

Innovating Packaging Solutions

- Fremtidens emballasje - effektiv transport med aktive og intelligente emballeringsmetoder

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Innovating Packaging solutions for fresh fish



Outline:

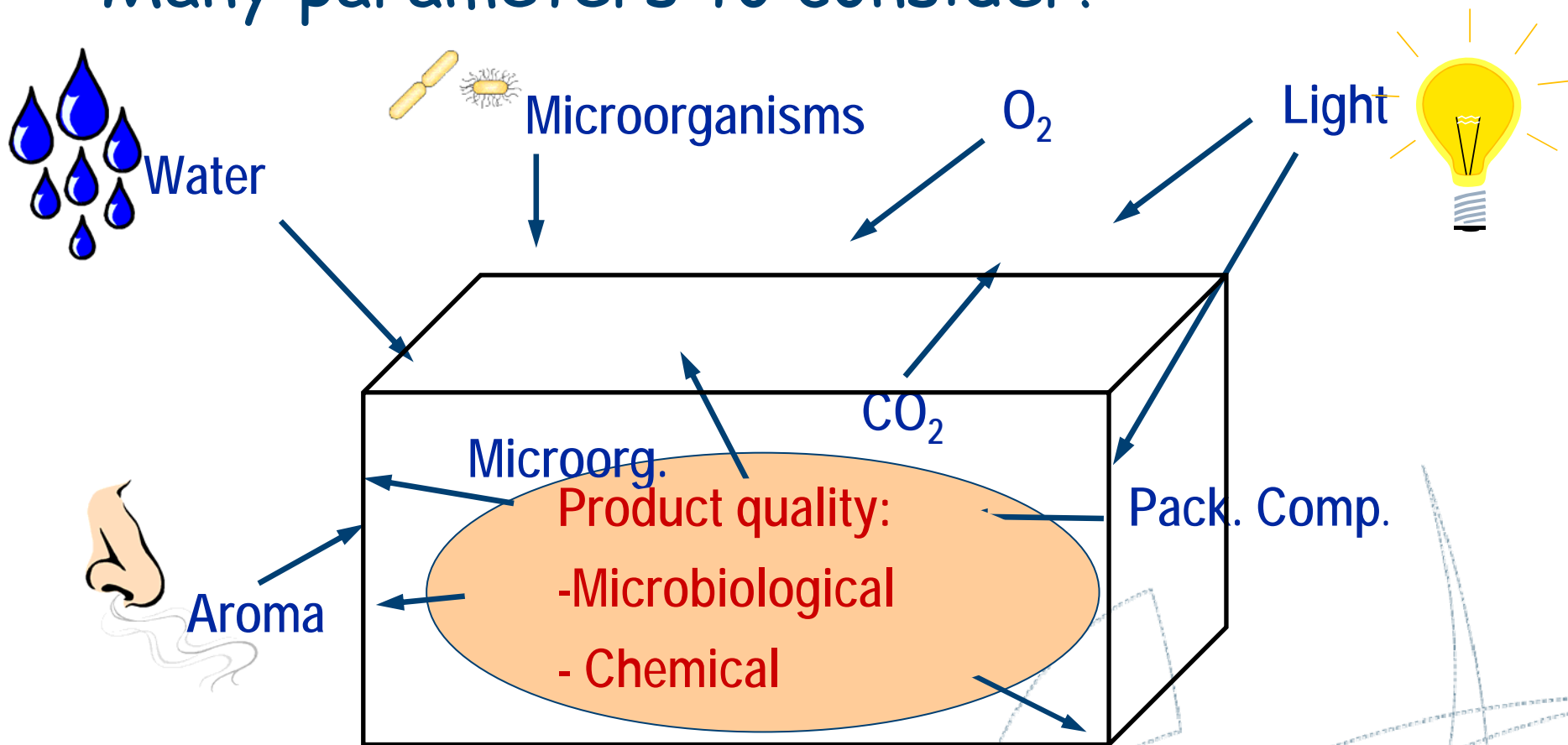
- ✓ Packaging in general and the foods requirements for packaging
- ✓ Packaging of fresh fish
- ✓ Active and intelligent packaging methods

Packaging in general

- ✓ Function of packaging:
 - ✓ Protect
 - ✓ Preserve
 - ✓ Practical
 - ✓ Containment
 - ✓ Communication
 - ✓ Information
 - ✓ Marketing



Requirements to food packaging: Many parameters to consider!



