Perten Science World
Issue No 2

News from Perten Instruments

In all businesses, irrespective of where you are active, scientific findings will help in developing products and processes that will benefit producers and consumers. A novelty that may seem minor or trivial at the start can develop into something major when applied, while other developments have more straightforward benefits. For this reason we appreciate the work done both in the research community as well as in industry. In this publication we look at new interesting applications with existing instruments, but also at novel methods or product ideas that may take quality and process control to a new level.

I hope you find the second issue of Perten Science World as interesting, useful and stimulating as we do!

Bo Allvin, Business Development
Perten Instruments AB, Sweden

IN THIS ISSUE

Articles

Technical News

Rapid Visco Analyser in the management of dysphagia

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Dysphagia or swallowing impairment, dysfunction or difficulty is a symptom of many disorders and diseases, and can lead to complications such as malnutrition, dehydration, chest infection, aspiration, pneumonia, and mortality. It affects all age groups, and it can be managed with ready-to-use thickened fluids or by adding powdered commercial food thickeners to drinks to control their viscosity. (Sopade et al., 2007).

The health and safety issues associated with thickened fluids emphasise the need to measure their rheological properties properly to effectively manage dysphagia. The RVA involves in-situ mixing, is relatively simple to operate and uses inexpensive accessories (So, 2007), making it suitable for assessing the flow properties of fluids used in managing the condition.

Materials And Methods

Three commercial food thickeners marketed in Australia were used:

- *NovartisTM:* Resource Thicken-UpTM (Novartis Nutrition Inc. Police Road, Mulgrave, Vic. 3170), modified maize starch
- *QuikThikTM:* QuikThikTM (Steggall Nutrition Pty. Ltd., Enoggera, Qld 4051), xanthan gum
- *SupercolTM:* (Chipmonk Pty Ltd., Nambour, Qld 4560), guar gum

For each thickener, dispersions at four solids contents (%, w/w) were prepared in water and allowed to fully hydrate and equilibrate overnight. Each dispersion (25 g) was put in a canister and analysed in an RVA-4 at 30oC for 10 min. at four rotational speeds (200, 160, 100, and 50 rpm). These speeds correspond respectively to shear rates (s-1) of 16.8, 33.5, 53.6, and 67.0 (Lai et al. (2000)).

SupercolTM was studied at an additional solids content at speeds 200 and 100 rpm. Replicate dispersions were prepared, and all analyses were done in a randomised full factorial experimental design (3 x 4 x 4 x 2 + 2 x 2 = 100). Analysis of variance (ANOVA) and significant tests were performed using Minitab ver. 15.

Results And Discussion

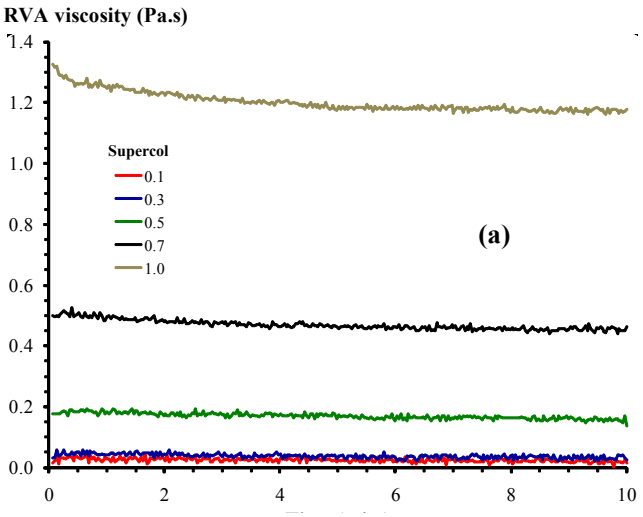
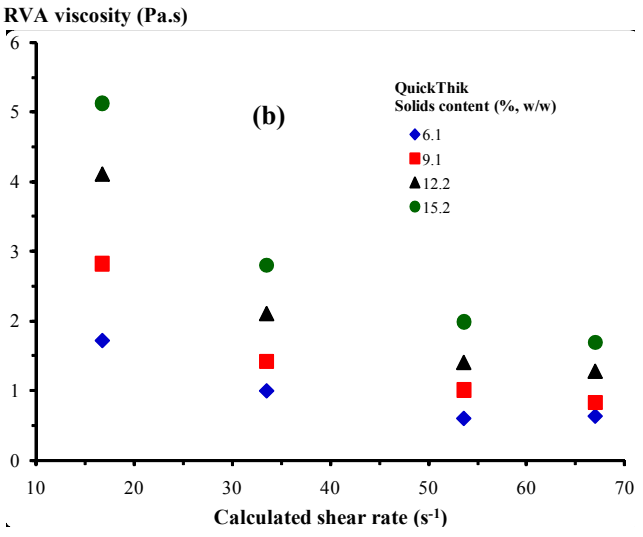


