

MATERIAL & PACKAGE TESTING LABORATORY

CLIENT: KITE PACKAGING - COVENTRY
REF: THERMAL INSULATION PACK TESTING
DATE: 25TH MAY 2021

PURPOSE OF TESTS

Comparative tests were completed to determine the thermal properties of various types of cold storage boxes.

Five types of packaging were monitored by means of a data logger with thermocouples situated inside the pack and fixed to the outer surface of the packaging. All tested packaging contained four frozen gel packs.

The packaging was monitored for 48 hours with readings taken every minute.

Types of packaging and testing conditions

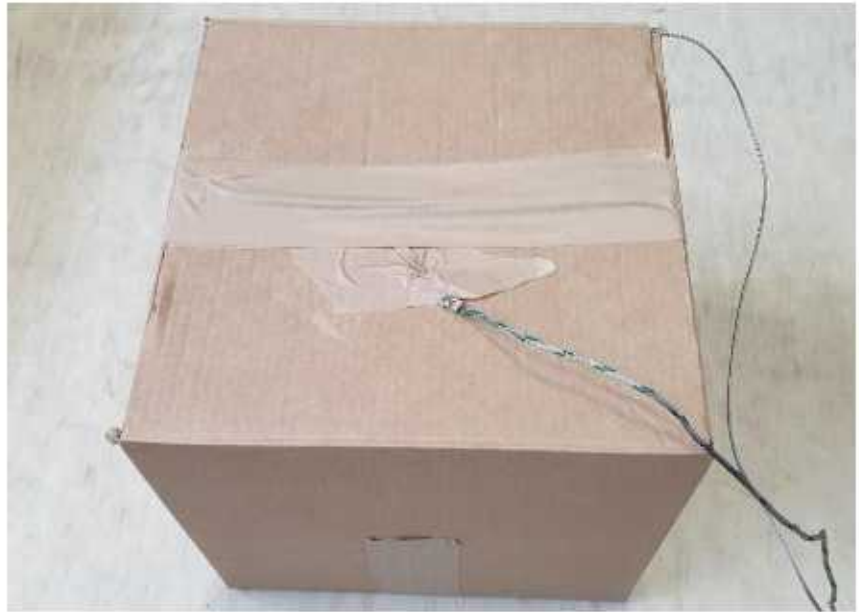
Test	Box reference	Test number / Testing conditions
1	Polystyrene	5°C – Cold-room
2	Polystyrene	23°C – Controlled Laboratory
3	Starch liner	5°C – Cold-room
4	Starch liner	23°C – Controlled Laboratory
5	Foil liner	5°C – Cold-room
6	Foil liner	23°C – Controlled Laboratory
7	Corrugated liner	5°C – Cold-room
8	Corrugated liner	23°C – Controlled Laboratory
9	No liner	5°C – Cold-room
10	No liner	23°C – Controlled Laboratory

