

# Temperature Issues Raised by the Use of Returnable Plastic Crates (RPC's) during the Cool Chain

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# Packaging Waste

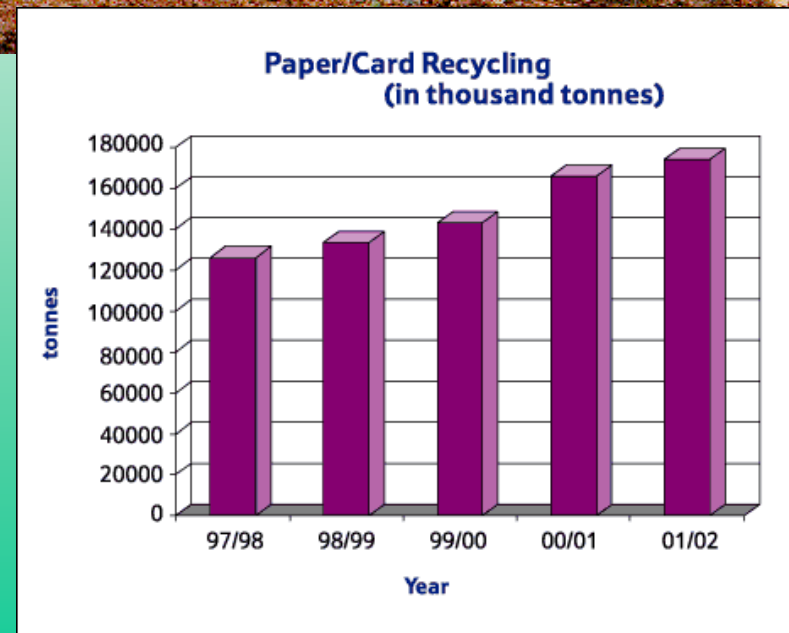
UK produces around 400m tonnes of waste annually, much of which is packaging.

EU has targets for % of packaging that should be recycled or recovered.



# Reasons for use of RPC's

- Reduces packaging waste (supermarkets wish to cut packaging waste because of image and money)
- Hygiene
- Easier to cool
- Strong even if exposed to moisture



# Packaging Waste



Chris Bishop



# Packaging

- The choice of packaging and how it is stowed can affect airflow and hence temperature uniformity. The two examples shown will have different airflow characteristics



# Returnable Containers



# Returnable Containers

## Returnable Containers

- Returnable containers carry a once only charge but typically do around 80 trips.
- Only used as outers in the fresh produce sector

**BUT HAVE DIFFERENT TEMPERATURE CHARACTERISTICS THAN THE TRADITIONAL CARDBOARD CARTON**

# Temperature Changes for RPC's

- Although Returnable Plastic Crates have many advantages, the increase in vent area (%free area) can result in faster temperature change of the product. This can be an advantage if it is required to cool the product but can also be a disadvantage during the cool chain if the crates are in a warmer temperature than ideal such as in a supermarket regional distribution depot where the temperature can be typically between 15°C and 20°C.
- To evaluate the potential for temperature warming trials were undertaken at Writtle College.



# Trial Procedures

- Bagged potatoes in nominally 2.5kg bags
- Standard cardboard or supermarket RPC
- Six bags per tray
- Still air with 0.3m or more of space around the pallet
- Results mean of monitoring six flesh temperatures in different locations for each treatment (not in top or bottom layer of pallet)