The golden triangle of packaging!

◆ Product

- ◆ Raw material
- ◆ Process
- ◆ Hygiene.

◆ Packaging-material and -machine

- ◆ Barrier
- ◆ Runability
- ◆ Sealability
- ◆ Design
- ◆ Hygiene.



◆ Distribution:

- ◆ Time
- ◆ Temperature
- ◆ Light
- ◆ Mechanical impact
- ◆ Logistics
- ◆ Environment
- ◆ Consumer.

Packaging of fresh fish



Atlantic Salmon



Lobster

- ✓ Fish
- ✓ Packaging materials and Packaging methods
- ✓ Innovating packaging solutions-
active and intelligent packaging solutions



Mackerel



Cod

Fish



945699 www.fotosearch.no

Fresh fish - Contamination and packaging methods

- ✓ Contamination depends on habitat, e.g. sea water, fresh water, pelagic or at the bottom
- ✓ Perishability or stability of the food product:
 - ✓ chemical, biological and physical nature of the product-initial quality
- ✓ Internal factors:
 - Water activity (a_w)
 - pH
 - Red-Ox potential (E_h)
 - Nutritive substances
- ✓ Storage conditions and environmental factors
 - Oxygen
 - Light
 - Temperature
 - Humidity
 - Storage time



Fish and packaging methods

- ✓ Air/Open with ice
- ✓ Vacuum packaging
- ✓ Modified atmosphere packaging
- ✓ Superchilled packaging
- ✓ Active and intelligent packaging



Fish and packaging methods- Modified atmosphere packaging



- ✓ Modified atmosphere packaging
 - ✓ Gas composition
 - ✓ Effect of CO_2
 - ✓ Solubility of CO_2
 - ✓ Gas/product ratio

MAP: the enclosure of a food product in a package (material with gas barrier), in which the gaseous environment has been changed or modified

Active and intelligent packaging methods

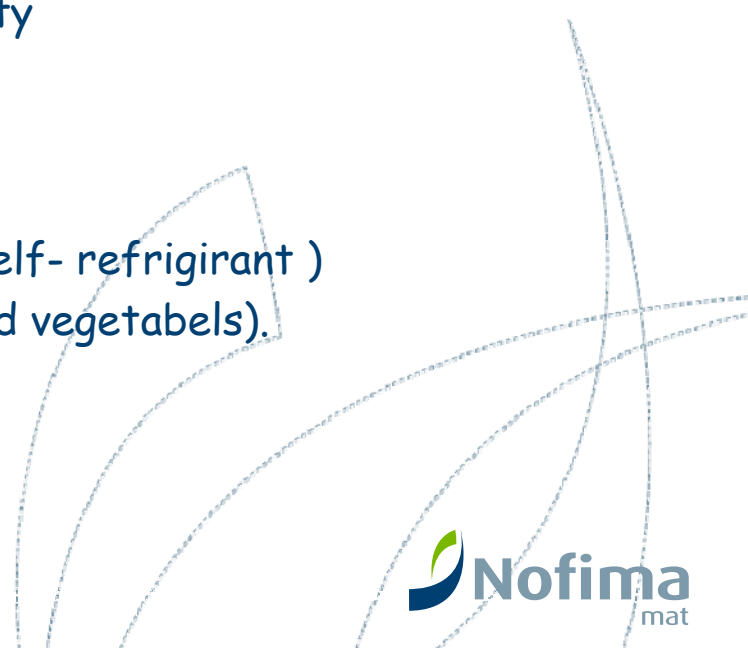


- Active packaging:
 - **INFLUENCE AND ALTER THE SURROUNDINGS** for the packed product
 - Extend shelf life
 - Improve/secure health-related security
 - Improve sensory properties
- Intelligent packaging concepts:
 - **MONITORING SYSTEMS - MONITOR THE SURROUNDINGS** for the packed product
 - Give information about the food products quality during transportation and storage
- Smart packaging
 - Collective name for active and intelligent packaging



