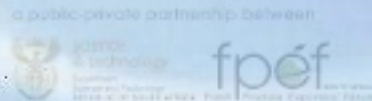
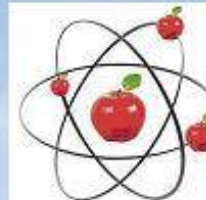


# ISSUES AROUND MANAGING THE SUPPLY CHAIN CORRECTLY



Malcolm Dodd

## POST HARVEST INNOVATION PROGRAMME



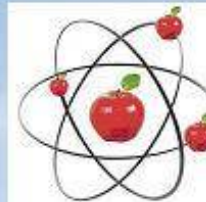
$\Phi$  Post-Harvest  
Innovation Programme





## THE COLD CHAIN

“THE COLD CHAIN IS THE SEAMLESS MOVEMENT OF CHILLED, FRESH OR FROZEN PRODUCE, FROM PRODUCTION AREA TO MARKET THROUGH VARIOUS STORAGE AND TRANSPORT MEDIUMS WITHOUT ANY CHANGE IN THE OPTIMUM STORAGE TEMPERATURE AND RELATIVE HUMIDITY.”



**Φ Post-Harvest  
Innovation Programme**



Department of Science and Technology  
REPUBLIC OF SOUTH AFRICA



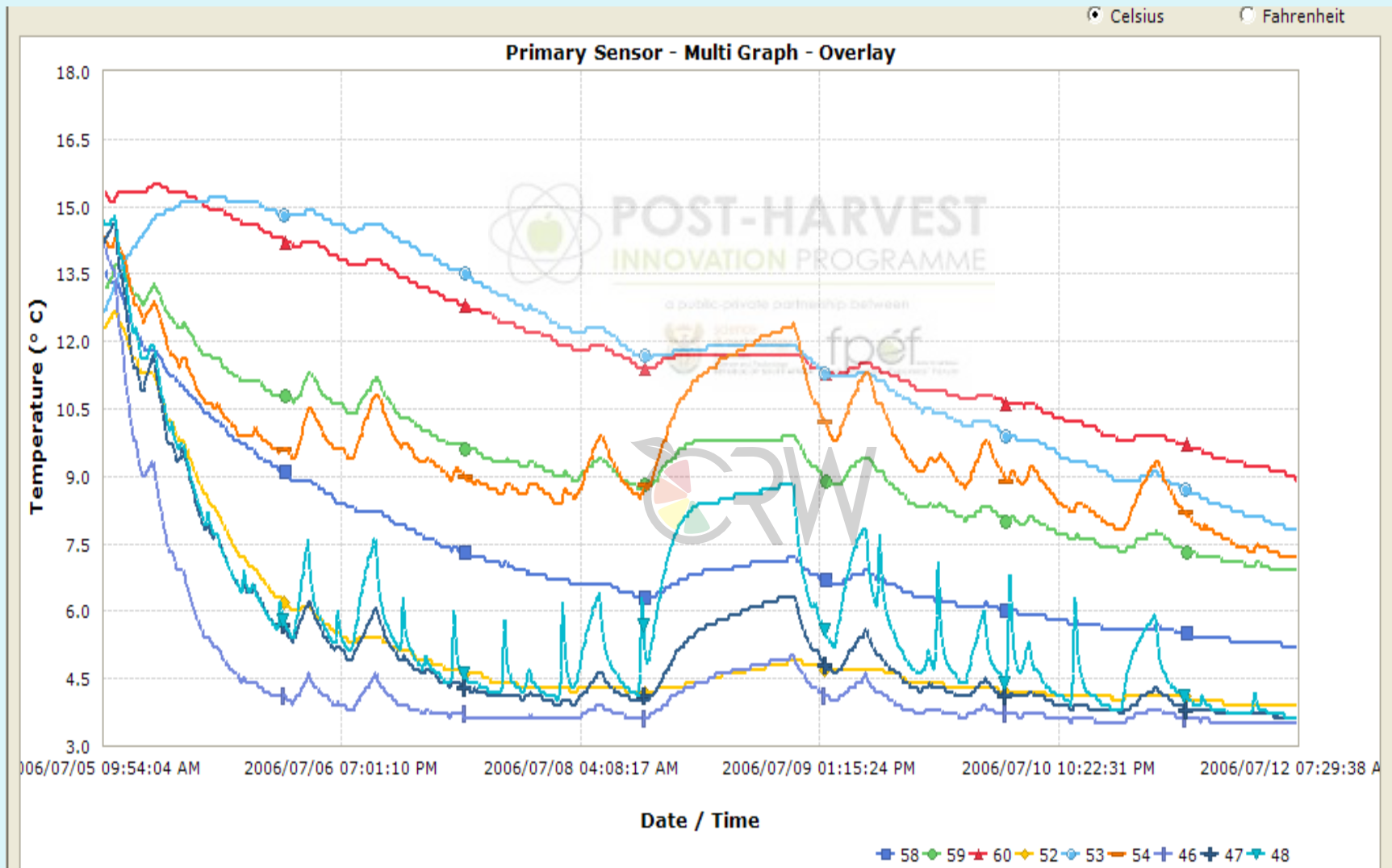
ARC + IZNR  
fpof  
Fresh Produce Exporters' Forum