# Trial Procedure

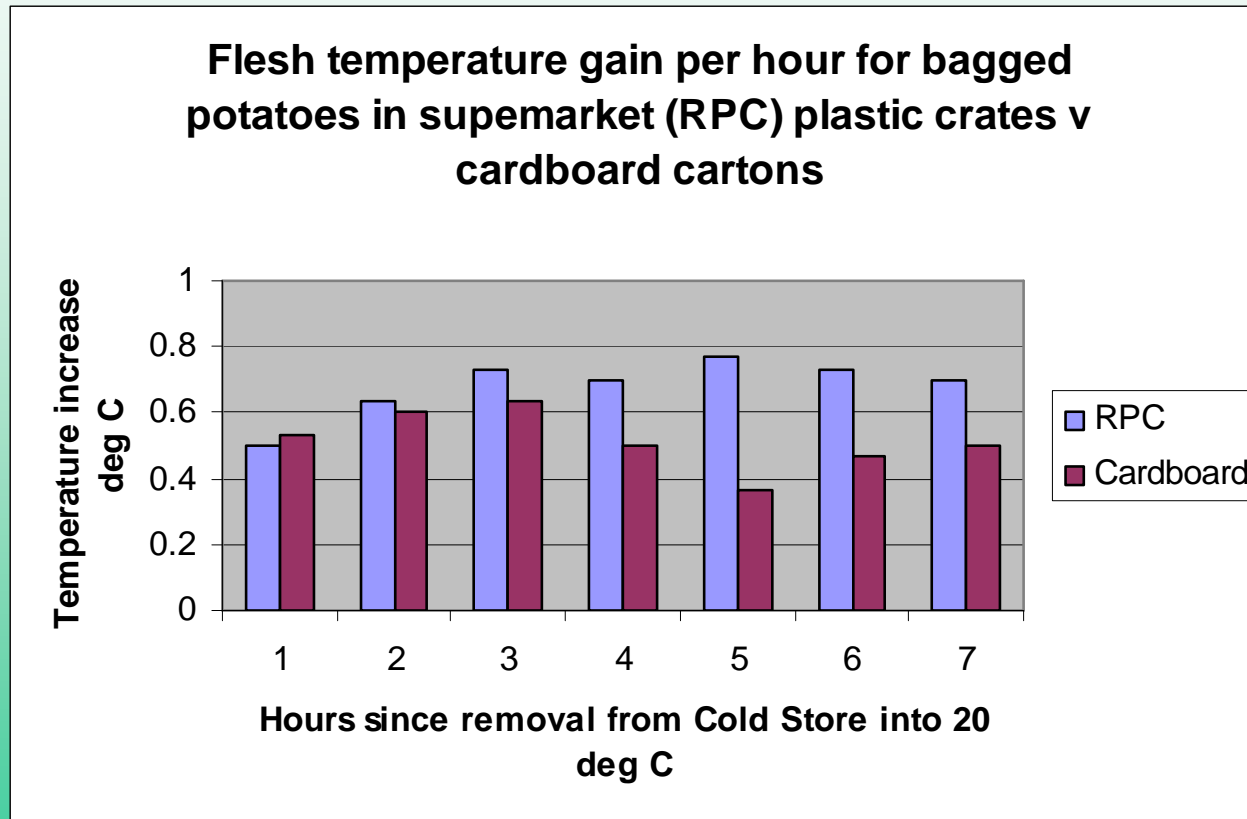
- The product was kept in a cold store set at 3.5-4°C for at least 72 hours prior to the trial and then the flesh temperatures were measured to ensure the product was cool. Flesh readings were 4.0 – 4.6°C. The flesh temperature was then recorded at a minimum of six locations using Gemini “tinytalk” external lead loggers. All results given are for a mean of the temperatures recorded. All experiments repeated second time



# Question I What difference does a RPC make in rate of warming compared to a cardboard carton

- The crates of potatoes were removed from a cold store at 4°C and placed in still air at approximately 20°C on two pallet stacks (cardboard and RPC) which were not touching any other pallets After seven hours the temperature for the bagged potatoes in the plastic crates was 8.8°C for the bagged in the RPC and 7.5°C for the bagged in the cardboard carton

