

come these problems, one or more thermocouples could be inserted easily into product in cartons on the inside of the last pallet before it is positioned for cooling with the thermocouple leads located outside the canvas area. An inexpensive handheld thermocouple reader could be used to measure cooling for all the tunnels. The thermocouple reader is accurate and has a fast response time (seconds). The thermocouples are durable and can be used many times. With additional investment, permanent thermocouple leads and remote data loggers could be used.

Velocity and flow rate

Velocity and flow measurements are difficult and require expensive instruments, however the total flow rate is an important item of information. A cheaper and more convenient method is to use the manometer mentioned above to measure the static pressure across forced-air cooling fans and then estimate the flow rate using fan performance curves supplied by the fan manufacturer. The performance curve estimates the flow rate for various static pressure operating conditions.

Summary

This publication presents several methods for increasing the efficiency of forced-air precoolers for fresh produce. Recommendations for increasing efficiency with minimal cost and increased management include seal-

ing air bypasses (particularly through the pallets) to force additional air through products, improving carton stacking configurations/orientation, and proper temperature monitoring. Modifying pallet-tunnel length and width also show promise for improving efficiency. Recommendations which require more time and cost include increasing carton vent opening, increasing fan capacity, and increasing refrigeration capacity. Of these three, the design of the carton with particular attention to the percent vent openings should be addressed first. Increasing the fan and refrigeration capacity should be considered only after all the above-mentioned changes have been accomplished.

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