Abstract:

Uniform air distribution within fruit and vegetable cool stores is important for both maintaining and minimising quality variability during long-term storage. Air distribution patterns within cool stores are complex and are the result of many interacting factors. Some of these factors are the location of evaporators, number and capacity of fans, loading patterns within the store, packaging used and the type of produce. Design engineers have few tools to optimise cool store air flows. Whilst complex mathematical models using techniques such as computational fluid dynamics have been developed, many of these remain untested against data collected in large commercial cool stores. This work measured air flow patterns and temperature distributions within a commercial controlled atmosphere apple cool store. An array of carbon monoxide (CO) sensors were placed spatially throughout the cool store. CO was injected into a range of positions within the cool store and time of arrival at each of the CO sensors was determined. Air flow patterns were deduced from these readings. Spatial temperature patterns were determined from an array of temperature data loggers placed within the cool store. Results showed an uneven distribution of air flow within the cool store. The top layers and side columns of bins received sufficient air flow. Central positions received lower air flow. Temperature measurements showed warm spots were present within the cool store. These warm spots were found to coincide with the areas of lowest air velocities.