Flavors & Ingredients
Weighing and Analysis in the Laboratory

News 1

METTLER TOLEDO adds value to flavor and ingredient companies

The flavor and ingredient industry is experiencing rapid change. Increased competition, demanding customers and changing regulations force companies to be continuously innovative, reduce production costs and seek food standard certification, such as BRC or IFS. In order to master these challenges, it is essential to collaborate with a competent partner for lab equipment. METTLER TOLEDO's knowledge of the flavor and ingredient industry will help companies in this industry to identify process improvement potential.

Times are changing

Tremendous changes have shaken flavor and ingredient producers in recent years. First, mergers and acquisitions have led to a consolidated industry, leaving fewer, more globalized, companies offering a comprehensive range of flavors and ingredients. As a consequence, competition is more intense and truly international. Secondly, large food companies and retailers have improved their purchasing behavior to take advantage of this intensified competition, thus putting pressure on price and margins. Finally, consumer protection and producer liability force all food manufacturers to inspect quality management procedures throughout their supply chain. As a result, flavor and ingredient manufacturers' production and quality control departments are frequently subject to customer audits, which reduce productivity and require significant time investments.

In response, flavor and ingredient companies must step-up their innovation rate to take advantage of consumer taste and behavioral changes, reduce manufacturing and quality control costs and streamline quality management efforts by achieving the necessary food industry quality standards certification, such as BRC or IFS.

Competent partners add value to the business

To achieve all this it is essential to collaborate with a competent partner for laboratory equipment, such as METTLER TOLEDO, who understands industry requirements and provides solutions which optimize each laboratory step in order to meet the challenging goals faced by flavor and ingredient companies. A faster precision balance, for instance, speeds up formulation in product development, a fully automated titrator allows better and faster QC sample analysis and a density/refractometry system with automatic sampling eliminates contact with malodorous or poisonous substances. Tailored service products deliver the appropriate level of quality management to comply easily with the respective quality standards.

In one of our segment initiatives, METTLER TOLEDO investigated the specific requirements of the flavor and ingredients industry with the aim of developing the most appropriate solutions for this industry and educating our sales and service force accordingly. *«Competent partners add value to our business»* is a feedback we often receive from satisfied customers.

Successful and forward looking flavor and ingredient companies therefore contact METTLER TOLEDO. Our representatives will help to identify money saving opportunities and thereby help driving the value of your business. ■

METTLER TOLEDO

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Imprint

Publisher
Mettler Toledo GmbH
Laboratory & Weighing Technologies
Im Langacher
CH-8606 Greifensee
Switzerland

Production
Laboratory Marketing Support
Switzerland

Technical Articles
Mettler Toledo GmbH
– Laboratory & Weighing Technologies
– Analytical Instruments

