Title Development and validation of "grey-box" models for refrigeration applications: A review of key concepts

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Abstract

"Grey-box" modelling combines the use of first-principle based "white-box" models and empirical "black-box" models, offering particular benefits when: (a) there is a lack of fundamental theory to describe the system or process modelled; (b) there is a scarcity of suitable experimental data for validation or (c) there is a need to decrease the complexity of the model. The grey-box approach has been used, for example, to create mathematical models to predict the shelf life of chilled products or the thermal behaviour of imperfectly mixed fluids, or to create models that combine artificial neural networks and dynamic differential equations for control-related applications. This paper discusses the main characteristics of white-box, black-box and their integration into grey-box models, the requirements and sourcing of accurate data for model development and important validation concepts and measures.