

**Title** Integrated open loop control and design of a food storage room  
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### **Abstract**

Usually, control design in a food storage room takes place after the plant has been designed. However, the performance of the plant connected to the controller might be improved by simultaneous design of the plant and the controller. In the case of open loop control, expressions that describe the dynamics of a controlled system (a bulk storage room) and its design criteria are deduced. These expressions contain all the physical system parameters, and give insight on how the system performance (in terms of energy usage and temperature uniformity) depends on the physical parameters. This insight gives realistic guidelines for integrated systems design and control, without the need for complex numerical computations. The physical relations that could not be found in the literature are identified experimentally. It is shown that a higher fan capacity reduces energy costs and improves the bulk temperature uniformity considerably, whereas the bulk shape is of very little influence. Furthermore, better wall insulation leads to a substantial energy cost decrease.