Figure 1a shows typical RVA viscograms of the SupercolTM at five solids contents, rotational speed 100 rpm (calculated shear rate 33.5s-1). RVA viscosity increased as the solids content was increased for all thickeners.



Figures 1b–1d show the sensitivity of the RVA to the concentrations of NovartisTM, QuikThikTM and SupercolTM, in water.

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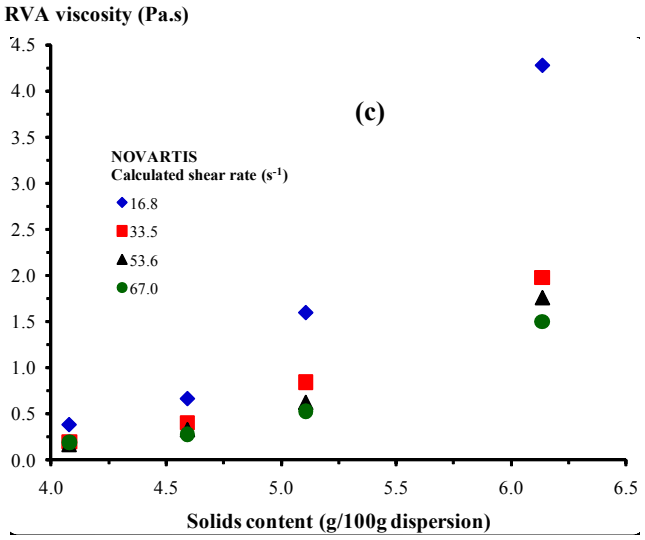


Figures 1b and 1c show that the thickened fluids reduced in viscosity (shear thinning) as the shear rate was increased.

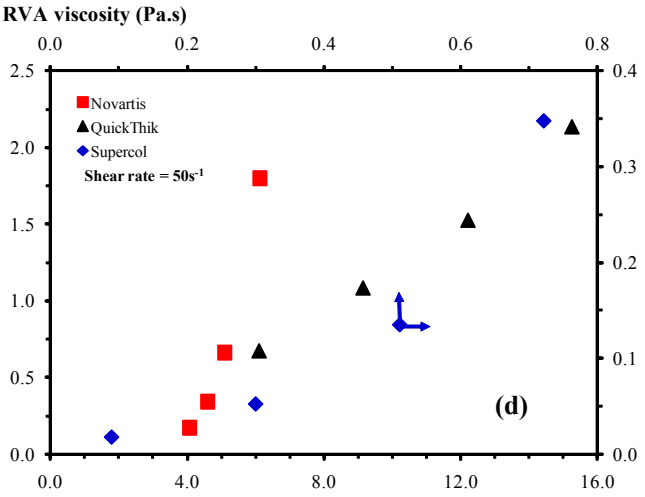


Figure 1d shows the relationship between solids content of NovartisTM, QuikThikTM and SupercolTM, and the interpolated viscosity at a shear rate of 50s-1, which is usually assumed to be the swallowing shear rate.

Conclusion

The RVA can be used to assess the viscosity of thickened fluids used in dysphagia management, at relevant solids contents and shear rates. (Estimated swallowing shear rate, 50s-1, is equivalent to an RVA stirring speed of 150 rpm.)

The RVA can be used to assess the three common categories of thickened fluids: Level 150 – mildly thick (nectar, ¼-thick); Level 400 – moderately thick (honey, ½-thick); Level 900 – extremely thick (spoon-thick, pudding-thick, full-thick), widely used to manage dysphagia.

The RVA can be used with other dispersing media such as juices, milk, tea, and coffee which are commonly used to prepare thickened fluids for dysphagic individuals.