Style of box tested – 0201

Approximate box dimensions – 250 x 250 x 250mm

Grade of outer box – Single wall

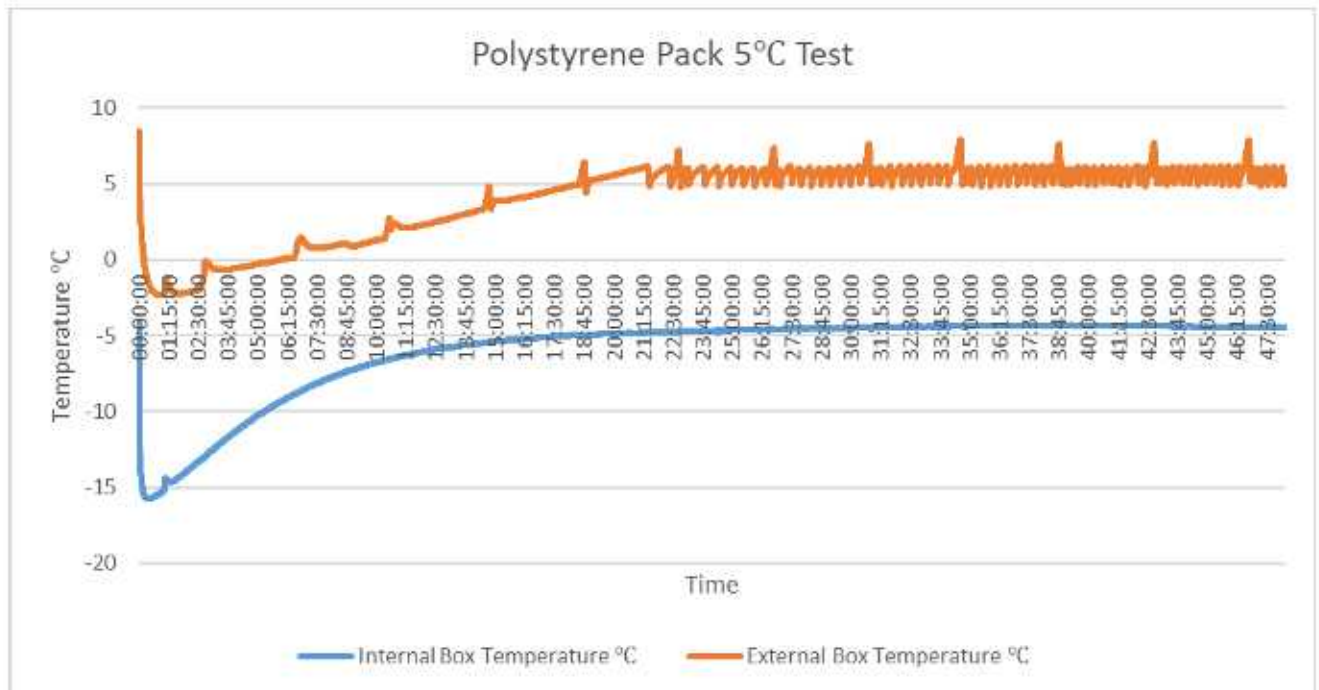
Positioning of thermocouples



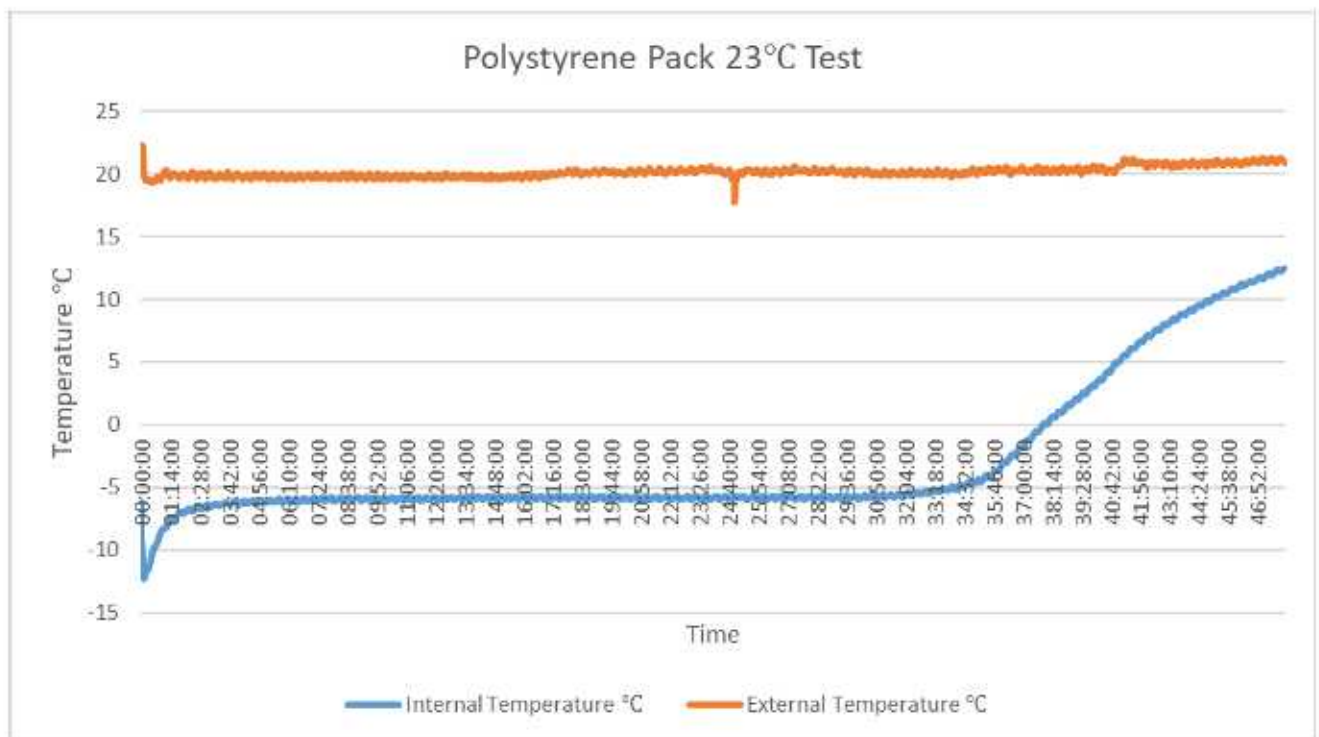
Polystyrene box



Test 1



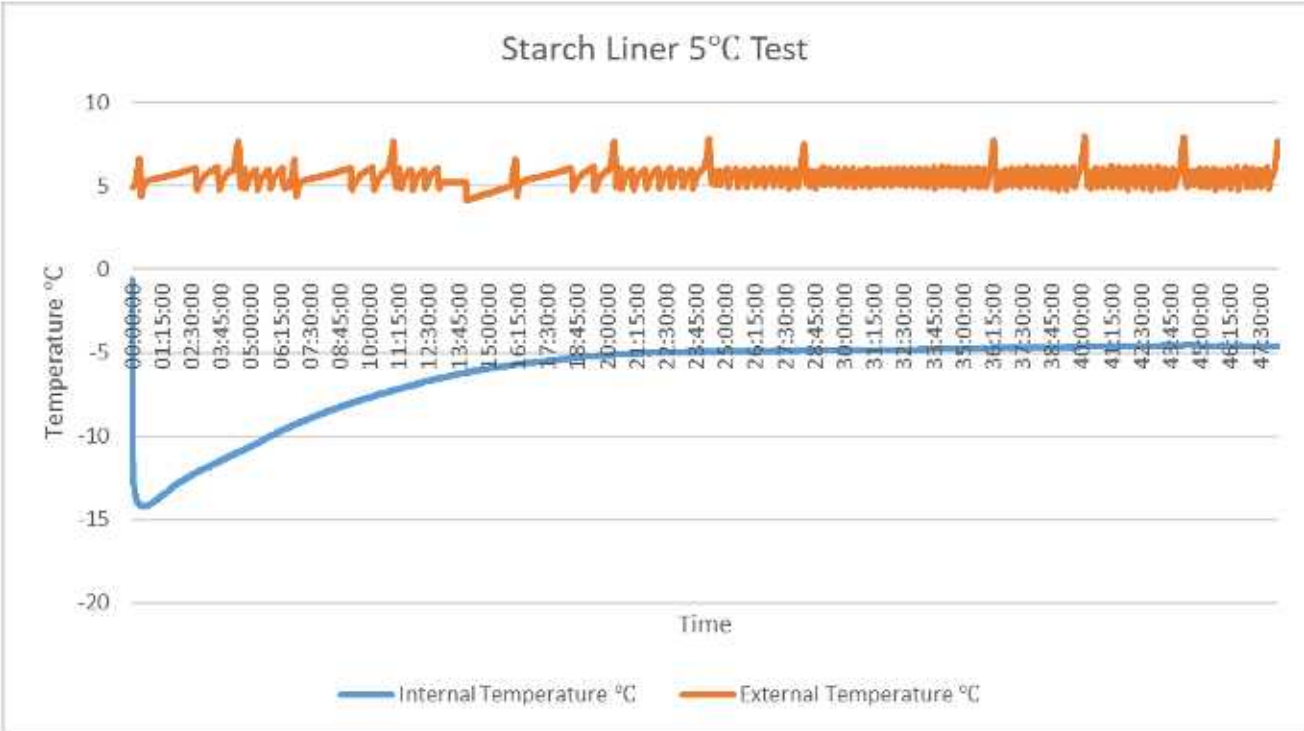
