



## Modified Atmosphere Packaging Technology

Complete Solution for extending Freshness of  
Vegetables, Fruits and Flowers



## **Our Mission**

## **Maximize Freshness, Minimize Waste**

## **Our Expertise**

Pioneering solutions that preserve the quality and extend the shelf life of fresh produce and flowers.

## **How We Do It**

Utilizing Modified Atmosphere Packaging (MAP) technology, we provide comprehensive systems that include innovative hardware, intelligent software, and post harvest expertise.



# PerfoTec's Global Reach

## +40 Countries

Active on all continents, serving a diverse range of markets.

## +300 Sites

Extensive presence across the globe, ensuring local impact.

## Global Network

Supported by a strong network of distributors worldwide.



# Reducing Food Waste to Lower Environmental Impact

**Global Food Waste**  
(FAO, 2011)

About **1/3 of food** produced for human consumption is lost or wasted

**Post-Harvest Losses**  
(FAO, 2019)

~14% of food is lost between post-harvest and retail stages.

**UK Food Waste**

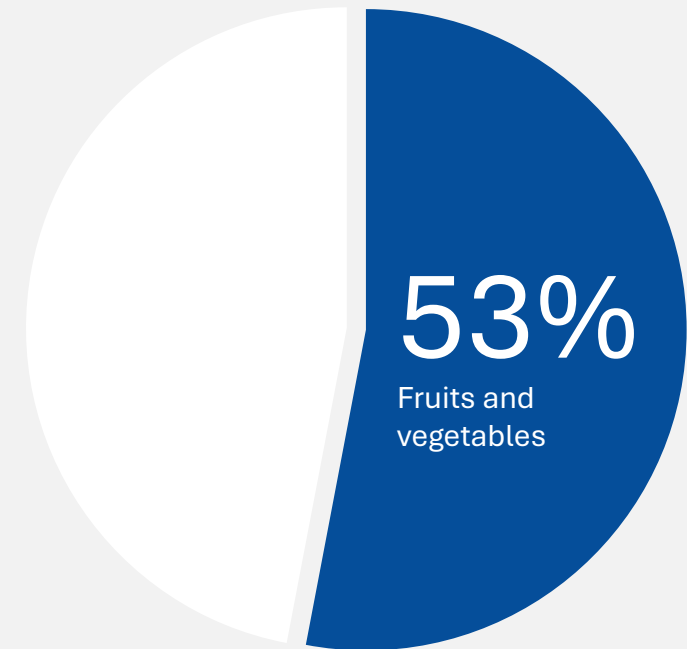
**13.1 million tonnes wasted annually.**

- Primary production: 16.1%
- Distribution: 4.8% ▶

## Distribution Waste Breakdown

Fruits and vegetables make up 53% of waste.

- Vegetables: 34%
- Fruits: 19%



■ Fruits & Vegetables    □ Other

**Focusing on reducing waste in distribution, specially for fruits and vegetables, can significantly lower environmental impact.**

# Cut Food Air-Miles with PerfoTec:

Reduce Emissions by  
Choosing Sea Over Air

Switch to sea-freight with  
PerfoTec Liner to cut emissions and  
reduce food air-miles.

## Air transport emits 50x more greenhouse gases than sea transport.

Emission factors for freight by transport mode (kilograms of CO<sub>2</sub>eq per tonne-kilometer)

Transport Mode	Temp-Controlled Transport (kg CO <sub>2</sub> eq)	Emission Ratio (vs. Sea)
Road Transport	0.2 to 0.66	10x to 33x
Rail Transport	0.06	2.5x to 3x
Sea / Inland Water	0.02	1x (Baseline)
Air Transport	1.13	56.5x

Temperature-Controlled: Transport with refrigeration (e.g., for perishables).