The sweet smell of success

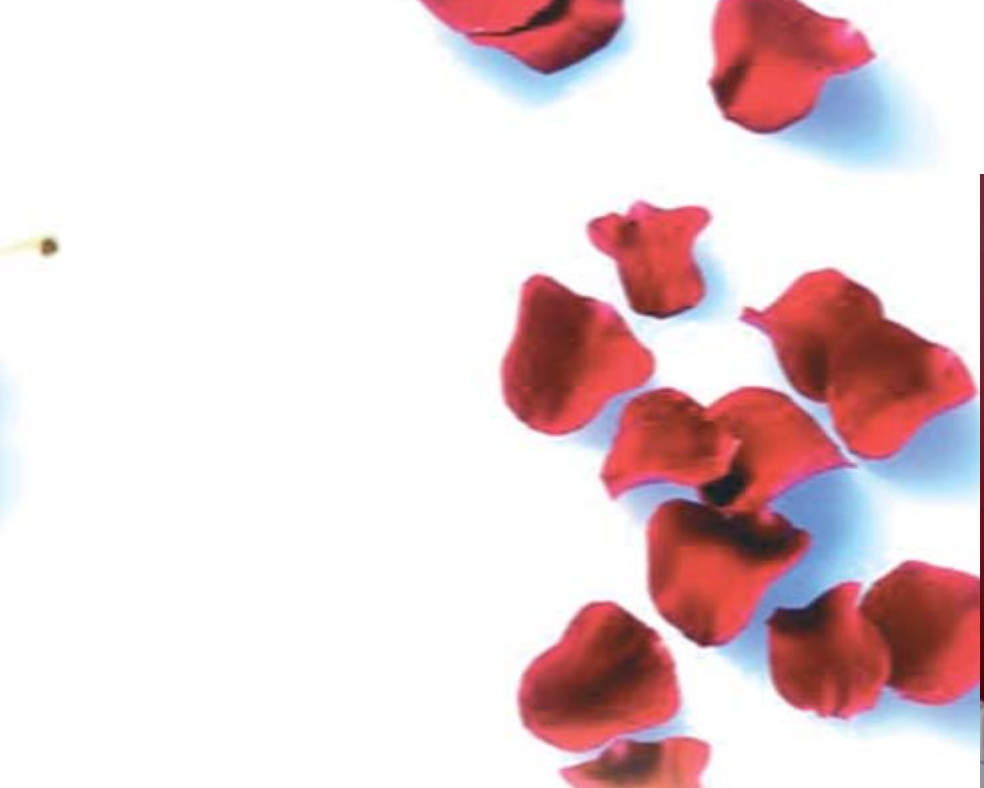
Givaudan, the international creator of fragrances and food flavors, has three sites in France: Paris, Argenteuil and Lyon. We met up with Mr. Serge Lemaître, Quality Control Manager at Argenteuil, who uses a titrator to determine the saponification index of raw materials.

The perfumer's palette

The key activities of Givaudan, founded in 1780 under the name Roure, are the creation and development of perfumes and fine fragrances, the manufacture and sale of new molecules and synthetic products and the creation and development of food flavors. Usually referred to as the *famous palette*, the raw materials available to the perfume/fragrance industry are continually evolving. Around 1,000 raw materials are commonly used but 2,000 are produced in total and used for older fragrances on the market. Although functional fragrances; i.e. those used in deodorants, shampoos, detergents, etc are also produced at the site, Argenteuil is dedicated to the production of top of the range, fine fragrances - whereby natural materials are never replaced by synthetic materials due to the very specific olfactory characteristics of natural products. Concentrates are manufactured in the mixing room according to formulas established by perfumers and selected by clients. The site uses many natural materials from various suppliers. The first step is to analyze the quality of these raw materials. As Serge Lemaître explains, «We check quality and consistency. To do this we use three different types of control: analytical, chromatographic and olfactory. Although controlling the olfactory aspects is very important in terms of our clients brief, the analytical aspects are also vital. We have to check our raw materials in order to ensure we obtain concentrates with consistent color, appearance and viscosity as well as fragrance.»

Monitoring possible discrepancies

Givaudan monitors its production closely. The Quality Control Laboratory is directly linked with perfume creation as it ensures that large-scale manufacture corresponds to the sample originally selected by the client. The initial control is carried out through comparisons with this reference sample. Controls are then carried out



on samples taken four times per day in order to check for the slightest discrepancy. «We need to know if any discrepancies are due to a production anomaly or inherent in the raw materials, which can vary (as a function of the crop, the source, the year, etc). Every ingredient is weighed out by an operator who then records the data in a computer program, which allows us to check every batch of raw material that has been used in each production.» Since the system's bottleneck occurs in the olfactory control (around six hours are needed for a concentrate to evaporate in order to check the base notes) the Quality Control Laboratory must receive these samples as quickly as possible. The product is dispatched from the company within 24 hours, once released by Quality Control, in order to comply with a delivery period of five days.

