



Preliminary Observations and Recommendations for Implementation of Postharvest Best Practices

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1. Executive Summary

An introductory visit was paid to XXX and included the central warehouse / distribution center and the packing facility operated and managed by XXX and the two satellite facilities owned and managed by XXX.

This visit had two main objectives: (1) Assessing the opportunity and the scope of technical support needed to implement Postharvest Best Practices ('PBP') as a means to support XXX's declared growth targets (2) Identifying 'low hanging fruit' i.e., operations improvement that requires minimal to no capital expenditure and has a potential to support future comprehensive PBP goals. This visit was intended to illustrate how the "Discovery Process" proposed by PHH would and does work.

Overall the current operating practices that were observed during the 36 hours spent in XXX, both in the fields, packing facilities and warehouse clearly indicate that there are significant opportunities for improvement. It should be noted that based on work conducted to date if a majority of improvement opportunities are ignored it is our opinion that not only can growth targets be seriously compromised, but the XXX brand could suffer from exposure to food safety breaches, related liability and customer satisfaction can suffer.

The following report represent recommendations mostly comprised of what we refer to as "low hanging fruit", meaning corrective actions relating to a number of critical processes can be achieved without capital expense.

This report can and should be translated into detailed action plan should XXX wish to engage Post Harvest Hub for ongoing work. A broader operational analysis is required in order to achieve PBP, and make them it franchise-able.



2. Brief description of the Process from harvest to cold storage

- 1) Produce is harvested in the field and placed into round buckets weighing 20-30 lbs.
- 2) Buckets are loaded on a flat platform or dumped into large plastic bins that are situated on a platform.
- 3) It takes a minimum of three hours from the time that picking is started until the full platform is delivered to the packing shed. During the entire time the produce is exposed to direct sunlight resulting in dehydration and heat buildup, thus ultimate freshness is compromised.
- 4) Upon arrival at the packing shed, the bins are piled and await processing on the washing /sorting/ packing line. At that time the produce is likely kept under roof, however the duration of the time until it is processed is not monitored and produce may be left over night before it is processed, packed and cooled resulting in further comprised shelf life.
- 5) There is no precooling of any type employed therefore variable time periods take place after the harvest before packaged product is placed inside the cold room to be cooled using a forced air cooling system.

Fig 1: Produce hulling platforms





Recommendation

Cut to Cool time should be monitored and goal should be set for this to be minimized.

While in the field, the produce that is on the platform should be covered with reflective shade net, XX or equivalent, to protect the produce from direct sun light.

3. Produce must be processed within limited time after it's been picked and should never be left overnight in the bins of buckets.



3. Cold storage and warehouse management

The operation in general is in complete disarray. Raw product, culls, waste, packaging materials, packaged product are all mixed together leading to substantial damage to product, extensive waste, suboptimal productivity rates and substantial liability risk.

Repacking is done for two reasons (1) specific pack style requested by customer (2) sorting out unmarketable fruit in cases where produce condition was compromised while staying in the cold room. The later takes place on a daily basis. The root cause of both reasons can be identified and corrected.

Inside the cold room there are stacks of partial pallets, open cartons, damaged boxes and broken pallets. Produce was found with pack dates ranging from June 2nd to June 25th aside from old produce dated from a previous season (corn and cabbage).

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Fig 2: Inside the cold room



Recommendations

1. Warehouse:

- a. Designated area should be assigned for packaging materials.
- b. Itemized signs should put in place indicating specific slot for each type of packaging.
- Inventory management protocol needs to be developed and strictly adhered to. C.



- 2. Cold Storage:
 - a. Cold storage should be cleaned daily.
 - b. There should be no waste found inside the cold room.
 - c. Designated person(s) should be assigned to conduct daily rotations, maintaining FIFO protocol.
 - d. Avoid opening of cartons and splitting pallets (partial pallet should be pushed by Salesforce to customer to minimize shrinkage).

4. Cartons used and palletizing

The range of cartons used can be rationalized between grower label, XXX's label and the various pack styles.

Cartons all are hand assembled and have rough bottoms with the lock-tabs sticking out damaging the delicate skin of the produce (mainly squash, eggplants and cucumbers).

