

Preface

INNOVATIVE TOOLS FOR SUPPORTING COLD-CHAIN-MANAGEMENT

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Due to globalisation food supply chains become more and more complex and thus the logistic requirements increase progressively. To ensure high quality and safe products in every step of the chain a controlled cold-chain-management system is required. Therefore food producers and retailers become more and more interested in innovative systems to control food safety and quality over the whole chain.

There are several systems available to support cold-chain-management:

- Temperature monitoring systems, e.g. Time-Temperature-Indicators
- Predictive models for shelf life and food safety, e.g. shelf life models for meat
- Rapid methods for food freshness and safety analysis, e.g. biosensors
- Packaging- and storage systems to prolong shelf life and increase food safety, e.g. oxygen scavenger and -indicators

The integration of innovative solutions in different supply chains is a challenge where several factors have to be considered. An important prerequisite for a successful integration is an easy adaptability to the heterogeneous structures of international food chains. Cost effective and user friendly implementations as well as the integration in already existing or new technologies and software and inspections-schemes are also important prerequisites for successful market launches.

A further added value to produce high quality and safe products can be generated by combining innovative solution to support cold-chain-management, like temperature monitoring systems and microbiological growth models. Compared to a single solution a practical implementation of combined innovative solutions should be even more flexible according to the structure of international food chains. Usually are no guidelines available that explain how to integrate complex solutions in different supply chains and which chain specific parameters have to be considered. Instructions about the best solutions for specific chains are also missing. This leads to long implementation phases and the result is often not sufficient for each participant.

The following paragraphs illustrate the complexity and show which different scientific and economic knowledge is necessary to investigate predictive models to calculate the actual shelf life of food in each step of different cold chains.

The determination of the remaining shelf life of each step in the supply chain delivers an important contribution for safe and high quality products and it allows companies to optimise their storage management and to minimise economic losses. The development of predictive models requires a detailed knowledge of freshness loss and the behaviour of all microorganisms that are responsible for the spoilage in dependence of different influence factors as described by WHITING et al. 1993.

Shelf life calculations in each step of the supply chains may be estimated by traditional microbiological analyses that are very time-consuming. More cost-efficient is a combination of shelf life models with rapid methods for food- freshness-analyses to determine the actual status of special microorganisms. Another opportunity is to draw conclusion back from the temperature history of the product to the remaining shelf life. This requires a comprehensive temperature monitoring along the whole supply chain which has to take into account many different factors that depend on the different physical and chemical kinds of measuring equipments for temperature monitoring.

Several companies control temperature conditions by data loggers, which normally measure the environmental temperature. But environmental- and surface temperature of food often differs from each other in dependency of the placement of the logger, the packaging material or the specific heat capacities of the surrounding atmosphere and the food etc. (MOUREH et al., 2002, Raab et al, 2008). Thus, the calculation of the remaining shelf life based on the environmental temperature history can lead to an underestimation of remaining shelf life and thereby cause economic losses. A combination of data loggers with heat transfer models can be a possible method of resolution to increase the Return on Investments of all companies that are in touch with cold chain management. Also the integration of Time-Temperature-Integrators, that are directly located on the food, allows to calculate the shelf life of a product in different steps of the chain.

A successful implementation of predictive growth models combined with rapid methods or temperature monitoring equipment requires the consideration of several factors. Which solutions will be the best for specific chains mainly depend on the organisations structure and technical circumstances of the supply chain? A successful implementation therefore demands a detailed knowledge about practical conditions in supply chains regarding quality control- and temperature monitoring as well as inter-organisational structures, logistic processes and information exchanges. Fig.1 shows the complexity for a generic model to predict the remaining shelf life in different cold supply chains and which factors have to be taken into account.

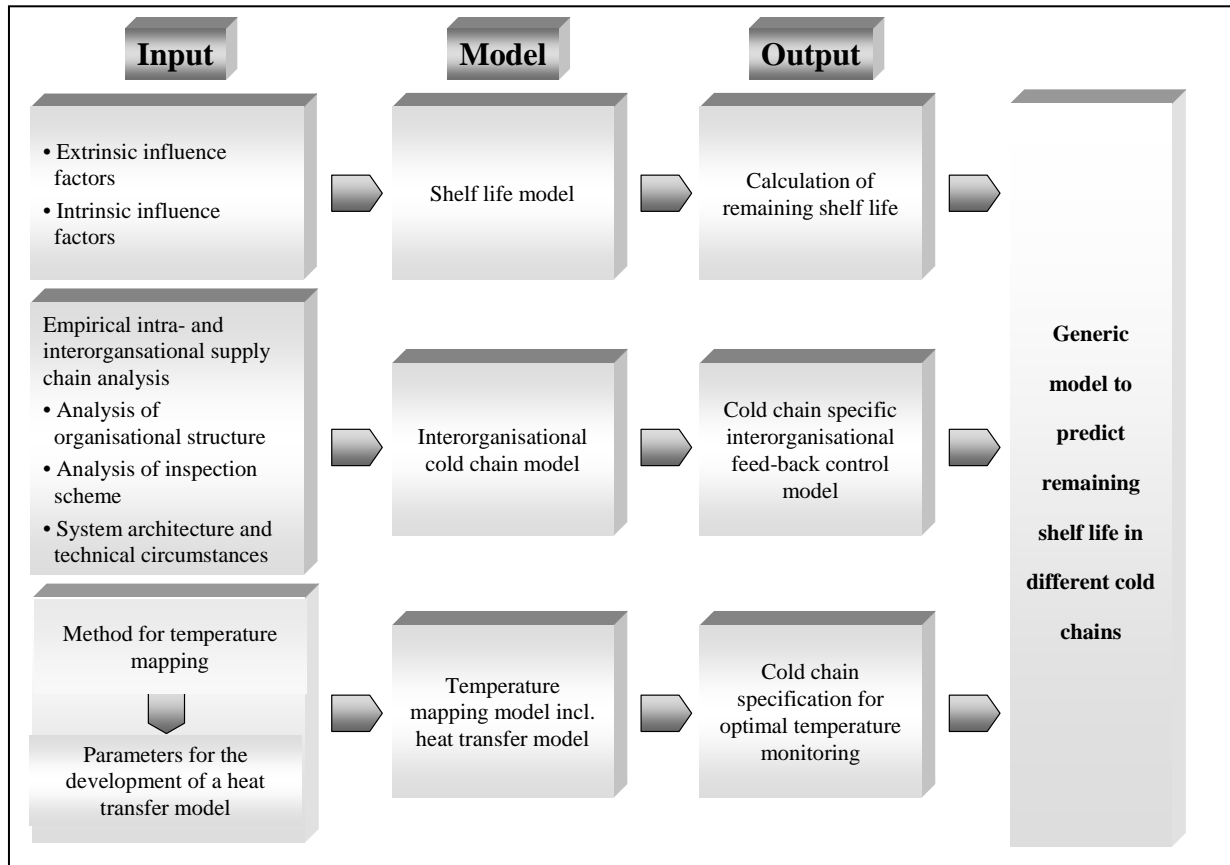


Figure 1 Concept steps for the development of a generic model to predict remaining shelf life in different cold supply chains (Raab et al. 2008)

The above paragraphs demonstrate that the practical implementation of complex innovative systems in the field of cold-chain-management requires a brought and interdisciplinary knowledge from different fields.

Therefore, one aim of this workshop is a get-together from different fields of research, industry and public organizations. It shall be a place to share the expertise from different kinds of views to discuss activities, future trends and requirements and also to find partners for collaboration to develop new ideas to support cold-chain-management.

Reference

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