The DL53 determines the saponification index

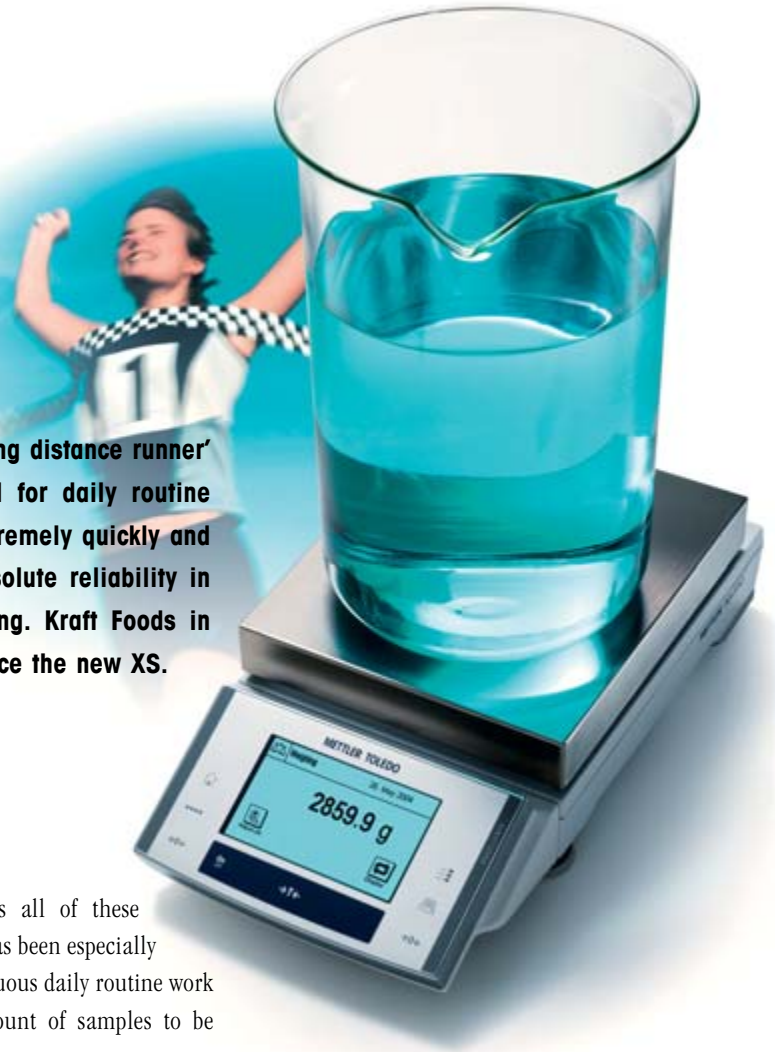
Serge Lemaître comments that: «For me, it was imperative that we changed our titrator because our old one did not have a traceability function, which is required by the ISO 9000 Standard. We also wanted a system with an automatic sample changer then samples can be analyzed independently by the automatic titrator and technicians are free to concentrate on other work.» The saponification index (the number of mg of potassium hydroxide consumed per gram of sample analyzed) is a measurement of the free and esterified acid content of fats, oils and fatty acids. Only certain raw materials are analyzed in this way: synthetic products, liquids, pastes, resinous materials, absolutes and natural products.

Problem solving

The sample, dissolved in a suitable solvent, is heated to reflux temperature for a given time in the presence of potassium hydroxide. However, a potential problem in automating the titrator and automatic sample changer was the standard 29/32, round bottomed, necked flask type of recipients used for heating the samples to reflux temperature . This meant that the sample had to be decanted into a titration beaker, resulting in inaccuracies, loss of time and greater material and solvent consumption. The solution proposed by METTLER TOLEDO was to replace the flasks used for manual analysis by COD tubes. The sample can now be directly weighed into the tube before the introduction of the solvent and potassium hydroxide, heated and then cooled. The tube is then placed in the automatic sample changer. The DL53 then only has to assay the fraction of potassium hydroxide not consumed and calculate the saponification index. Serge Lemaître concludes that, «The DL53, coupled with the Rondo 60 automatic sample changer, have given us more flexibility and increased process speed. We can now release batches much more quickly.» ■

▶ **www.mt.com/titration**

Weighing Marathon at «Kraft Foods»



The new Excellence XS precision balance is the 'long distance runner' in the world of balances. The XS is most useful for daily routine weighing: hundreds of samples can be handled extremely quickly and with precise results. It has been designed for absolute reliability in challenging environments and allows easy cleaning. Kraft Foods in the USA was one of the first laboratories to introduce the new XS.