Test 2



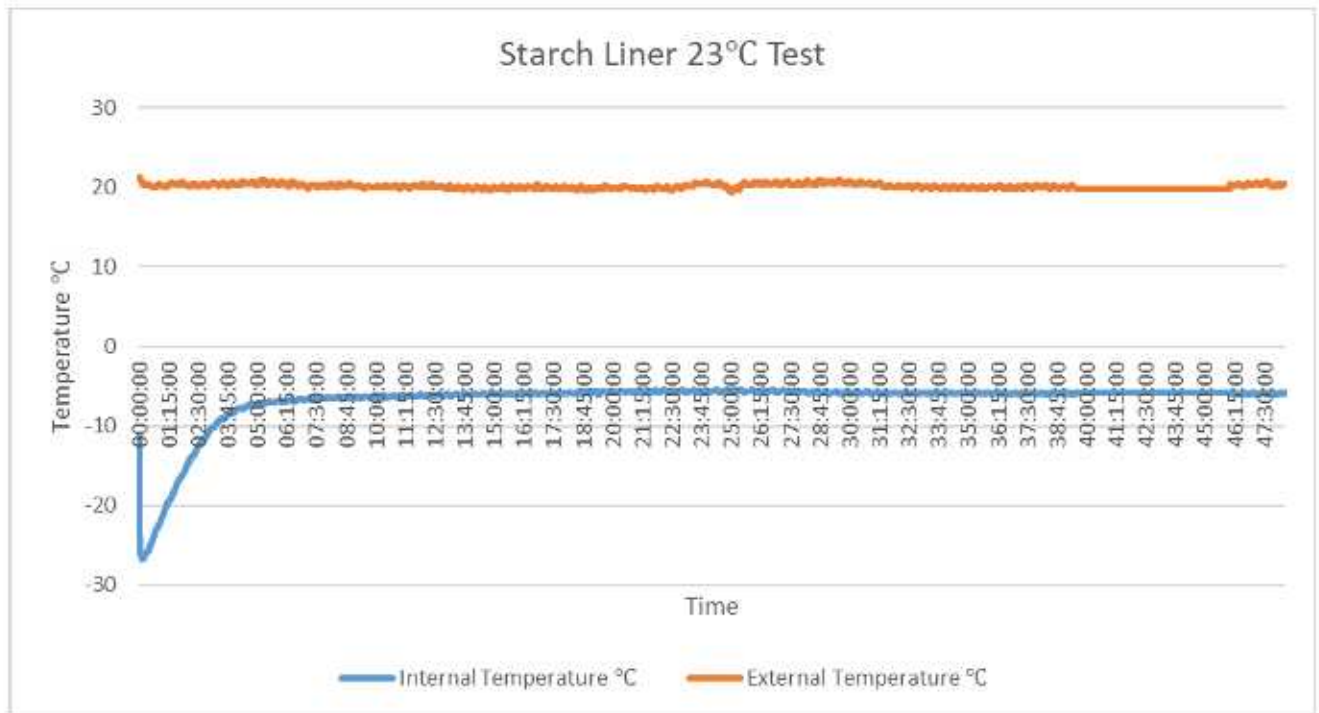
Starch Liner



Test 3



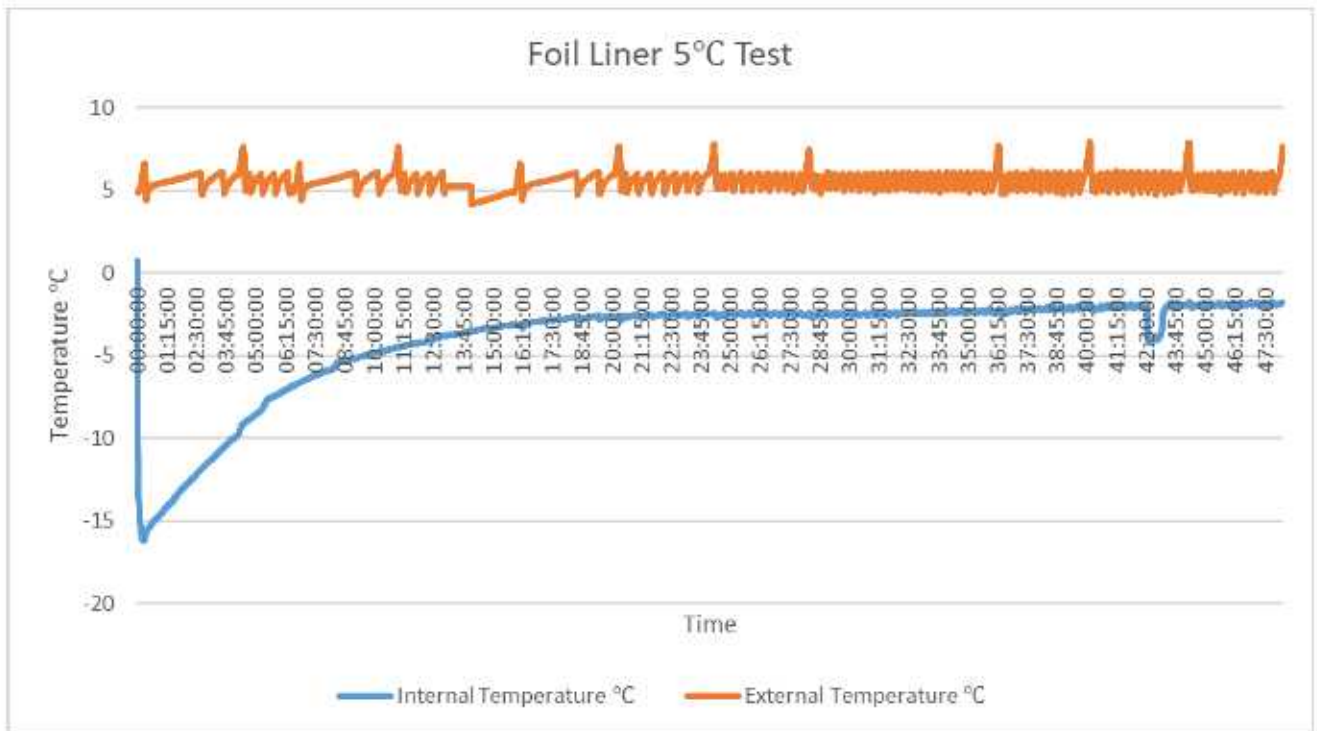
Test 4



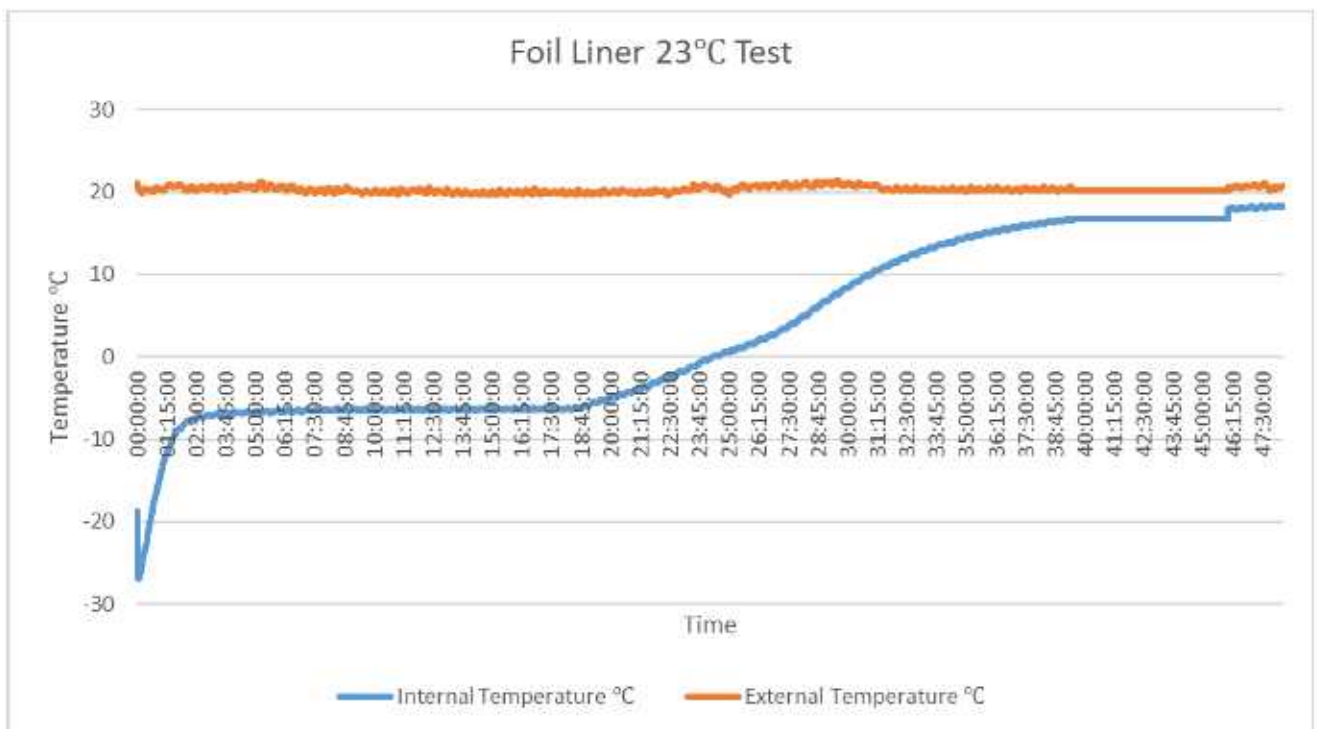
Foil Liner



Test 5



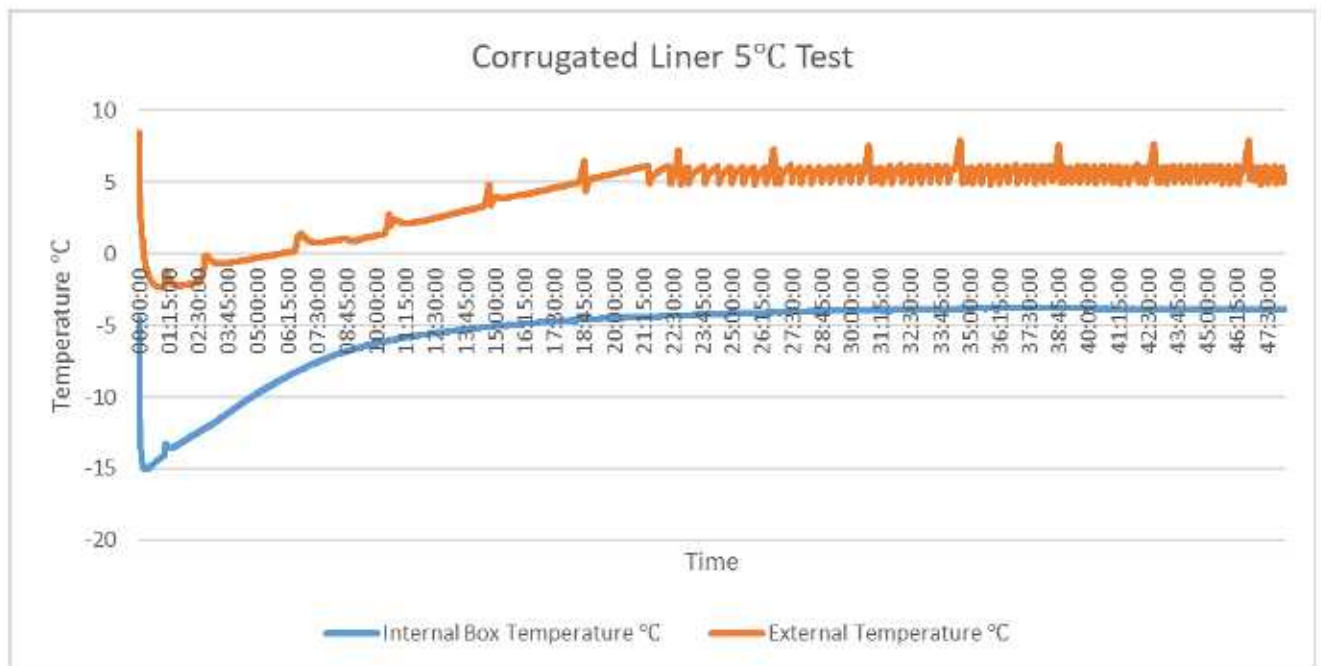
Test 6



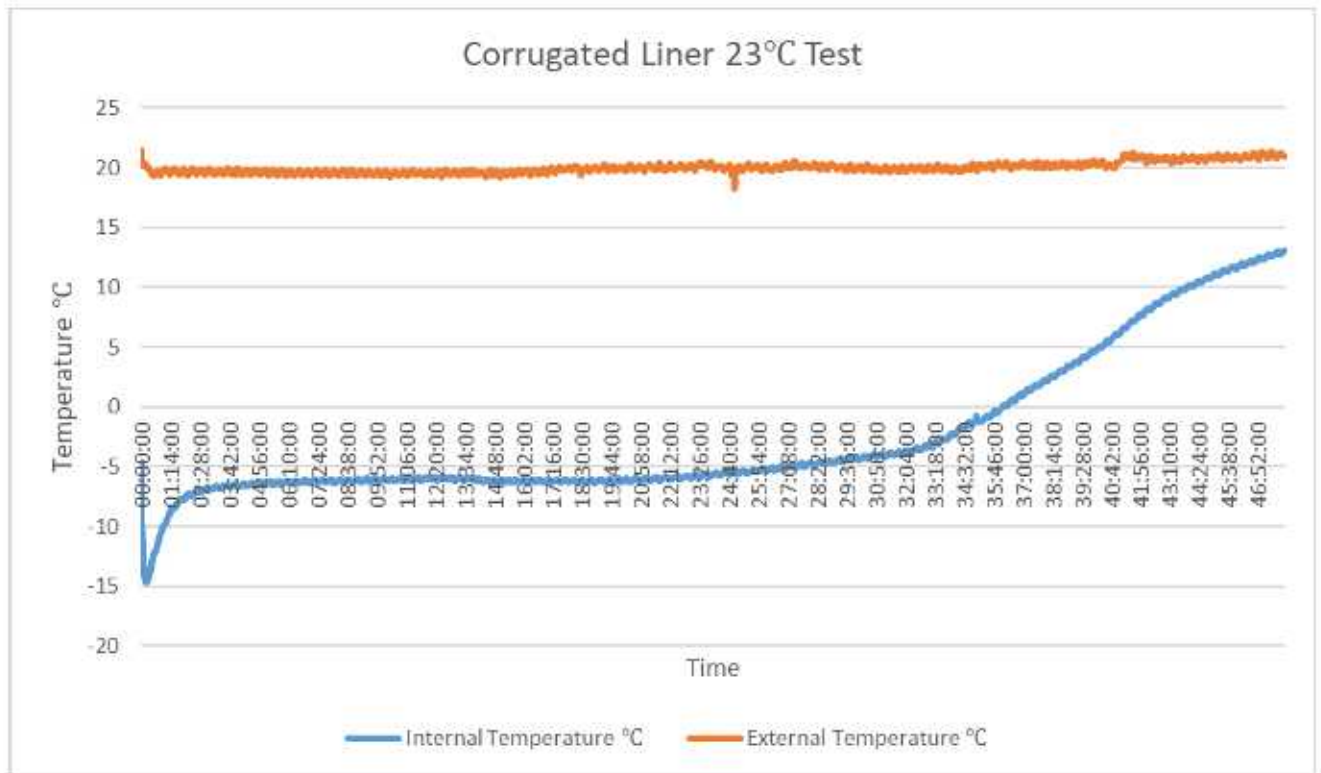
Corrugated Liner