# Question I What difference does a RPC make in rate of warming compared to a cardboard carton

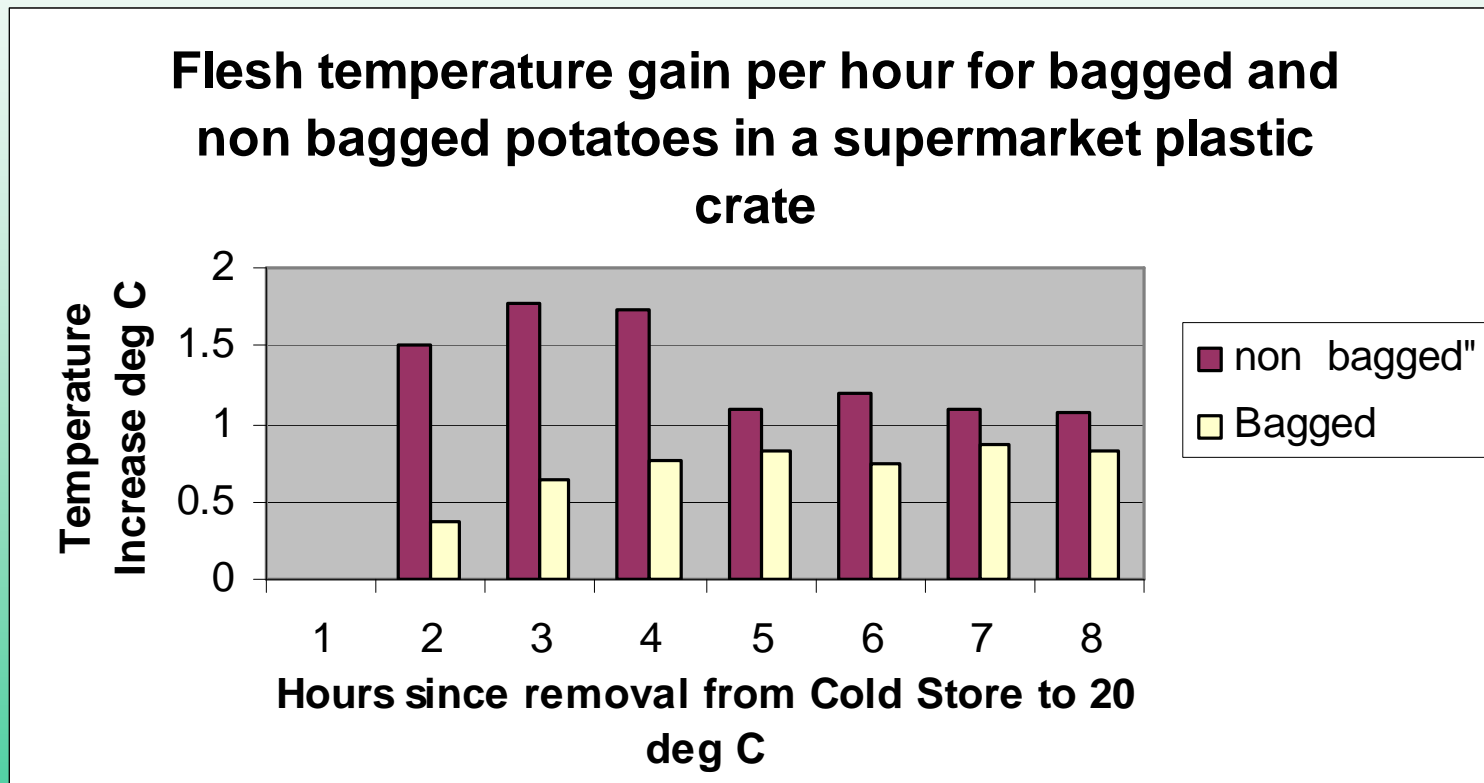


## Question 2 – if the product is already in plastic bags what difference does this make to the rate of warming

- The crates of potatoes were removed from a cold store at 4°C and placed in still air at approximately 20°C on two pallet stacks (bagged and unbagged) which were not touching any other pallets. The rate of warming slowed for the non bagged potatoes after three hours because the temperature difference became less and also as some condensation was observed .
- After seven hours the potatoes had warmed to a mean temperature of 13.9°C for the non bagged and 8.9°C for the bagged

