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Process Cheese Manufacture and Meltability

Summary of a paper by L. E. Metzger, R. Kapoor, L. A. Rosenberg and P. Upreti presented at Cheese Science 2002

Experimental variables, such as type and level of emulsifying salt, manufacturing parameters and natural cheese characteristics, influence the quality of process cheese (Zehren and Nusbaum 2000). Recently the RVA has been used to analyse numerous dairy products, including process cheese, on a small scale (Bennett et al. 2000; Haydon et al. 2000; Metzger and Leman 2001).

Method

Process cheese (30% fat, 40% moisture), process cheese food (25% fat, 44% moisture) and process cheese spread (20% fat, 48% moisture) were manufactured in the RVA in 30 g batches as shown in the graphs (this page).

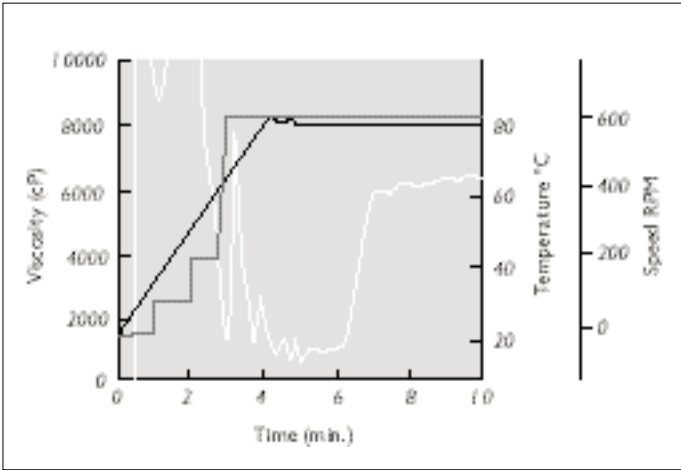
After being cooled to 7°C the cheese was removed from the RVA canister, ground, and the melting characteristics determined in the RVA as shown in the graphs (p. 2).

Discussion and Conclusion

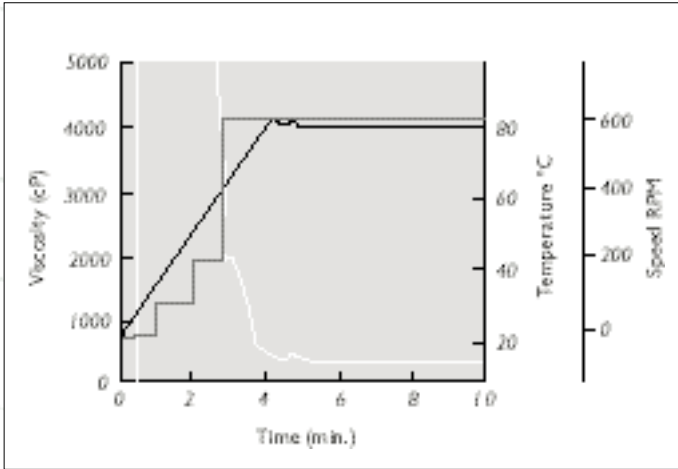
RVA hot viscosity and the time at the melting peak are a measure of cheese meltability (Metzger and Leman 2001). Results indicate that batch-to-batch variation in the melting characteristics of process cheese, process cheese food and process cheese spread produced in the RVA was small (RSD<7) and similar to batch-to-batch variation obtained when using a pilot-scale Blentech twin screw horizontal cooker. (CONTINUED P. 2)