# HEAT OF RESPIRATION OF VARIOUS FRUITS

PRODUCE KIND	STORAGE TEMP °C	VITAL HEAT IN BTU/TON/HR
GRAPES	0	400
	5	1000
APPLES	0	700
	5	1350
SUMMER PEARS	0	1100
	5	1650
CITRUS	5	1200
	10	2600
PLUMS	0	550
	5	1450
NECTARINES	0	1150
	5	1700
AVOCADOS	5	5500
	10	24500
MANGOS	10	9900
	15	24900

# PULP TEMPERATURES IN STANDARD CONTAINER.

## Rise in pulp temperature due to power failure.







ORCHARD



PACKHOUSE



INSPECTION



COLDSTORE



INSPECTION



# THE COLD/LOGISTICS/VALUE CHAIN FOR PERISHABLES



TRANSPORTER



INSPECTION



SUPERMARKET



CONSUMER



INSPECTION



DEPOT



LOADING



COLDSTORE



INSPECTION



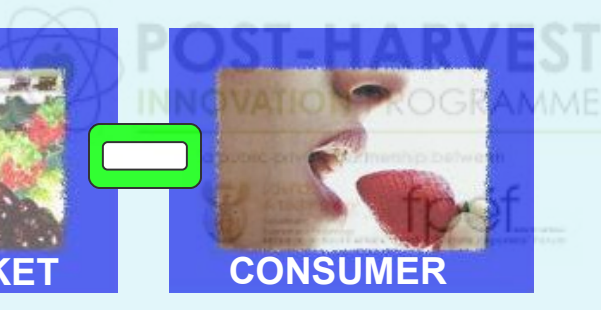