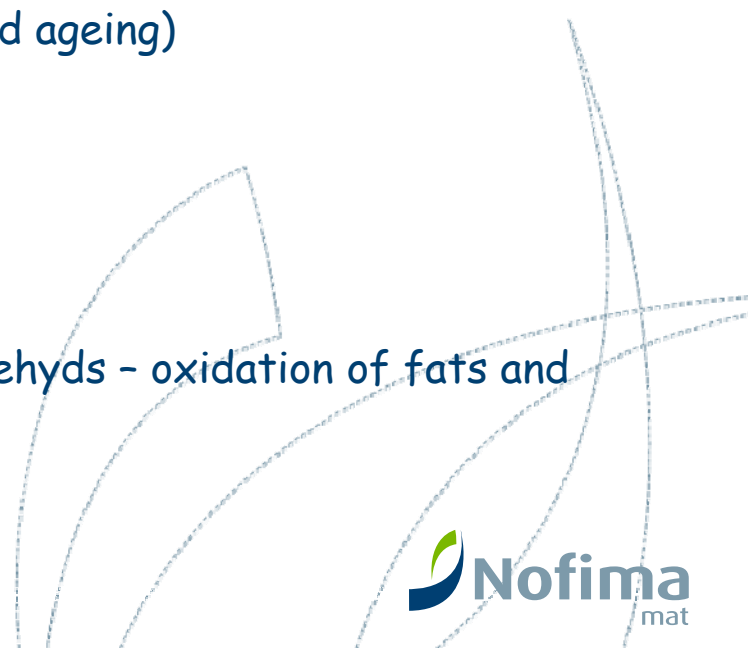
Active packaging

- Main groups of active packaging:
 - **Absorbers:**
 - Remove /absorb unwanted components in the atmosphere around the food product in order to extend the shelf life and/or improve the quality
 - **Emitters:**
 - Add components into the atmosphere of the food product in order to extend shelf life and/or improve the quality
 - Other concepts:
 - Microwave susceptor
 - Solutions for blocking UV-lys
 - Temperature regulation (self-heating or self- refrigerant)
 - (controlled gas permeable - fresh fruit and vegetabels).



Absorbers - types and area of applications

- Oxygen
 - Important
 - Reduce oxidation, growth of microorganisms
- Carbondioxid
 - Freshly roasted coffee
- Ethylene gas
 - ("phytohormone" - influence the ripening and ageing)
- Humidity
 - Bags: for dry food products
 - Drip absorbing pads : meat, fish, vegetable
- Unwanted smell and taste
 - Bitter taste - orange juice, TMA - fish, aldehyds - oxidation of fats and lipids
 - NB! EU regulations.....



Emitters- types and area of applications

- Antimicrobial systems (great potential - many patents)
- Antioxidants
 - BHT/BHA
 - Vitamin E og C
- Carbondioxid
 - Meat, fish, fruits and vegetables, nuts, snacks
- Aroma components
 - Hide unwanted odour
 - Adding aroma components :
 - Ice cream, orange juice
 - Smoking aroma



Active packaging Bags



DO NOT EAT



Multisorb Minipax luktabsorber
<http://www.multisorb.com>

Ageless O₂ -absorber
<http://www.keepsafe.ca>



Bioka O₂ -absorber
<http://www.bioka.fi>

Active packaging

Antimicrobial concepts

- Act on the surface of the food - may reduce adding/ the needed amount of preserving agent
- Two main principles
 - Migration - release of preserving agent (into the food or to the surroundings of the food)
 - Not migrating - antimicrobial action when the unwanted microorganism get in touch with the antimicrobial surface.
- Direct contact between the active component and the food is often needed.

Nafispack : Active and intelligent packaging : natural antimicrobial function

Intelligent packaging :

Intelligent packaging (monitoring)



- Time, Temperature Indicator (TTI), freshness, leakage, ready-prepared
- Tamper evidence
- "Pirate copying"
- Tracking and tracing devices/Supply chain management
- Intelligent film (indicator film)
- Diagnostic inc (e.g. bar code not readable in the presence of a particular microorganism).

Temperature sensitive ink showing if the product hold the right temperature



Intelligent packaging: EXAMPLE

VITSAB® Trippel-indikator: Tolkning



The product is fresh – max. shelf life



The quality of the product is some reduced, but is still acceptable – saleable within "y" days

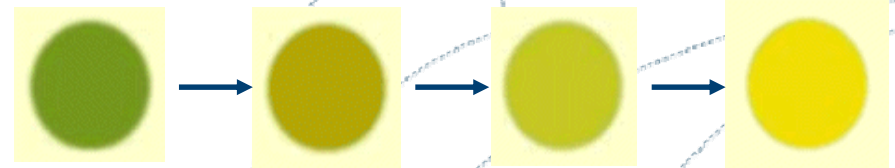


The quality of the product is some deteriorated, salabele within "z"