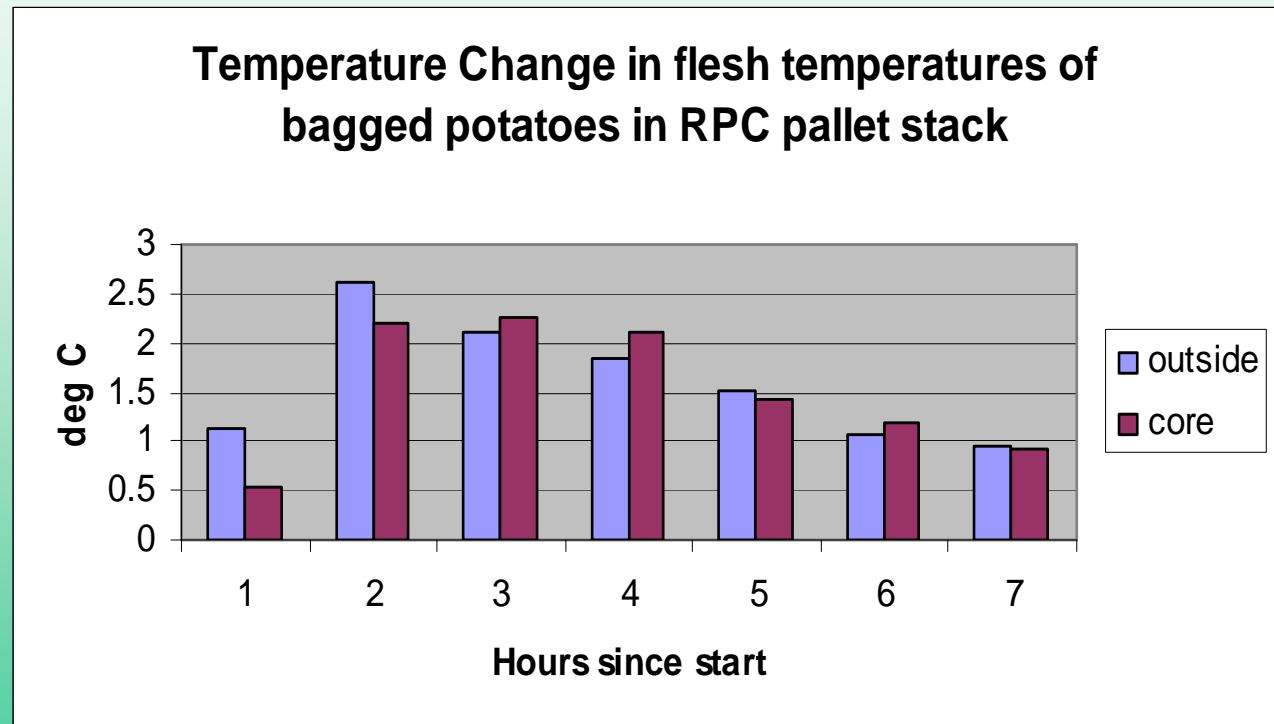


# Question 2 – if the product is already in plastic bags how much faster does the product warm



# Question 3 How uniform is the temperature change throughout the stack

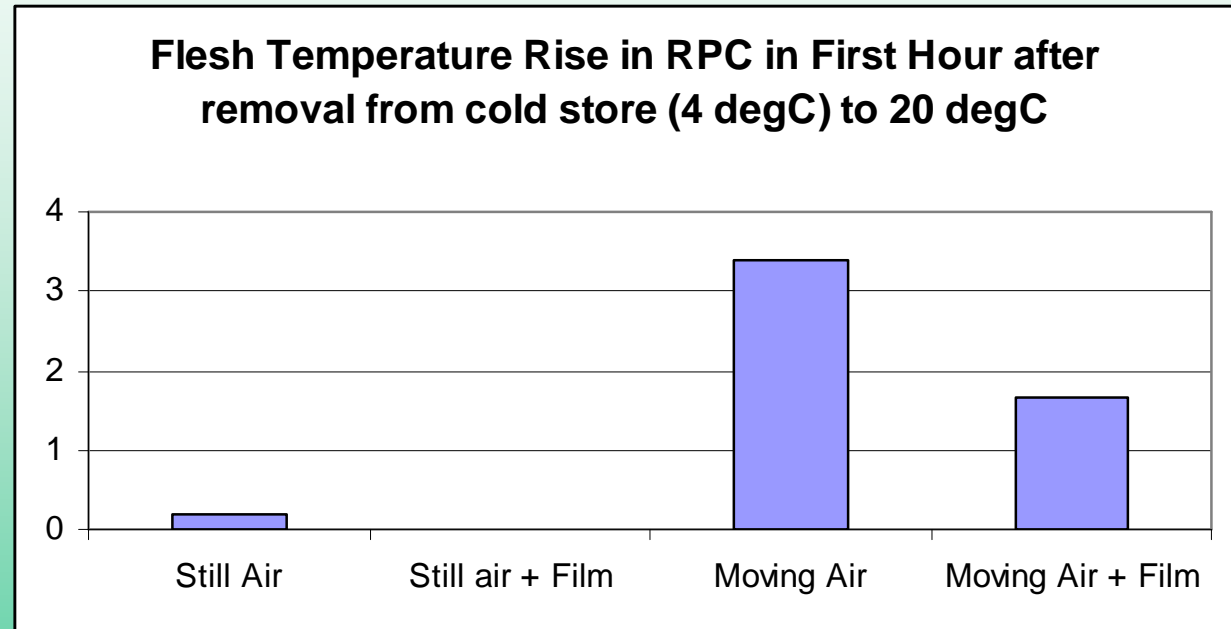
- The flesh temperatures on the outside were all within 200 mm of the edge and those in the core were all at least 350mm from the edge



