CRI Cutting Edge
Securing the future of citrus through science
Dec 2021 No. 333

New A15C Supervent cartons for EU exports (2022)

Tarl Berry, Dawid Groenewald and Paul Cronje
Citrus Research International (CRI)

Effective cooling during shipping is a critical component of the South African citrus industry phytosanitary programmes. The FMS (FCM Risk Management System), in particular, relies on a systems approach that grants us access to a range of setpoint temperatures. The application of uniform, low-temperature cooling during the shipping process is critical to improve the effectiveness of the FMS.

Research performed over the 2021 season showed that using a more ventilated A15C carton (Figure 1, right) significantly reduced the incidence of hot spots during container shipping. Analysis of the cellular temperature logger data from each FMS container has shown that the FMS programme would benefit from applying colder temperatures at longer duration. These findings are reflected in the most recent FMS (2022) changes, including the adoption of the new A15C Supervent carton.

A major benefit to implementing this new ventilation design is that only the new A15C carton will be eligible for FMS shipments at setpoint 2°C (EC2).

Market eligibility

- The new A15C design is the only telescopic carton that may be sent under the FMS codes.
- When packing in the new A15C, all shipping codes are eligible (including the EC2 code).
- Any A15C cartons may be used for non-FMS fruit (lemons and key limes) going to the EU.
- Old A15C cartons may still be used in all non-FMS markets.
- Open-top cartons are not eligible for the EC2 code.

Cooling performance of the new A15C

A large-scale commercial container trial (60 containers) was conducted over the 2021 season to compare the old A15C and the new A15C Supervent designs. A significant improvement in cooling was recorded by using the new A15C Supervent design. Figure 2 shows an example of how fruit temperatures differ during shipping. Figure 3 illustrates how the new A15C design improves vent-hole alignment during stacking. Note, ventilation was not increased along the sides of the carton.

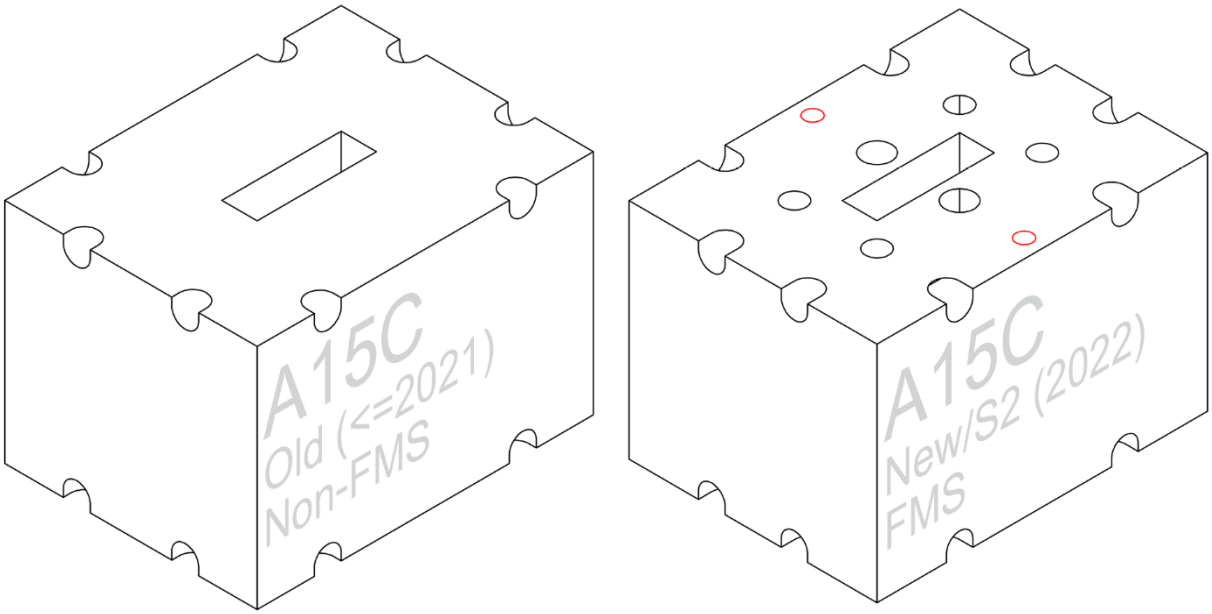

Figure 1: The current A15C SuperVent carton (left) and the new A15C (S2) carton (right). The round, red vent holes at the top (and bottom) of the new A15C carton will only be applied later in the 2022 season after early season evaluations.

