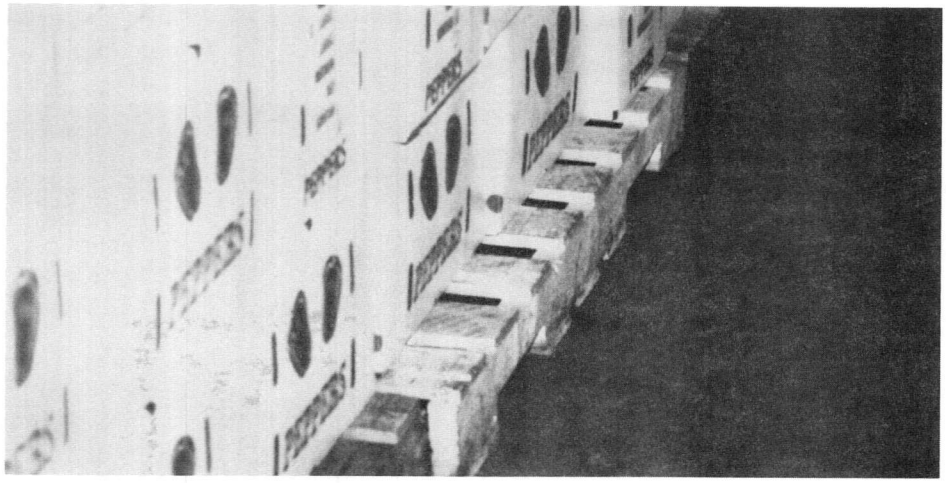

Figure 5. Opening in tops of pallets and misalignment of pallets forming forced-air cooling tunnel.

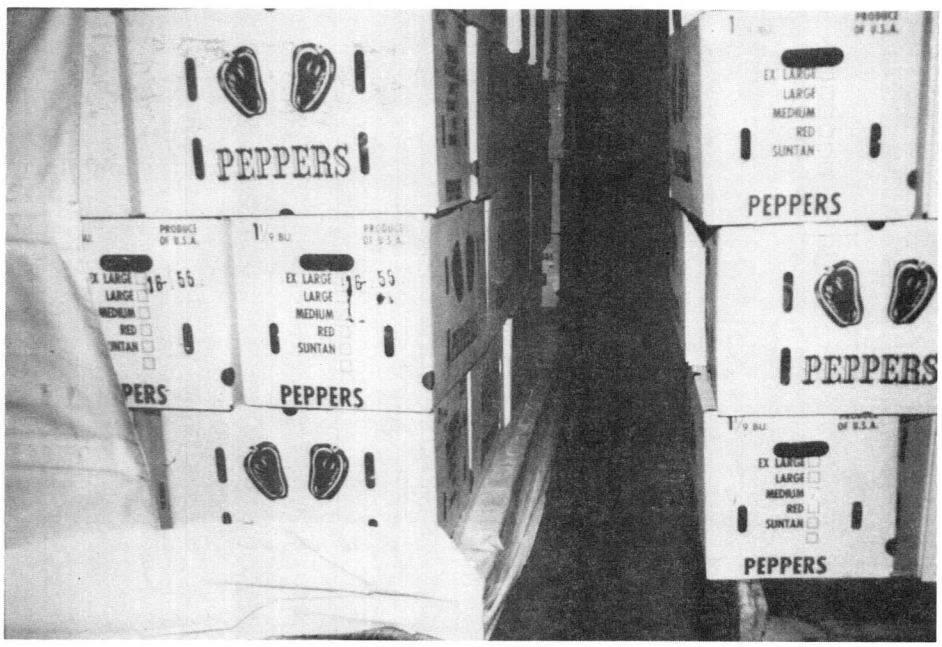

Figure 6. Plastic used to seal the pallet opening in the row of pallets on the left.

Recent research on forced-air cooling of peppers [9] has shown that the air bypass of the openings beneath pallets can be blocked with plastic (Figures 4 and 5), significantly reducing cooling time. This study also clearly illustrates that a large volume of cooling air can pass through seemingly small gaps between adjacent pallets of a product.

Flexible materials such as plastic, canvas or foam rubber should be used to seal openings that allow cooling air to bypass containers (Figure 6). This material should be placed such that the fan suction seals the undesirable openings. Plywood is used in some strawberry and other forced-air cooling operations for blocking large, open areas, and is not effective in reducing bypassed air. In the above-mentioned study [9], sealing pallet openings with plastic was successful in blocking air bypasses while lumber placed against the sides of the pallets was not effective. Apparently the rigid structure of the wood could not properly seal the openings in the pallets. Lumber and plywood are not effective unless duct tape or plastic seals the spaces between the wood and containers or plenums. Boards can be effective if 5 cm (2 in) of polyurethane foam is glued to the side of the boards placed against the pallets.

A simple idea for sealing pallets is to attach purchased or salvaged plastic or scrap corrugated paper to cover the top of the pallet and the pallet side openings not normally used for the forklift blades. This can be accomplished inexpensively by in-house personnel using staplers or tape.

The more resistance through the product, the more important it is to seal leakage areas. Therefore, reducing the resistance through the product (e.g. increasing carton face-vent area) can reduce the significance of air leakage or bypass.

Carton face-vent area

For forced-air cooling the recommendation for minimum carton vent opening is 5% of the container surface facing the airflow [2, 6, 9]. Many Florida packinghouses should increase the openings of the carton vents to achieve this recommended value, which reduces the resistance to airflow through the cartons (Figure 7). A few larger holes produce less resistance than several smaller holes of the same total area.

The percent of vent openings of a particular carton surface or face can be calculated by determining the ratio of the vent openings of a particular surface to the total area of that surface (Figures 8 and 9). Only the surfaces perpendicular to the air flow should be considered. To determine the percent vent opening for a container surface, the area of each vent should be calculated using basic geometric equations and the area of all vents added. Most