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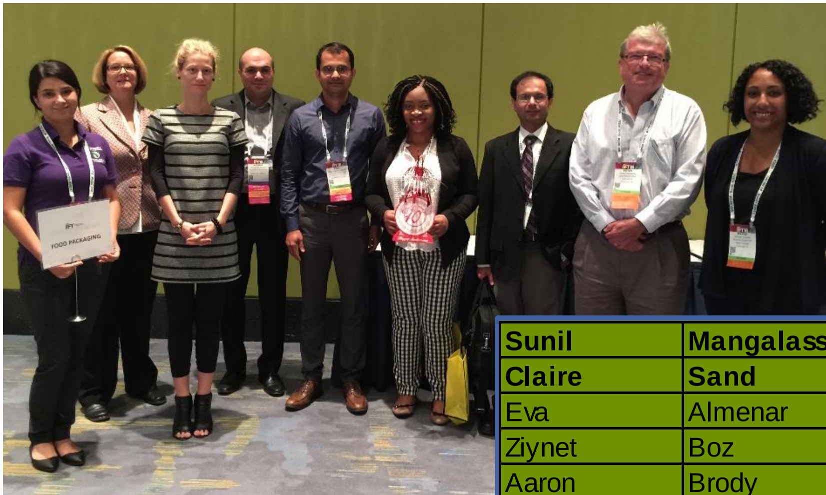
IFT Division Webcast:

Packaging Solutions to Decrease Food Waste for Meat, Seafood, and Cheese-based Products

March 2, 2017

10:00 a.m. – 11:00 a.m. CT

IFT's Food Packaging Division Executive Committee



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Peter	Salmon	International Food Network LLC
Hongchao	Zhang	Washington State Univ

Today's Speakers

- Myron Geiser
  TC Transcontinental Packaging, Sr. Director, R&D
- Jay Cornillie
  Tyson Foods, Inc., Packaging Engineer- Ball Park Branded Products
- Lora Spizzirri
  915 Labs, VP of Food Packaging Solutions
- Claire Koelsch Sand (moderator)
  Packaging Technology & Research, LLC, Owner
  Michigan State University, Adjunct Professor

Myron Geiser

Myron graduated from the University of Wisconsin-Stout with a degree in Packaging and began his career as a packaging development engineer in the pharmaceutical industry with Marion Labs in Kansas City. Myron relocated to Cincinnati with Marion Merrell Dow and led the Packaging Engineering group for five years. From there, Myron went to Keebler to manage packaging development for the Salty Snacks division until it was divested, and then to American National Can which later became Pechiney and Alcan. At Pechiney, Myron managed product development activities for the Healthcare & Specialty division at their technology center in Neenah, WI, later becoming the marketing director for the Specialty division at their Chicago headquarters, a position he held for three years. He then took a position with Appleton Papers as they began building a packaging business, first in a business development role, then becoming Director of Marketing. As a result of downsizing, Myron came to Schreiber Foods in Green Bay, WI in 2006 as a Packaging Engineer and progressed to the Director of Packaging. He managed the packaging engineering functions for this $5 billion dairy producer of cheese, cream cheese, and yogurt products. In 2014, Myron left Schreiber to become the Sr. Director of Engineering and R&D for TC Transcontinental Packaging after they acquired Schreiber's Capri flexible packaging division.

Myron has an MBA from Xavier University and is a member of the Institute of Packaging Professionals through which he is a Certified Packaging Professional. He is married and has two girls.

Cheese – What is it?

- Concentrated form of milk with a culture so it coagulates into curd.
    - A culture normally consists of lactic acid, bacteria, and enzymes.
    - Approximately 10# of milk makes 1# of cheddar cheese.

- Processed cheeses are natural cheeses that are blended with salt, water, milk solids, and emulsifiers that are pasteurized so further ripening stops, thus providing a longer shelf life and smoother melt characteristics. The Code of Federal Regulations (CFR) identifies the requirements for cheese types, examples include:
    - Pasteurized Process Cheese
    - Pasteurized Process Cheese Food
    - Pasteurized Process Cheese Product

- All cheeses have <u>Federal Standards of Identity</u> to identify the ingredients and limits a product must contain to be marketed under a certain name.

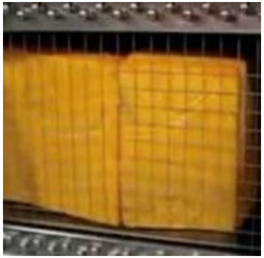
Cheese Factoids

- Most bulk cheese is made into 40 or 640 pound blocks packed in bulk bags lining a container or corrugated box and sent to converters for cutting, shredding, cubing, etc.

- Most high volume natural cheeses are made by dairy cooperatives or large dairy producers, not retail brands.
  - Co-ops: DFA, Foremost Farms, Land O' Lakes
  - Large producers: Glanbia, Hilmar, Leprino, Saputo
  - Retail brands typically make processed cheeses and <u>convert</u> natural meaning they purchase in 40 or 640 lb. blocks and convert them into chunks, cubes, slices, shreds, etc.

- Today's presentation will primarily focus on typical hard natural cheese types like cheddar and not soft cheeses like brie or fresh cheeses like cottage cheese or cream cheese. There will be some discussion of processed cheeses because their shelf life is longer than natural cheeses.

