COAGUSENS™ FLEX

Application note | CoaguSens™ Flex

Yield optimization journey – Phase 1: Mastering Technological Parameters in Cheese Production

BACKGROUND

Parameters such as temperature, pH, coagulant dosage, protein content and calcium chloride influence the way milk coagulates. Real time data provided by CoaguSens™ Flex help understanding and controlling the influence of technological parameters on coagulation kinetics and consequently on yield.

This application note shows how CoaguSens™ Flex was used to measure the coagulation kinetics of milk under different conditions of temperature, pH, calcium chloride concentration, coagulant concentration and protein enrichment.

See how CoaguSens™ Flex clearly highlights how subtle changes in these technological parameters impact milk flocculation time, speed of coagulation and final gel firmness. This important phase of the 'Yield optimization journey' will help you identify the levers of control to master coagulation.

COAGUSENS™ FLEX

CoaguSens™ Flex is a lab testing instrument designed for the dairy industry to measure milk gel firmness during coagulation. It is used in R&D to develop or improve the formulation of products and to optimize industrial production processes. CoaguSens™ Flex is also used in Quality Control to qualify and document the quality of products or ingredients.

CoaguSens™ Flex measures the firmness of milk during enzymatic or acid coagulation. It measures the firmness evolution of a sample during its phase transition from liquid to soft solid state. CoaguSens™ Flex App displays in real time gelation kinetics as well as the speed of coagulation that can be used to formulate recipes and adjust processes. The instrument and its App are user-friendly and intuitive. They have been designed for food technologists that are not necessarily experts in the field of rheology.

METHODOLOGY

CoaguSens™ Flex was used in this study to analyze the effect of temperature, protein enrichment, pH, Calcium Chloride ($CaCl_2$) and coagulant concentration on the coagulation of milk. These parameters were sequentially changed and different milk samples were prepared accordingly in order to measure their coagulation kinetics and their curd firming rate (i.e. speed of coagulation) using CoaguSens™ Flex. The repeatability of measurements was evaluated by repeating four (04) times the tests of milk protein enrichment.

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RESULTS

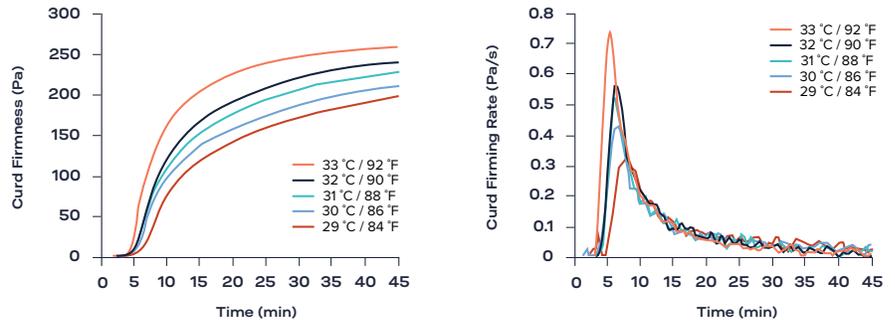## Sensitivity to coagulation temperature

Figure 1 - Effect of temperature on milk gel formation during coagulation and coagulation speed.
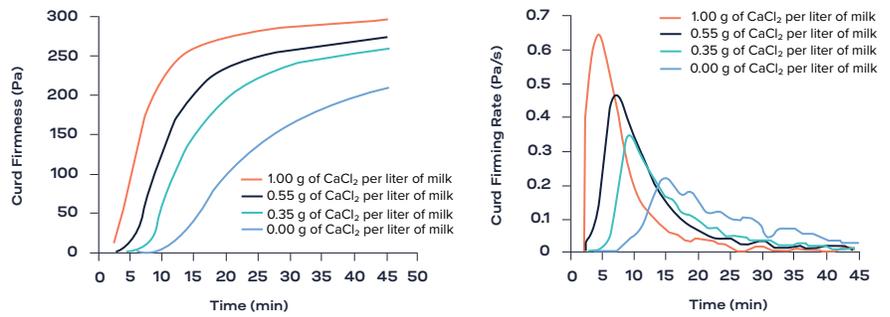
Sensitivity to calcium chloride dosage

Figure 2 - Effect of calcium chloride dosage on milk gel formation during coagulation and coagulation speed.