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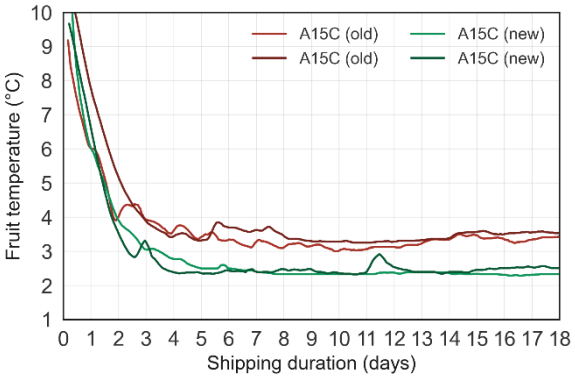

Figure 2: Examples of fruit temperatures during container shipping when using the old and new A15C cartons.

New A15C evaluation/review process

The new A15C carton was evaluated through large-scale packaging and container commercial trials. The results were only concluded towards the end of the 2021 season. Once the importance and benefits of the carton were identified, a technical working group (TWG) was immediately formed between the CRI and the accredited carton manufactures to facilitate implementation in the 2022 season.

Over the course of several weeks, the design was carefully reviewed and optimised to account for various practical concerns (e.g. glueing, assembly, etc). The TWG will further oversee continued early-season evaluations on the carton as the volumes ramp up from the large scale trial to full-scale production.

Carton strength implications

More than 150 000 new A15C cartons were commercially exported over the 2021 season. Carton integrity was evaluated at destination, and all cartons were noted to be of high quality, and both the importers and on-site evaluations reported no issues. Furthermore, quality evaluations of the fruit showed no differences between fruit shipped in the old A15C and new A15C cartons.

Manufacturing cartons that meet the requisite strength standards remains solely the responsibility of the carton manufacturer. However, box compression tests (high humidity and ambient conditions) conducted to date on all the tested design iterations have shown a consistent increase in strength of 5% compared to the old Supervent design. This improvement is attributed to the vents being moved away from the corners of the carton.

Chilling injury implications

The primary goal of the new A15C carton is improved distribution of cold air through the pallets. Previously, it was found that fruit near the container delivery air vent were blasted with concentrated cold air (cold spots), as the container attempted to regulate temperature, leading to chilling damage. Additionally, hot spots form in a small ratio of