DISCHARGE



IMPORT PORT



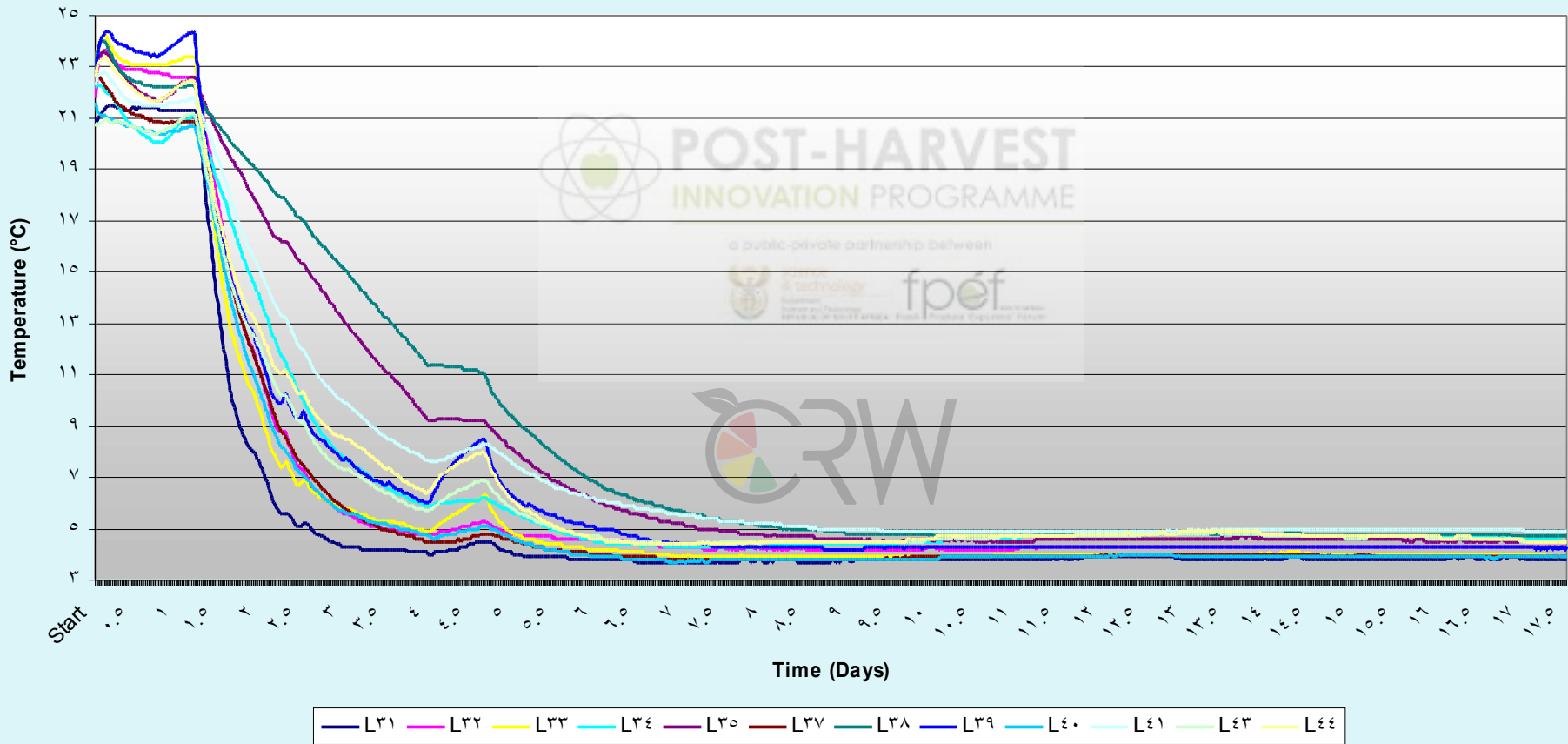
SHIP



# **Trial comparing the pulp temperatures of citrus loaded ambient in 2 containers. Refrigeration turned on 1.5 and 5 days after loading**

- Two containers of fruit were packed in Letsitelie.
- The fruit was Valencia's in C15 telescopic cartons.
- Containers loaded at the pack house and trucked to Tzaneen station.
- Containers loaded on the fruit train.
- Power to container 1 switched on 1.5 days after loading.
- Power to container 2 only supplied 4.5 days after loading when placed in the stack in C Town.
- QC conducted on arrival in Europe.

