Citrus Packhouse

Module 7:
Packing Practices

Learner Guide

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Introduction

We have reached the stage of the packhouse process where the fruit has been prepared for packing, and grouped together according to size and grade, or class. The next step is to pack the fruit into the right carton, in the correct packing pattern, and with or without labels and wrappers, depending on what the market wants. After this, the carton must be labelled with the correct details, weighed and recorded on the system, and then stacked on a pallet with cartons containing fruit of the same grade and size, packed in the same way in the same cartons, and destined for the same market.

Before we look at how to do these things, we need to learn more about packing material and about packing instructions.

Packing Material

Packing Cartons

The first and most important packing material is the packing carton. Cartons come in many sizes, configurations and colours, but there are only two main kinds of cartons, namely telescopic and open-top display cartons. Before we look at these two kinds, note that carton types are coded, and are generally referred to by this code. The number in the code, such as the 15 in A15C, is the weight of the fruit the carton is designed to carry.

Telescopic cartons consist of two parts, being an inner, into which the fruit is packed, and an outer, or lid, which it is placed over the fruit when the carton is full. The outer is usually printed with branding information. The A15C telescopic carton, at 400x300x270mm, is the most commonly-used carton for export citrus. But apart from the A15C, there are actually not many other telescopic carton sizes that are used. The others for which there are specifications are the A07C at 400x300x150mm, the D15C at 600x400x160mm, the E15C at 600x400x170mm, and the G15C at 600x400x215mm.

Open-top display cartons do not have lids, and they are ready to be packed on shelves in stores without having to be re-packed. Open-top cartons come in a much greater variety of sizes and configurations than telescopic cartons. Fruit is usually packed in one, two or three layers in the carton. These are the open-top display cartons that are used for export citrus.

Both carton types have ventilation holes. The configuration, or pattern, of these holes are the result of thorough research around the flow of air through stacked pallets. In the module dealing with logistics, we discuss in detail the cold chain and its critical role in the success of citrus exports. For now, it is important to note that when pallets of fruit are being stored or transported under refrigeration, cold air is forced through the pallets vertically and horizontally. The ventilation holes in cartons enable cold air to flow into and through the fruit inside cartons to cool them. The holes are designed to line up when cartons are stacked on pallets. This airflow is critical to maintaining fruit quality and shelf-life. The configuration that is now used for almost all A15C telescopic cartons is reasonably new. Cartons with this configuration are called super-vent cartons, and this configuration is highly recommended.

Cartons are manufactured from corrugated board according to strict specifications. The corrugated board is either in three layers, being liner-fluting-liner, or five layers, being

liner-fluting-liner-fluting-liner. Board with five layers is stronger, and is used for the inners of telescopic cartons, and for open-top display cartons.

Cartons used for export citrus cannot be manufactured from recycled paper. When paper is recycled, the fibres that make up the paper get shorter every time it is recycled, weakening the paper. Virgin paper still has long fibres, making the paper stable and strong. Cartons are exposed to cold, heat, moisture, and pressure on its way to the overseas market, and they have to be as strong as possible to withstand this exposure. It is also important that the paper used for the fluting and liner is of the right thickness, or weight, expressed in grams per square metre. If the paper is too thin, the cardboard will also not be strong enough.

Cartons are printed with special designs, usually reflecting the branding under which the fruit is being exported, but sometimes just in plain colours. The ink that is used is water-based and environmentally-friendly, so that all cartons are recyclable and biodegradable. At the same time, the cartons are cut into a particular configuration and the ventilation holes are punched through. The cartons are also scored to make them easy to fold.

Cartons are delivered to packhouses in flat packs. They are erected by special machines. One type of machine is used for making telescopic cartons, and another for open-top cartons. The most modern machines can be set to make different types of open-top cartons, some of which have double-sided ends, and others with fold-overs.