# Question 4 - What is the effect of moving air and what can be done to restrict its effects

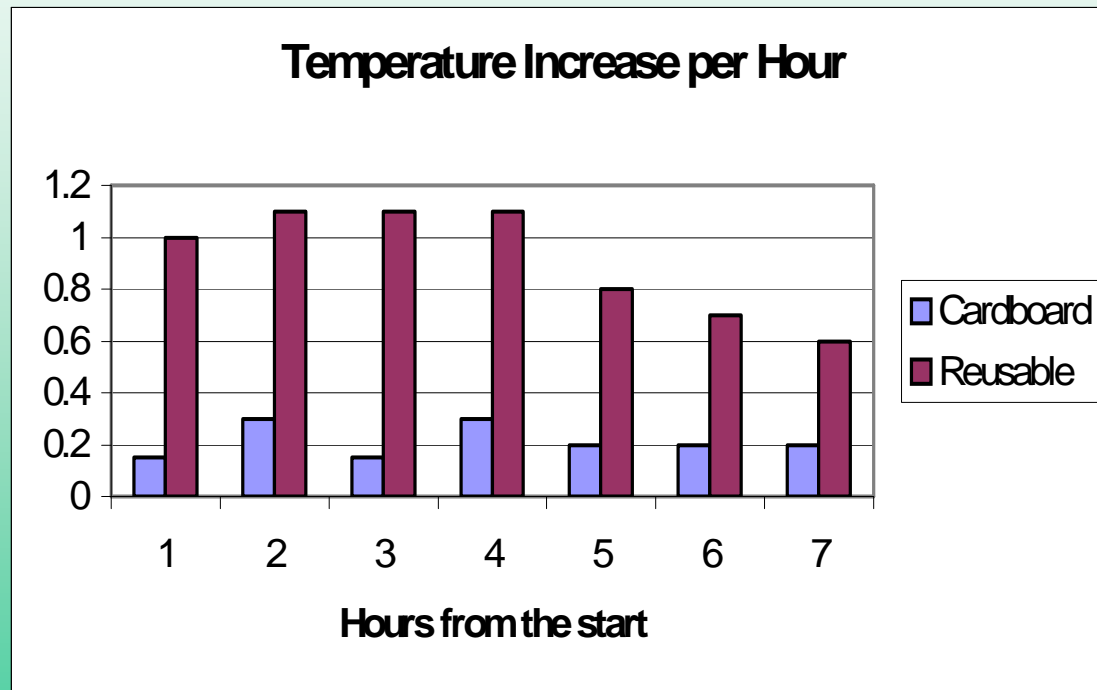
The pallet stack of bagged potatoes in RPC's was placed directly in an airstream of 0.5m/s. There was a temperature gradient across the stack so the actual temperatures do vary from the mean.

The experiment was repeated with a pallet wrapped in plastic film.



# Other Crops in RPC's

- Other crops are being considered  
Example shown is netted citrus in RPC's or traditional cardboard cartons



**THANK YOU**

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**QUESTIONS?**