«Workhorse» for the test kitchen

Scott Ostergaard works in the testing kitchen of Kraft Foods, USA. He weighs-in around 200 substances every day to discover new tastes for barbecue sauces, i.e. spices, acids, syrups, additives and colors, requiring a balance, that is a real 'workhorse'; performing quickly, accurately and reliably, year-in, year-out. Ease of use and fast cleaning are equally important.

The XS offers all of these advantages and has been especially designed for strenuous daily routine work with a large amount of samples to be weighed-in.

XS, the long distance runner

The XS has a touch screen display, which makes it extremely easy to use. It also allows alphanumeric sample identification. Results are available 20% faster thanks to new high-speed weighing technology. Due to its robust construction the XS is completely protected from dust and water and guarantees trouble-free operation in even the most challenging of environments. Last, but not least, the XS is designed for fast and easy cleaning.

A future-proof investment

The XS is a future-proof investment. The flavor and ingredient industry is a competitive environment with constantly developing regulations. Not only must international food standards, such as BRC Global Standard Food, be satisfied but also the ever-stricter industry internal quality management within the food chain.

Consistent documentation and the possibility of connecting the balance to a PC are becoming a necessity rather than a luxury. The XS offers Blue tooth and Ethernet and can therefore be easily integrated into networks. The six interfaces make this possible.

Considering all these benefits, it wasn't hard for Scott to make the new Excellence XS his balance of choice. ■

The Excellence XS family of precision balances comprises 18 different models with a readability between 1 mg and 0.1 g and a weighing capacity from 120 g up to 10 kg.

▶ **www.mt.com/xs-precision**

Halogen technology saves time – fast moisture content analysis

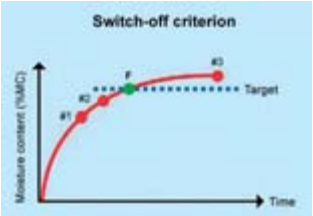
Thermo-gravimetric moisture content analysis is a method frequently used for the quality control of food ingredients. Usually, this method needs to be carried out quickly and reliably to enable corrective intervention in production processes. A fast and cost-effective alternative to the traditional drying oven process is now available. The new HR83 halogen moisture analyzer from METTLER TOLEDO supports these needs perfectly in developing a new drying method and allows the easy transfer of your existing drying oven method for fast and reliable results.

Moisture Analyzers for fast results

The moisture content of an ingredient is one of the important factors determined during raw material analysis, in production control and, final quality control. Moisture analyzers have generally replaced traditional drying oven methods as analysis is much faster and therefore results are available far quicker. Moisture balances also use the LOD (loss on drying) principle. The HR83's halogen heat source has replaced the older infrared technology for drying. With this, analysis time can be shortened as the halogen radiator reaches full heating power extremely quickly. The low heat capacity of the halogen radiator significantly improves the heating/cooling response time, resulting in outstandingly reproducible determination of moisture content for food ingredient testing and other application areas.

Automatic matching to the reference method

Reliable results also depend on developing and utilizing the right method. Thanks to the AutoMet function, the HR83 saves you time and spares your nerves during method development. It has never been easier to match reference values so perfectly, simply select the AutoMet function of the HR83 and enter the reference value and it swiftly proposes the optimal switch-off criteria. These ideal parameters can then be saved as a method. Developing methods with AutoMet is especially useful when an existing reference value, from the drying oven method or a previous instrument, must be matched to the last decimal place. AutoMet differs from other instruments by automatically determining ideal parameters as the target value is reached.



Thanks to AutoMet, the HR83 determines the ideal switch-off criterion (F) completely automatically.