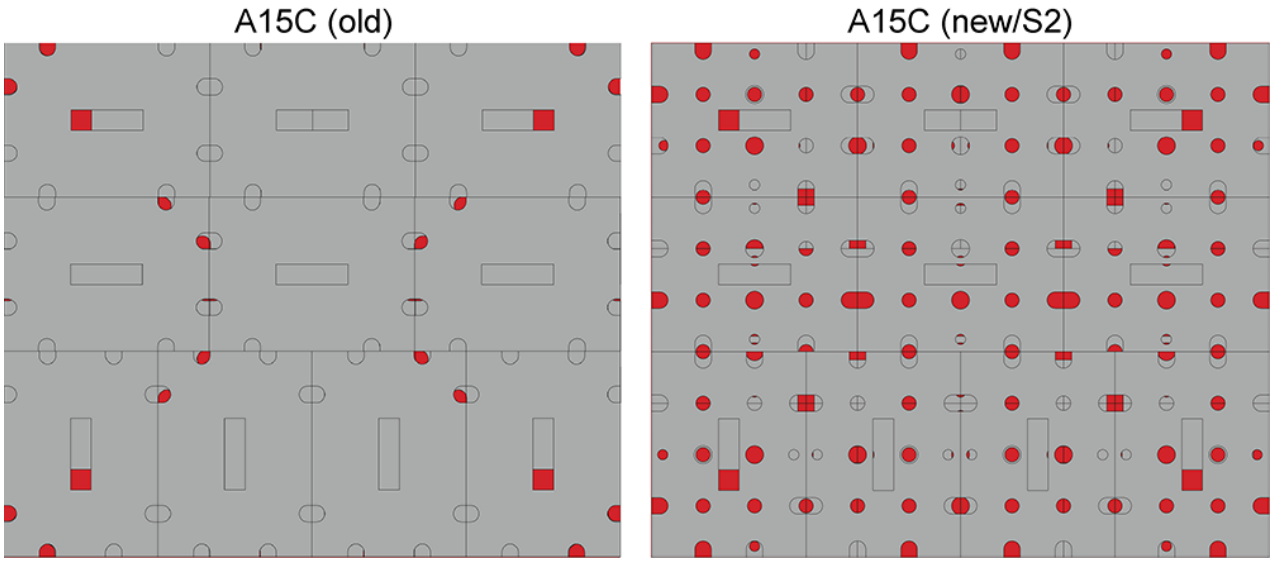

Figure 3: Illustration of the vent-hole alignment during cross-stacking when using the old and new A15C cartons. Red indicates regions of aligned ventilation. Much of the improvement was achieved by just shifting the vents.

containers due in part, to inadequate ventilation and the fruit being isolated from cold air.

A significant benefit of the new A15C carton is that it will distribute the cold air to all regions **more evenly**. Compared to the old A15C cartons, cold spots and chilling injury could be reduced in cartons near the delivery point, and better cooling potential of hot spots will be realised.

Carton nomenclature

The A15C name will remain in use and refers to all A15C cartons, irrespective of ventilation design. For the sake of technical nomenclature, the new ventilation design being applied to the A15C is referred to as the "S2".

Distinguishing old stock

All carton manufacturers will now only make the new A15C carton. However, it is recognised that some packhouses do already hold stocks of the old A15C cartons. During the 2022 season, the stocks of old A15C cartons need to be directed to non-FMS markets. For this to be achieved, it will be necessary to distinguish the similar-looking cartons from one another.

As packhouses are responsible for using the correct carton, we ask all packhouses to step up and ensure that this change goes ahead smoothly.

Until stock of the old A15C are used up, both carton designs will be used simultaneously in certain packhouses, and it is vital that the cartons do not get mixed up, resulting in the wrong carton being sent to the incorrect market.
PPECB inspectors will check for compliance in the packhouses during pallet inspections. For this to be achieved, cartons must be clearly distinguished from one another.
In order to do this, the following practices are suggested:

1. Keep old A15C and new A15C cartons in separate storage areas.
2. Clearly **mark all** flat-packed **old A15C** cartons. Marking the old carton will be less labour intensive, as these cartons will be phased out and fewer cartons will need to be marked over time.
3. After packing, printed labels should indicate if the carton is an old A15C or new A15C.
4. It is important to include at packhouse level, a digital record (e.g. S2-code) of the new carton being used for EU consignments.
5. Hold a training workshop with the carton erectors, the packers and palletisers to inform them of the differences.
6. Print and display the graphic guide in this Cutting Edge for ease of reference.
7. Use colour coded box-end labels that can be seen from a distance by forklift drivers to distinguish the old carton.
8. Use chalk to temporarily mark the differences on cartons and stacked pallets.
9. When handling inners and outers in the packhouse before packing, the difference between old and new cartons is obvious, with the new design having holes in the top and bottom faces, whereas the old cartons have no such holes.
10. Take care to ensure the correct inner must be placed with the correct outer.
11. Implement quality checks along the packing process and at the final pallet to be sure the right carton was used.

N.B! The use of incorrect cartons will mean that those pallets must either be sent to a different market, or the fruit must be re-packed.

Future research steps

The new A15C cartons eligibility for FMS shipping setpoints regime of 2°C, is something we would like to extend to opentop cartons as well. CRI research is thus currently underway to develop similarly ventilated open-top carton designs. This work will be performed in conjunction with the certified carton manufacturers.