Source: Our World in Data

### Why It Matters?

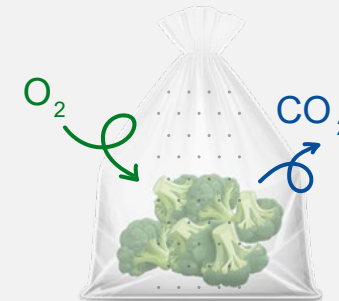
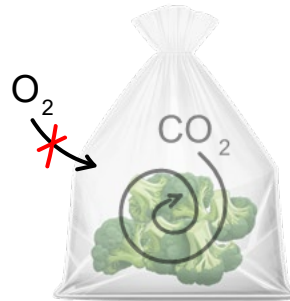
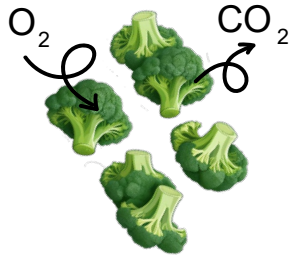
- Climate change and rising CO<sub>2</sub> emissions from transport are growing concerns.
- International trade of fresh produce often relies on high-emission air-freight.

### PerfoTec's Solution!

- PerfoTec Liner extend the shelf life of fresh produce.
- Enables sea-freight (low-emission) instead of air-freight (high-emission).

# Extend Freshness with MAP Using PerfoTec Liner

PerfoTec optimizes  $O_2$  and  $CO_2$  levels to slow the respiration of fresh produce, extending shelf life and reducing waste. PerfoTec Liner use advanced film technology to achieve MAP, ensuring the best conditions for freshness.



## Macro Perforated Product

### Ambient Conditions

( $O_2$ : 20%,  $CO_2$ : 0.04%)

High  $O_2$  accelerates aging, leading to a short shelf life.

## Airtight Packaged Product

### Anaerobic Conditions

( $O_2$ : 0%,  $CO_2$ : 21%)

Excess  $CO_2$  causes damage, resulting in rapid spoilage.

## MAP Packaged Product

### Optimized Conditions with PerfoTec Liner

( $O_2$ : 1-10%,  $CO_2$ : 5-15%)

Reduces metabolic rate, extending shelf life significantly.

# Optimized PerfoTec Liner with PerfoTec Technology

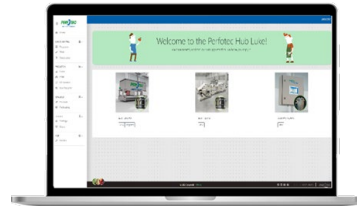
## Fast Respiration Meter

Quick Product Measurement in Just 4 Hours.  
Comprehensive O<sub>2</sub> and CO<sub>2</sub> Data Analysis.



## PerfoTec Platform

Product-Specific Respiration Data Collection  
Optimized OTR & COTR Calculation for Packaging  
Automated Laser Program Creation for Liner Production



## Laser Perforation System

Best in Market for Film Permeability  
Advanced On-Line Perforation  
Patented Closed-Loop Feedback Camera



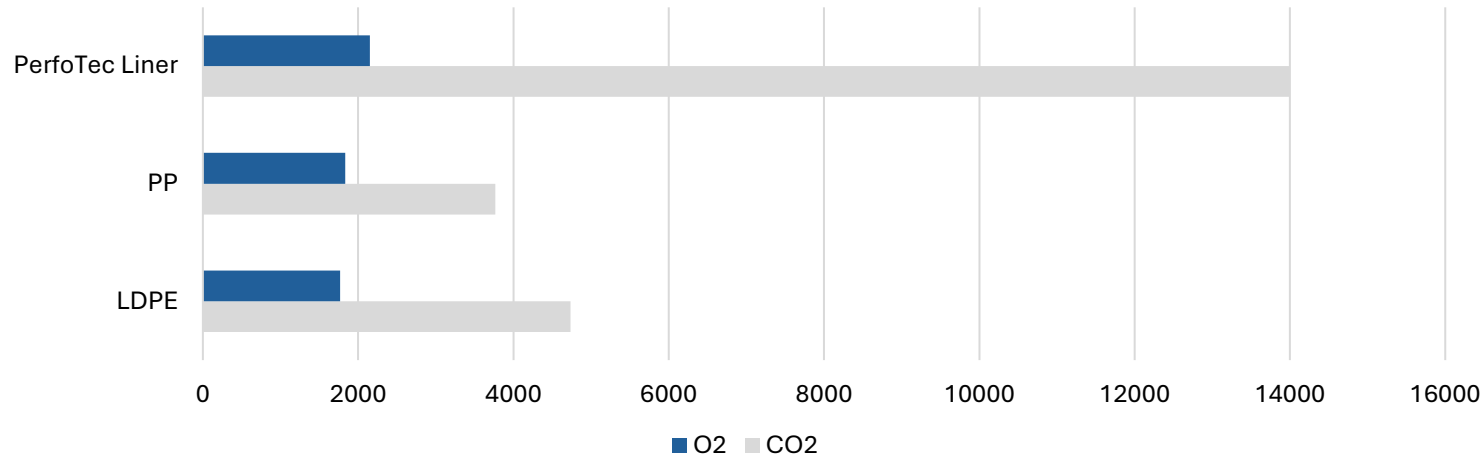
## Why use it?