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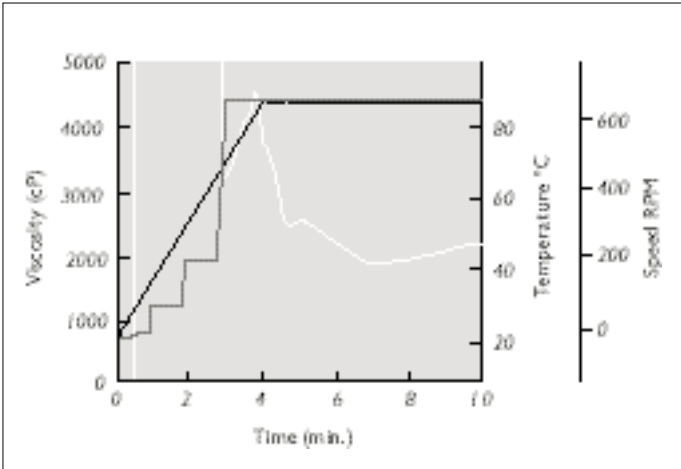
- Starch Viscosity Changes of Dehydrated Potatoes
- RVA™ Helps Quality Control and Product Development



Process Cheese Manufacture



Process Cheese Spread Manufacture

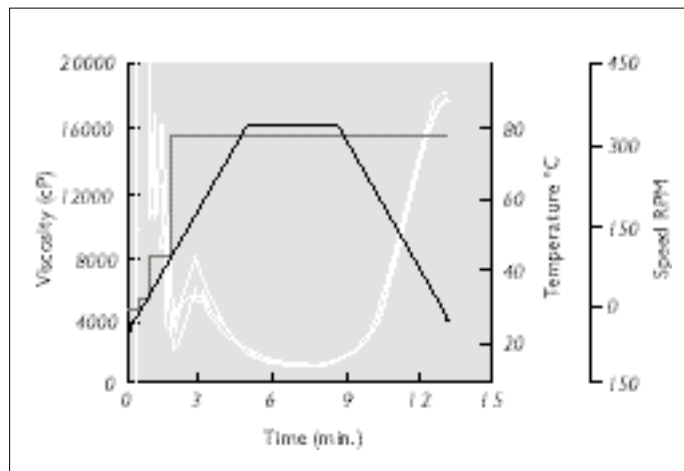


Process Cheese Food Manufacture

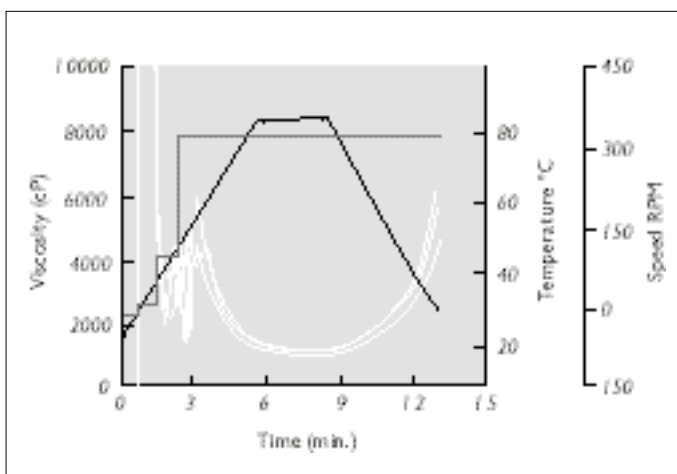
Since the RVA repeatedly produced process cheese with consistent melting characteristics, it can be used to produce and evaluate process cheese on a small scale. This research will facilitate the rapid and inexpensive assessment of experimental variables which may influence process cheese quality.

References

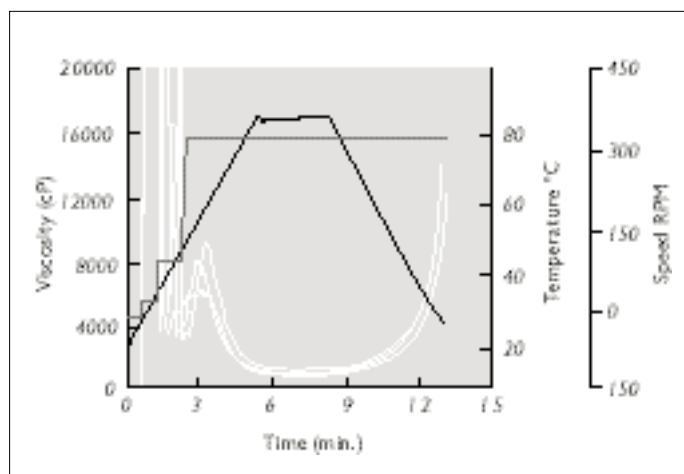
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Process Cheese Melt Test