Any questions can be directed to Tarl Berry (tarl@sun.ac.za, 082 419 7218) or Dawid Groenewald (dawid@cri.co.za).

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Nuwe A15C Supervent-kartonne vir EU-uitvoere (2022)

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Doeltreffende verkoeling gedurende verskeping is 'n kritieke komponent van die Suid-Afrikaanse sitrusbedryf se fitosanitêre programme. Die FMS (VKM risiko bestuurstelsel), in besonder, maak staat op 'n stelsel benadering wat die bedryf toegang verleen tot 'n reeks verskepings temperature (stelpunte). Om die doeltreffendheid van die FMS te verbeter, is dit dus belangrik om te verseker die verlangde temperatuur word effektief en eenvormig gedurende verskeping toegepas.

Navorsing, wat gedurende die 2021-seisoen gedoen was, het getoon dat die gebruik van 'n beter geventileerde A15C-karton (Figuur 1, regs) die voorkoms van warm-areas in palette gedurende verskeping in verkoelde houers (*containers*) aansienlik verminder. Die analisering van data ingewin d.m.v. die sellulêre temperatuurloggers geplaas in elke FMS-houer, het getoon dat hierdie program sal baat vind by aanwending van laer temperature vir langer periodes. Hierdie bevindinge word weerspieël in die mees onlangse FMS (2022) veranderinge, insluitend die aanvaarding van die nuwe A15C Supervent karton ontwerp.

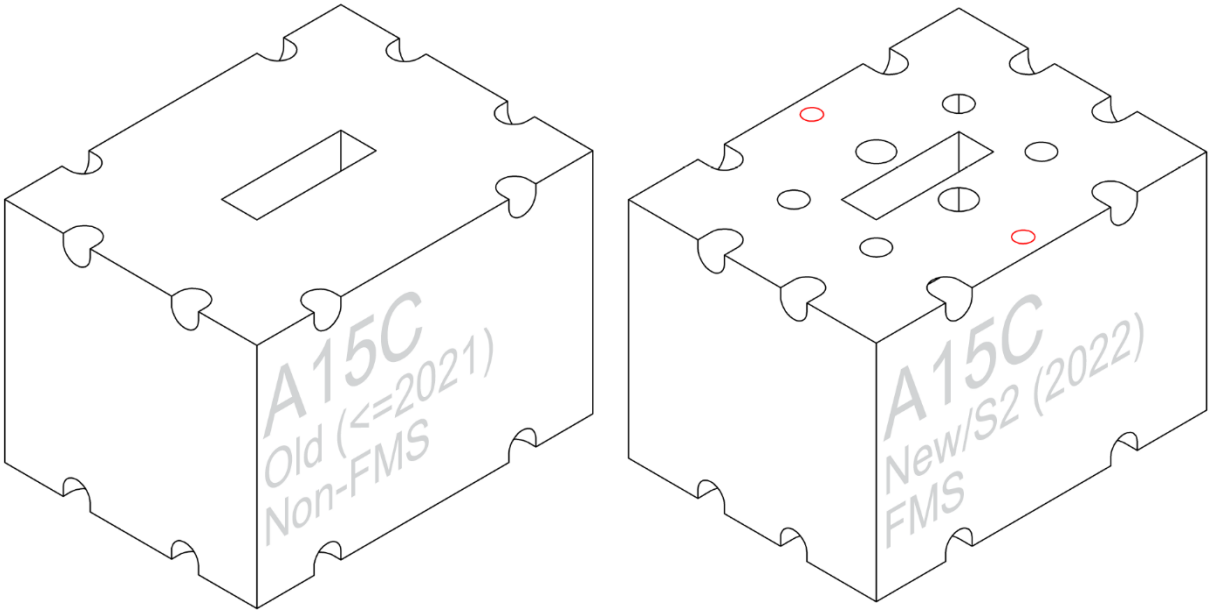
'n Groot voordeel vir die implementering van hierdie nuwe ontwerp (i.t.v. ventilasie), sal wees dat verskeping in die FMS program teen stelpunt 2°C (EC2) toegelaat sal word vir die nuwe A15C-karton.