- Gain insights into your produce's breathing behavior.
  - Optimize shelf life with ideal perforation patterns.
  - Determine precise gas settings for specific weights and temperatures.
- 
- Optimized Liner Design for Extended Shelf Life
  - Adapts to respiration changes.
- 
- Extends produce shelf life and reduces food waste.
  - Cuts costs on pre-perforated films.

# PerfoTec Liner

## Optimal MAP for Freshness

Permeability Comparison (mL/m<sup>2</sup>/day)



	COTR/OTR
LDPE	2.7
PP	2.1
<b>PerfoTec Liner</b>	<b>6.5</b>

**High COTR/OTR = Better Protection!**

O<sub>2</sub> Transmission Rate (OTR)  
CO<sub>2</sub> Transmission Rate (COTR)

### Unique MAP Design

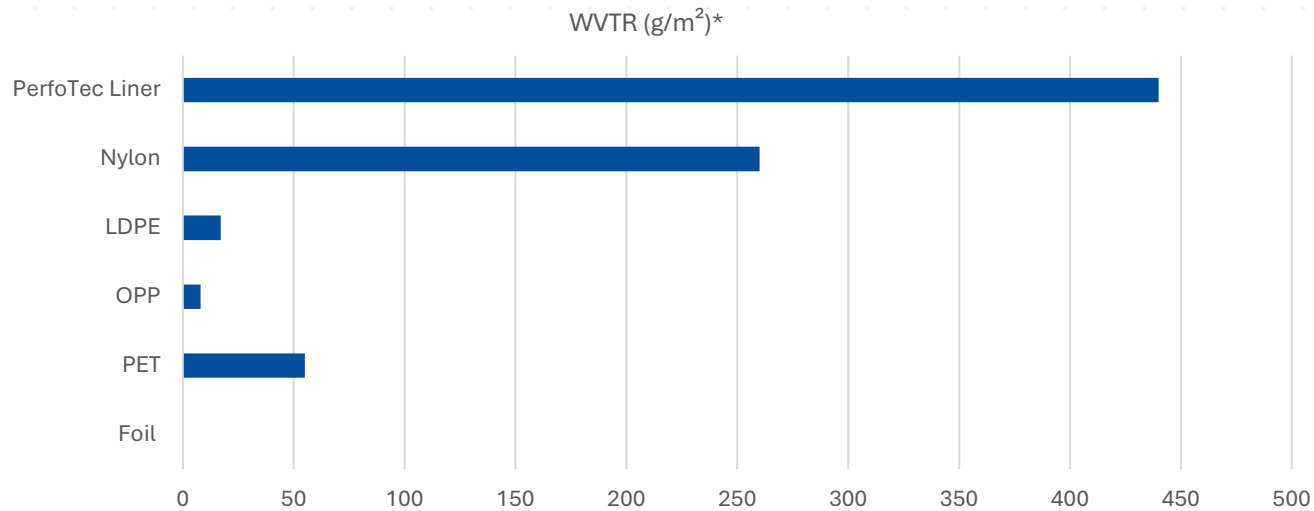
- PerfoTec Liner creates optimal modified atmosphere (MA) conditions.
- High CO<sub>2</sub> Transmission Rate ensures safe O<sub>2</sub> levels without excess CO<sub>2</sub>.

### Practical Benefits

- **Extends shelf life** by balancing O<sub>2</sub> and CO<sub>2</sub> transmission levels, keeping produce fresh.
- Reduces mould and rot.
- **Prevents tissue damage, off-color, and off-odor** with optimal CO<sub>2</sub> levels.