Process Cheese Spread Melt Test



Process Cheese Food Melt Test

RVA™ Measurement of Starch Viscosity Changes During Processing of Dehydrated Potatoes

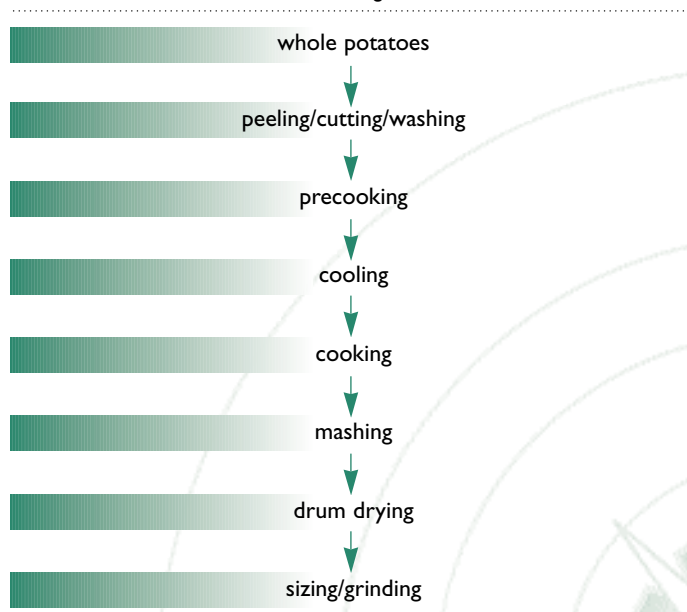
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Introduction

Starch functionality, defined by processing and product performance, is key to the development of innovative starchy food products (Bello 1998). The RVA has been used as an indirect measure of starch functionality in dehydrated potatoes, including finely ground potato flakes, flours, and granules typically used to manufacture salty snacks and breads in the USA (Bello 2000).

Potato Processing Flow Chart



Potato Processing

Potatoes were cut into pieces and cooked by either indirect steam injection in a kettle cooker or direct steam injection on a steam table. Cooking temperatures ranged from 160-205°F and cooking times ranged from 10-30 minutes. Potatoes were pre-cooked and cooled to increase starch annealing and starch retrogradation, respectively (Bello 2001).

Starch Viscosity of Cooked Potatoes

Raw potatoes exhibit a typical starch pasting profile (Caldwell et al. 2000).

Cooked potatoes exhibit a typical gelatinised starch profile. Increasing the severity of the cooking process (time and temperature) was associated with reduced cold paste viscosity and setback. Cooling of the cooked potatoes was associated with higher setback due to starch retrogradation.

Starch Viscosity of Mashed Potatoes

Mashed potato was prepared by mixing cooked potato with an emulsifier in a Hobart mixer using a paddle mixer to disperse the emulsifier. The mashed potato was then drum dried at 320°F in a two-roll drum dryer.

Setback viscosity increased significantly in experimental mashed potato made from non-dehydrated potato compared to its cooked counterpart. Setback viscosity decreased in drum-dried mashed potato made from dehydrated potato compared to its non-dehydrated counterpart, probably due to starch-lipid complex formation.

Process differences between a commercially produced sample and an experimental sample are clearly evident in the RVA profiles.

Starch Viscosity of Dehydrated Potatoes

Dehydrated mashed potatoes are prepared for snackfood applications by grinding, producing a product known as 'grind flakes'.

The Experimental Fine Grind 1 and Commercial Fine Grind 2 products were produced by the 'full-cook process' which involves double cooking the potatoes with a single cooling process to minimise disruption of potato cellular integrity and to promote starch retrogradation.

The Experimental Fine Grind 2 and Commercial Fine Grind 1 products were produced by a single cooking process without a cooling step to promote the

disruption of potato cellular integrity and starch granular structures and reduce starch setback and retrogradation.

