



Case Study



SSL™ PLUS

**The next generation
of Secondary
Seal Technology**

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The next generation of Secondary Seal Technology.

Confinement odour and blood drip in vacuum packed meats are a main cause of complaints for supermarkets, especially on export meats such as beef and lamb.

Krehalon SSL™ Plus technology takes Secondary Seal (SSL™) to the next level by reducing confinement odour and introducing fat adhesion properties that improve blood drip control and enhance product presentation of vacuum-packed meats over extended shelf life.



in association with
Campden BRI
food and drink innovation

Commissioned study to prove odour reduction and shelf life benefits of SSL™ Plus

Testing was carried out on 700 lamb legs packed in Krehalon's SSL™ Plus in order to determine potential shelf life extension, blood drip loss and confinement odour reduction benefits over standard sealing shrink bags.

Products were stored at 0°-3°C for 28 days and then split into 'Commercial' and 'Retail' temperature abuse trials.

Temperature variability during shelf life:

◀ 28 days at 0°-3°C

Then split into:

◀ Commercial trial: 0°-3°C

◀ Retail trial: 5°C for 7 days;
22°C for 2 hrs; 7°C ongoing

Testing of the packaging included:

◀ Microbial testing - TVCs

◀ Odour and sensory quality grading

◀ Drip loss

◀ Peel test – film to meat

◀ Tensile testing - Secondary Seal Appearance

How does SSL™ Plus work?

SSL™ Plus uses special sealant materials to allow the inner packaging layers to fuse together through the normal production processes of vacuum packing and hot water shrinkage.



Pressure

During the process of vacuum packing, the bag collapses around the product and against itself under the influence of atmospheric pressure, allowing SSL™ Plus inner packaging layers to fuse together.



Time

Product immersion in hot water for 1.5 seconds helps optimise SSL™ Plus self-welding properties whilst preventing meat blanching when passing the vacuum-packed meat through the hot water shrink system.



Temperature

Elevated temperature is needed to ensure maximum seal integrity. SSL™ Plus is effective in water temperatures above 80°C.



Contamination

Contamination in the seal area may reduce the effectiveness of SSL™ Plus, especially in manual loading conditions. The Flovac™ and Formshrink® automated processes of packing are therefore considered the best packing methods for SSL™ Plus.

Case Study

SSL™ PLUS

proved significant odour reduction compared to standard bags over shelf life

SSL™ Plus
Towards end of shelf life



Standard Bag
Towards end of shelf life

RAW LAMB ODOUR GAMEY ODOUR STALE BLOOD ODOUR

	RAW LAMB ODOUR		GAMEY ODOUR		STALE BLOOD ODOUR	
	Standard bag	SSL™ Plus	Standard bag	SSL™ Plus	Standard bag	SSL™ Plus
Day 1	2	2	0	0	0	0
Day 28	4	3	0	0	0	0
Day 35 - Retail	5	4	2	1	4	2
Day 47 - Retail	6	5	4	2	5	3
Day 55 - Commercial	6	3	4	0	5	1
Day 61 - Commercial	7	5	6	2	7	1

OVERALL SENSORY QUALITY

	Standard bag	SSL™ Plus
Day 1	Excellent	Excellent
Day 28	Very good	Excellent
Day 35 - Retail	Satisfactory	Fairly good
Day 47 - Retail	Just acceptable	Fairly good
Day 55 - Commercial	Just acceptable	Good
Day 61 - Commercial	Poor	Fairly good

Strength of odour grading:

A panel of experienced sensory assessors measured the intensity of each odour (raw lamb, gamey and stale blood smells) giving it a rating from 0 (absent) to 9 (very strong). An overall quality grading was then awarded to each – from 'Bad' to 'Excellent'.