Bulk Bins

Bulk bins are large cartons which are used for exporting processing fruit. They are usually not printed, and are also delivered to the packhouse in flat packs. They are erected at the packhouse using strapping, and special corner pieces to strengthen them for stacking. Bulk bins are stacked two high on pallets.

Fruit Labels (PLUs)

Fruit labels, also called PLUs, which stands for price look-up codes, are attached to fruit and reflect the brand of the fruit. Sometimes they also display the PLU code for the fruit, hence this common name for them. The PLU code is a four- or five-digit code that is used for fresh produce, to identify the product by commodity, variety and size group.

Fruit Wrappers

Fruit wrappers are used to wrap some of the fruit in a carton, according to the requirements of the market. Fruit wrappers are made from thin tissue paper, and can be plain or printed with product branding. The paper usually has a thin waxy layer and feels slightly slippery to the touch. This makes the paper easier to handle while wrapping and helps to protect the fruit when it is packed. The wrappers are already cut to size and one wrapper per fruit is used. It is common practice now to only wrap some rows, often diagonally, in the top layer of fruit in the carton, because wrapping is detrimental to the cooling process during shipping.

Pallets

Pallets are critical to the security and safety of export products. Pallets take a lot of abuse – every time the fruit has to be moved, the pallet is lifted with a forklift or some other piece of machinery, which means they can easily be damaged. If the pallet is not

properly constructed using, for example, inferior wood or nails that are not large enough, it can easily break, compromising all the cartons on the pallet.

The wood used for pallets has to be treated to protect it against pests and fungal growth. If this is not properly done, the pallet will be weakened by infestations of this nature. The pallet itself can even become a source of contamination.

Pallets must also be constructed according to the correct design. For citrus exports, what is known as the 1210x1010mm pallet for export citrus, or more informally as the CRI pallet, has been designed and tested to be the strongest and most stable configuration of slats for transporting citrus cartons. Pallets that are not made according to the CRI design often have the slats in the wrong places, or are too thin, resulting in the bottom cartons falling off the slat edge, compromising the integrity of the whole stack.

All pallets must be constructed according to specifications, and it must carry the ISPM15 mark, which means that it complies with the requirements of the Guidelines for Regulating Wood Packaging Material in International Trade, which was issued by the International Plant Protection Convention (IPPC) Secretariat.

Securing Sheets

Securing sheets are used when palletising open-top display cartons. Securing sheets are placed between some layers of cartons, to keep the stacks of cartons from separating and falling off the pallet. Securing sheets also have ventilation holes in them. They are available in different configurations, to go with different open-top cartons. It is important that the right securing sheet is matched with the right carton, otherwise the ventilation holes will not line up and the airflow through the palletised fruit will be obstructed.

Pallet Caps

Pallet caps are used with open-top cartons to cover the top layer on the pallet, and to cover the top bulk bins used for processing fruit. It is made from cardboard, and folded before being put in place.

Corner Pieces

Corner pieces and strapping are used to secure the cartons on pallets, so that the cartons remain stable and do not topple off the pallet. Corner pieces are made from laminated cardboard and must comply to manufacturing specifications.

Packing Material Specifications

The cost of packing material constitutes the largest component of the total packing cost for a carton of export citrus, with the carton itself being the priciest component. Packing material also has to keep the fruit safe and healthy on its way to its destination.

On this journey, it will probably be transported by truck, handled and stored in a cold store or a fruit terminal – or both, loaded directly into the hold of a ship, or into a container and then onto a ship, transported across the sea, unloaded in the receiving port, and transported to its destination. The packing material will be exposed to cycles of cold, heat, moisture, humidity, friction, pressure, and repeated handling during this journey. It is critical that the

packing material must protect the fruit throughout this journey, and play its part in ensuring that the fruit arrives at the destination in the best possible condition.

Take the time to weigh up the cost of quality packing material against the cost of failure of inferior packing material – the cost of losing even one pallet of fruit can nullify the supposed savings on inferior, cheaper packing material. It is simply not worth taking the risk.

