

Multiparameter Beverage Analysis Saves 10 Minutes per Sample

Beverage products undergo multiple quality control tests, including acidity, pH, and Brix measurements, to ensure consumers get the most from their juices and sodas. METTLER TOLEDO's InMotion™ Autosampler fully automates these measurements within a single system, including degassing. At RAMSEIER Suisse AG, a leading Swiss beverage producer, this has sped up the quality control workflow by around 10 minutes per sample.

RAMSEIER Suisse AG has several decades of experience in beverage production and holds a solid position in the Swiss beverage market thanks to selling its brands, including RAMSEIER, SINALCO, and ELMER, and producing a variety of other beverages under private labels. The strict quality standards in the industry require running several quality control tests on the products before they reach the consumer. With so many different products, efficient and reliable quality control is crucial.

Tedious multi-instrument testing and degassing

The most important QC tests performed on any beverage before it reaches the market are density, sugar content (Brix), acidity, pH, and, for carbonated beverages, the CO₂ content. Additional parameters may also be determined, e.g., vitamin C, color, or turbidity. At Ramseier, correct degassing is necessary for the standard quality control measurements that are carried out after CO₂ concentration determination on a Steinfurth CO₂ tester. Ramseier completely degassed them using a separate vacuum pump and magnetic stirrer to prepare their samples for analysis.

This degassing procedure was time-consuming, and each QC parameter was then determined on a discrete instrument. This required manually cleaning each instrument and manually entering each result into a database. The workload for the lab technicians reached a very high level, particularly after the weekend when samples from production had accumulated in the lab.

Degassing with InMotion™

The procedure using a vacuum pump and magnetic stirrer to degas carbonated beverages took up to two minutes per sample and required manual operation. However, a novel solution that degasses directly in the sample beaker was found. This is achieved using a compact overhead stirrer at gradually increasing speeds (too quickly at the beginning would create too much foam) and an additional pump that blows air into the beaker releasing the CO₂ bubbles to the surface. The duration and speed of the stirring function have been optimized for different product types to reduce degassing time. Not only does automatic degassing save time but operator dependency is also eliminated. Mr. Kunz, the Quality Assurance Manager at RAMSEIER, states, "The automated degassing process turned out to be very repeatable."

All parameters in a single run

Instead of carrying out routine analysis on separate instruments, METTLER TOLEDO demonstrated a more efficient, automated system. This system combined a density meter, refractive index cell, and titrator, all automated with an InMotion™ Autosampler. The system (Figure 1) was designed so that the operator need only place the samples on the autosampler rack and choose the product to be measured via the OneClick™ shortcut on the touchscreen of the density meter. The density meter, in this case, acts as the master instrument of the whole system. The refractive index cell was placed vertically to avoid any pulp or solid particles from juice settling onto the prism and affecting the accuracy of the measurement.

In the first step of the analysis, the titrator measures pH directly in the beaker placed on the sample rack while stirring with a compact stirrer. Then the density meter, refractive index cell, and sample loop (5 mL) are filled with the sample.

While the density and refractive index determination are being performed, the position of the valve switches automatically, and the sample contained within the sample loop is pumped with deionized water into the titration beaker for titration. As soon as the titration has finished, the acidity content data are sent to the density meter, where the sugar:acidity ratio is calculated, and all sample measurements are stored and displayed. A schematic of the system is shown in Figure 2

Low complexity, high efficiency

Depending on the sample, the titration endpoint is either pH 7.0 or 8.1, and depending on the type of acid to be determined, different factors are used in the acidity calculation. With the automated system, the user does not need to enter these settings or even the correct titration method. The complete analysis can be started directly from the touchscreen by selecting the OneClick shortcut for the product.

For the operator, the whole workflow for measuring routine parameters is reduced to a few steps: placing the beakers with the sample (e.g., juices) on the rack, selecting the correct shortcut for the product group (e.g., for juice, it would be the shortcut 'citric' as citric acid is of interest) and entering the number of samples and the associated sample ID. After a measurement series, the system can be flushed and filled with DI water with a single click. A test to ensure absolute cleanness of the density and refractometer cells can also be integrated.

Not only has the automated system made testing less complicated for Ramseier, but it has also reduced the total time required per sample. Mr. Kunz adds, "With the fully automatic combined analysis, we have saved at least 10 minutes per sample, and results are highly repeatable." So while the multiparameter system with InMotion is doing the routine job, the lab technicians have more time to focus on other tasks.

A customized modular system

The instruments are fully modular, and this automated system was specifically built according to the requirements of Ramseier Suisse AG. The system's measured parameters and instruments required can be customized according to individual needs (e.g., to measure Brix and pH only, to add a UV/vis spectrophotometer for color measurements, etc.).

Furthermore, the system is run with the LabX™ PC software for easy and secure data handling and automatic data exchange with a LIMS/ERP system. The system can be adapted to meet any specific need.



Figure 1: Mr. Kunz, the Quality Assurance Manager at RAMSEIER Suisse AG, and the measurement system comprising an InMotion™ Flex Autosampler, DM40 density meter, RX50 refractive index cell, and T90 titrator.

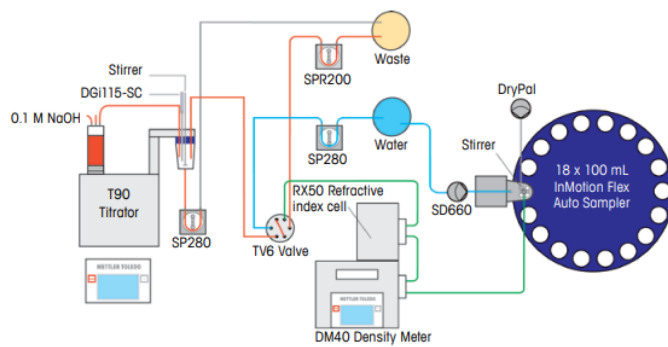


Figure 2: Schematic diagram of the automated measuring system.

For more information and to see a video of the system, go to <http://www.mt.com/inmotion-beverage>

About METTLER TOLEDO

METTLER TOLEDO is a leading global supplier of precision instruments and services. The Company is the world's largest manufacturer and marketer of weighing instruments for use in laboratory, industrial, and food retailing applications. METTLER TOLEDO also holds top-three market positions in several related analytical instruments and is a leading provider of automated chemistry systems used in drug and chemical compound discovery and development. In addition, the Company is the world's largest manufacturer and marketer of metal detection and other end-of-line inspection systems used in production and packaging and holds a leading position in certain process analytics applications. Additional information about METTLER TOLEDO can be found at www.mt.com.

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