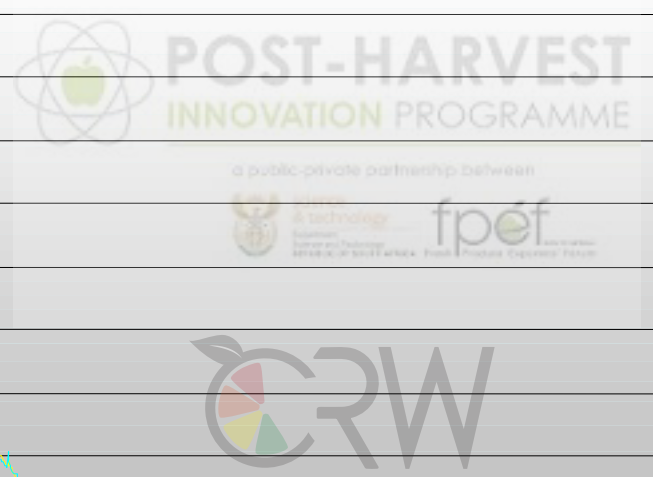
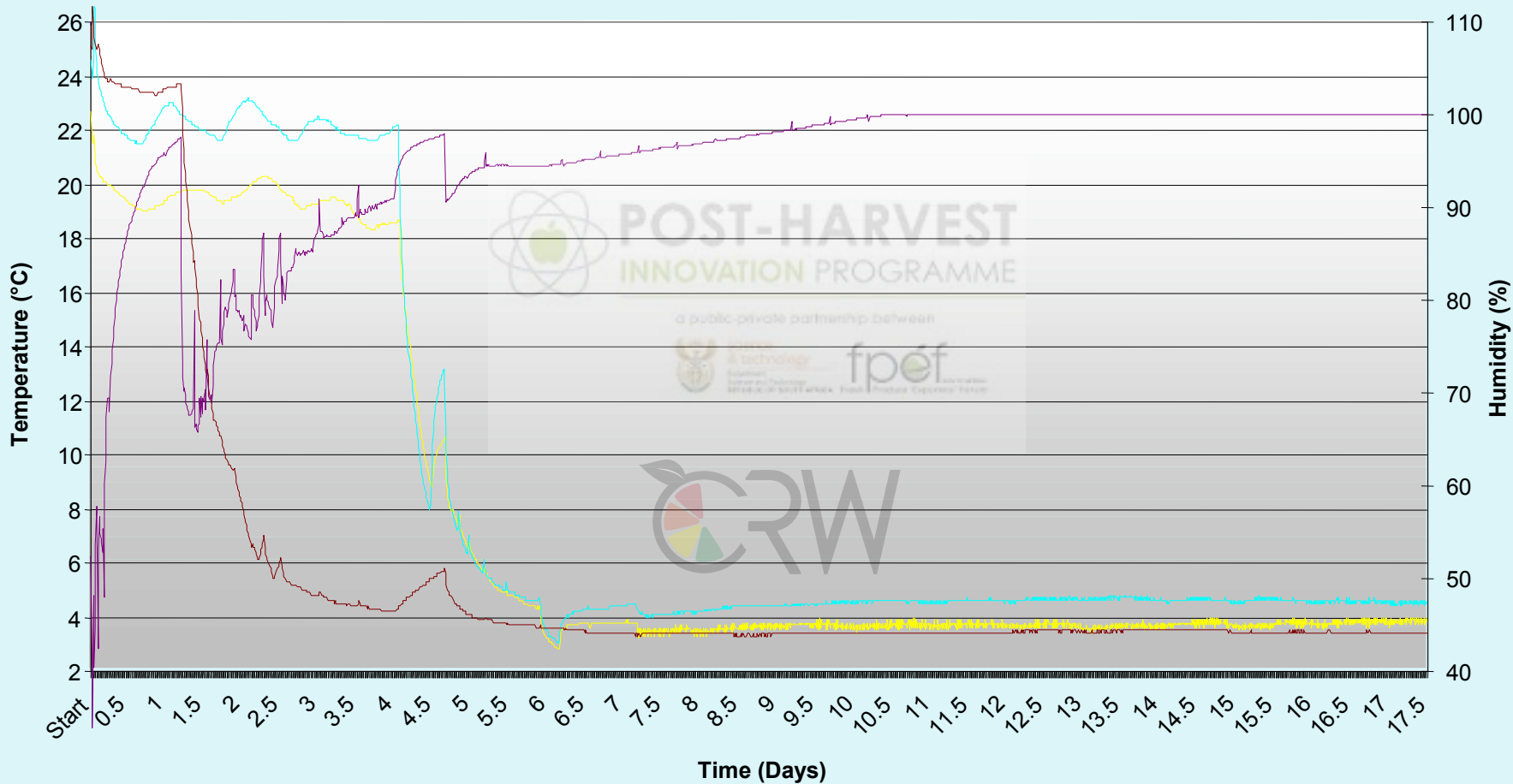
Graph 1. Train and ship, pulp temps pre-cooling rate. Container 1.







# Delivery air temperature in both Containers and relative humidity in one.



a4 a5 a6 rh7 temp rh7

# RESULTS

- The results show that the fruit starts to cool immediately the refrigeration is turned on.
- In the container where the refrigeration was only switched on 4.5 days after loading there was no increase in pulp temp during this time.
- The QC reports showed no adverse quality due to this technique.
- In some parts of the container the fruit cooled much slower; this is due to the packaging not being optimised