At XXX there is a machine, provided by Georgia Pacific that erects the cartons using hot melt glue, yet the carton design is of hand assembled style.

Cross-lock stacking pattern is commonly used and many pallets found leaning and cartons bulged and collapsed.

Cartons are held together on the pallet using tape with no corner boards. This procedure that seems to be picked for time and material saving, completely disregarding the image and its effect on the brand as well as the condition of the produce within the cartons.

Fig 3: Cartons, stacking pattern and pallet strapping

Fig 3a: locking tabs sticks in on the bottom of the carton, hurting the delicate skin of the squash, eggplants and cucumbers.





Fig 3b: Cross-lock stacking pattern, pallets leaning and cartons bulges out and collapse.



Fig 3c: Adhesive tape pallet strapping creates poor image.



<u>Recommendation</u>

- 1. A branded pallet of produce should be perfectly aligned, strapped and solid. This configuration also assure that the produce within is properly supported so that mechanical damage (compression) is avoided.
- 2. Since carton strength is at the corners and therefore there is no other proper option than column stacking or else the carton will, sooner or later, collapse. The carton foot print should be designed so that it is optimal for the pack style sold and utilize the entire area of the pallet. Ideal layouts support 6, 8 and 10 down, symmetric stacking pattern.
- 3. Carton strength should be defined with the carton suppliers based on the load (weight, distance, transportation method and storage conditions) it is subjected to. The carton supplier should be



required to provide adequate quality control measures of the cartons provided including compression texts under specified RH conditions. Inputs for the packaging company to use when working the carton specifications must be provided by XXX in order for the brand to be adequately protected and presented.

- 4. Palletizing patterns should be decided upon and adhered to, including the use of corner boards on all pallets and pallet straps instead of adhesive tape. The position of the straps should be specified and followed.
- 5. For the produce items marketed by XXX the most suitable carton would have a smooth flat bottom. Ideally this would be machine erected cartons for efficiency and alterngth purposes.

5. Labor

Inefficiencies were identified in the entire operation and in particular around the washing and packing line. Bottle necks are created and produce is compromised yet it seems that there is no one maneuvering people around to alleviate pressure and remove the bottle necks which were observed.

It was indicated by XXX, the packing operation manager, that labor is at scarce and quite often people do not show up for work and that labor turnover is fairly high.

Other than the people that are picking produce out in the field, which are paid a 'bucket fee', all other people are paid hourly rated which meet minimum wage requirements.

It would appear that little thought is paid to the working environment in general and to the working station of each employee in particular. Therefore workers might be subject to interruptions by gnats and working productivity is compromised for lack of ergonomic arrangement of the working station.

Recommendations

Labor is critically important in this industry which is labor intensive. It is desirable that labor attrition and turnover is intensive. So that labor could develops proficiency and consequently productivity rate is improved.

- Professional attention is needed for each worker at his/her working station. The implementation of ergonomic design of the working station is achieved so that movements are minimized in order to complete a given task. Doing so is not a luxury but a method to immediately improve throughput.
- Removal of distractions and creation of friendly working environment (gnats free, air-condition, music...) would be beneficial too.
- 3. The compensation plan should be thought through so to reverse the prevailing process where XXX continuously is seeking for workers and have XXX in a position to select the best workers out of those applying for work. Such a plan could include (open list):
 - a. Productivity incentives.
 - b. Continuity incentive paid to dedicated employees that show up for work, on time, day after day, for the duration of the season or defined % of the season.
 - c. Picking pay should be adjusted to assure 'hourly rate' that is based on the individual employee productivity, independent of the produce picked. This should also allow for increased picking standards such as clipping of bell peppers.



6. Food Safety

Lack of food safety practices present major concerns as it exposes the company, brand and officers to substantial liability risk. The food safety practices observed at the central packing house and cold storage offer significant opportunity for improvement, the following list covers just a bit of the picture:

- There is no policy enforced regarding the use of hair nets, aprons and gloves.
- Light bulbs are not protected.
- Soap dispenser at the washing station is beyond reach.
- Food items are found in the working area.
- Waste and culls that is decayed remains in the premises.
- There is no sanitation of any kind applied to the produce processed at the central packing shed.
- At XXX the washing station is very good and set example for how washing station should look like.
- Except for one line at XXX where Chlorine and acid administered automatically and ORP (Oxidation Reduction Potential) is automatically monitored, water chemistry is not checked in any other place.