The CRI Postharvest Technical Forum issues the Packaging Material Specifications and Palletisation Protocols at the beginning of every year. The protocol sets out in great detail the specifications for all types of cartons used for citrus export, standards and specifications for pallet construction, palletisation protocols, and other information to assist the grower and the packhouse to verify that their packaging material manufacturers and suppliers are accredited and up to standard.

Additionally, the Postharvest Technical Forum also facilitates a self-regulatory accreditation system that has been established by carton manufacturers. This system involves printing a quality mark on cartons that comply with the specifications of the Forum. All cartons used for packing export citrus must have this mark.

Packing Instructions

Before we look at how to pack citrus into different types of cartons, we need to ask ourselves: How does a packer know what fruit to pack, which carton to use, whether to wrap the fruit, whether the fruit should be labelled, and what label to put on the carton? And, taking into account that every packer at every table is likely to be packing something different: How do the supervisors coordinate and manage it so that packers get what they need, and the fruit ends up in the right boxes, in the right place?

This information is all contained in packing instructions. A packing instruction is given to supervisors of different divisions in the packhouse for every run. It contains all the information needed to ensure that the fruit packed during the run will comply with the different market requirements. The supervisor in control of the automated grading system uses the packing instructions to set the tolerances on the grading system in line with the market requirements. The supervisor at the packing tables needs to communicate this information to the packers so that they are clear on their instructions. The quality control supervisor uses the packing instructions as the standard for inspections. The carton erection supervisor uses the packing instructions to make the right cartons and ensure that enough are available for the run.

Packing instructions differ from packhouse to packhouse, and will often contain codes and abbreviations unique to that packhouse. But the purpose remains the same for all packhouses, and we can safely say that packing instructions would contain the following information:

- Citrus type and cultivar
- Fruit grade and size
- Target market
- Country of destination
- Carton type
- Brand
- Fruit labelling
- Fruit wrapping

- Cartons per pallet

The packing instructions may also include the order number and the number of pallets ordered, so that the supervisors can plan ahead for the packing run.

These instructions can be communicated to packers in different ways. Some packhouses have visual boards with instructions to packers, while others use television screens that can be easily updated.

Fruit Labelling

If the market requires this, fruit can be labelled in the packhouse with branded labels that sometimes display the PLU code for that fruit. Fruit labels are usually put on the fruit by automatic labellers that are close to the automated grading system. Labelling banks are installed over the lines coming out of the grading system, and automatically put a label on a fruit if the automated grading system instructs it to do so. More than one labelling bank can be installed, for when fruit of different brands is packed.

Sometimes the buyer wants only the top layer of fruit to be labelled, and for the label to be placed in a particular spot on the fruit. In such cases the fruit has to be labelled by hand by the packer after they are done packing the carton. There are smaller labelling banks that can be installed with automated place packing machines to label fruit in this manner.

Packing Practices

Preparation

With each packer now aware of their packing instructions, and with fruit of the right quality and size heading their way from the automated grading system, the packer needs to gather all the materials and equipment they need. This includes fruit wrappers and labels, as required.

A few different systems are used to deliver cartons to packers in packhouses. The most common is the monorail. A monorail runs above head height but within reach of people at the packing tables, and it has hooks from which cartons are hanged. In the carton erection area, the rail is constantly replenished with all the carton types that are being used at any given time. The rail runs past all the packing tables, and packers remove the cartons they need, as and when they need them. Systems that are becoming more prevalent deliver the right cartons directly to packing tables, using either conveyor belts running under the tables, or chutes if the carton erection area is above the packing floor.

Packing Diagrams

There are two methods for packing fruit in cartons. By far the most prevalent is place packing, which is when fruit is placed according to packing diagrams into specific patterns, dependant on the carton type and the size of the fruit. A specific number of fruit is packed into the carton when this method is used. The second method is jumble packing, when fruit is simply jumbled into a carton until it reaches a certain weight.