The product is not salabel
– must be thrown

Colour change:



Innovative packaging solutions- active packaging with CO₂ emitter

- ✓ Modified atmosphere packaging
 - ✓ Gas/product ratio
 - ✓ Optimal g/p ratio 3:1
 - ✓ Economically and environmentally unfriendly
 - ✓ CO₂-emitter
 - ✓ Production of CO₂ after sealing
 - ✓ Reduction of g/p ratio
 - ✓ Proven effect



Wolffish



CO₂ emitter- project

- ✓ User-led Innovation project
- ✓ Vartdal Plastindustri AS
- ✓ Financed by NFR Matprogrammet



Requirements to CO₂-emitter

- ✓ Adjustment to product
 - ✓ Type of fish
 - ✓ pH
 - ✓ Water activity (liquid loss)
 - ✓ Product volume



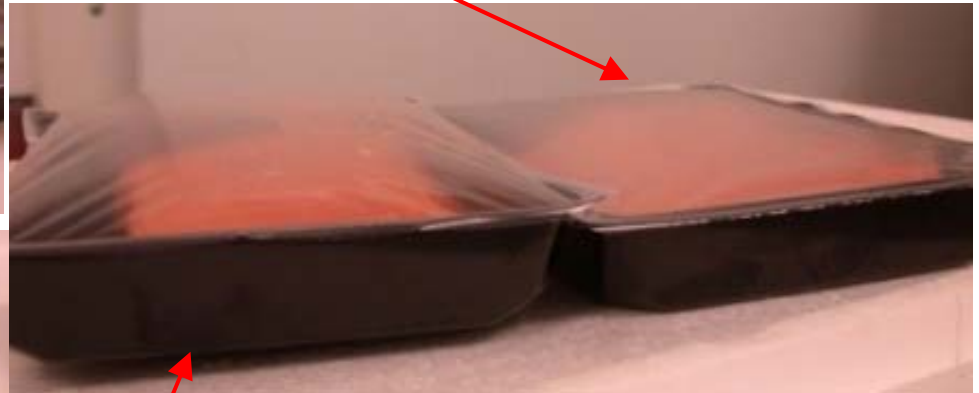
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Adjustment of CO₂-production capacity