# PerfoTec Liner

## Moisture Management



### Reduces Condensation

- High Water Vapor Transmission Rate (WVTR) eliminates condensation.
- Keeps products dry and prevents spoilage.
- Minimizes dehydration.

### Practical Benefits

- **Extends shelf life** by minimizing condensation, reducing fungal and bacterial growth
- Virtually zero weight loss, **preserving product quality.**



# PerfoTec Liner

## Technical Specification

---

### Technical Specifications C+500

---

- Thickness: 30-micron, made from natural potato starch and bio-based polymers (compostable per EN 13432).
  - CO<sub>2</sub>/O<sub>2</sub> Transmission Ratio: 7:1 (ISO 15105-1 and ISO 15105-2 standards).
  - WVTR: 440 g/m<sup>2</sup>/24hr (DIN 53122 T1 standard).
  - Certifications: TUV certified, OK Compost Industrial; printable, plasticizer-free, GMO-free, and food-safe.
  - Laser Perforation: Optimized for different produce with ideal transmission values.
- 



# Overcoming Postharvest Challenges with PerfoTec Liner

## Postharvest Challenges

## PerfoTec Solutions

### Temperature

Higher temperatures increase product respiration, leading to faster quality degradation.

Lower O<sub>2</sub> levels at peak temperature times to suppress respiration and maintain quality.

### Transport

Unexpected delays in the supply chain during long-distance transport.

Liners optimized for the transport conditions, extending shelf life over long-distance transport.

### Shelf Life and Spoilage

Perishable produce with short shelf life; mould, rot, and condensation issues.

Extends shelf life with precise MAP; suppresses mould, rot, and condensation (via high Water Vapor Transmission Rate WVTR).

### Atmosphere

Anaerobic conditions during storage/transport leading to quality loss.

PerfoTec's laser-perforated liners optimize O<sub>2</sub> and CO<sub>2</sub> levels inside packaging—reducing oxygen without causing anaerobic conditions and increasing CO<sub>2</sub> to suppress microorganisms without harming the product. This ensures better freshness compared to regular materials.

### Moisture

Dehydration during storage/transport, causing product spoilage.

The liner's high WVTR efficiently removes excess moisture while maintaining optimal humidity, minimizing dehydration (<1% weight loss), preserving freshness, and preventing mold and bacteria for long-term quality.

### Ripening and Quality Loss

Ripening leads to loss of firmness, color changes, and metabolic issues (e.g., sprouting in potatoes, onions, flower bulbs; internal breakdown).

Inhibits ethylene production and sprouting (e.g., in potatoes, onions); reduces ripening, color changes, and internal breakdown with optimal MAP and temperature control.



# Logistical & Economic Benefits of PerfoTec Liner for Flowers

## Cost Savings & Increased Revenue

- Save money by enabling **sea transport** instead of air.
- **Store flowers for longer period** to sell during high-price periods (e.g., Valentine's Day, Mother's Day).

## Extended Storage & Transport

- **Maintains vase life** during long-distance sea transport (1–4°C).
- **Ensures freshness** after air/truck transport with fluctuating temperatures (2–20°C).
- Keeps flowers fresh during B-C courier deliveries, even after 48 hours at ambient temperatures (2–30°C).