It is important that all the packers know and adhere to the packing diagrams, to ensure that every carton of a specified type and size will be identical. Packing diagrams have been developed to find the most efficient way to fit the number of fruit in a specific size category into a carton. Let's look at two examples.

This is the packing pattern for count 72 oranges packed in an A15C telescopic carton. This information is in the header of the diagram. Below is the pattern that the fruit should be in. The number in the fruit at the top of each row is the number of fruit that should be in that row. The meaning of "4 layers (18)" is that four layers should be packed in the carton in this pattern, with eighteen fruit in each layer. Four multiplied by 18 gives us 72, the number of fruit that must be packed into the carton.

This is another example, of lemons of count 189 in an A15C carton. This is different, because the layers are not the same. The first layer will have seven rows, of five, four, five, four, five, four and five fruit, bringing the total fruit in the layer to 32. The second layer will again have seven rows, but this time with four, five, four, five, four, five, and four in the rows, bringing the total number of fruit in that layer to 31. The fruit in the second layer nestles into the gaps between the fruit in the first layer. We can see this alternating pattern from the text below the diagram, where we learn that we need to pack six layers like this, bringing the total to 189, the number of fruit that should be in the carton.

Place Packing

Before we start, it is important to remind packers that they are the last people to see and handle the fruit before it is received in the overseas market. If they find any fruit in their trays that is not up to standard, especially if the fruit is damaged or injured, they must not pack this fruit. If they find many poor quality fruit , they must alert their supervisor immediately.

To start, the packer places the carton next to them on a flat surface where they can easily reach it and where it is secure and won't move around. The first layer of fruit is packed as per the relevant packing diagram, starting in one corner of the carton. The fruit should fit comfortably if the right packing diagram is being used. Once the first layer is complete, the second layer is added, and so on, until the required number of fruit has been packed in the number of layers prescribed by the packing diagram. In most cases, the fruit in upper layers will nestle between those in the layer below. Don't squeeze fruit too tightly into the carton, especially if you are packing more sensitive fruit types, such as soft citrus, because this will damage and bruise the fruit.

If the top layer of fruit must be labelled, the packer will now apply those labels as per instructions. This is usually done by hand.

Sometimes buyers also want some or all of the fruit to be individually wrapped. The packer would have been instructed whether all of the fruit needs to be wrapped, or only some of them, such as alternative layers or diagonal rows. Wrapping is mostly cosmetic, so it is often the top layer of fruit that is wrapped. The packer picks up a wrapper with the dominant hand, on which they will often have a rubber thimble, or fingerette, that makes it easier to pick it up. The fruit is picked up with the left hand, and put inside the wrapper. The wrapper should be wrapped right around the fruit and twisted slightly at the bottom so that it remains in place.

Once the carton has been packed and the lid has been put in place, if there is one, the carton labels are stuck onto the side of the carton. Packers must ensure to label the correct end of the carton, in the correct position, straight and neat, and to smooth down the label so that the corners don't lift. Labels must never overlap so that information is concealed, and they must never be peeled off and replaced once they are stuck on.

Jumble Packing

For jumble packing, the packer puts the carton on a scale and scoops the fruit into the carton until the desired weight is reached. When the carton has been filled, the carton is labelled in the same way as for place packing.

Weighing Cartons

The packed cartons are now placed on a track or rail system that moves cartons from the packing table to palletisation. In more advanced facilities, scanners scan the barcodes on the cartons and direct them to the right palletisation station. In others, all the cartons move along one track and it is up to the palletiser to select the cartons that belong on their pallet, as directed by the carton label.

On the way to the palletising station, some or all the cartons are weighed to ensure that the packed cartons achieve the minimum weight required by the market. Fruit lose weight in transit due mainly to moisture loss. Packhouses therefore aim to pack cartons about eight to ten percent overweight. For example, an A15C carton will usually weigh around 16kg right after being packed.