The Experimental Fine Grind 1 and 2 products demonstrated a unique setback viscosity feature typical of starch-lipid complexes in bread. These products may be more suitable than conventional potato flakes, granules and flours for manufacturing innovative potato-based food products such as extruded snacks, pizza crusts and food-service frozen dinner entrees.

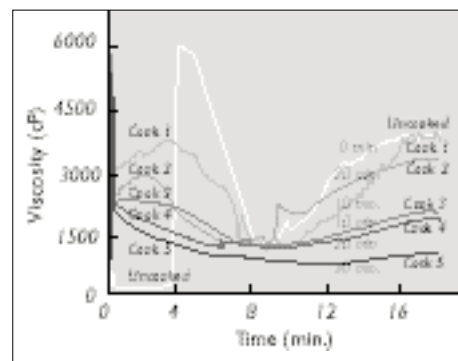
Conclusion

The RVA is an effective indirect measure of the processing and product performance of dehydrated potato products used as ingredients in manufactured foods. The changes in starch viscosity due to gelatinisation, solubilisation, retrogradation and lipid-complexing may be key to the processing and product performance of fabricated potato food products such as snacks, breads and frozen dinner entrees.

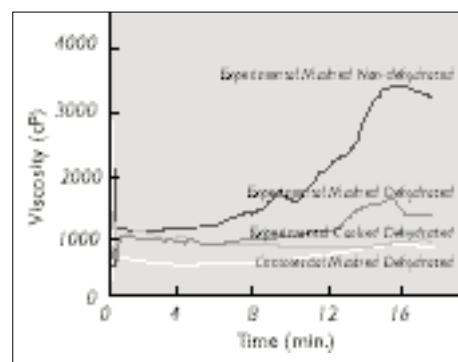
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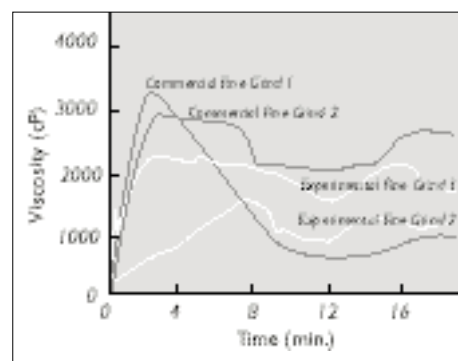
*Dr Tony Bello is the Managing Director of Ebiita Food Tech Consulting and Associates. He has successfully used the RVA to create potato and corn products that exceed consumer expectations in the marketplace and has developed a processing platform for making value-added dehydrated potatoes using the RVA to monitor starch degree of cook during processing.



RVA™ Viscographs of Cooked Potatoes



RVA™ Viscographs of Mashed Potatoes



RVA™ Viscographs of Dehydrated Potatoes

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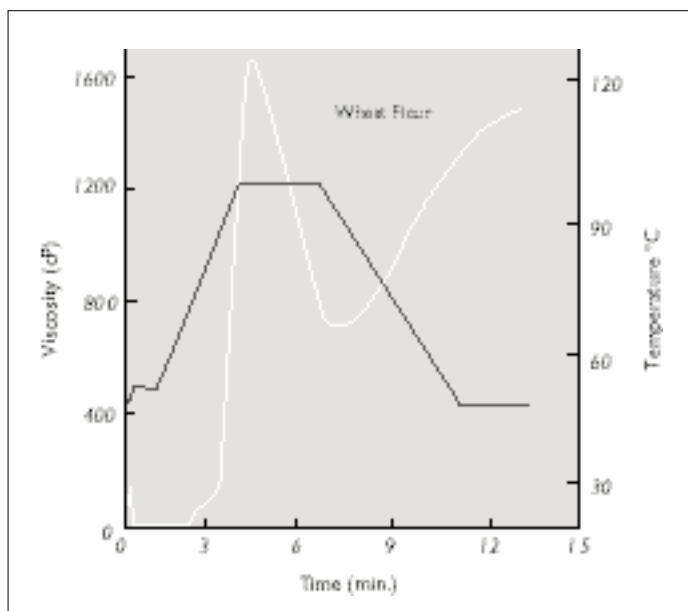
The RVA™ Helps Quality Control and Product Development

