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### **Modeling Compost: The Spatial Approach**

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Mathematical models can help us better understand, predict and optimize the composting process. Most of existing models are spatially uniform and can only be applied to model in-vessel composting in laboratory conditions. However, space is an important consideration for windrow composting, which is the most widespread composting technology. Only a few models exist for windrows: by Finger (1976) and Sidhu (2007). Both models neglect consumption of substrate and predict only the temperature and oxygen profiles in the pile during the thermophilic stage of composting, when the available substrate is abundant. These models do not permit analysis of the process as a whole, from the beginning to the end of decomposition. Another important shortcoming of Fingers and Sidhus models is that they neglect the chimney effect or the ! upward movement of warm air in the pile.

We propose a spatially dependent windrow model that incorporates consumption of substrate and the chimney effect. Our model predicts temperature, oxygen concentration and available carbon profiles of a windrow over time. The model allows estimation of the total time required for decomposition, and analysis of how factors such as ambient temperature, oxygen concentration, shape and size of the pile affect the composting process.