Automated Packing Machines

Many packhouses are introducing automated packing machines. There are two types of automated machines, one which does place packing, and the other jumble packing.

Automated Place Packing

Automated place packing machines use plates on which fruit is arranged in indentations on the plate, placed and spaced according to the relevant packing diagram. The plate is moved along a conveyor and, after being labelled as required, stops under a set of suckers that correspond with the indentations in the plate. The fruit is lifted off the plate by the suckers, the plate is returned to the starting position, and the fruit is placed into a carton below the plate. If alternate layers are required, the suckers turn the fruit around before placing them in the carton. There are particular sets of plates and suckers for each carton type, fruit size, and packing diagram.

Automated place packing is about two to three times faster than manual packing. If this technology is available to the packhouse manager, the category of fruit with the highest volume will be directed to the automated lines.

Automated Jumble Packing

In automated jumble packing machines, the fruit is collected in a hopper that has an integrated scale. As soon as the fruit in the hopper is the right weight, the fruit is dropped into the carton below. The fruit is gently shaken around to settle it down, and the carton is moved on to palletisation. Automated jumble packing machines can also be used to fill other containers, such as bags.

Palletisation

Stacking and securing cartons on pallets is the next step in the packhouse process. This is a critical step. By far the most claims from overseas buyers result from the cartons collapsing in transit, which can be because of poor quality packing material, but is most likely to be because of improper palletisation.

High Cube vs. Standard Pallets

Traditionally, fruit was predominantly exported in specialised reefer ships. The height in the decks of these vessels only permitted a pallet height of two meters. These pallets are referred to as standard pallets.

Over the past ten years there has been strong growth in containerised shipping, after the development of the high-cube integral container. Containers allow for a pallet height of 2.4 meters, which means one or two more layers of cartons could be added to standard pallets, depending on the carton type. These pallets are called high-cube pallets. Twenty high-cube pallets can be loaded into a high-cube integral container, while remaining within the maximum permissible height to allow for sufficient air circulation within the container. Using high-cube pallets results in considerable cost savings, because so many more cartons can be stacked on each pallet.

When high-cube integral containers were originally introduced, containers were stuffed at cold stores, where standard pallets had to be broken up to make high-cube pallets before they were loaded in containers. There were some challenges with this practice, and packhouses soon started to stack high-cube pallets at the packhouse, so that they could go straight into containers when they reached the cold store. More recently, packhouses started filling containers at the packhouse already, from where they were transported to the harbour where they were plugged in to maintain the cold chain, and then loaded straight onto container ships.

Many of the initial constraints of high-cube pallet stacking have been resolved over time. Initially, not all cold stores were able to store high-cube pallets in their racking systems. Cartons were also not designed to be strong enough to carry the extra weight, but this has also now been improved. Recently the scarcity of containers and a shortage of plug-points at the harbour have been the biggest constraints on using containerised shipping. Still, around 90% of citrus is now exported from South Africa in containers, meaning that 90% of pallets are high-cube.

Pallet Stacking Patterns

Pallets used for export citrus are 1210mm long by 1010mm wide. Cartons are sized to fit onto pallets in particular configurations. For instance, telescopic cartons, including the popular A15C, measure 400 by 300mm. This means that three cartons can be placed end to end along the length of the pallet – 400 times 3 equals 1200 – and two short sides and one long side can fit along the width of the pallet – 300 times 2 plus 400 is 1000. In the same way, the most popular open-top display carton size is 600 by 400mm. Two of these cartons can be packed end to end along the length of the pallet – 600 times 2 equals 1200 – with another row of three cartons placed perpendicularly to the first two to complete the layer – 600 plus 400 equals 1000, and 400 times 3 equals 1200. All cartons are designed to fit on pallets in some configuration or another.

