Analysing Imported Wine and Sparkling Wine: a Semi-Automated Laboratory Measuring System in use for Customs Checks in China

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Flawless quality control has high priority at the Inspection and Quarantine Comprehensive Technology Center of Zhangjiagang Entry-Exit Inspection and Quarantine Bureau, People's Republic of China

Measuring Instruments: Alcolyzer Wine M, DMA 4500 ME, Xsample 122, CarboQC, SFD

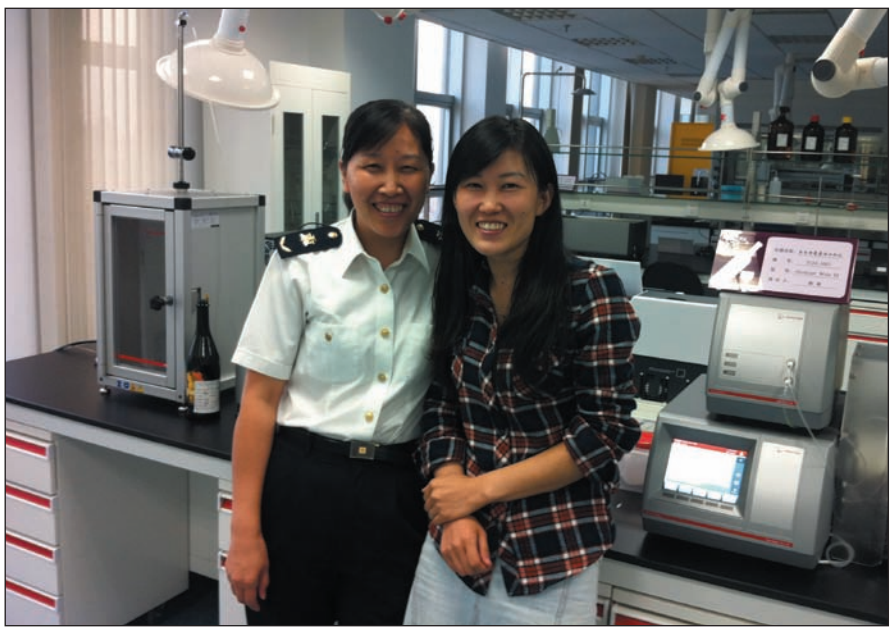

Figure 1. Colleagues at the Jiangsu Entry-Exit Inspection and Quarantine Bureau. Zhangjiagang CIQ

Zhangjiagang Entry-Exit Inspection and Quarantine Bureau Technical Centre

The Inspection and Quarantine Comprehensive Technology Center of Zhangjiagang Entry-Exit Inspection and Quarantine Bureau (Zhangjiagang CIQ for short) belongs to the General Administration of Quality Supervision, Inspection and Quarantine of P.R.C. and the Jiangsu Entry-Exit Inspection and Quarantine Bureau. Zhangjiagang CIQ *(see Figure 1)* has three offices, occupying more than 12,000 m^2, and employs more than 300 co-workers. It is responsible for testing food and wine, as well as mining products and chemicals that are imported from overseas as well as through Zhangjiagang port.

Wine testing requires speed as well as accuracy

Every single port in China is importing more and more wine to cope with the increasing demand from Chinese consumers.

Zhangjiagang CIQ is in charge of testing the wine passing through Zhangjiagang port, which is one of the largest ports in north-east China. In 2012, around one million litres of wine were imported through Zhangjiagang port. Due to this considerable turnover, a quick and reliable way to test wine is needed by Zhangjiagang CIQ. The customers include most of the wine importers across China, such as Xiamen Utrans Supply Chain Management Co, Ltd, but also government departments that do not have their own equipment to analyse wine.

Wine is an alcoholic beverage resulting from the fermentation of grape juice by yeasts. The main components of wine are water and ethanol. The characteristic flavours of wine originate from wine components such as sugars (mainly glucose and fructose), acids, other alcohols, and phenols. On top of these ingredients, wine contains around 500 additional non-volatile and volatile components in trace amounts such as aroma and colour compounds. This makes wine a very challenging and comprehensive matrix for analyses.

The wine has to be analysed for its alcohol content and, in the case of sparkling wine, its carbon dioxide content. Previously, the officially recognised method for testing CO_2 in sparkling wine was inconvenient and cumbersome. Therefore, the need for a reliable, simple and fast analysis method without CO_2 losses arose.

The solution to this problem is a CarboQC beverage carbonation meter by Anton Paar in combination with the Sparkling Wine Filling Device (SFD). With this combination the determination of dissolved carbon dioxide and the amount of other gases in the sample is performed quickly and reliably without any loss of CO_2.

Establishing the alcohol content

The knowledge of the alcohol content is important to ensure that the wine conforms to the declaration of alcohol given on the label, and to establish the basis for tax classification. Distillation is the traditional determination method for alcohol. Distillation is time-consuming and the management at Zhangjiagang CIQ were interested in replacing it with an instrumental method. Alcolyzer Wine M from Anton Paar turned out to be the ideal solution. Alcolyzer Wine M is based on a patented NIR method and used to determine the alcohol content in wine. If Alcolyzer Wine M is used in combination with a DMA ME density module, the specific gravity and total extract in wine can also be determined simultaneously. This instrument combination was found to be the best choice to test wine in Zhangjiagang CIQ.

