

RHEOLOGY SOLUTIONS

THE STORAGE TEMPERATURE DEPENDENCE OF THE VISCOSITY OF DAIRY PRODUCTS

PROBLEM

A manufacturer of dairy products wished to investigate the dependence of viscosity on temperature of a number of foods under conditions of both storage and use.

SOLUTION

The TA Instruments Controlled Stress Rheometer employs a unique and rapid method of heating and cooling within the range of -10° to $+99.9^{\circ}\text{C}$. The study of viscosity relies on accurate control and maintenance of sample temperature. The samples studied here were a base yoghurt; a propriety brand butter; and a cheese spread.

Effect of temperature on Yoghurt:

Figure 1 indicates a dramatic fall in viscosity, associated with a loss of structure, in the yoghurt at about 4°C (this temperature was in fact highly significant to the manufacturing process). It indicates that a small increase in the products temperature, around this point, will allow vastly increased pumping and filling rates.

Effect of temperature on butter:

Butter is generally stored in the refrigerator and spread some time after it has been standing at room temperature. How well it spreads will depend on the time it has been able to warm up and therefore the temperature it has reached. Figure 2 shows that the viscosity of butter falls quite steadily within the temperature range studied. Some work has to be done to relate viscosity to spreadability and thus calculate optimum conditions of storage for efficient use.

Viscosity profile of a cheese spread:

The spread under study here is designed to be warmed in a microwave oven prior to use. Figure 3 details the fall in viscosity as the spread is warmed from 15 to 65°C . The dramatic fall in viscosity to 20°C explains why it is recommended that the product is stored in the refrigerator. Having been warmed to in excess of 30°C the fall in viscosity is far less dramatic; so when cooled, during application, the rebuild of structure will not be too dramatic either - until it cools to below 30°C . This means that the spread will not become unmanageable for some time after initial heating.