The RVA viscosity of the thickened fluids studied exhibited the same relationships with the rate of shear and solids content as those obtained with rheometry, however, the RVA offers advantages such as in-situ mixing, relatively simple operation and inexpensive accessories.

Acknowledgements

The authors are grateful to the manufacturers of the ready-to-use thickened fluids and food thickeners and Dr Julie Cichero of the School of Medicine, The University of Queensland, St Lucia Qld 4072, Australia.

References

Lai, K. P., Steffe, J. F. and Ng, P. K. W. (2000). Average shear rates in the rapid visco analyser (RVA) mixing system. Cereal Chemistry 77: 714–716.

So, N. (2007). Effects of premix conditions on (RVA) rheology of food thickeners used in managing dysphagia. Unpublished Honours thesis. School of Land, Crop and Food Sciences, The University of Queensland, St Lucia, Australia.

High-speed durum semolina quality tests on doughLAB

doughLAB enables manufacturers to select the correct processing conditions for producing the best pasta. Testing at higher energy input produces more rapid, accurate and relevant results.

Physical dough tests are important because they determine the behavior of dough during mechanical handling, which affects the quality of the finished pasta. Physical dough tests provide an indication of the resilience of the gluten matrix that develops and is important in giving cooked pasta its firmness and cohesive texture. The test also indicates the amount of water required for the dough to reach a defined consistency. Semolina makes strong doughs that resist the stress of mixing, producing flat curves with indistinct peaks that are difficult to analyze and don't adequately differentiate between semolina flours of different quality.

The doughLAB is a laboratory scale (300 g bowl and 50 g bowl) z-arm dough mixer to determine flour processing quality. It can perform conventional tests (63 rpm, 30°C) and high-energy mixing tests to emulate commercial dough mixers.

doughLAB

Materials and Methods

Twenty semolina samples (Tamworth, Australia) were mixed on doughLAB using the 50 g bowl, standard speed (63 rpm) and accelerated speeds (120 and 180 rpm). Repeatability was evaluated by one-way ANOVA.

Results

1. Dough Development

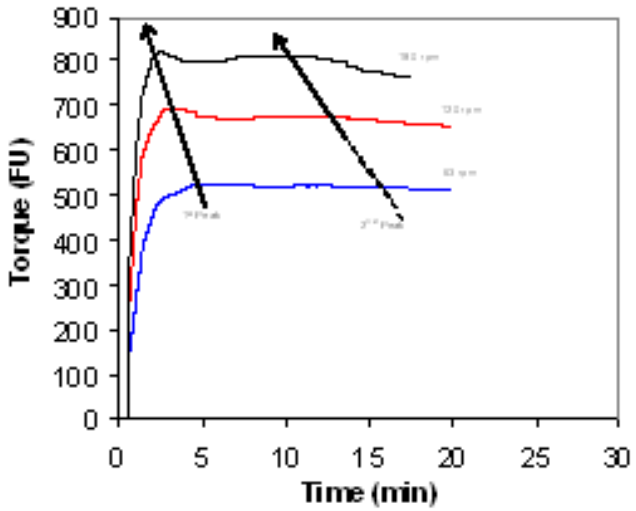


Figure 1. Dough mixing curve of semolina at 63, 120, and 180 rpm.

Increasing mixing speed resulted in better peak resolution and earlier dough development time on the doughLAB. (Figure 1) At higher speeds, a second peak was evident in several samples which suggests that testing semolina, or any difficult-to-develop samples, at standard speed would bias results to detect only the first peak. The second peak was taken to be the true mixing peak. Dough development time and stability values were more repeatable at 120 rpm (smaller root mean squares (RMS) and lower coefficients of variation (CV)) than at 63 rpm. Dough development time at 120 rpm is approximately half that at 63 rpm.

2. Water Absorption

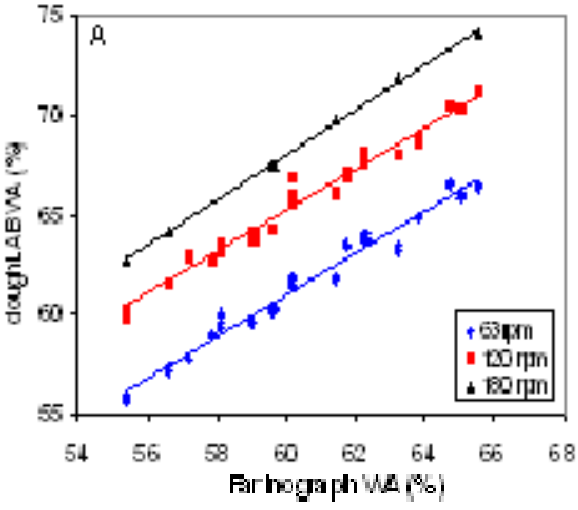


Figure 2. Water absorption of semolina at 63, 120, and 180 rpm.