This is the purpose of pallet stacking patterns, which have been developed to prescribe how cartons of different sizes should be placed on pallets to fit properly. Pallet stacking

patterns can be found in CRI's Packaging Material Specifications and Palletisation Protocols.

Typically, telescopic cartons are stacked with at least the first three layers in the same pattern, which is called column stacking, and then alternating layers with the pattern of the cartons reversed. This is referred to as brick stacking.

Open-top display cartons are column-stacked all the way to the top. The cartons have special tabs that allow the stacked boxes to interlink. This gives some vertical support to the columns by ensuring that the cartons are securely lined up in the column. The stacking patterns are designed to fit the cartons onto the pallet, according to the carton size.

Palletising Stations

Packed cartons are heavy, and can weigh up to 17kg, which is the packed weight of a carton of grapefruit. The most common telescopic and open-top cartons both hold 15kg of fruit. The cartons are also stacked high, at 2m for standard pallets and 2.4m for high-cube pallets. Seventy cartons are stacked on a standard pallet of A15C cartons, and eighty on a high-cube pallet. From these simple facts, it is clear that palletising is hard work, and that a person cannot stack a pallet to the top while standing on the ground. It will be almost impossible for a person of average height to reach the top of a pallet and put the cartons neatly in place.

There are various systems in packhouses aimed at making palletising easier, while ensuring that fruit quality is maintained throughout the process. Pallet elevators are popular, where the palletiser stands on a platform or walkway, and the pallet is on an elevator next to him. When the elevator is at the top with a new pallet on it, it is at just the right height for the palletiser to put the bottom layer of cartons in place without having to bend or stretch too much. As he adds each layer, the palletiser uses the hydraulic system to lower the platform with the pallet on it, until the elevator eventually reaches the bottom, and the top layer of cartons on the pallet is level with the palletiser. This system allows for efficient palletising, and allows the palletiser to put the cartons in place without having to throw them, while also avoiding injuring himself.

However, in most packhouses pallets are still stacked from floor level. Palletisers are given steps that they place next to the pallet and climb on as the pallet is stacked higher. It is important that they use the steps. If they don't, they end up launching cartons to get them into the right spot. This can cause injury and bruising to the fruit, injure the palletiser, and will definitely disturb the neat packing patterns of the cartons.

The latest development is a move towards automated palletising systems. In these systems, the cartons move along a conveyor to a plate where the cartons are arranged into layers. When the layer is complete, it is lifted up and placed on the pallet. These systems are used together with automated packing machines.

Pallet Stacking Practices

Before starting, it is important that the palletiser has everything required to hand, including pallets and securing sheets if stacking open-top cartons. If stacking from floor level, the palletiser must also have their steps to hand.

Before stacking the pallet, the palletiser must make sure that the pallet is sturdy, and carries the ISPM15 mark. The pallet must have no wood splinters or nails sticking out

that can catch on or stick into the cartons and fruit. They must also check that there is no fungal growth on the wood.

Pallets are stacked with identical cartons of fruit, meaning that all the fruit in the cartons must be of the same class and size category, packed in the same way, and destined for the same market. The palletiser can identify the cartons by looking at the carton labels. Some packhouses have automated systems that scan barcodes on the cartons and direct them to the right palletising station. Others have systems where the palletiser scans every carton before stacking it, thereby eliminating errors.

When placing the cartons in the first layer on the pallet, it is very important to line up the ventilation holes in the cartons with openings between the pallet slats, while ensuring that the four corners of each carton rest squarely on wood. Lining up the ventilation holes allows for airflow, which is vertical on ships and in containers, to reach the fruit during cooling.

The cartons are then stacked in layers, according to the stacking pattern for the particular carton type, and in the number of layers prescribed by the stacking pattern. The side of each carton carrying the label must always face outwards. The palletiser should pay attention to the cartons, making sure that they are not damaged or softened by moisture. Cartons on pallets carry all the weight of the cartons above them, and this can be considerable for cartons in lower levels. If the cartons are not sound, they will collapse under the weight, which can lead to the entire pallet collapsing.

