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MAINTAINING APPLE QUALITY

Assurance that apples are as good as or better than the day they were picked is the best recommendation you can make to a consumer. Fortunately, techniques for maintaining tree-ripe freshness are available. These techniques start with picking the apples at the right state of maturity. Following harvest, they must be cooled immediately and then held in storage at a low temperature. Low temperatures slow down ripening processes that make the apples ripe or over ripe.

Assuming that apples are picked at optimum maturity for good condition in storage, ideal handling and storage conditions hold these ripening processes almost at a standstill and retain the tree-ripe freshness for six months or more. Any conditions in the handling or storage that are less than the best result in apples of poor quality. To maintain good quality and extend the storage life of apples, it is necessary to follow the four steps outlined below.

The First Step

The first important step is to remove the field heat as soon as possible. This normally means moving the fruit from the orchard into the cold storage the same day it is picked or the morning of the following day. Apple ripening rate about doubles with each 10 degree rise in temperature. One day at 70° shortens the storage life (advances ripening) as much as ten days at 30°.

Pre-cooling fruit before moving it into the regular cold storage or before packing helps to maintain quality and to extend the storage life. Packed apples compared with loose apples require up to three times as long to cool. The core temperature of pre-cooled apples approximates that of the surrounding air much sooner than does that of non pre-cooled apples.

One method of pre-cooling consists of placing the fruit in a cold storage room in which the cold air moves with high velocity. Tests have shown that air passed over loose apples at a velocity of 300 to 800 feet per minute increased the cooling rate four to eight times over that in a regular cold storage room. Such pre-cooling can be performed in regular cold storage units or in a special room built for this purpose.

Pre-cooling can also be done in a hydrocooler. Hydrocoolers are used extensively to pre-cool many perishable vegetables and soft fruits. Apples with a field temperature of 60° placed in 32 degree to 34 degree water for 45 to 50 min. cools to a core temperature of 38° to 40°. When the time of treatment is limited to 15 min. the temperature still cools to about 45°.

* Information herein is taken in part from research work done at the U. S. Department of Agriculture at Wenatchee, Washington.

The Second Step

The second step in good storage is to maintain a supply of air in the storage room as cold as possible without freezing the fruit. Apples freeze at approximately 28.5°. The best you can hope to do with air of this temperature is to maintain a storage temperature of 30°. Under ideal conditions there still is a difference between air temperature and fruit temperature in cold storage. This variation can be controlled to a large extent by air circulation and air distribution within the room. A check of the difference in temperature between warm and cold spots within the cold storage room may show that the coldest areas have a temperature of 30° and the warmest areas several degrees higher. This check might show an average of 34° for the cold storage. This is not good enough.

Lowering the temperature of the fruit from 32° to 30° increases storage life 25%. With rapid removal of field heat (pre-cooling) followed by good air distribution in the cold storage room, there should be not more than one degree difference in the fruit temperature as compared to the air temperature in the cold storage room.

The Third Step

The third step in good storage is to insure good air circulation in the cold storage room. Apples packed in wooden boxes and stacked in single stacks cool in about half the time required by apples in wooden boxes and stacked in solid stacks on pallets. The difference is even greater with cartons. Adequate air circulation around the container is essential. Flat sides of cartons permit stacking close together. This close stacking eliminates air circulation around the individual cartons. Air circulation must be provided for this type of container on pallets. Providing a minimum of 3/4" spaces between the first and second and between the third and fourth stacks on the pallets allows air circulation between stacks and speeds the cooling of the apples. These spaces can be provided by using upright 1" x 4" boards in the stack on the pallet. This gives additional support in highstacking also. Preliminary tests with chimney stacking and also venting the fibre board cartons with air holes has not proven to be as good as providing the air spaces between the cartons for air circulation.

The Fourth Step

The fourth step is to provide adequate humidity in the cold storage room. Insufficient humidity results in considerable fruit shrinkage. It is a simple matter to check the humidity by the use of a wet and dry bulb thermometer. The humidity should never go below 85%. Maintaining proper humidity is more difficult at the start of the season as the fruit is brought into the cold storage rooms the frequently opened doors allows moist air to escape.

Many apples are now being stored loose in bulk bins. Air circulation around the fruit in these containers is highly important. At least 10% of the surface of the bin should be left open for air circulation. This can be either on the bottom or on the sides close to the bottom of the bins. Bins should be stacked uniformly in rows parallel with the air flow, leaving at least 6 inches of free air space around the wall of the cold storage plant and at least 5 inches between

the rows of stacks of bins. It is necessary to take into account the added refrigeration load needed due to the increase of volume of fruit in the cold storage rooms when bins are used. This increase is often 20% in the volume of fruit.