Gas content and appearance



Optimal appearance and CO₂ production



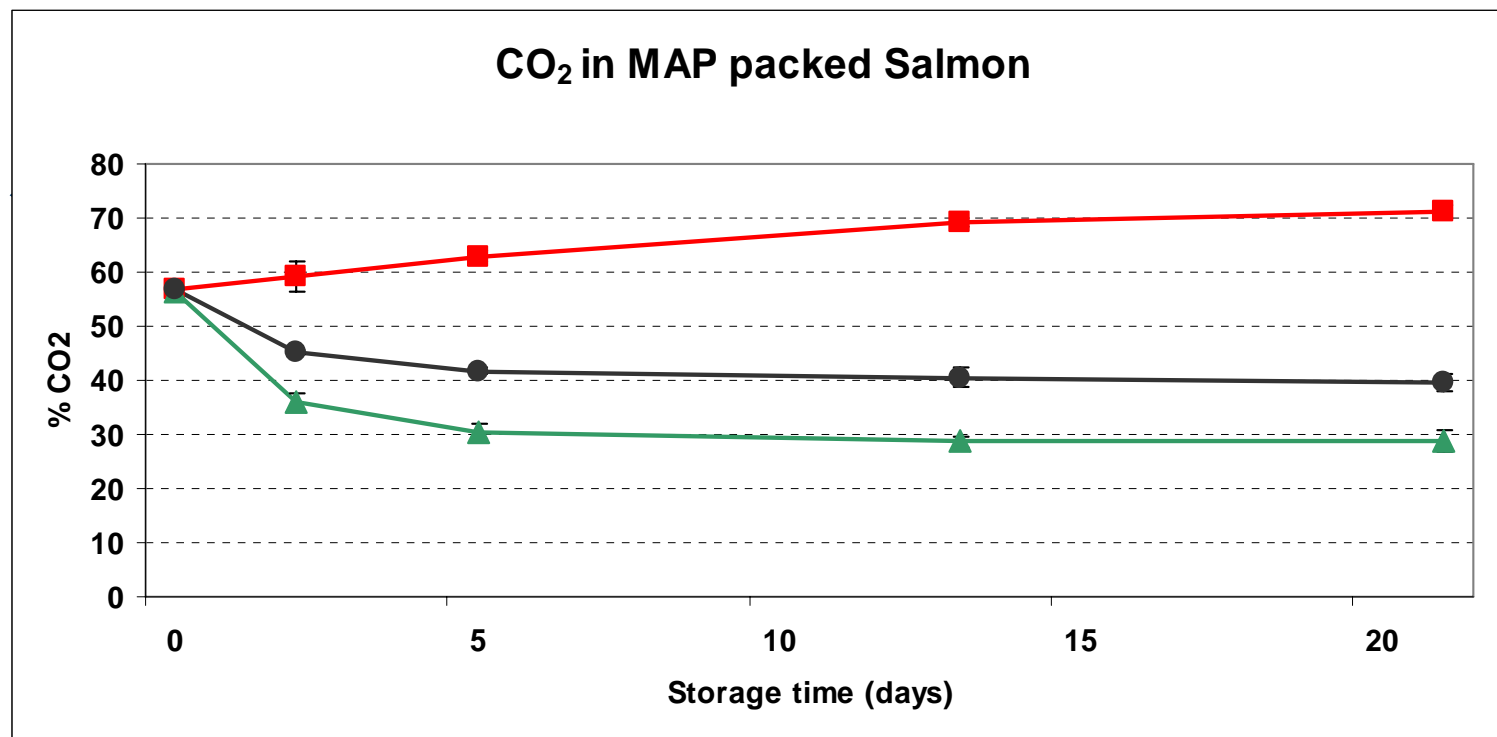
baloon effect : too high CO₂ production



Vacuum effect : too little CO₂

Why CO₂-emitter?

