Abstract  Modelling and simulation (M&S) is a critical technology when applied to complex logistics; it is evident that food and especially the fresh-food supply chain [1] represents a very interesting application area, considering all the inter-related constraints and variables: time-to-market, traceability, transport/storage conditions, handling, production/process control, demand variability, seasonal behaviours, etc. In fact, food represents a strategic sector; in order to increase margins on specific products such as red and white meat, fresh fish, fruits, vegetables, frozen foods and dairy products, an effective management of the logistics operation costs and food preparation is needed in order to develop new solutions for these special supply chains. This approach requires development of logistics models in order to achieve different results such as faster distribution processes, rapid response with cost reduction, and increase in good useful lifetimes. The chapter proposes a fresh-food supply chain model devoted to support logistics network re-engineering as well as operation management.
8.1 Introduction

Among the most relevant critical aspects affecting fresh-food products, it is easy to identify several specific aspects such as:

- Perishability, which implies the need for very rapid logistics processes.
- The very high profile needed from an organoleptic quality and freshness point of view, which constitutes hard constraints for cost reductions.
- Traceability, required among the goods to be distributed as well as controls for guaranteeing safety and also for securing the supply chain.
- The special processes required for preparing food along the supply chain: for instance, slaughtering, meat cutting, packaging or modified atmosphere packaging (MAP).
- Strong seasonal behaviour of demand and production, which introduces a continuous evolution in the product mix as well as the necessity to organise a robust and flexible logistics network [2].
- Difficulty in creating an efficient and optimised platform due the interaction among many logistics flows (many supplier deliveries to be divided and mixed for shipping to many shops).
- Presence of direct distribution flows from producer to final consumer (stores).

Considering these factors the problem of very rapid logistics is really challenging, especially considering concurrent needs for guaranteeing a high level of service to the customers, while maintaining an efficient system of safety/security controls on the products, and reducing costs.

For instance, in the case of retail companies serving stores [3] the logistics solution needs to satisfy many constraints looking to optimise multiple target functions; in fact these realities operate often on diverse scenarios: they need to serve different kinds of stores characterised by size, customer profiles and cultural gastronomic backgrounds related to the different geographical locations (urban areas vs. rural, coastal vs. inland zones). This complexity often requires developing tools for decision support and logistics management based on M&S. In fact in this context it is critical to define a strategic logistic view for identify the right solutions considering all possible trade-offs in term of time control, quality levels, customer satisfaction and economic profitability. These decision support systems are not only devoted to supporting supply chain design or re-engineering, but also to defining/maintaining the performance reference baselines and metrics to be used in overall process control [4].

8.1.1 Fresh-Goods Processing

From production sites to final customers, the flow of fresh goods is processed and moved along the different phases of the supply chain, while in the opposite direction information flows are used for driving the planning and distribution.