Fig 4: Food safety issues

Fig 4a: Decay, rotten produce and organic matter remains on the washing/packing lines (left) and food/drink packaging alongside fruit and waste is all over the floor.



Fig 4b: Light bulbs are not protected.



Fig 4c: No hair net, apron and gloves policy is enforced.





Fig 4e: Washing station at XXX (left) should be used as an example for good installation. Soap and paper dispensers are beyond reach at the central packing shed (right).



Recommendations

1. Food safety protocol should be installed and enforced. Ideally Global G.A.P and HACCP accreditations are ackleved.

2. The entire facility should be sanitized daily. Dedicated labor and time should be made available for that. No culls and produce waste should remain at the premises and the surrounding area.

Eating, drinking, smoking and chewing gums is prohibited except for designated areas.

Adequate constation optocol for the produce and washing water should be installed using supporting technologies as headed. Common sanitizers that could be used are:

- a. XXX, 60-800pm. Supplied by XXXX
- b. Stabilized applied chlorine tablets / powder. XXXX supplied by XXXX
- c. Chlorine r Acid by various suppliers. The chlorine concentration used for disinfecting purposes needs to be increased to 100-150 ppm and the pH reduced and maintained at pH 6.0-6.5 for efficient sanitation. As shown in Chart 1 below, an increase of the pH above 7 results in significant decrease in the amount of the effective Chlorine acting form (HOCI). In order to achieve it Citric Acid, Phosphoric acid or Hydrochloric (HCI) is commonly used. It is important to always have the pre wash tub maintained with ORP which is higher than 650mV.





Chart 1: Influence of pH on the proportions of the active chlorine (HOCI) in water

- d. It is recommended that ORP meters as well as pH meter are purchased and that water chemistry is checked once an hour, data is recorded and corrective actions are taken when necessary. It is better yet to have an automatic system that administer the sanitizers and maintain the recommended working dosage automatically.
 e. Recommended QC devices: ORN probe for example 'pH and ORP tester combo
 - (http://www.hamaunst.com/products/prodline/newProd.cfm?ProdCode=HI%2098121)



7. Green bell pepper handling

When bell pepper is pulled off the plant using current practice it results in severe injury to the calyx. There were peppers with the calyx completely removed all the way to the sepals, others were broken in half and yet others where the calyx is intact to the knuckle and beyond. Unfortunately, this is a common practice.

Another common practice is to overload the cartons thus when stacked on one another a pressure is applied to the fruit causing bruising which later manifest itself throughout the supply chain creating waste and loss of sales, rejections or price adjustments. .

At XXX, the bell pepper line was not designed to minimize bruising which results in dropping fruit in several places along the line and in particular where the bins are dumped. The drop is very high and damage to the fruit is unavoidable.

Fig 5: Green bell pepper handling issues

Fig 5a: various calyx cut. Ripping the calyx off (right) or breaking the calyx (left) leaving severely injured tissue that is likely to develop decay over time.





Fruit bruising, result of rough handling and overloading of cartons.



Fig 5c: Overly loaded cartons.



Fig 5d: Ample organic material is compacted on the sorting line (left) and a lot of fruit is falling on the floor (right).





Fig 5e: Bell pepper sorting line deficiencies: (1,2) High drop at the loading station; (3) high drop between elevator and washing cell; (4) rusted rough divider entering the washing cell; (5) rough un-padded surface exiting the washing cell; (6) divider that is prone to cause congestion. Suggested improvement to allow uninterrupted flow is demonstrated.



Recommendations

Given that XXX would like to become a leader in the supply of green bell pepper, specific definition of the product characteristics and qualities to be marketed is required. Consistency is critical for the branding to be successful and for that purpose every part of the process, from cutting the stem to grading, pack style and carton identification is needed to be attended to.



- 1. Whatever the specification is established, the stem must be cut using sharp clippers that are routinely sanitized. This is to minimize the size of the wound and avoid contamination and decay.
- 2. The bell peppers lines should be looked at and the following should be fixed:
 - a. Sharp objects and rough surfaces that might bruise the product.
 - b. High drops should be leveled (metal work) so that there is no drop that is higher than 4". These should be than padded using soft and washable material.
 - c. Access organic material (leaves and stems) should be left in the field and not be brought to the packing line. Those that still make it to the line should be removed constantly.
 - d. Traps where the peppers get caught and accumulate or loopholes where peppers are thrown off the line should be fixed.