Test 7



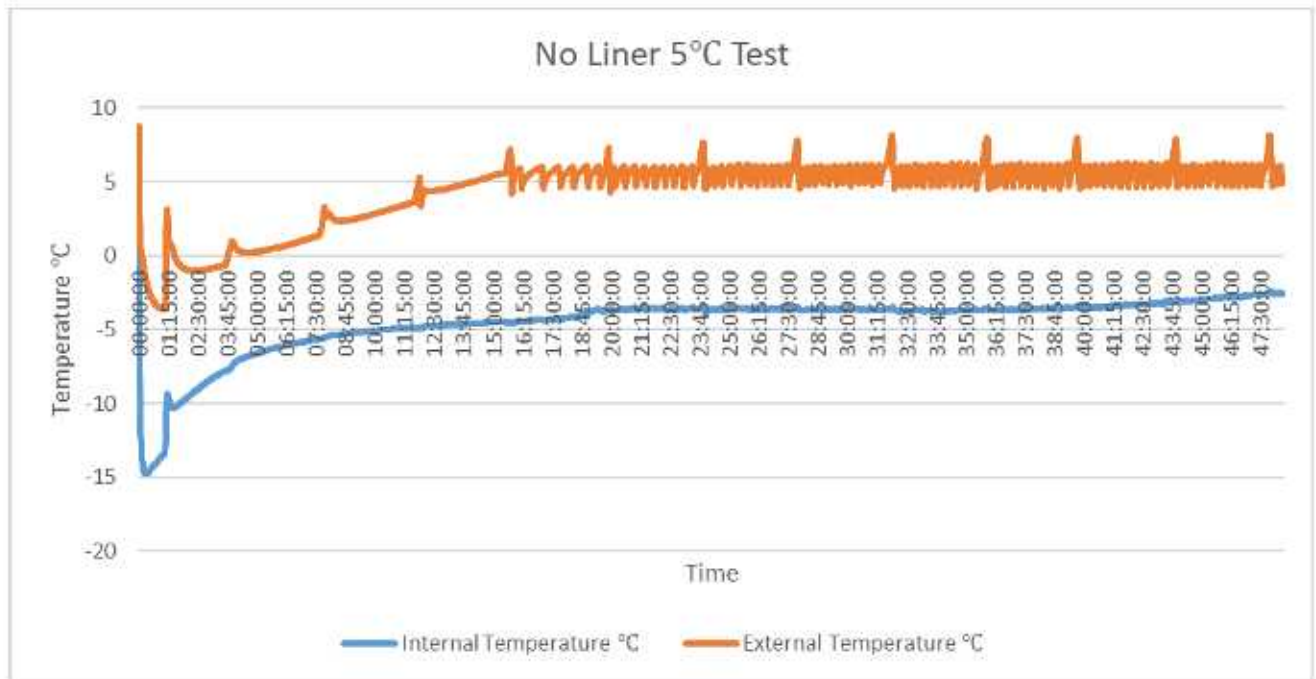
Test 8



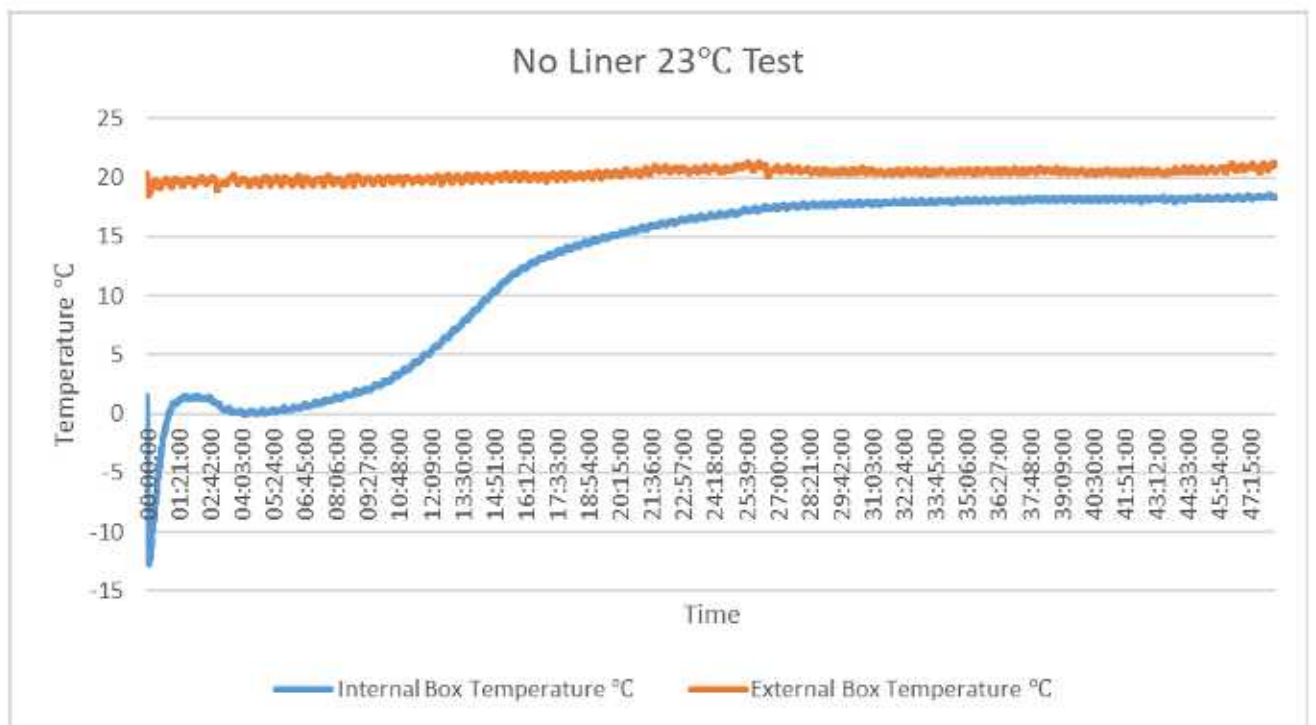
No Liner



Test 9



Test 10



SUMMARY

Temperatures recorded for packs when conditioned at 5°C

	Polystyrene	Starch liner	Foil Liner	Corrugated Liner	No Liner