# Commercial Trial on un-precooled Oranges in Mondi E15D open top display cartons

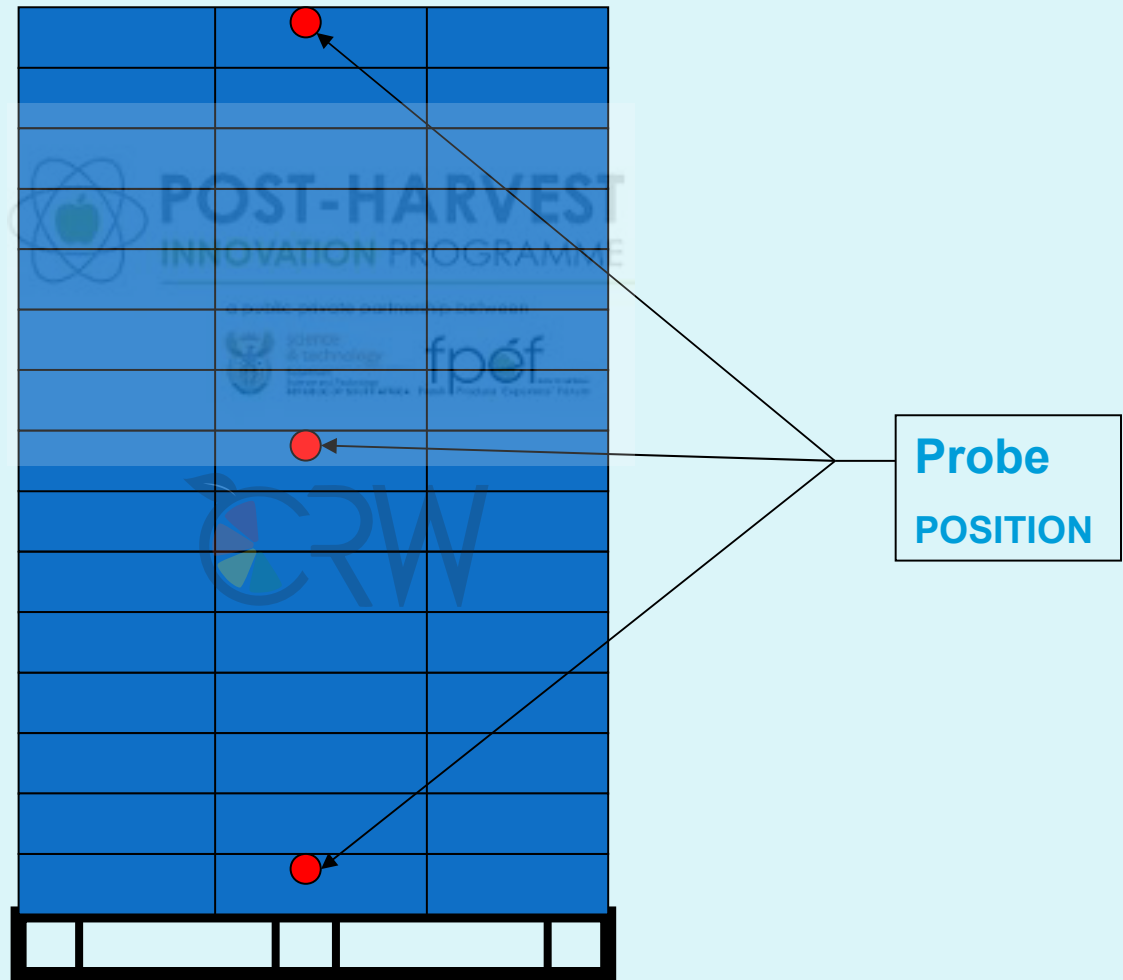


# METHODOLOGY

- The experiment was carried out in conjunction with Mondi Pack.
- 18 temperature recorders were placed in positions into each of two containers as per pages 2 & 3 above.
- Recorders A5, A6, A7 & A8 were placed into the cartons recording air temperature.
- Recorders RH2 & RH3 recorded relative humidity.
- 15 probe recorders in each container recorded pulp temperature.
- The refrigerated containers were standard.
- The open top cartons used were of a new design.
- Fruit temperatures taken soon after loading indicated that most were between 10.0°C and 12.5°C.

# Probe Position In Pallet

(Vertical View facing the doors)