8. Rinsing and Drying process

The produce is currently washed using fine sprayers positioned relatively high above the roller brushed or rolls over which the produce is conveyed on. The type of sprayers used can only wet the product but the amount of water administered is not enough to wash it. As a result when fruit exits the washing cell the fruit still carries residues of organic material and debris.

Form the washing station the produce is conveyed onto the sorting line where it is sorted and later on packed. In the case of eggplant and soon with bell peppers too, each fruit is labeled.

Since no adequate water removal system is installed labor is employed to wipe off the excess water creating bottle neck. Moreover, the fruit remains wet and the stickers often rub off and attach themselves to the conveyor belt.

The bell pepper washing chamber is open top and spray of chlorinated water spread out of the chamber causing eye and throat irritation to the worker at the sorting station nearby.

Fig 6: Inadequate rinsing method that's leaves behind considerable residue (spray misters (right) and fine jets (left).





Fig 7: Wet eggplants is packed into the cartons. Having the fruit packed soaked wet compromised the carton compression resistance.



Fig 8: Chlorinated water spray spread out of the open-top washing chamber.

Recommendations

washable, interlock belt should be annexed between the washing station exit conveyor and conveyor belt of the ning line. This would allow excess water to drain as the wet product is rated from the tub and rinsed.

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to pursue the option of buying and installing high-capacity, high-airflow, air knifes. This type of air knite should be installed between the water tub and the sorting line so that all excess water will be removed having little to no moisture layer on the fruit's skin. Typical cost per unit can run approximately \$800, Such air-knife could be sourced from XXXX



9. Pallets

Two types of pallets are used, XXX and wood pallets. While the XXX pallets are produced to spec there is no spec for the wooden pallet and therefore a variety of quality and shapes of pallets could be found. When walking across the cold storage and packing area a lot of broken pallets and poorly constructed pallets were found. The use of the low quality pallet negatively affects the presentation of the unit sold and compromises the quality of the produce within. Pallets that were not built to proper specification presents potential liability for XXX upon arrival at the consumer's location. Sloppy presentation of the units sold calls for closer QC inspection by the receiver risking higher claim and rejection rate for XXX.

Fig 9: Broken wooden pallet and weak wooden pallet compromise the quality of the produce packed and jeopardize the brand.



Recommendations

Whenever pessible invoduce the use of XXX While the pallets are excellent for presentation, sautation doublity etc., a close attention is needed to manage inventory and avoid losing pallets or shipping it out of XXX network or else the monetary consequences could be high.
 A specification for wooden pallets needs to be developed based on fit for use and taking into account receiver needs. A letter of compliance should be provided by each supplier. While materials may vary between countries, the performance of the pallet must be assured. Pallets that do not meet specification would not be used and returned to the supplier. Any compromise should be viewed as a threat to XXX branding effort.



10.Safety

Safety hazard observed with the roller (skate) racks used, inside the cold room, where the pallets on the upper racks tend to slide out of the racks. Broken wood bar is used as a 'stopper' to prevent pallet sliding off of the racks.



Fig 10: Broken wood is used as a 'stopper' on the upper racks.

Recommendations

'L' bar should be installed across the upper racks as a 'stopper' to prevent pellets from sliding off. Install the 'L' bar so that it reaches up to 1x4-1/3 of the void at the bottom part of the pallet to allow for easy access to forklift.



11. Forklift and pallet jacks

Maneuvering of pallets around is done using forklifts which is cumbersome and increase the risk for accidents and damage in areas that are as dense as they are in this particular distribution center. Moreover, the forklift at Moore farm is gas operated, emitting Ethylene that compromises the condition of the cucumbers and grape tomatoes that are packed in this facility.



Fig 11: Gas operated forklift should not be used in fresh produce operations.



Recommendations

Maneuvering equipment should be electrically

It is suggested to consider replacing the forklifts with electric pallet aches, leaving 1-2 forklift to work inside the cold room on inventory rotation.

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