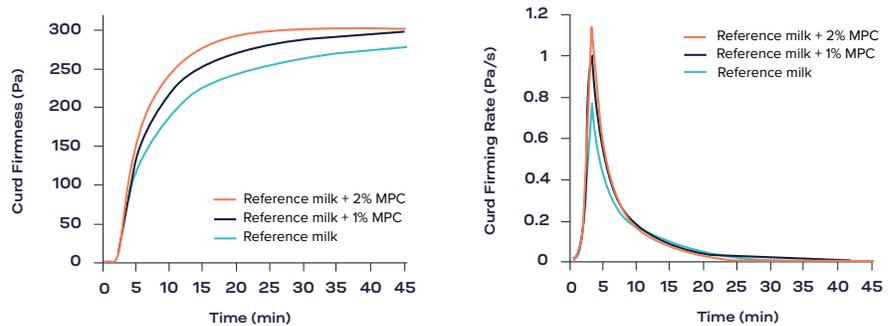## Sensitivity to protein enrichment

Figure 3 - Effect of protein enrichment on milk gel formation during coagulation and coagulation speed.
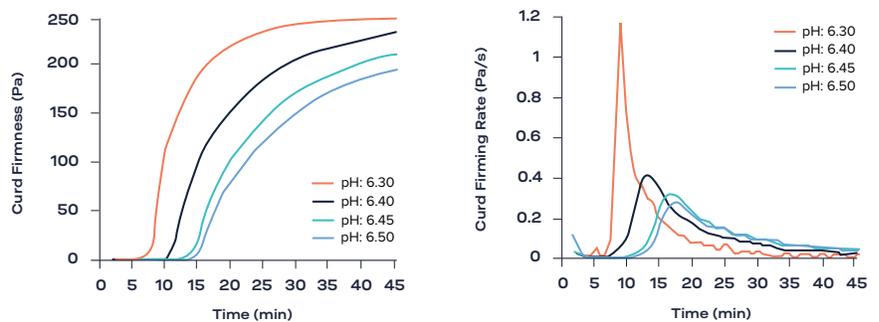
Sensitivity to milk pH

Figure 4 - Effect of pH on milk gel formation during coagulation and coagulation speed.

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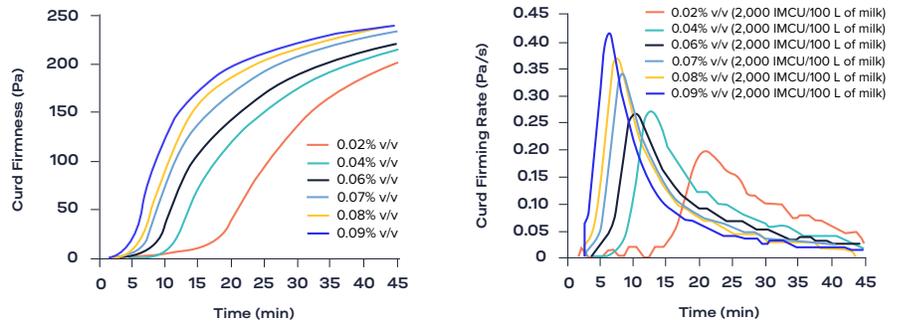## Sensitivity to coagulant dosage

Figure 5 - Effect of coagulant dosage on milk gel formation during coagulationanf coagulation speed.
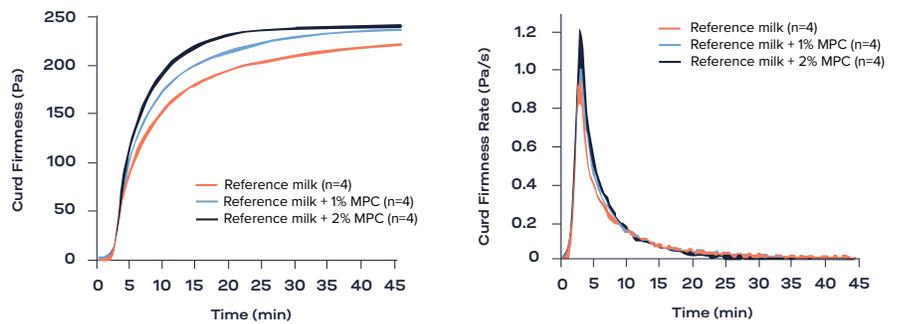
Repeatability test

Figure 6 - Repeatability of testing on CoaguSens™ Flex

CONCLUSION

CoaguSens™ Flex is a new testing instrument that monitors milk coagulation through the measurement of the gel firmness during its formation. In this study, the ability of CoaguSens™ Flex to measure the effect of cheese technological parameters on coagulation was evaluated. CoaguSens™ Flex was able to describe with high fidelity how temperature, protein enrichment, pH, Calcium Chloride ($CaCl_2$) and coagulant concentration influence coagulation. In addition the high repeatability of CoaguSens™ Flex measurements was established through a repeatability study.

CoaguSens™ Flex is a suitable tool to optimize milk coagulation process by changing the technological parameters of the recipe. Inversely, one can use the CoaguSens™ Flex to measure the effect of changing the recipe on the coagulation process and, ultimately, to anticipate changes in the operations.