Fresh-cut products: Maintaining Quality and Safety

Packaging Film Technology and Selection
20 September 2006

Presented by:
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Packaging for Fresh-cut Produce

• Introduction
• History
• Possibilities
• Challenges
  – Interdisciplinary Design
  – Separate Industries
  – Different Languages
Relevant Industries

- Seed Company
- Grower
- Processor
- Transportation
- Converting
- Film
- Resin
- Additive

Package Design Requirements

- Produce Physiology Requirements
- Polymer Engineering
- Converting/Filling Machine Requirements
- Marketing Requirements
Produce Physiology

Converting/Filling Technology

Polymer Engineering

Marketing

OTR = \( R_{R_{O_2}} \cdot t \cdot W/A \cdot (O_{2\text{atm}} - O_{2\text{pkg}}) \)

Where:

* OTR = Film O₂ Permeability (Oxygen Transmission Rate) per mil
* RR = Respiration Rate (O₂ Consumption)
* t = Film Thickness (mils)
* W = Product Weight (Kgs)
* A = Film Surface Area (cm²)
* \( O_{2\text{atm}} \) = Desired O₂ Concentration in the Package (O₂ Target Atmosphere)

The calculated OTR is the per mil transmission rate for the given thickness of film used in the calculation.
In other words, if you plug in 2 mils, the resulting OTR is the per mil transmission rate of that 2mil film.

To convert OTR (CC/mil/cm²/Hr) to OTR (cc/100 in²/day) multiply by 15483.84.
Packaging Calculations Con’t

\[ \text{OTR} = \frac{1}{\frac{t_1}{\text{OTR}_1} + \frac{t_2}{\text{OTR}_2} + \frac{t_3}{\text{OTR}_3}} \]

Converting Requirements

- Dimensions
- Construction Type
- Seal Type
- Graphics
- Stiffness
- Desired OTR
Converting Requirements Con’t

• COF
• Beta Value
• Antifog Requirements
• Re-seal Requirements
• Microwave Requirements

Filling Machine Requirements

• Seal Type
• Filling Speed
• Sealing Conditions
• Differential COF
• Heat Resistance Differential
• Re-seal Attachment
• Antifog
Marketing Requirements

- Appearance
- Construction
- Graphics
- Stiffness
- Economics

On-going Quality and Testing Requirements

- OTR Specification and Range
- COF Specification and Range
- Antifog Performance
Packaging Misconceptions

• Temperature Control
• Incoming Product Quality
• Post Harvest Technology
• Leakers
• Gas Flushing
• Static Environment
• Cold Chain Management
• One Product Fits All

Structures

• Hermetically Sealed Pouch
  – Pre-made
  – Roll Stock
• Stand Up Pouch
• Macroperforation
• Microperforation
Structures Con’t

• Patch Technology
• Rigid Containers
  – Natural Aspiration
  – Peelable Lidding
  – “Breathable Rigid Containers”

Perforated Materials

• Macropert
• Microperf
  – Laser Technology
  – Spark Technology
• Patch Technology
• Advantages/Challenges
Polymers

- Polyolefins
  - Low Density PE
  - Hi Density PE
  - Medium Density PE
- Metallocenes
  - Linears
  - Plastomers
- EVA
  - %

Polymers Con’t

- K-Resin
- PET
  - APET
  - CPET
  - RPET
- PP
- PVC
- PLA
Films

- Polyolefins
- OPP
- Mono Blends
- Coextrusions
- Peelable Structures
- Clarity
- Stiffness

Antifog Requirements/Properties

- Coated
- Impregnated
- Performance
- Sealing properties
- Microwaveable
Microwave Requirements/Properties

• Applicable CFR’s
  Although there is no specific code which applies Microwave applications, the following CFR’s may be applicable when dealing with Antifog’s in Microwave Applications.
  21CFR Chapter 1 177.1520
  21CFR Chapter 1 177.1350
  21CFR Chapter 1 177.1390
  21CFR Chapter 1 177.1395

• Structure
• Antifog
• Additives

Putting It All Together/Conclusions

• Thorough Understanding of Requirements and Desired Results
• Matching Requirements to Properties
• Understand the Language
• Selecting the Proper Package
• Designing the Proper Package
• On-going Quality and Testing
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