Internal temp @ 24 hours	-4.708	-4.956	-2.462	-4.263	-3.752
External temp @ 24 hours	5.491	5.967	5.491	5.491	4.534
Internal temp @ 48 hours	-4.411	-4.597	-1.929	-3.852	-2.548
External temp @ 24 hours	5.544	5.447	5.544	5.544	5.077

Temperatures recorded for packs when conditioned at 23°C

	Polystyrene	Starch liner	Foil Liner	Corrugated Liner	No Liner
Internal temp @ 24 hours	-5.828	-5.68	-0.448	-5.636	16.696
External temp @ 24 hours	20.282	20.681	20.951	20.091	20.594
Internal temp @ 48 hours	12.533	-5.981	18.157	13.12	18.422
External temp @ 48 hours	20.935	20.372	20.578	20.894	20.722

When storage conditions are at a constant of 5°C the contents inside all styles of packaging maintained a negative temperature – at 48 hours the core temperature of the foil liner and no liner packs had increased approximately 21 & 32% respectively.

Storage conditions of 23°C showed that the only version that maintained a constant negative internal temperature was the starch liner pack, contents were kept at -5°C for the full 48 hours of testing. Tests confirmed that the corrugated liner pack was as affective as the polystyrene pack for maintaining an internal temperature over the full testing period.