✓ Production of CO₂ after sealing

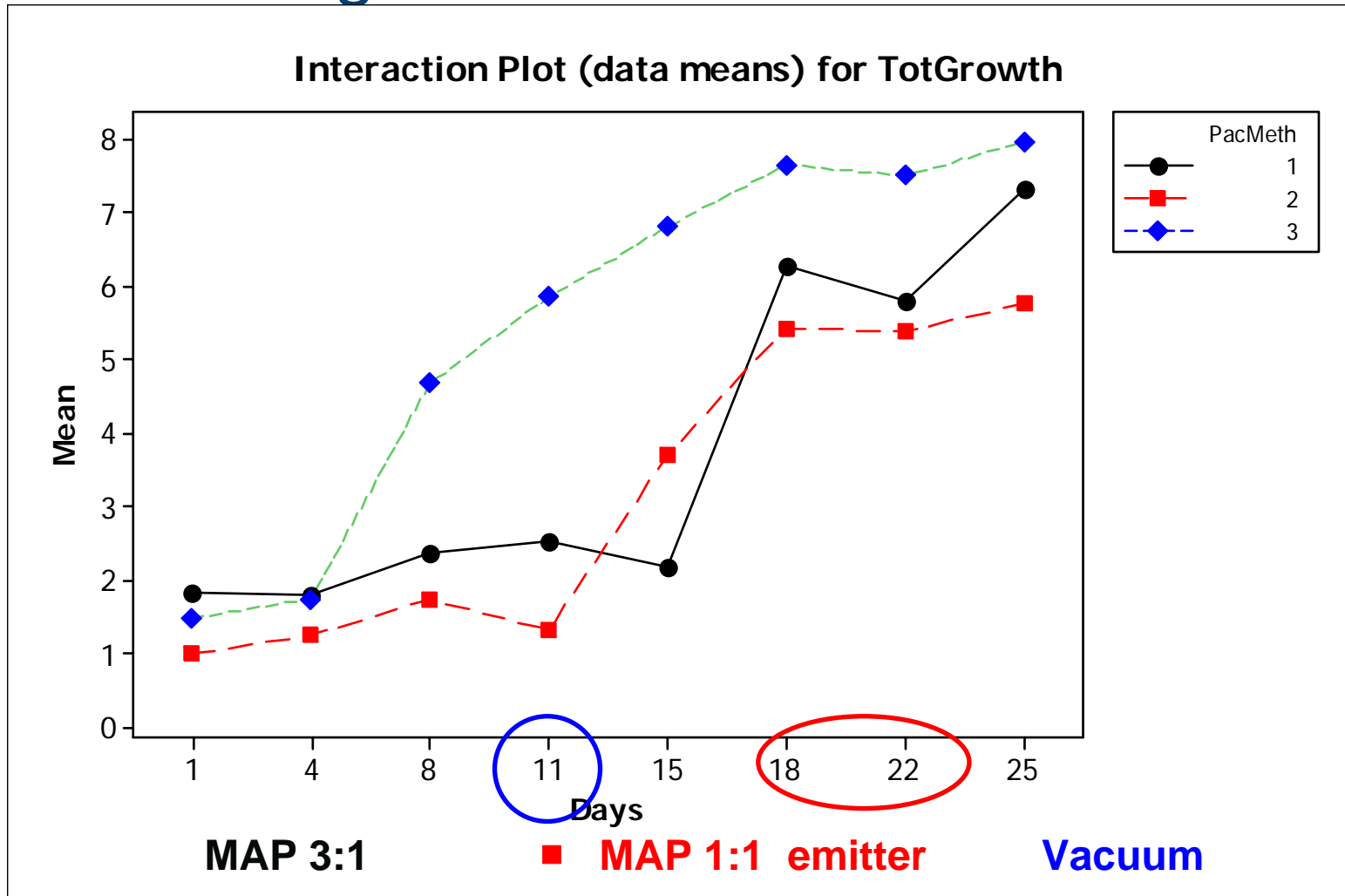


■ **MAP 1:1 emitter**

MAP 2:1

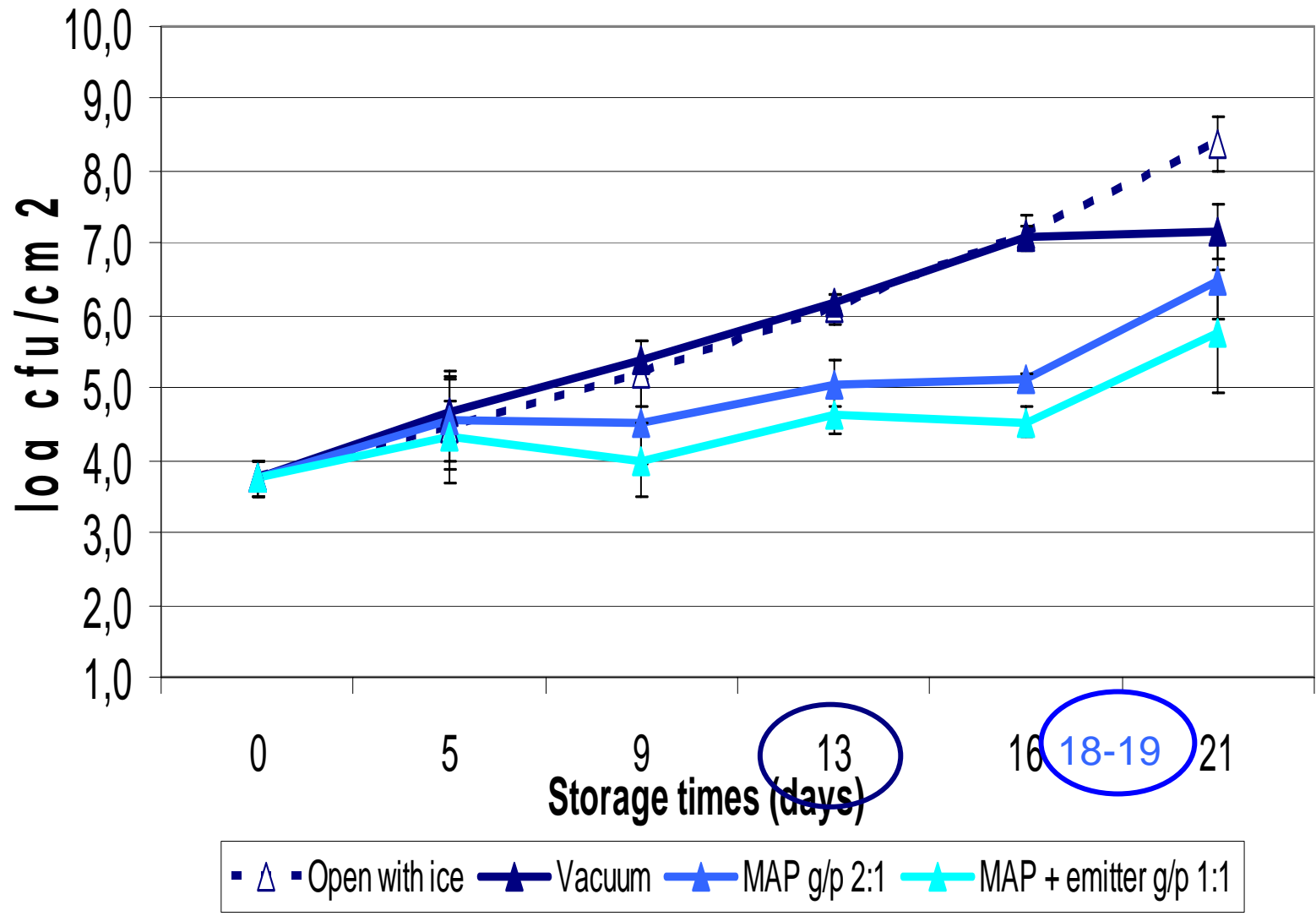
MAP 1:1

Bacterial growth in Salmon - TVC



Salmon stored at 1°C with 60% CO₂ / 40% N₂

Lactic acid bacteria in COD



Why CO₂-emitter?