Mark toegang

- Die nuwe A15C-ontwerp sal die enigste teleskopiese karton wees wat gebruik mag word vir uitvoer met die FMS-kodes.
- Indien die nuwe A15C gebruik word, kan alle verskepings kodes (insluitend die EC2-kode) gebruik word.
- Kartonne met enige A15C-ontwerp mag egter gebruik word vir ***nie-FMS-vrugte*** (suurlemoene en Key lemmetjies) wat na die EU gaan.
- Die ou A15C-kartonne mag steeds in ***alle nie-FMS-markte*** gebruik word.
- Oop vertoon-kartonne mag nie gebruik word vir verskeping met die EC2-kode nie.

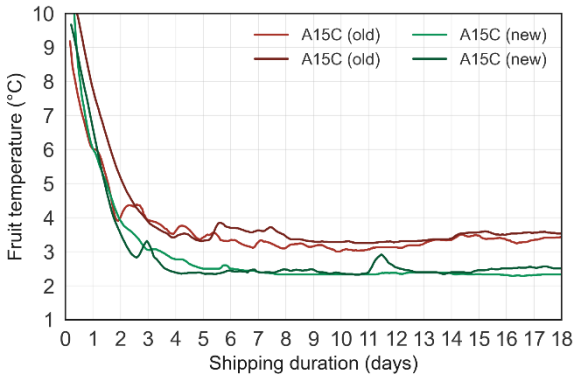
Verkoelingvermoë van die nuwe A15C

'n Grootskaalse kommersiële houer proef (60 houers) was gedurende die 2021-seisoen uitgevoer om die ou A15C en die nuwe A15C Supervent-ontwerpe te vergelyk. 'n Beduidende verbetering in verkoeling was waargeneem vir die nuwe A15C Supervent-ontwerp. Figuur 2 toon 'n voorbeeld van hoe vrugtemperatuur tydens versending verskil. Figuur 3 illustreer hoe die nuwe A15C-ontwerp die ventilasiegate belyning tydens



Figuur 1: Die huidige A15C SuperVent-karton (links) en die nuwe A15C (S2)-karton (regs). Die ronde, rooi ventilasiegate aan die bokant (en onderkant) van die nuwe A15C-karton sal eers later in die 2022-seisoen ná vroeë seisoen-evaluasies toegepas word.

stapeling verbeter. Let wel, ventilasie gate op die sykante van die karton is nie verander nie.



Figuur 2: Voorbeeld van vrugtemperature tydens houerverskeping wanneer die ou en nuwe A15C kartonne gebruik word.

