



Decrease Operating Costs with Water Recycling by David Wensloff, PE

Compliments to the growing competition from NAFTA, tighter environmental regulations, and increasing demand for higher quality finished products, the profits for Fresh Cut Food processors has decreased over the years. Profits can be as low as a few cents per pound of finished product. Plant managers and engineers are scrambling to find methods of decreasing the processing operating costs and still maintain the level of quality higher than ever before.

There is a growing trend to save money by decreasing the amount of water coming into a plant as well as leaving, water recycling and conservation. Simply, if a plant can decrease the amount of process water entering the plant thereby decreasing the amount of water leaving the plant, there is a double savings on the operating costs. In addition, if a plant utilizes this technology prior to starting production, then the water supply system can be smaller, the hookup fee to a municipal wastewater treatment facility would be less, or the cost and size of the equipment to treat the wastewater can be reduced, saving capital expenses. Once in production, there is a daily savings in operational costs. The topics of water reuse is very diverse and case dependent, but the general trends and technologies as well as their impacts to the 'Fresh Cut Food' processor will be discussed.

As a first step to water conservation, documenting the present water usage is a first step to determine the existing flows as well as a means to quantify the financial payback of a water recycle system. On the otherhand, if a plant is at its peak for freshwater usage, or the water demand exceeds the fresh water supply, then it is easier to justify a water reuse system. Once the flows are determined, the costs can be associated for both the water supplied to the process (\$/gallon) as well as the cost to dispose of the 'used' water (\$/gallon). The flow data also is used to size the water recycle system and a capital cost can be determined.

When looking at water recycle, it is important to realize that the reuse water quality is decreasing due to the increased solids (TSS) and biological material (BOD). Therefore, if at all possible, use the freshwater for sanitizing and the used sanitized/washwater for the first stage wash. In other words, use the cleanest water upstream in the cleaner stages of the product where a free chlorine residual is required and use the dirtier water (low chlorine residual with final rinse particulate) at the start of the process. Remember as the washwater

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becomes dirtier, there is an increase in chlorine demand due to the increased biological and bacterial activity so additional chlorine might be required.

Typically, 'Fresh Cut Food' processors have an initial wash step at the front end of the process that can use as much as 50% of the total water used by the plant. These vary from simple flume systems which wash as well as convey the product to rotary washers, scrubbers, first stage peelers, etc. This first step is fairly easy to implement a water recycle system by installing a loop in the water makeup and washwater drains. The characteristics of the washwater with the contaminants need to be analyzed for the best separation technique, but experience has shown that the wash stage removes residual dirt and particulate that tends to want to settle. Therefore, a clarifier works well with the washwater being pumped from the washer to the clarifier for separation and the return water pumped from the clarifier back to the washer. Valving controls the blowdown as well as the blowdown of the settled solids to maintain a level of washwater quality and a simple ball float controls the fresh water makeup.

In one example, a traditional wash system uses a total of 200 gpm to wash and provide a final rinse. With a water reuse system, the same washing is performed with a total flow of 100 gpm. The water saved over a two shift day equates to 96,000 gallons per day.

After a water reuse system, the final rinse is a critical step for quality control of the finished product. In water reuse systems, maintaining a chlorine residual, low bacterial counts, and minimizing plant water usage are more difficult than traditional once through water use systems. The controlling factor is the quality of the finished product for chlorine residual, taste, color, etc. When a water reuse system is used, it is important to have the QA/QC staff monitor the bacterial counts versus chlorine residual versus freshwater makeup to the water reuse system. For example, a water reuse system is operated with a free chlorine residual of 2 ppm, the freshwater makeup is 10 gpm, and the washed product loading is 5,000 pounds per hour. It is determined that the bacterial count is close to exceeding the quality standard of the finished product. With data from the QA/QC staff, an operator will know the steps to take by either increasing the chlorine residual level, increasing the makeup water, removing more solids, or increasing the final rinse water/chlorine level. With accurate measurements, it can easily be determined the best operation for chlorine residual, water blowdown, and solids removal. Proper operation of a water reuse system requires a coordinated effort between the plant staff.

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The final rinse is critical in a water reuse system. The final spray needs to remove any residual dirt or particulate as well as add some free chlorine to keep biological growth to a minimum. A water reuse system allows an increased flow from the final sprays with a minimal impact to the overall water use of the process. It needs to be noted that when more chlorine is added to water, it raises the pH. As the pH increases, the free chlorine quickly converts to total chlorine with a lower kill factor for bacteria. Therefore, it is advised to install a pH or ORP controller to add acid (usually citric acid) to the water to keep the chlorine in the 'free' and not 'total' state.

A water reuse system will save operating costs. It is important to perform a thorough investigation and evaluation to determine the best water reuse system for each application.