- ✓ Production of CO₂ after sealing
 - ✓ Stable level of CO₂ during storage
- ✓ Proven effect
- ✓ Reduction of gas/product ratio
- ✓ Transport efficiency

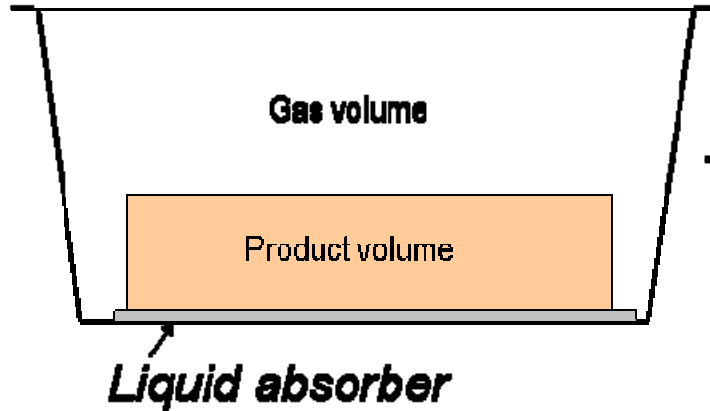


How to reduce the number of trucks?

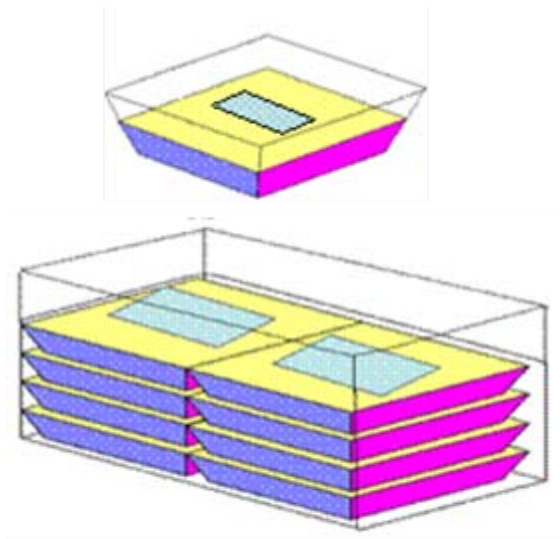
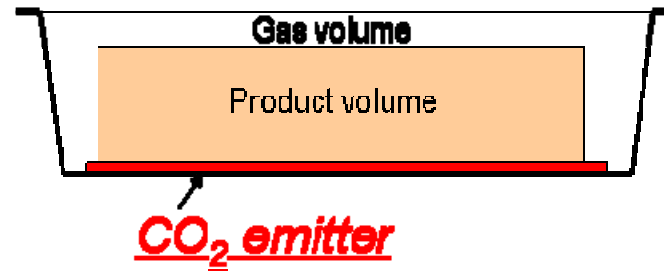