Die evaluering/hersiening proses van die nuwe A15C ontwerp

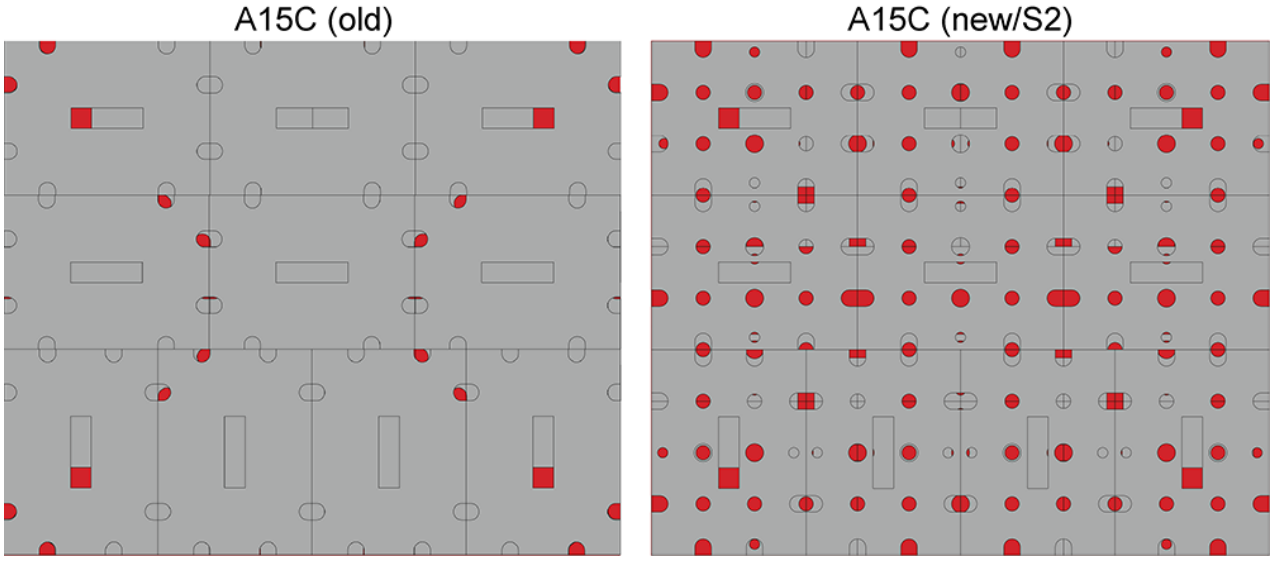
Die nuwe A15C-karton was geëvalueer deur grootskaalse verpakking en houerverskeping in proewe, wat geskied het in die kommersiële koueketting. Die resultate was dus eers teen die einde van die 2021-seisoen beskikbaar. Kort daarna, en met die besef van die belang hiervan en die voordele wat die kartonontwerp inhou, is 'n tegniese werkgroep (TWG) tussen die CRI en die geakkrediteerde kartonvervaardigers gestig om implementering in die 2022-seisoen te vergemaklik.

In die loop van 'n paar weke is die ontwerp noukeurig hersien en ge-optimaliseer om rekening te hou met verskeie praktiese kwessies bv. vou en lym, ens. Die TWG sal verder betrokke wees oor voortgesette evaluasies gedurende die vroeë-seisoen- op die karton, namate die volumes toeneem van die grootskaalse proef na volskaalse produksie.

Impak op karton sterkte

Gedurende die proef was meer as 150 000 nuwe A15C-kartonne gedurende die 2021-seisoen kommersieel uitgevoer. Karton-integriteit was by bestemming geëvalueer, en beide die invoerders en evaluerings op die perseel het geen probleme gerapporteer nie en genoem dat alle kartonne van hoë gehalte was. Verder het die vrugte geen verskille getoon i.t.v. kwaliteit tussen die ou A15C en nuwe A15C kartonne wat verskeep was nie.

Die vervaardiging van kartonne wat aan die vereiste stapelsterkte standaarde voldoen, bly uitsluitlik die verantwoordelikheid van die kartonvervaardiger. Karton-stapelsterkte toetse (onder hoë humiditeit en omgewingstoestande) wat gedurende die 2021 proewe gedoen is het egter 'n konsekwente toename in sterkte van 5% getoon in vergelyking met die ou Supervent-ontwerp. Hierdie verbetering word toegeskryf aan die ventilasie gate wat weggeskuif is van die hoeke van die karton.



Figuur 3: Illustrasie van die ventilasiegat-belyning tydens kruisstapeling wanneer die ou en nuwe A15C-kartonne gebruik word. Rooi dui streke van belynde ventilasie aan. Baie van die verbetering is bereik deur net die ventilasie gate te verskuif.

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Impak op die potensiaal vir koueskade

Die primêre doelwit van die nuwe A15C-karton is verbeterde verspreiding van kouelug deur die palette. Daar was gevind dat vrugte naby die houer se area waar koue lug gelewer word blootgestel word aan areas met gekonsentreerde kouelug (lei tot koue kolle), aangesien die houer poog om temperatuur te reguleer. Die situasie kan lei tot koueskade. Verder meer kan daar warm kolle ontwikkel in sekere gedeeltes van die houers, deels as gevolg van onvoldoende ventilasie en die vrugte wat van kouelug geïsoleer word.

