Sensors to follow in real time the tomato and apple quality attributes during processing in puree

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The interest of real-time measurements for F&V processing:

Fruit and Vegetables (F&V) are reactive with **variable** properties and compositions depending on species and varieties, maturity stages, processing conditions... Developing a smart processing device able to **live-diagnose** the change during **processing** is a challenging objective for controlling quality and optimizing processes.

Our project aims at **customizing** a cooking and grinding pilot for R&D. It allows thermo-mechanical processes equipped with a double-wall tank heated by steam, in which pressure/vacuum and product temperature are continuously **monitored** and **controlled** (®RoboQbo, Parma, Italy). Our first achievement was to integrate both, near infrared (NIR) and visible **spectroscopy** as optical sensors and a device for **trapping** volatile organic compound (**VOC**) in the cooking vapor.

Visible and near-infrared spectroscopic sensors:

Commercial NIR and visible spectrometers were connected to the pilot through an optical fiber, in order to register the product light **adsorption** during processing. As F&V adsorption properties vary according to their composition (water/sugar content, color), the spectral properties were studied in relationship with the **modification of composition** and texture of the matrices during processing in order to test and ultimately validate sensors for later use to **optimize** processing conditions.

VOC sampling and calibration for diagnostics:

A cooling and drying device was designed for sampling aliquots of cooking vapors through Tenax ® VOC traps during processing. This device was associated with another “static” device allowing calibration and quantification of VOC content by **gaz-chromatography mass-spectrometry**. When used “in tandem”, we were able to monitor the vapor composition during cooking of F&V. In order to quantitatively assess changes, **automated** condensation-injection systems are under development.

The “static” device is already automated allowing for a timely valve-controlled nitrogen flux pushing headspace’s VOCs through a Tenax® trap.

Further development of this pilot will facilitate the integration of the signals and composition for establishing **models to predict changes throughout processing.**