Performance is faster and more accurate with optimized methods. AutoMet can efficiently develop and save up to 40 methods and reactivate them at the push of a button. Using AutoMet saves a great deal of time, especially in the food ingredients industry, where many different products are analyzed for their moisture content.

Seamless transfer from old instruments

The AutoMet function of the HR83 is also practical when it comes to the replacement of old infrared moisture balances. For example, the temperature setting is specified in an existing Standard Operating Procedure. AutoMet automatically determines the optimal switch-off criterion for that temperature. The transfer of the existing method takes place simply, quickly, and therefore inexpensively.

With the HR83 your samples are analyzed quickly and precisely

With the HR83 halogen moisture analyzer, the moisture content of samples can be determined rapidly, precisely and repeatably, matching your reference method. ■

▶ **www.mt.com/moisture**

Moisture in snack food flavor mixes: DL58 improves performance

Flavor production for snack foods is a growth industry but manufacturers need to be innovative, productive and in compliance with certification standards such as 'BRC Global Standard Food'. METTLER TOLEDO has helped a large flavor mix manufacturer to improve their quality control laboratories with an easy to use, highly automated Karl Fischer titrator for moisture determination of flavor mixes. This has helped to increase the labs' productivity, improve accuracy and repeatability of tests and develop compliance with quality management requirements.

Changes in the snack food flavor industry

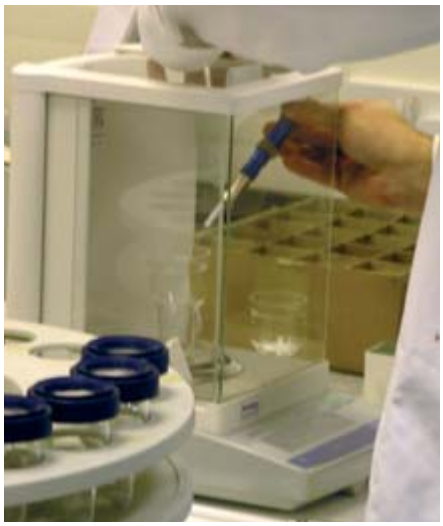
The market for savory snack foods has experienced significant growth in recent years. Changes in lifestyle patterns are partly responsible for this along with a continuous series of innovations by the snack food and ingredients industry such as new flavors, new preparations and new packaging. Innovation cycles are reduced, a larger number of flavor varieties need to be produced and production has to be ramped up. Quality standards demand more and necessitate improvements to the quality control laboratory.

Optimized moisture determination with METTLER TOLEDO DL58

A large UK based ingredient manufacturer has recently teamed up with METTLER TOLEDO to prepare their laboratory for these new requirements. The challenge was to find optimized tests for determining moisture content of savory ingredient mixes in order to reduce operator labor time and to increase accuracy and precision of these determinations. Additionally, BRC certification needed to be supported through comprehensive result documentation .

The DL58 automatic titrator, in combination with RONDO 60 sample changer and LabX software, proved to be the right response to these requirements. Karl Fischer titration was chosen for the moisture determinations mainly due to its selectivity for water, its short analysis time and its automation capability. The operator simply has to weigh-in a suitably large amount of flavor on a METTLER TOLEDO balance, cover up the beaker and place it on the roundtable sample changer. The instrument carries out all other steps, such as blank determination, dissolution and the actual analysis of moisture content. One operator commented that, «It is extremely easy to use, you can't make any mistakes and it is a heck of a lot faster than the oven methods we used in the past!» The quality manager particularly appreciates that results are automatically transferred to LabX software. In his experience, auditors look for systems that facilitate quality management and help people to make pro-active decisions. An added benefit lies in the fact that automation allows more samples to be analyzed by the same number of operators.

Investment into the lab does not stop here. Encouraged by the experience with moisture, the company is now looking at replacing old instruments for salt determination. Again, the DL5x titrator is likely to be the best solution, particularly as technicians are already familiar with the operation of the instrument and LabX titration software allows the integration of all results into one central database thus keeping documentation tasks simple.