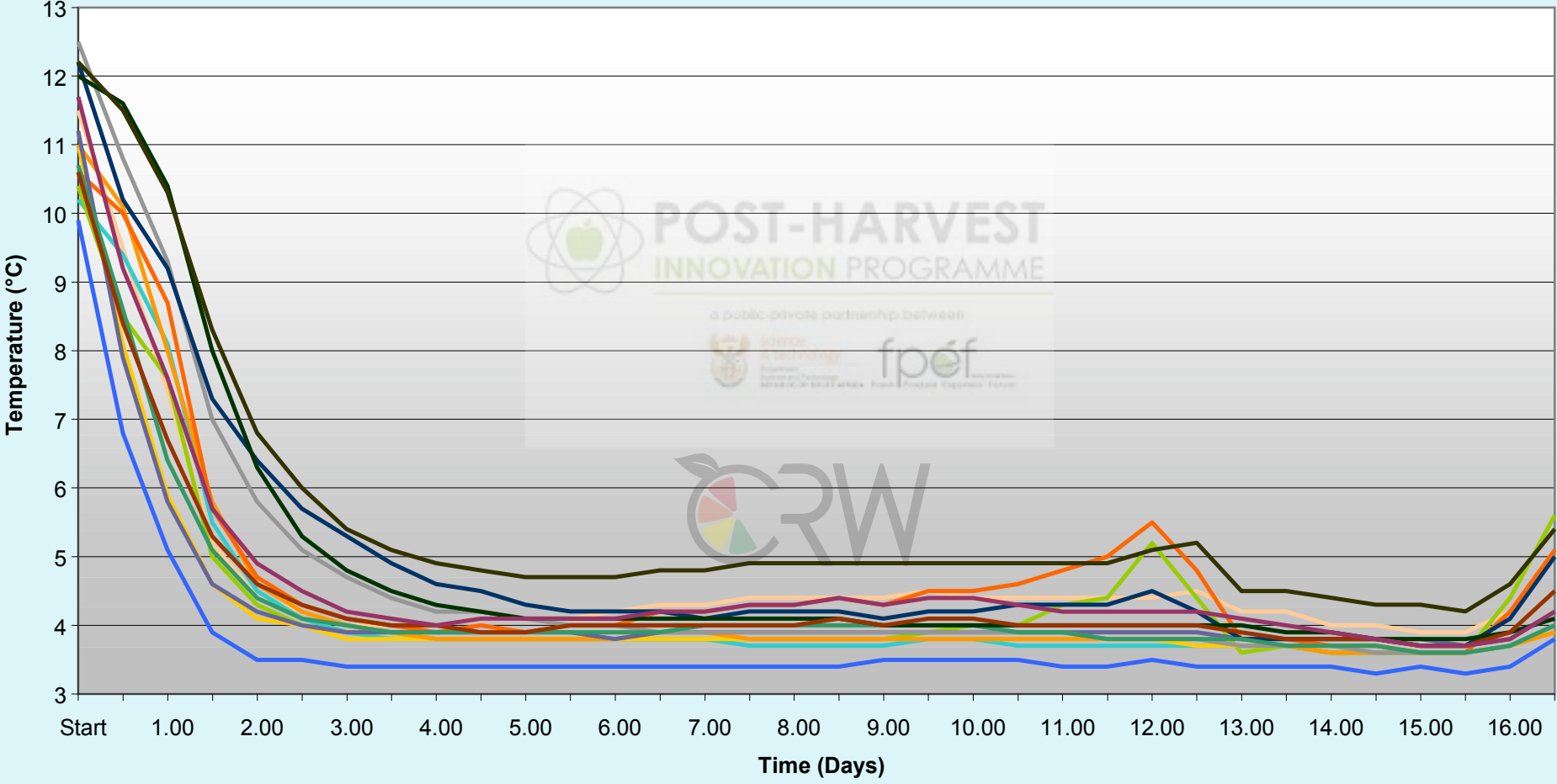
# **OBJECT OF THE TRIAL**

**Test the ability of a container to pre-cool a load of warm palletized oranges packed in open top E15D cartons.**



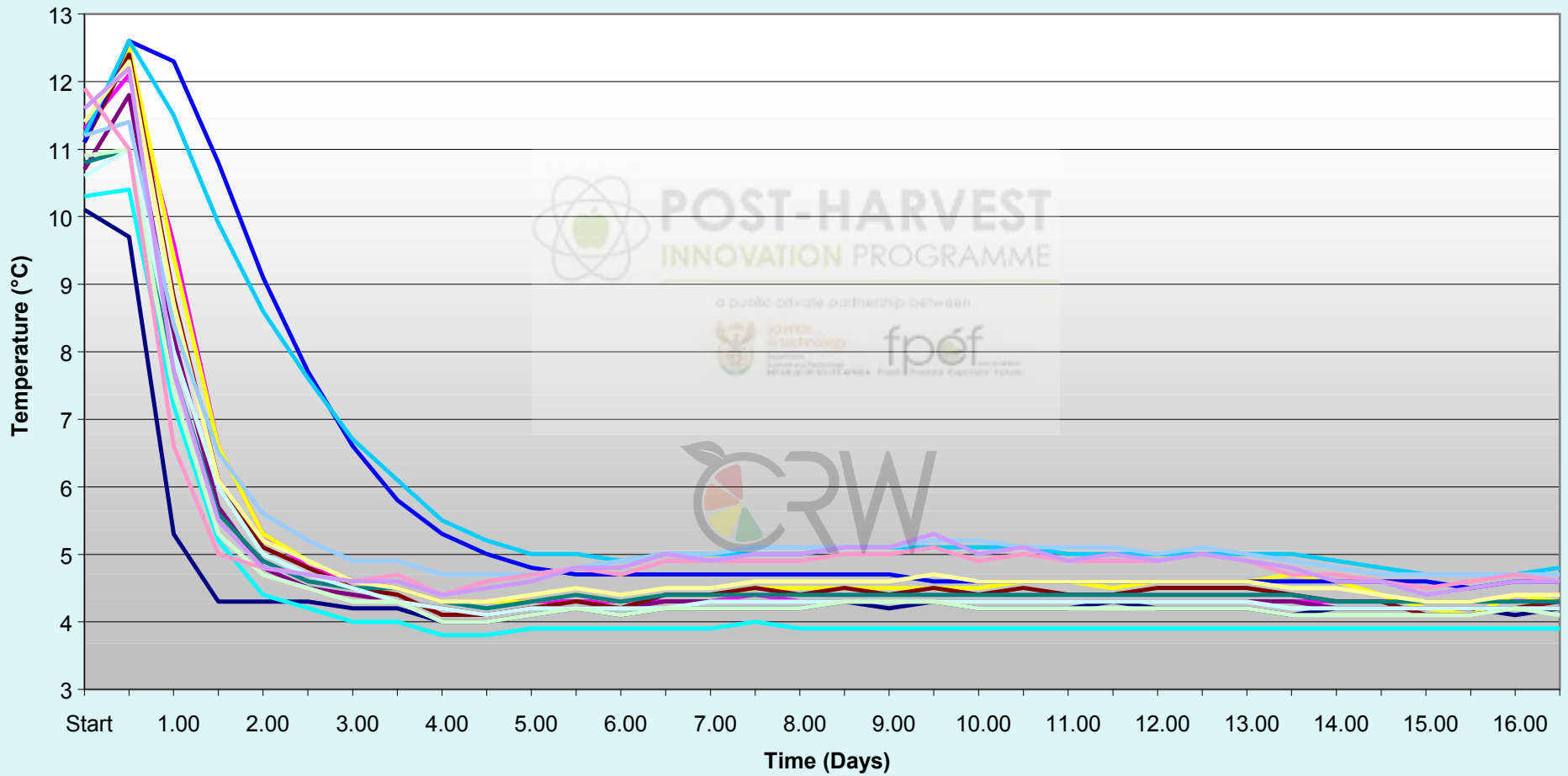


**Graph 2: Ambient Load Trial 10a  
MORU 0406846 (12 Hour readings)**

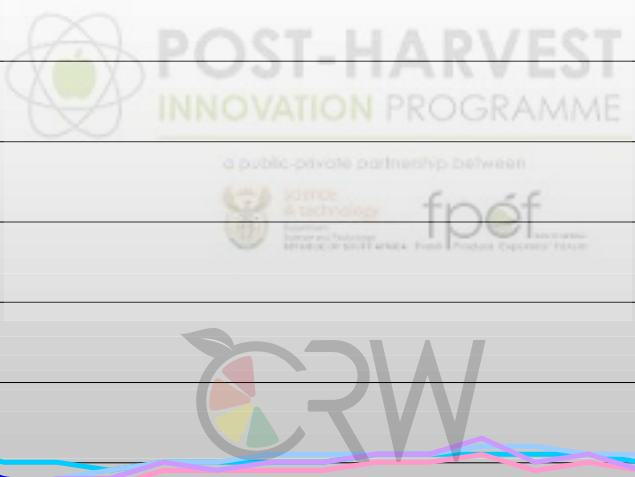


L16 L17 L18 L19 L20 L21 L22 L23 L24 L25 L26 L27 L28 L29 L30