Figure 2. Instrument combination for wine analysis. DMA 4500 ME, Alcolyzer Wine M and Xsample 122

The reasons for choosing a Wine Measuring System

Dr Gu, employed at Zhangjiagang CIQ and very experienced in comprehensive quality analysis, tested numerous instruments before deciding on Anton Paar laboratory equipment. He chose the Anton Paar instruments for numerous reasons: Alcolyzer Wine M met with his approval mainly due to its high accuracy and short measuring times, combined with very low maintenance costs and a user-friendly operation interface. "We have been using Anton Paar products for many years and we trust their high-quality performance," said Dr Gu. "Many years ago we bought two DMA 4500 density meters from Anton Paar and we still use them. Their performance has always been very good."

After his recent experience with the measuring system Dr Gu appreciates its functionality. While distillation, the formerly used method for alcohol determination, was very time-consuming and had to be carried out by experienced operators, Anton Paar's wine measuring system does not have to be supervised. This leaves more time for the operators to perform other tasks. Given the frequency of analyses, the advantage of increased measurement speed clearly shows: Generally, wine is investigated once or twice a week, and always 10 bottles at a time, sparkling wine is analysed less often.

Reliable results in less time

The results obtained with Alcolyzer Wine M give more reliable results in considerably less time. This fact blends in perfectly with the need for more samples to be analysed in the same time, and the demand is still growing. Also, the customers can see the improved performance; more orders for analyses testify to the successful development as the instrument's specified accuracy of 0.01 % v/v alcohol positively affects the quality, safety and cost of wine.

According to Chinese national standards, a measured alcohol content 1 % v/v higher than the figure on the label already requires the manufacturer to modify the label to be allowed to sell the wine in China. This makes it indispensable to use high-accuracy equipment: Taking into account the error between the factory's test result and Zhangjiagang CIQ's result, a deviation higher than 0.5 % will already attract attention. Zhangjiagang CIQ will be held responsible for incorrect results and the ability to perform correct and reliable analyses will be questioned by the customers.

It is mandatory to determine the methanol content of the wine. This is done with gas chromatography, but before injecting the sample into the gas chromatograph it needs to be distilled. Dr Gu longs for a measuring system that is capable of determining more parameters, including the harmful methanol which is added to wine in order to increase sweetness and alcohol content. The simultaneous measurement of sugar, preferably by an automated system, is also on the wish list as the sample preparation for the currently used method for measuring sugar is very time-consuming. The samples have to be diluted and their pH value adjusted at the given temperature, and then titrated when boiling. In contrast, a density meter allows users to draw conclusions from the results: knowing the degrees Plato helps to correctly dilute the wine as the degrees Plato change with changing sugar content. Thus, the correct dilution factor can be deduced, blind dilutions are avoided and work efficiency is increased.

Inclusion in standards

Even if the NIR method for alcohol determination, the oscillating U-tube method for density measurement and the Multiple Volume Expansion method for determining the true amount of dissolved CO_2 in sparkling wines are all included in OIV standards, they are not yet officially recognised methods in China. Nevertheless, Dr Gu has collected a lot of comparison data between the officially recognised distillation method and NIR. "The results satisfy our requirements," reported Dr Gu. "Also, density meters have been widely used in China for quite a long time, so we are planning to apply for re-editing the national standard in 2013 based on the data that we collected." Dr Gu is confident that the NIR and oscillating U-tube methods are soon likely to be listed among the national standards in China. Also, the improvement that the Multiple Volume Expansion method would bring to testing laboratories will, according to Dr Gu, lead to its widespread recognition.

Infobox

Alcolyzer Wine system

- One adjustment is valid for all wine types
- Precise results
- Easy operation
- Simply adjust with water for the zero point and one binary ethanol/water mixture
- No sample preparation required for general wine
- Free user-definable display, data format, memory and output to printer or file
- Patented NIR method as also described in "Resolution OIV/OENO 390/2010 Appendix 1"
- USB keyboard, USB bar code reader and USB mouse support

CarboQC + SFD system

- No sample preparation required
- Sparkling wine samples are taken without any loss of CO_2
- Sample transfer directly from the bottle
- Adaptable from small bottles to magnum bottles
- Full operator protection
- CarboQC method is also included in "Risoluzione ENO_02-2006 Appendix D"

New Automated Colony Counter For Delivering Accurate Results

Synbiosis have introduced its aCOLyte 3 cost-effective colony counting system, which is ideal for microbiologists that need to significantly increase their throughput, as well as improve count accuracy.

The new aCOLyte 3 is a low-cost automated colony counter, designed for a rapid count of pour, spread and spiral plates. The system can read plates of up to 90mm in seconds, generating precise plate count results up to ten times faster than manual counts. The numerical count data and plate images can be directly transferred to Excel or Open office to avoid errors in data transfer, ensuring accurate GLP compliant result reporting and archiving every time.

The aCOLyte 3 provides full colour image display and comes complete with software based on Synbiosis' powerful ProtoCOL 3 software (independently validated as a highly accurate colony counting package). The system can be supplied with a computer or scientists can utilise their own laptop or desktop PC and simply connect the aCOLyte 3 via a USB port.

The aCOLyte 3 is lit by white LEDs mounted above and below the plate, enabling accurate detection of colonies as small as 0.3 mm. For laboratories where strong ambient light could interfere, there is also the option to have a detachable screen fitted to prevent any reflection or glare affecting the count.

Martin Smith of Synbiosis stated: "Microbiologists often have to count hundreds of colonies every day. This can be time consuming, tiring and error prone. What they need is simple to set up, yet inexpensive automation for detecting difficult to see colonies, so they can put the plates in a device and quickly obtain accurate counts."

Martin added: "Our design team has listened. After a year of development work, we are confident that our resulting aCOLyte 3 system is the best value technology available and will significantly increase microbial testing throughput in any food, environmental or clinical laboratory which chooses an aCOLyte 3 colony counter."

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