For open-top display cartons, securing sheets must be put in place to prevent the columns from collapsing outwards. The layers between which securing sheets must be placed is also prescribed in CRI's Packaging Material Specifications and Palletisation Protocols for each carton type.

Once the pallet has been stacked to the top, it is moved by forklift or by ride-on pallet jacks to the securing station. Ride-on pallet jacks are becoming more popular for use in packhouses because they are smaller than forklifts, more manoeuvrable, and less noisy and dangerous.

Securing Pallets

Stabilising cartons on pallets is extremely important. The fruit that is stacked on a pallet can weight more than a ton. If the pallet collapses it will likely destroy the fruit and endanger humans nearby. For this purpose, four laminated paper corner pieces are put in place, and horizontal straps are added in a few positions on the pallet. Corner pieces protect the corners of the cartons, and keep pallets neat and square. Corner pieces of different lengths are used on standard and high-cube pallets. The Packaging Material Specifications and Palletisation Protocols prescribe the specifications for the corner pieces.

Strapping is used to hold the cartons on a pallet together. Exhaustive research has gone into determining where the best positions are for strapping each carton type to ensure that the cartons on pallets remain secure. This information has been written into the Packaging Material Specifications and Palletisation Protocols, and this protocol must be strictly adhered to.

To secure a pallet, the corner pieces are put in place on the four corners, and the strapping on either layer 4 or layer 5 is done first to hold them in place. To be effective, corner pieces must rest on the pallet. The rest of the strapping is then added, as per the protocol.

Once the cartons on the pallet have been secured, the pallet is moved to a storage area to await inspection. At this stage, the final carton labelling and pallet labels are added.

Automated pallet strapping machines are becoming more popular in packhouses. In these systems, the pallet is placed on a plate in the machine. The strapping machine then puts the corner pieces in place with mechanical arms, after which a frame moves up and down the pallet, adding the strapping. These systems are more efficient and more precise than manual strapping.

Pallet caps are put in place on pallets of open-top cartons once the pallet has been inspected. The pallet cap is put in place over the top layer of cartons, secured by a strap. Pallet caps are also used for processing fruit exported in bulk bins.

Marking

At the time of making this module, almost 2 million pallets of citrus are being exported from South Africa every year, carrying more than 150 million cartons of fruit, heading for more than sixty countries around the globe. To keep track of this enormous number of pallets and cartons, robust and efficient information management is critical. Central to this is carton and pallet labelling and marking.

As per the Export Standards and Requirements, every carton must have on it a label with at least the following information:

- The type and cultivar of the fruit
- For grapefruit, the flesh colour
- The class of fruit
- The size reference and count
- The production unit code (PUC) of where the fruit was produced
- The packhouse code (PHC) of where the fruit was packed
- The packing date code
- The country of origin
- The name and address of the exporter, or owner
- The postharvest treatments that have been used with the fruit

Additional information that is usually added includes:

- The target market
- The cold store that the consignment is going to

The carton label also has a barcode on it, encoding this information. The label must be stuck on straight and neat, with no corners that are folded or not properly pressed down.

There are very strict rules around carton marking. The label must be on the right end of the carton, facing outward when stacked on a pallet, and in the exact position. Labels may not overlap, and they must never be peeled off and replaced after being stuck on. This is considered tampering and is grounds for immediately rejecting the fruit for export. Additional information, such as the details of the exporter or the cultivar, can be added on more labels.

Conclusion

We have now reached the point where, from the jumble of mixed, dusty fruit we received from the orchard, we have created ordered pallets stacked with cartons filled with clean, treated fruit which is protected from postharvest decay, with fruit of the same size and grade, and cartons secured on the pallet and neatly labelled. The fruit, cartons and pallets also comply with regulations and with market requirements. All that remains is for the fruit to be inspected and declared fit for export, and then to be loaded for transport to the harbour.