'n Beduidende voordeel van die nuwe A15C is dat die koue lug **meer eweredig** na alle gedeeltes versprei word. In vergelyking met die ou A15C kartonne, kan koue kolle en koueskade in kartonne naby die leweringspunt verminder word, en 'n verbeterde verkoelings potensiaal van warm kolle sal realiseer.

Karton-nomenklatuur

Die A15C-naam/kode sal in gebruik bly en verwys na alle A15C-kartonne, ongeag die ventilasie-ontwerp. Ter wille van tegniese nomenklatuur word die nuwe ventilasie-ontwerp wat op die A15C toegepas word, verwys as die "S2".

Om onderskeiding te tref tussen ou en nuwe voorraad

Alle kartonvervaardigers sal nou net die nuwe A15C-karton vervaardig. Dit word egter aanvaar dat sommige pakhuise steeds oordra-voorrade van die ou A15C kartonne het. Gedurende die 2022-seisoen moet die voorraad van ou A15C na nie-FMS-markte gebruik word. Dit is dus noodsaaklik om die ou en nuwe kartonne van mekaar te onderskei.

Aangesien pakhuise verantwoordelik is om die korrekte karton te gebruik, word alle pakhuise gevra om te verseker dat hierdie verandering glad verloop.

Totdat die voorraad van die ou A15C opgebruik word, sal beide kartonontwerpe gelyktydig in sekere pakhuise gebruik word. Dit is noodsaaklik dat die kartonne nie deurmekaar raak nie, wat daartoe sal lei dat die verkeerde karton na die verkeerde mark gestuur word.

PPECB-inspekteurs sal tydens paletinspeksies kartonne nagaan vir voldoening in die pakhuise. Om dit te bereik, moet kartonne duidelik van mekaar onderskei word.

Om dit te kan doen, word die volgende praktyke voorgestel:

1. Stoor ou A15C en nuwe A15C kartonne in aparte areas.
2. Merk alle plat/onopgemaakte ou A15C kartonne duidelik. Om die ou karton te merk sal minder arbeidsintensief wees aangesien hierdie kartonne uitgefaseer sal word en minder kartonne mettertyd gemerk sal moet word.
3. Na verpakking moet die gedrukte etikette aandui of die karton 'n ou A15C of nuwe A15C is.
4. Dit sal belangrik wees om op pakhuisvlak 'n digitale rekord (bv. S2-kode) in te sluit van die nuwe karton wat vir EU-besendings gebruik word.
5. Hou 'n opleidingswerkswinkel saam met die pakmateriaal personeel, die pakkers en palettiseerders om hulle van die verskille in te lig.
6. Druk en vertoon in die pakhuis die grafiese gids soos in hierdie Snykant vir maklike verwysing.
7. Gebruik kleurgekodeerde "box-end" etikette wat van 'n afstand deur vurkhyserbestuurders gesien kan word om sodoende die ou kartonne te onderskei.
8. Gebruik bordkryt om die verskille tydelik op kartonne en gestapelde palette te merk.
9. Wanneer binne- en buitestukke van kartonne in die pakhuis hanteer word, voor verpakking, is die verskil tussen ou en nuwe kartonne duidelik. Die nuwe ontwerp het addisionele gate op die bo- en onderkante, terwyl die ou kartonne nie sulke gate het nie.
10. Sorg dat die korrekte binnestukke van die karton met die korrekte buitestukke gebruik word.
11. Implementeer kwaliteit kontroles tydens die verpakkingsproses en by die finale stapeling om seker te maak die regte karton is gebruik.

N.B! Die gebruik van verkeerde kartonne sal beteken dat palette na 'n ander mark as die EU gestuur moet word of die vrugte moet herverpak word.

Toekomstige navorsing

Die nuwe A15C-kartonne wat geskik is vir FMS-verskepingstelpunte van 2°C gaan ook uitgebrei word na oop-vertoon kartonne. CRI-navorsing is dus tans besig om soortgelyke geventileerde oop-vertoon ontwerpe te ontwikkel. Hierdie projek sal in samewerking met die geakkrediteerde karton vervaardigers gedoen word.

Vir enige verdere navrae kontak Tarl Berry (tarl@sun.ac.za, 082 419 7218) of Dawid Groenewald (dawid@cri.co.za).

