

Development of a TTI based decision making tool for the chill chain management and optimisation

E. Gogou, J. Tzigounakis, M. Giannakourou, P. Taoukis,

The chill chain often escapes effective control. Time Temperature Integrators (TTI) allow continuous monitoring of temperature conditions, from production to consumption. A chill chain management system, coded SMAS, based on the real quality and risk profile of products, was developed. SMAS uses the information from the TTI response at designated points of the chill chain, ensuring that the temperature-burdened products reach consumption at acceptable quality level.

The objective was to develop a tool, in the form of software, that translates the information from the TTI to instructions for the further handling of products and can calculate the expected improvement at the time of consumption in comparison to the conventional FIFO approach.

A user friendly software, the “SMAS Decision Maker” (SDM) was developed and tested. SDM uses the TTI application scheme based on the kinetics of the TTI response and of product microbial deterioration. A library of TTI and product kinetic data is built in. Data for a specific TTI and /or product can be added by the user.

The TTI response information at the decision point is the input translated by SDM into the integrated temperature history and quality status of each product. Such information from all products is processed and the decision for their further handling is output. Further, SDM assesses by Monte Carlo simulation, the final quality and risk distribution of the products at the expected consumption time using risk assessment principles, and a temperature database for transport, retail and domestic storage. SDM was applied for a number of chilled products such as MAP cooked ham, VP beef and ground pork and the SMAS benefit was calculated.

Based on SDM use for several TTI/products, it was demonstrated that SMAS reduces the risk and optimizes the product quality at the time of consumption compared to FIFO policy.