Relative water absorption values appear to be independent of the rate energy is applied when mixing dough. This would allow the conventional water absorption values to be estimated using high-speed tests without any loss of discrimination between samples. Parallel lines of water absorption calculation show that water absorption for the conventional test can be estimated from high-speed tests simply by applying a suitable offset to the test value. (Figure 2)

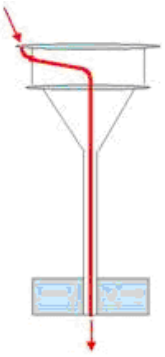
Conclusion

Testing at higher speeds could be used to reduce test time, increase laboratory efficiency and produce more accurate results to give the miller and pasta producer a better indication of dough stability.

Acknowledgements

Mark Bason, Jennifer Dang and Alison Curtis, Perten Instruments of Australia, Sydney, Australia; and for the semolina samples, Mike Sissons, Department of Primary Industries, Tamworth Agricultural Institute, Tamworth, Australia.

New Paddle enhances use of RVA as 'miniature pilot plant'



The RVA is emerging as a convenient bench-scale tool for formulation development, simulating and optimizing food processes involving heating and mixing, and evaluating the functional properties of processed food ingredients in the matrix in which processing will occur. In such 'miniature pilot plant' applications, the RVA is used as a miniature batch cooker to produce ultra small-scale food formulations in a very low cost, efficient and rapid new product development process.

The new RVA Syringe Paddle kit is a specially modified paddle and syringe which allows low viscosity fluids to be injected into the RVA sample can during a test. This streamlined addition of fluids enhances the RVA's 'miniature pilot plant' functionality.

Applications include simulated manufacture of dairy products such as stirred yogurt, recombined sweetened condensed milk, fresh soft cheeses that have been stirred to a smooth consistency, cooked custard and processed cheese.

New RVA 4500 launch at the AACC International Annual Meeting

The new RVA 4500 was launched at the AACC International Annual Meeting, Savannah, GA, in October.

For the first time in a single instrument, the new RVA 4500 combines exceptional sensitivity and accuracy when analysing low viscosity samples plus wide dynamic range when analysing high viscosity samples.

The RVA 4500 is a cooking stirring viscometer with ramped temperature and variable shear that can be used to determine the quality and processing characteristics of starch in grains, tubers, flours and extruded and cooked foods and feeds. There are also applications for protein foods, ingredients such as modified starches and hydrocolloids, and malting and brewing.

The RVA 4500 combines speed, precision, flexibility and automation plus USB connectivity to make it versatile, yet easy to use. This makes the RVA 4500 a unique tool for product development, quality control, quality assurance and process control.

New features for Rapid Visco Analyser models

Popular viscometers, RVA-StarchMaster2 and RVA-TecMaster, have been updated with Perten Instruments styling and new features including USB connectivity for real time data output to a PC, LIMS system, USB drive or label printer and external keyboard or barcode scanner for streamlined entry of sample information.

Both models feature simple, automated, stand-alone testing and data analysis with real time graph of viscosity plotted against time.

RVA-TecMaster

RVA-TStarchMaster2

The instruments are delivered with four standard viscosity test methods on board: quality control certificate on CD, in-built calibration check and reset procedures, backup utility software for instrument settings and password protection.

Options include method editing software and Chinese language software.

ArabLAB: United Arab Emirates, Dubai March 7-10
IDMA: Turkey, Istanbul April 21-24
Victam International 2011: Germany, Cologne May 3-5
NIR 2011: South Africa, Cape Town May 13-20
Livestock: Indonesia, Jakarta June 15-17
Space: France, Rennes September 13-16
Agro sud: France, Agen September 27-29
Anuga 2011: Germany, Cologne October 8-12
JTIC Milling Conference: France, Reims October 14-15
Vietstock 2011: Vietnam, Ho Chi Minh City November 9-11