Bram Gunter, R & D Laboratory, Codrico BV, Rotterdam

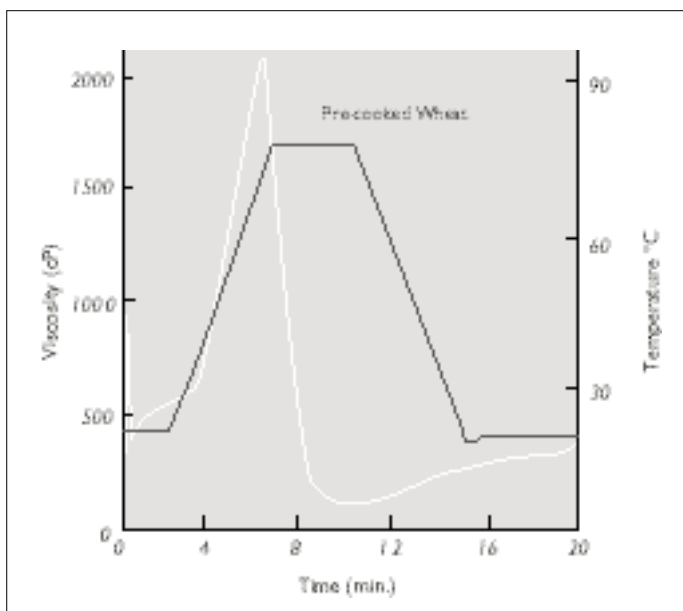
Based in the port of Rotterdam, Codrico BV is one of the largest cereal processors of north-western Europe. In the maize mill, maize is degerminated and ground to specific granulations. Products can be used in the conventional cornflaking industry — snackfoods, cornflaking by extrusion, and beer brewing. Byproducts are applied in animal feeding.

Extrusion is the other division of Codrico BV. Premium-quality

cereal grains and pulses amongst others are pre-cooked, which enhances digestibility and gives special properties such as cold-water swelling making the product an excellent cold-water binder. The extruded products can be used in snackfoods, pasta and other convenience foods, as well as in special animal feeds where pre-cooking is needed — such as for young animals and aqua-feed.



Uncooked Wheat Flour



Pre-cooked Wheat Flour Showing Cold Water Swelling

It is possible to monitor the products from both the corn mill and the extrusion division. Small differences in process conditions during extrusion can be monitored in the raw material and in the end product quality. The short time needed for analyses makes it possible to adjust the process quickly.

The developments Codrico has faced over the past years indicate that each application and each customer has their own requirements. The RVA has proved to be a great help in determining directions for R & D and, in quality control, the RVA gives figures for complete control of raw material and end product in both the maize mill and the extrusion division.

Raw materials, such as maize, wheat, peas and beans, can be selected based on RVA analyses. The information is not only helpful for Codrico BV's extrusion process, but also for customers working with Codrico materials in their own cooking processes. In cooperation with their customers, Codrico BV develops products as a bulk specialty for their own individual applications.

Codrico BV has found that in the relatively short period of using the RVA it has proved to be a great help in both quality control and product development.

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doughLAB™ Data Premieres at Budapest

Newport Scientific's brand new dough rheology instrument, doughLAB™, has starred at the recent ICC Conference held at Budapest University of Technology and Economics.

Applying a conventional z-arm mixing action to a wheat flour dough to determine its gluten functionality, rheological properties and bread-baking quality, doughLAB™ features variable speed and high speed/high energy input mixing which offers a number of advantages:

- relevance to modern-day commercial mixing
- more defined and easier to measure results
- relevant information in 3 minutes.

For your copy of the papers presented in Budapest 'New Approaches to Testing Wheat Protein Quality from Newport Scientific: Rapid Visco™ Analyser (RVA) and doughLAB™' and 'A New Instrument for Measuring Bread Dough Development' contact Newport Scientific.