

## **PACKINGHOUSE PRIMER: MATURITY, STORAGE AND HANDLING OF WASHINGTON APPLES**

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The following information is provided as a primer on harvest and postharvest practices followed by Washington State apple packers. Obviously, these management practices are viewed differently by individuals and are modified as they see fit. These are my observations on postharvest practices.

### **HARVEST MATURITY**

The Washington apple industry is oriented to marketing apples on a year-round basis and growers recognize the importance of harvesting fruit at the correct time to provide apples of premium quality. Growers, horticulturists, researchers and extension personnel work together in monitoring the progress of apple maturity in the orchards. Each grower consults with a horticulturist to decide when to harvest each orchard and how long the fruit in that orchard is capable of being stored.

### **FRUIT STORAGE**

The vast majority of apples are stored prior to being sorted and packed. Storage time may vary from 1 day to 11+ months, depending upon the quality of the fruit and the marketing program of the warehouse.

Once picking commences in each orchard, trucks bring the apples to the storage facility. Some storage operators employ quality control specialists who check the maturity and quality of the fruit as it is being received and make last minute modifications in the length of storage.

Storage may either be in refrigerated (regular) storage or in controlled atmosphere (CA) storage. Apples are stored at temperatures from 0 to 2 °C depending upon the variety. Apples in CA are stored in carefully controlled airtight rooms at 0.7 to 2.5% oxygen and 0.03 to 4.0% carbon dioxide. The specific atmosphere depends on the variety and the capability of the storage facility and whether any foreign government requirement is being followed. While in storage, apples are usually removed at regular intervals and inspected for changes in quality.

### **PACKING**

Apples are packed using one of two types of systems. The “direct pack” system takes from the bin and in one operation sorts, sizes and packs the fruit into shipping boxes. The “presize system” does the same, but in two separate steps. Apples are floated out of the bin, sorted and

sized and then placed back into bins for packing at a later time. The presize system allows a greater volume of fruit to be run.

In a typical **presize operation** the follow steps occur:

1. Apples are removed from the bin, usually by submersion of the full bin under water. Apples are floated out of the bin and transported in a water stream to a small fruit eliminator.
2. Small apples are removed from the stream by passing all fruit over a chain that allows the smaller fruit to fall through and are conveyed into a cull bin.
3. The remaining fruit are rinsed and then pass onto a sorting table.
4. At the sorting table trained personnel inspect each apple, and any apple that is misshapen, has insect or disease marks or is out of grade is removed.
5. Apples then move back into water in single-file columns.
6. Fruit then pass through an electronic eye that sorts apples by color, size and weight.
7. As each apple is being electronically scanned it is also being placed in an individual cup or holder. The computer commands that cup to drop that apple into a specific water flume that conveys only apples of that same quality and size.
8. Once a sufficient number of fruit accumulate in a flume they are conveyed underwater into a clean bin.
9. At this point each bin contains only apples of the same size, quality and grade. The bin may go back into regular storage or be packed. Usually apples are held for only a couple of weeks prior to being packed.
10. When fruit is to be packed, the bin is taken from cold storage and submerged. The apples float out of the bin and are conveyed to risers that elevate the fruit out of the water.
11. The fruit are conveyed over revolving brushes and pass under fresh rinse water.
12. Soap or detergent is applied and brushed onto the fruit.
13. The fruit is again rinsed.
14. The fruit pass over sponge rollers and then under fans to remove the water.
15. Apple wax may be applied at this point.
16. Fruit may go through a hot air dryer.
17. Labels or stickers may be applied to the fruit at this point.
18. Trained personnel reinspect the fruit for defects or out of grade product.
19. Fruit is placed onto trays automatically or by hand.
20. Trays are placed into boxes, top pads applied and the box is weighed.

21. In-house quality control and state/federal inspectors may examine the fruit at this time.
22. The boxes are palletized and placed into cold storage to be cooled and held for shipment.

The **direct pack** system accomplishes the same sorting and packing operation in one step without having fruit go back into bins. In a direct pack system, many sizes and grades are packed at the same time; in a presize system only one grade and size is being packed.