ABSENT	VERY WEAK	WEAK	MODERATE	STRONG	VERY STRONG
0	1-2	3-4	5-6	7-8	9-10

Blood loss results and appearance test

Test method:

- Each leg was weighed and imaged before opening
- Drip loss (%) was calculated on the amount of liquid collected based on leg weight

SSL™ Plus packs showed:

- Reduced blood seepage after 28 days
- Controlled blood movement to cut meat surface area
- Limited blood in bag ears due to Secondary Seal
- No blood movement across the fat surface

	Pack type	Average Drip Loss (%)	Notes
Day 28	Standard bag (control)	0.535%	Pack loose on leg, blood spread through to fat layer, not much adhesion. Pooling of blood near bone and to edges of packaging.
Day 28	SSL™ Plus	0.437%	Tighter pack than control, less blood pooling. Fat layer drier. More adhesion than control.
Day 47 Retail	Standard bag (control)	0.589%	Slight green hue across fat some samples. Packaging loose. Lots of blood across the meat surface.
Day 47 Retail	SSL™ Plus	0.579%	Pooling of blood on the cut surface. No blood on the fat layer. Channelling in the secondary seal of 1 sample.
Day 55 Commercial	Standard bag (control)	0.448%	Blood pooling in secondary seal area on all samples. Discolouration to the meat (green hue). Blood pooling around the leg.
Day 55 Commercial	SSL™ Plus	0.478%	No channelling in the secondary seal. Fat layer free from blood, pooling of blood around cut muscle and bone.

Potential for shelf life extension

This study proved that there are higher levels of bacteria in the meat blood compared to the meat surface, due to more nutrients being readily available in the blood for growth.

As such, it is believed that by controlling blood movements within the pack, SSL Plus is able to reduce overall bacteria counts and delay meat spoilage.

	Pack type	Aerobic bacteria Meat Surface	Aerobic bacteria Blood	Anaerobic bacteria Meat Surface	Anaerobic bacteria Blood
Day 55 Commercial	Standard bag (control)	9.50E+06 5.30E+06 1.80E+07	3.80E+08 1.20E+09 1.10E+09	8.80E+06 6.00E+06 1.80E+07	3.20E+08 1.10E+09 1.10E+09
Day 61 Commercial	Standard bag (control)	1.10E+06 3.10E+07 8.90E+06	2.40E+09 1.80E+09 1.30E+09	1.20E+06 3.60E+07 7.70E+06	2.60E+09 1.80E+09 1.40E+09
Day 55 Commercial	SSL™ Plus	8.20E+06 1.10E+06 7.20E+06	1.20E+09 2.80E+09 1.80E+08	8.20E+06 1.10E+06 7.20E+06	1.20E+09 2.80E+09 1.80E+08
Day 61 Commercial	SSL™ Plus	6.40E+06 1.50E+06 3.00E+07	5.80E+08 3.10E+08 1.50E+09	5.90E+06 1.50E+06 2.50E+07	5.30E+08 2.60E+08 1.30E+09

Case Study



Comparison between SSL™ Plus product (bottom) and standard shrink product (top).



SSL™ PLUS Improving pack presentation from beginning to end.

Odour reduction

- ◀ Reduced confinement odour (gamey and stale blood) associated with long-life vacuum-packed meats

Improved pack presentation

- ◀ Reduction in unsightly blood pools within the bag
- ◀ Visual 'whiteness' of product fat with no blood discoloration
- ◀ No relaxation of the bag, retaining product shape over shelf life.

Extended shelf life

- Bacteria is proven to grow faster in blood than the surface of the meat. As such, SSL™ Plus helps prolong product shelf life through:
- ◀ Improved control of blood movements within the bag
 - ◀ Reduced overall bacteria count

Thinner but stronger

- ◀ SSL™ Plus offers higher puncture resistance, allowing the use of thinner materials

SSL™ Plus offered improved visual appearance of the lamb legs towards end of shelf life:



◀ Product retained tight and "plump" shape



◀ Product fat remained 'white' and 'clean'



◀ Blood movement in the bag was restricted with SSL™ Plus (right), compared to standard bags (left)

◀ Secondary seal remained strong with no blood channelling in the bag 'ears'



KREHALON
Preserving Quality Together

Interested to learn more about SSL™ PLUS ?

Get all the benefits that SSL™ Plus can offer - contact us today
by completing the enquiry form on our website or request further
information from your local Krehalon representative.

www.krehalon.com