Advances in Temperature Management

J. F. Thompson, Department of Biological & Agricultural Engineering, UC Davis

Temperature management is still the most important factor controlling the life of fresh flowers, vegetables and fruit. Beginning as soon as possible after harvest, handlers of perishables need to start initial cooling and should keep them at their recommended handling temperature throughout the rest of the handling chain. The key to insuring that this happens is maintaining good records. Most of the recent advances in temperature management are in the area of improved measuring and recording equipment.

A number of companies sell moderately priced infrared thermometers. They display temperature almost immediately and this feature makes them particularly valuable for surveying the temperature of a large amount of product. They also do not require probing product. This helps maintain the integrity of the product and reduces the possibility of product contamination. Accurate and meaningful temperatures are obtained by remembering the following: 1) measure surface temperature and not pulp temperature like a probe thermometer does, 2) give good estimates of product temperature when product has been at a consistent temperature for several hours, and 3) units are accurate only when the thermometer itself is at the same temperature as the environment in which it is used. Immediately using an instrument that has been stored in the office in a 0°C (32°F) cold room will result in several degrees of error. Store infrared thermometers in the area where they will be used. These devices average temperature over a circular area that increases in size as the distance between the thermometer and the measured surface increases. Check the instrument manual for a description of the area of measurement. Infrared thermometers can be calibrated by measuring the temperature of a stirred ice and water mixture, much like a probe thermometer.

Electronic temperature sensors with built in data recording have become widely available. Some cost as little as $50 and can record data for several months. Their small size and low cost make them ideal for measuring pulp temperature in handling systems. Older units were bulkier and mainly used to measure air temperature in a refrigerated environment. The data are saved internally so the units must be returned so information can be retrieved. These are probably most useful for special testing or in-house monitoring where company personnel can insure the monitors are returned.

Color change temperature monitors have been commercially available for a number of years. They cost a few cents each and are an easy way to display the temperature conditions that a product has been exposed to. Some are designed to indicate when a threshold temperature has been exceeded. Others react to integrated time-temperature conditions. They have been used on an experimental basis with cut flowers to display the temperature conditions in transport and handling.

Transportation companies can now monitor the location and operating conditions of their refrigerated vehicles while they are en route. The system is an added feature built into the refrigeration equipment. It transmits information on refrigeration system operation and can be configured to also transmit air and product temperatures. This allows companies to instantly detect equipment malfunction and to alert their drivers. This real time monitoring may allow transport companies to set thermostats closer to freezing and chilling temperature with less concern for causing product damage.

The use of centerline loading for highway trailers has moved from the strawberry industry to a number of other commodities. Several companies offer affordable air bags that are used to stabilize the load in the center of the trailer. This allows refrigerated air to circulate around the load and maintain more consistent produce temperatures. This is particularly valuable for loads shipped under extreme temperature conditions. We are currently testing the value of this technology under a range of outside temperature conditions.

These new products will help the industry keep produce under better temperature conditions after harvest. Managers should set goals for temperature conditions and measure the performance of their operation in achieving these goals. Improved temperature management will reduce claims and make customers more satisfied.