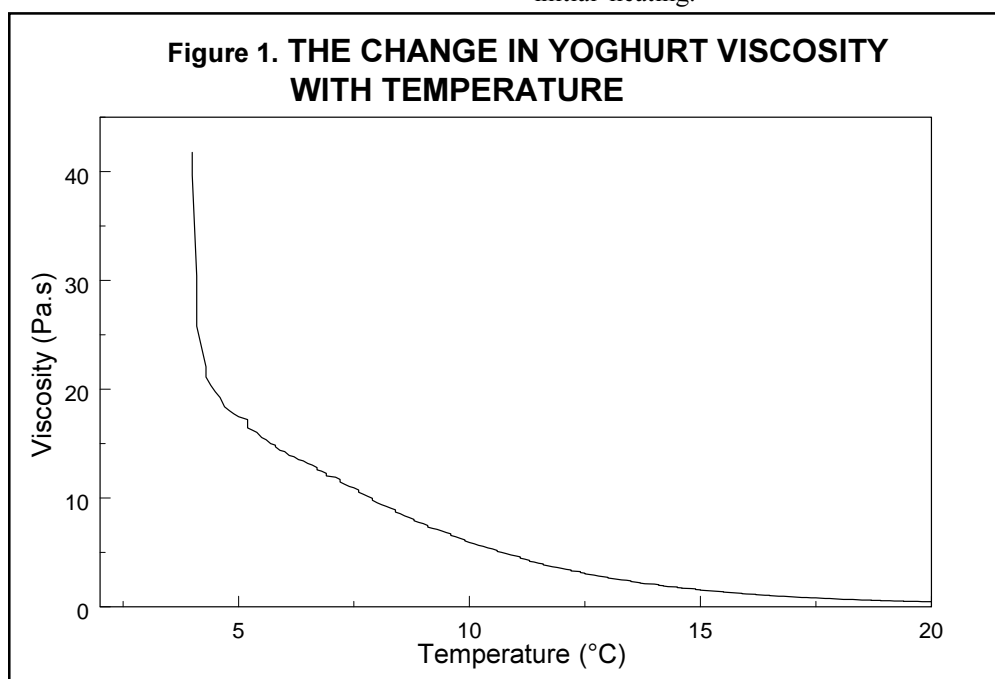


Figure 2. CHANGE IN BUTTER VISCOSITY WITH TEMPERATURE

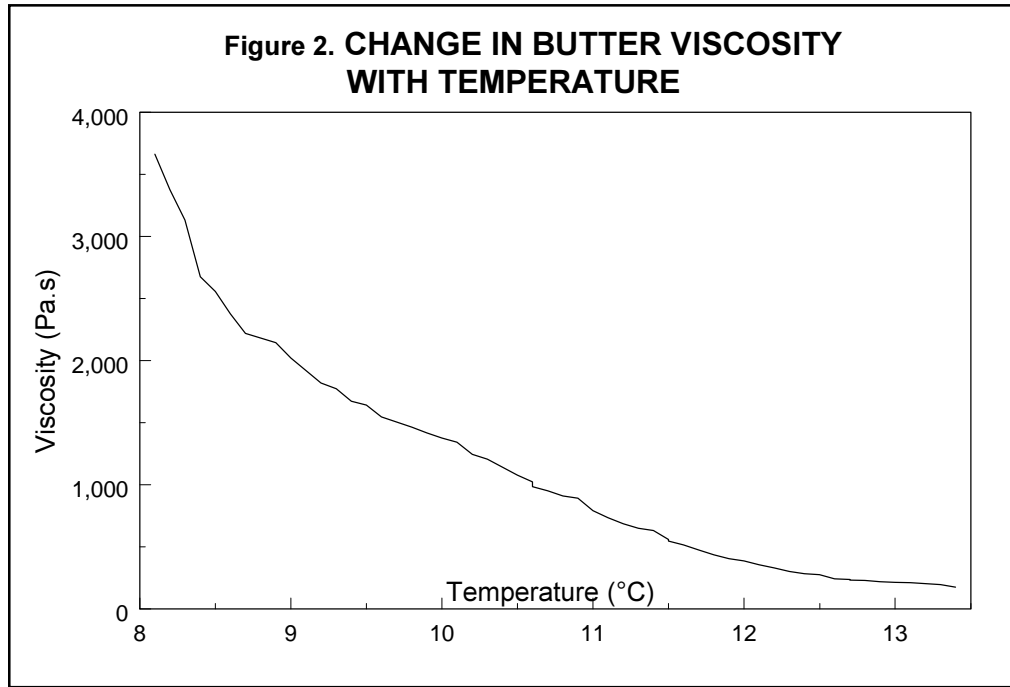
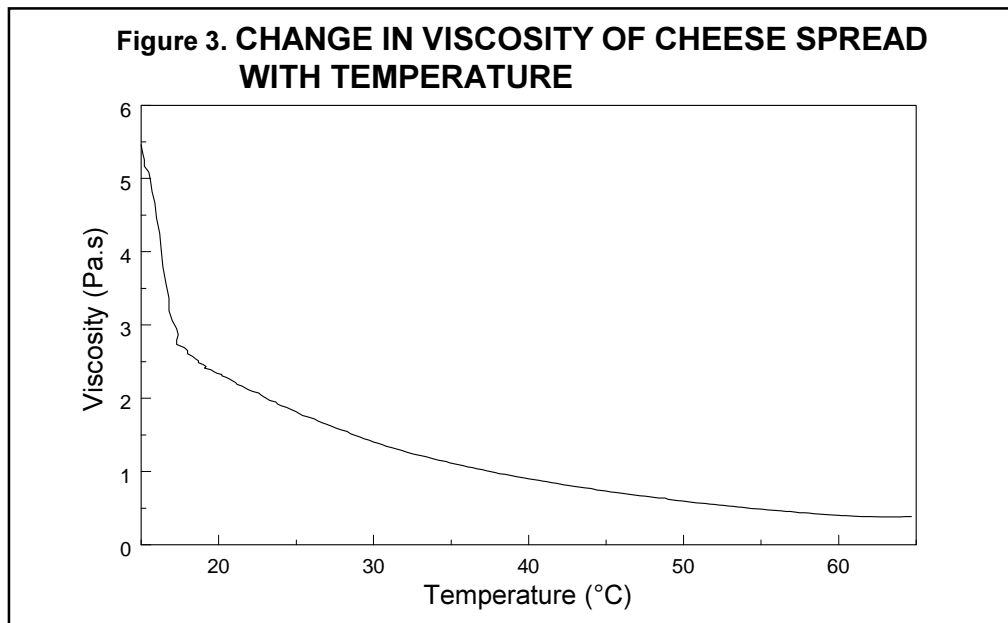


Figure 3. CHANGE IN VISCOSITY OF CHEESE SPREAD WITH TEMPERATURE



For more information or to place an order, contact:

TA Instruments, Inc., 109 Lukens Drive, New Castle, DE 19720, Telephone: (302) 427-4000, Fax: (302) 427-4001

TA Instruments S.A.R.L., Paris, France, Telephone: 33-01-30489460, Fax: 33-01-30489451

TA Instruments N.V./S.A., Gent, Belgium, Telephone: 32-9-220-79-89, Fax: 32-9-220-83-21

TA Instruments GmbH, Alzenau, Germany, Telephone: 49-6023-30044, Fax: 49-6023-30823

TA Instruments, Ltd., Leatherhead, England, Telephone: 44-1-372-360363, Fax: 44-1-372-360135

TA Instruments Japan K.K., Tokyo, Japan, Telephone: 813-5434-2771, Fax: 813-5434-2770

Internet: <http://www.tainst.com>