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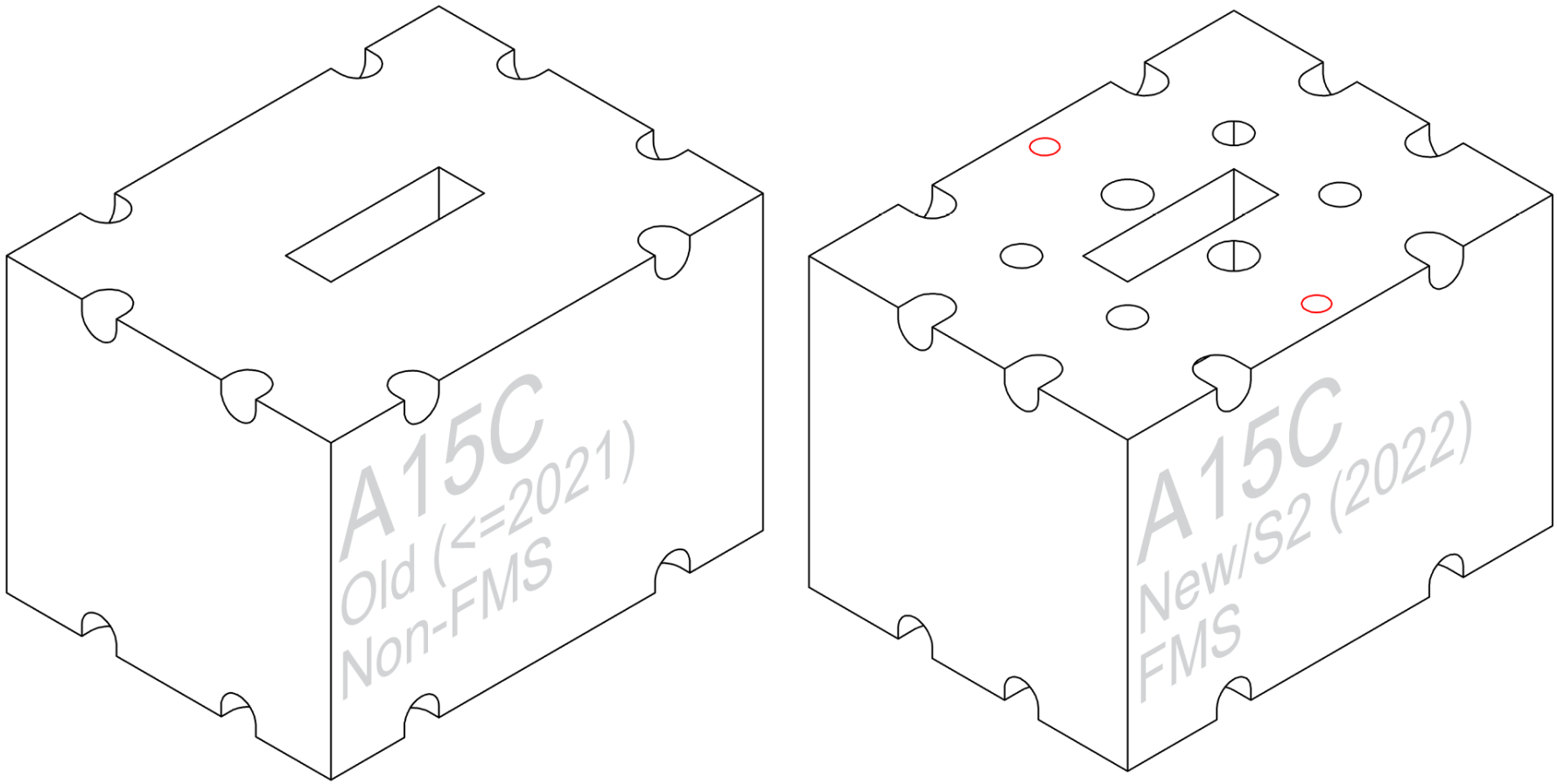

The old A15C carton (left) and the new A15C (S2) carton (right)