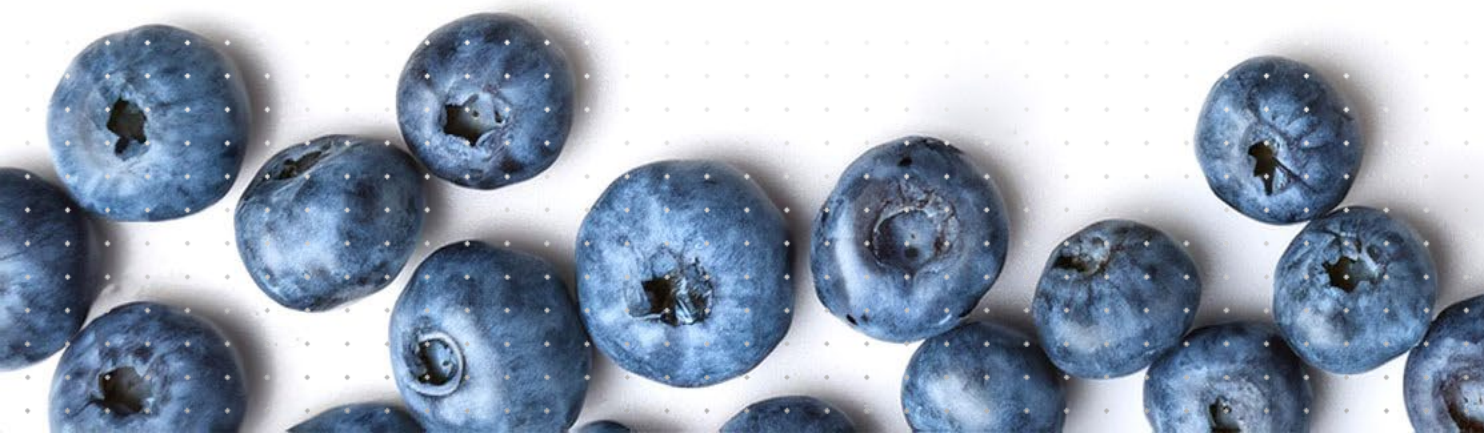
## Environmental Impact

- **Lowers carbon footprint** by 80% by switching from air to sea transport.

# Value from Investing in PerfoTec Products

## Increase Profits while reducing food waste

PerfoTec extends the freshness of produce and flowers so that there is more time for suppliers to ship products, retailers to sell them and consumers to enjoy them. Decreased weight loss (reduced shrink at retail) bring higher profit to retailers.



### PerfoTec Liner Yield Assumption

Packing weight per box	3 KG
Weight loss - conventional packaging	5 %
Weight loss - PerfoTec packaging	1 %
Expected price per kg	€ 7
<b>Savings per box</b>	<b>€ 0.84</b>

**+2 weeks longer buffer time**  
in work inventory and less  
internal waste.





## PerfoTec Avocado Liner

Extended Storage & Cost Savings Across Produce Types



### Conventional Packaging

Day 50

7,8% Weight loss

Avocado – Sea freight

Stored at 2°C

### PerfoTec Liner

Day 50

1,7% Weight loss

### IMMEDIATE SAVINGS

Minimal €0,50 per kilo product (PerfoTec Liner vs. CA container)



## PerfoTec Asparagus Liner

Extended Storage & Cost Savings Across Produce Types



**Naked**  
13 Days  
Air freight

**Green Asparagus**

Stored at 3°C

**PerfoTec Liner**  
33 Days  
Sea freight

### IMMEDIATE SAVINGS

€1,80 per kilo product (sea vs. air transport)



## PerfoTec Snow Peas Liner

Extended Storage & Cost Savings Across Produce Types



### Conventional Packaging

Day 47

4,7% Weight loss

Mould present

### Snow Peas – Sea Freight

Stored at 2°C

### PerfoTec Liner

Day 54

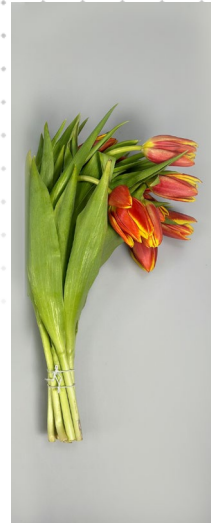
0,4% Weight loss

No mould

Uniform Colour

### IMMEDIATE SAVINGS

Enables cost-effective sea freight over air transport.



