementary consortium of 3 market-leading industrial partners, Storex, Senseair, NKT and 1 academic partner, Radboud University, combining cutting-edge technologies with unique expertise. After completing the MAX-FRESH project in 2023, the ISS-Monitor will make an impact on the global food production system by contributing to sustainable food production for the ever-growing world population. QCAP project leader Frans Harren: "Cooperation between knowledge institutes, high-tech companies and agricultural organizations is essential for the development of such a monitoring system.





Mock-up sensor

In the QCAP project we coordinated this collaboration from Radboud University, but closer to the end goal we think it's better that a commercial party will pull the cart. That is why Storex is now taking over. They have connections with the market and I am confident that they can successfully introduce the system in the sector."

Meet Bert Verlinden,

research manager at the Flanders Centre of Postharvest Technology (VCBT)

What is your expertise?

"I'm a trained food technologist. During my PhD research, I investigated how cooking processes change the texture of vegetables and how these physico-chemical processes can be rendered as mathematical models. At VCBT, I apply that modelling work to how we preserve fresh fruit and vegetables. My aim is to increase our knowledge of how quality changes and to establish under what storage conditions we can maintain this quality for as long as possible."

Why do you participate in the QCAP project?

"The fact is that we should change our preservation techniques each new season, as the fruit has different properties each time. The QCAP project is developing technology to facilitate this: we try to 'listen' to the fruit in storage by measuring certain volatile substances released by the fruit while in storage, and we use this data to find out whether the fruit 'feels good'. This enables us to intervene before things go really wrong."

What is your most important challenge in this project?

"One very interesting challenge is how the instrument builders and physicists on the one hand and the conservation physiologists on the other are collaborating. The physiologists work with living plants and speak a totally different language. But the major challenges are of a technical nature. Ensuring that fragile measuring instruments work reliably in a cold and wet storage environment, let alone how to understand the language that the fruit 'speaks', is still extremely tricky."

Bert Verlinden

Contact

Radboud University
Heyendaalseweg 135
6525 AJ Nijmegen
The Netherlands

Frans Harren
f.harren@science.ru.nl
+31 24 365 21 28
www.nweurope.eu/qcap