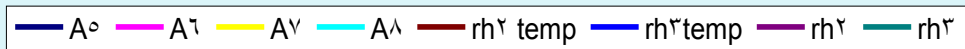
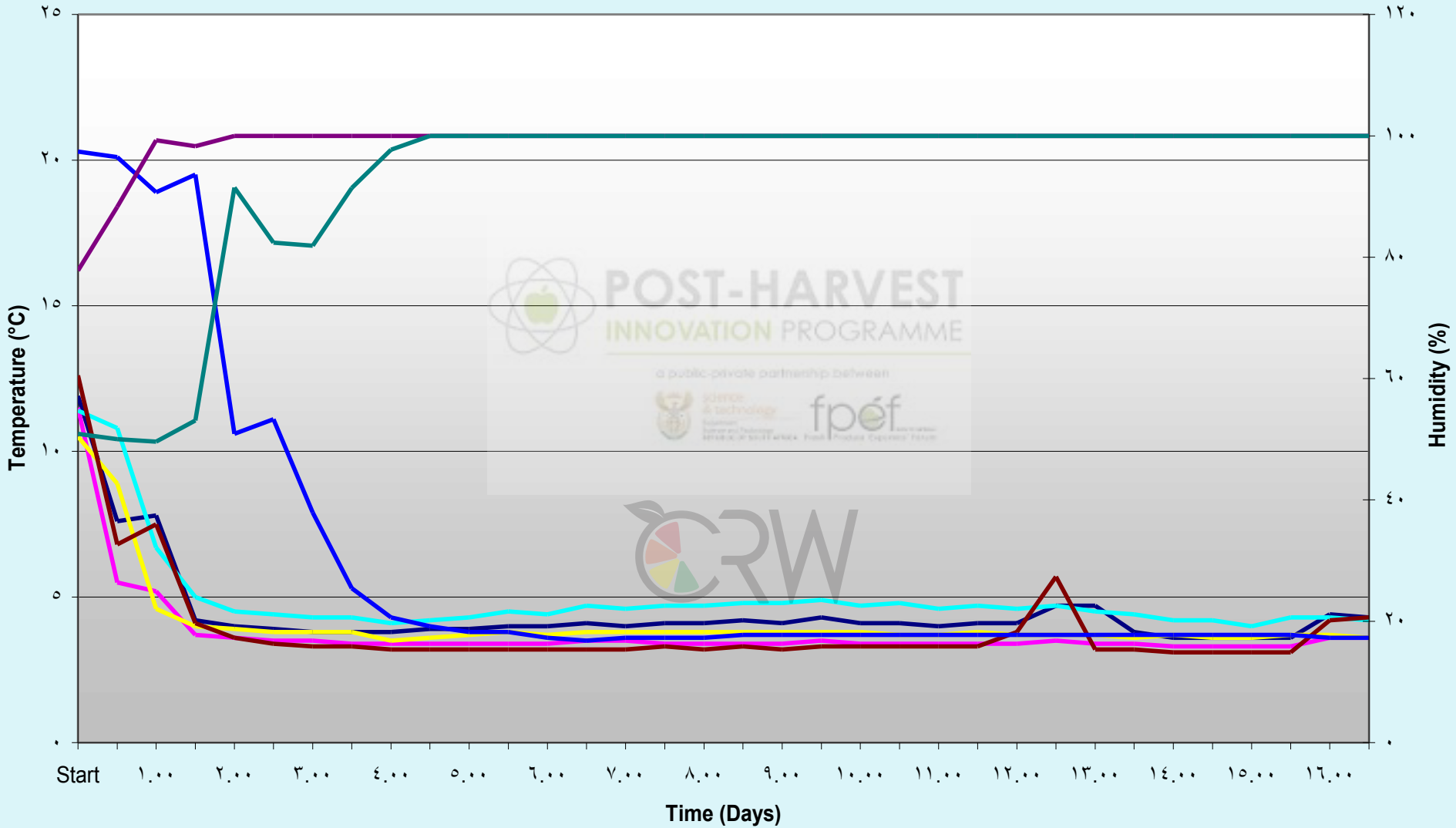
**Graph 3: Ambient Load Trial 10b  
MORU 0207021 (12 hour readings)**



- L1
- L2
- L3
- L4
- L5
- L6
- L7
- L8
- L9
- L10
- L11
- L12
- L13
- L14
- L15



**Graph 5: Trial 1 - Relative Humidity & Air  
a & b Combined (12 Hour readings)**



# To Do's

CHALLENGE	SOLUTION
<p>Integrate all components of the supply chain.</p>	<p>Choose cartons and pallet suppliers carefully to obtain the product that best fits your operation to maintain fruit quality.</p>
<p>Maintain a seamless supply chain.</p>	<p>Invest in chilled and air lock load bays.</p>
<p>Fruit quality is dependant upon all actions taken in the packing operation.</p>	<p>The devil is in the detail.</p>