## PerfoTec Tulip Liner

Extended Storage & Cost Savings Across Produce Types



<p>◀ <b>Conventional Packaging</b> Day 31</p>	Continued Growth during storage
<p><b>Tulips - Storage</b></p>	Stored at 4°C
<p>◀ <b>PerfoTec Liner</b> Day 31</p>	Preserves Freshness during storage

**Extends storage period with 50%** compared to conventional storage.



## PerfoTec Lime Liner

Extended Storage & Cost Savings Across Produce Types



### Conventional Packaging

Day 42

12,8% Weight loss

Yellow & Dehydration

Limes – Sea Freight

Stored at 8°C

### PerfoTec Liner

Day 42

2,3% Weight loss

Green & Fresh

Keep limes green and prevent dehydration for an extended period



## PerfoTec Bell Pepper Liner

Extended Storage & Cost Savings Across Produce Types



### Conventional Packaging

18 Days

5% Weight loss

Dehydration

### Red Bell Pepper – Transport / Storage

Stored at 8°C

### PerfoTec Liner

28 Days

2% Weight loss

Preserved Quality

**Extends storage period with 50% compared to conventional storage**



## PerfoTec Blueberry Liner

Extended Storage & Cost Savings Across Produce Types



◀ **Conventional Packaging**  
40 Days

Mould present

**Blueberries – Sea Freight**    Stored at 0°C

◀ **PerfoTec Liner**  
40 Days

### **IMMEDIATE SAVINGS**

€1,80 per kilo product (sea vs. air transport)



## PerfoTec Broccoli Liner

Extended Storage & Cost Savings Across Produce Types



<p>◀ <b>Conventional Packaging</b> 10 Days</p>	<p>In polystyrene box With Ice</p>
<p><b>Broccoli – Air Freight</b></p>	<p>Stored at 4°C</p>
<p>◀ <b>PerfoTec Liner</b> 36 Days</p>	<p>Without Ice Dry produce</p>

### IMMEDIATE SAVINGS

On box and ice! No more contamination by micro-organisms via water.)



## PerfoTec Brussel Sprouts Liner

Extended Storage & Cost Savings Across Produce Types



### Conventional Packaging

8 days

Brussels sprouts

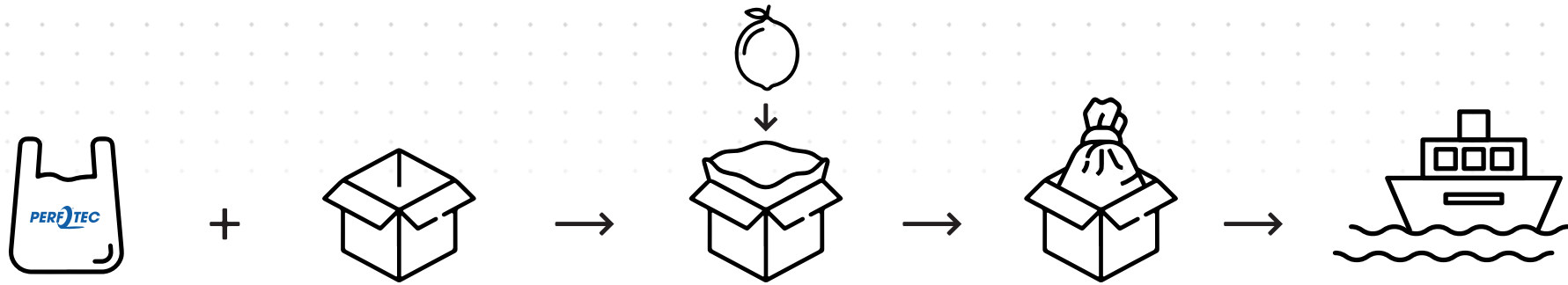
Stored at 0°C

### PerfoTec Liner

30 Days

### IMMEDIATE SAVINGS

\$infinite, no more brown ends!



## ***Naturally Extending Freshness***

### **Transition from Air freight to Sea Freight**

No need for Controlled Atmosphere containers.

### **Extend the Season and Optimize Sales**

Store products, sell at a higher value.

### **Prevent Claims**

Avoid quality and weight loss issues.

Summary

# Elevate Your Business with PerfoTec Liner

## **Extended Shelf Life**

Maximizing sales during peak demand.

## **Cost Efficiency**

per kg with sea freight, reducing logistics costs by 70–90%. Save €0.50–€2.90

## **Sustainability**

Cut carbon footprint by 80–90% and use compostable, bio-based materials.

Contact Us Today to  
**improve your life!**

**We'd L♥ve to Hear from You!**

☎ +31 (0) 297 255 554

✉ [salesupport@perfotec.com](mailto:salesupport@perfotec.com)

🌐 [perfotec.com](http://perfotec.com)