Innovative packaging solutions- active packaging with CO₂ emitter

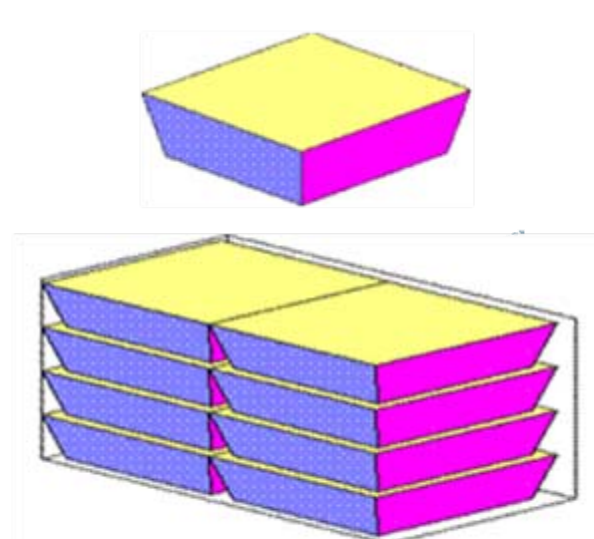
Traditional MAP



MAP with CO₂ emitter



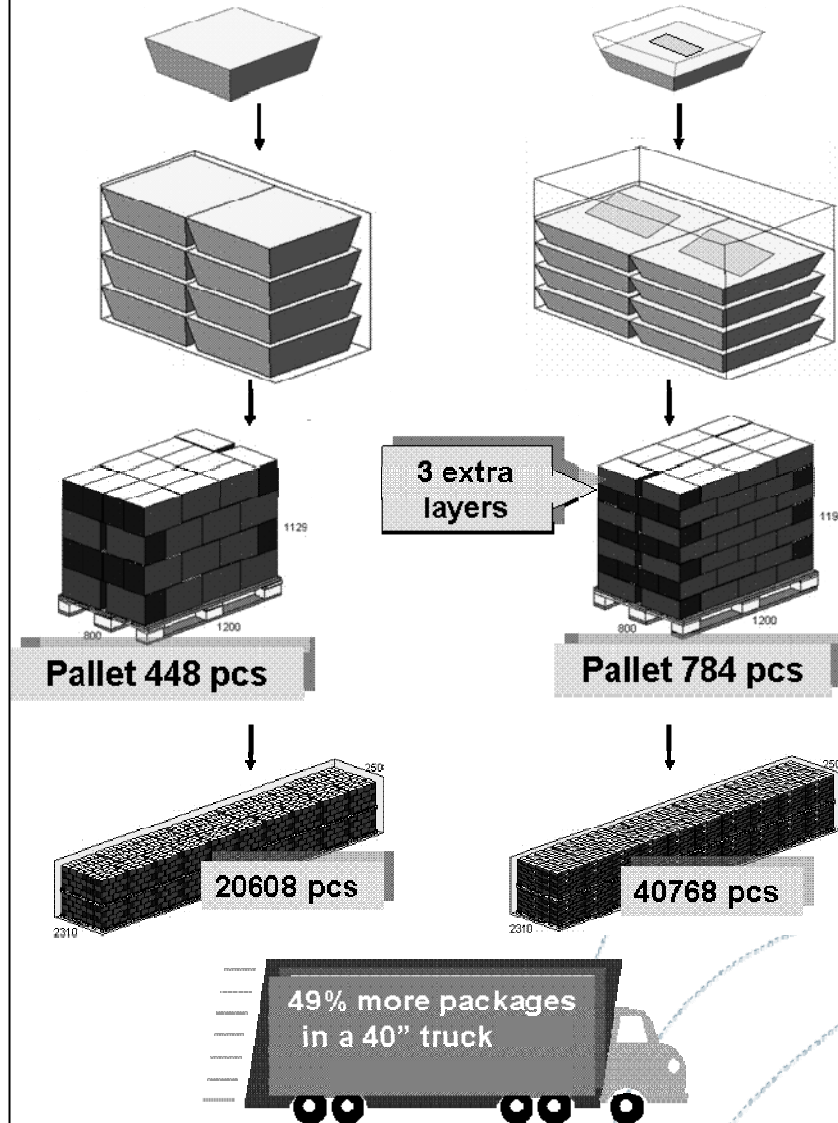
MAP with CO₂-emitter



Traditional MAP

Traditional MAP

MAP with CO2-emitter



MAP and use of CO₂-emitter- Summary



- ✓ Better quality and longer shelf life compared to vacuum packing and open/ice packing
- ✓ Equal or better quality and shelf life compared to optimal g/p ratio in traditional MAP
- ✓ Reduction of package volume
 - ✓ Higher transport efficiency
 - ✓ Economically and environmentally better solution
 - ✓ Packaging material reduction



Thank you for
your attention!

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