Sample weights are transferred from the balance to the titrators system at the touch of a button

Ingredients companies who want to improve their QC labs performance should partner up with METTLER TOLEDO for a long term, mutually beneficial collaboration. ■

▶ **www.mt.com/titration**

Combined density and refractive index measurement in the flavor and fragrance lab

All flavor and fragrance companies need to analyze their raw materials and compositions for purity and identity. An ideal technique is combined density and refractive index measurement, which allows one to 'fingerprint' a substance within a very short time. Automatic density and refractive index measurement increases productivity, reduces the need for handling malodorous samples and can serve as an important safety check in HACCP compliant production.

The importance of purity and identity

Flavor and fragrance companies produce a large number of products for various different applications, such as: ice cream, beverages, snack foods, confectionary or household products. A typical product is composed of a mixture of 20 to 30 aromatic substances dissolved in ethylene-or propylene glycol. As each product line must continuously taste or smell identical, both raw materials and finished mixtures must be carefully tested for identity and purity in order to produce consistent mixtures.

The measurement of density and refractive index is an ideal solution for this purpose. Each substance has a very specific density or refractive index and any deviation from this indicates impurity or mistaken identity. Within complete mixtures, the density and refractive index serves as a «fingerprint» and deviation from the nominal value indicates an erroneous composition.

Combined measurement for faster and better results

The METTLER TOLEDO DR40 and DR45 Combined Meters allow the measurement of both parameters simultaneously. Each sample passes through a flow-through cell for refractive index measurement and then through an oscillating u-tube for density measurement. Both results are available in unison and recorded via a print-out and/or exported to PC software. This minimizes manual interaction and eliminates errors by confusion. Lab productivity is enhanced, results are available quicker and the reliability of testing is improved.

An added benefit lies in the sophisticated automation capabilities of the instrument. With the SC1 sample delivery unit and, in particular, with the SC30 round table sample changer, measurements can be totally automated and without the need for manual sample handling. Samples are placed in sealed vials, a barcode serves as identification and all sample handling and cleaning is performed automatically by the analytical instrument system. The laboratory remains almost odorless and analysts' families will breathe a sigh of relief.

With the advent of quality standards such as GMP or «BRC global standard food», food manufacturers are concerned with the HACCP (Hazard Analysis and Critical Control Points) protocol. This requires companies to identify critical control points in their production process, which could prevent health risks for consumers. Although completely harmless in dilution, concentrated flavor substances can be relatively toxic. Checking density and refractive index of finished flavor mixtures therefore bears relevance to the HACCP protocol. If these values are correct, no substance is added in excessive concentration and consumers' health is protected.

Flavor and Fragrance companies should contact METTLER TOLEDO to learn more about the exciting benefits of DR40 and DR45 combined density and refractometers. ■

▶ **www.mt.com/de-re**

The DR45-SC30 system for automatic, simultaneous determination of density and refractive index

We share our knowledge

Learn from what we have learned. Our knowledge and experience are at your disposal - in print, on the web, and also increasingly available on CD-ROM. Each document can be used as a reference book, glossary, or guide to inform you of the manner by which METTLER TOLEDO applications laboratories are developing and constantly refining methods for a wide ranging variety of purposes.

Methods for flavors & ingredients industry

- Titration methods:
  - Determination of vitamin C by amperometric titration

www.mt.com/titration

- Thermal analysis methods:
  - Different scanning calorimetry (DSC) to determine gelatinization of starch

www.mt.com/ta

- Density/refractometry methods:
  - Determination of density and refractive index in essential oils and aromatic substances

www.mt.com/density

- Moisture analyzer methods:
  - Moisture determination of stock
  - Moisture determination method for potato flakes
  - Determination of the moisture content of cornstarch

www.mt.com/moisture

Product literature

1 Excellence XS precision balance
2 Moisture analyzers
3 Density & refractometry measurement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Technical documents

4 Weighing the right way
5 Basics of titration
6 Methods of moisture content determination


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