Efficient Packing and Cutting of Blocks



Waste Reducer

- 640 lb. cheese boxes are changing from wood to plastic. With wood, there is occasionally splintering during handling which creates a contaminant.

- Dimensions of 40 and 640 lb. blocks vary slightly so the outsides of the blocks are cut off to provide uniformity for further cutting, dicing, cubing, shredding, etc.

Waste Reducer

- Technology advancements include intelligent cutters that measure block size and mass of the blocks to optimize cuts and reduce trim waste.

- While trim waste is typically used for processed cheese, it is waste in the process.

Natural Cheese Packaging

- Mold spores are naturally occurring organisms in the atmosphere and despite the best sanitation practices they will be on the outside surfaces of natural cheese when packaged.
- The key to prevent mold growth is to use a natural mold inhibitor and/or eliminate oxygen in the package since mold spores need oxygen to grow.
- Natamycin is a naturally occurring antifungal agent commonly used to control mold growth on the surface of many cheeses. It is used on 40 and 640 lb. blocks (spray or powder). It is also blended with starch (anti-cake) and added to shredded cheese.

- Cheese requires preservation against yeast and molds but needs to allow cultures (i.e. bacteria) to remain active.

Natural Cheese Packaging

- Natural cheese packages are flushed with Carbon Dioxide (and some Nitrogen for shreds and slice).
    - Carbon dioxide is absorbed into the cheese (typically in 24-48 hours) causing the film to draw down so chunk cheese appears to be vacuum packed.
    - Nitrogen is added to shred and slice packages to prevent the film from drawing tight, if the film was tight it would cause the cheese to clump and stick together. Nitrogen does not absorb into the cheese.

- EVOH is the primary resin used to provide oxygen barrier in flexible packaging films, it replaced most PVDC (often known by the trade name Saran) many years ago because it provides a better oxygen barrier and is more cost-effective.
- Swiss Cheese gives off CO_2 so the film must allow that out but still limit the amount of oxygen coming in. That's why it is said that Swiss cheese breathes.

Processed Cheese Packaging

- The product is not 'living' so it is much less susceptible to mold growth.
- It is not gas flushed so the film is only needed to keep the product from drying out, there is no need for the film to provide an oxygen barrier.
- Polypropylene based films are primarily used because they provide a good moisture barrier and are clear.

Waste Reducer

- Using processed cheese instead of natural cheese is a way to minimize food waste because it extends the shelf life with no requirements for oxygen barrier to prevent mold growth.
- The balance of this presentation will focus on natural cheeses.

How Natural Cheese is Packaged

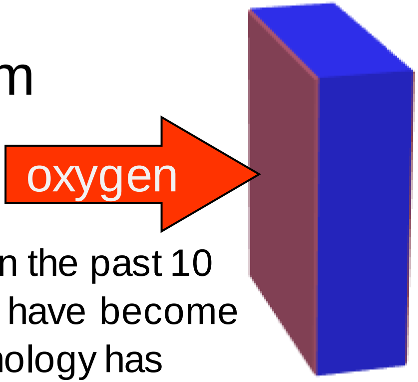
- Regardless of the packaging format or product form, the goal is to eliminate oxygen by gas flushing with CO_2 (and sometimes nitrogen as well). Typical spec limits require residual oxygen levels in the package of <1%.

- To provide for the typical 3-9 month shelf life, the packaging must provide an outstanding barrier to oxygen permeation.

- The packaging film must also have sealant layer technology to run at today's line speeds.

- Finally, the packaging film must be robust to withstand the distribution cycle.

Obtaining Oxygen Barrier in the Film



- EVOH is commonly used for shredded cheese, in the past 10 years 7-layer blown co-extruded EVOH sealants have become the norm for retail shredded cheese as the technology has become more commercially available and costs for finished barrier sealant films have decreased.
  - EVOH also does not have the negative environmental stigma like PVDC.
- While EVOH is the predominant resin to provide oxygen barrier, in large bags of institutional/foodservice shreds, biaxially oriented nylon often provides sufficient oxygen barrier with a non-EVOH sealant, providing a more economical package.
- The barrier film only extends shelf life until the package is opened and oxygen enters. Most labeling recommends that natural cheese be used in 7-14 days after opening.

Meeting the Packaging Line Speed Challenge

- Horizontal shredded cheese lines for retail bags can run in excess of 150 bags per minute so a low seal initiation temperature is required.
    - Metallocene resins are now widely incorporated into the sealant layer blends to provide outstanding seal properties.
- Most retail chunk cheese is packaged on horizontal wrappers, pleats are common in end seals so the sealant must caulk and flow to fill those voids. Channel leakers will result if a typical shredded cheese sealant was used, one that doesn't caulk as well.
    - Resins with a high melt flow (low viscosity) are needed, that was traditionally only achievable through extrusion coating of a sealant (typically Ethylene Vinyl Acetate).
    - Resin technology for blown film sealants has evolved so now many chunk films use a blown film sealant which has eliminated a major technology hurdle since many converters, especially smaller ones, do not have extrusion coating capabilities.

Withstanding the Distribution Cycle

- Although most people believe that plastic films are very tough, hard folds in a film can create tiny holes or cracks. Also, as packages rub against the inside of the corrugated case during transit, hard points can abrade and create small fractures.
    - Flex cracks and holes from abrasion primarily occur in the sharp corners of chunk cheese packages and just above bottom seals of institutional/foodservice shred bags where the film folds.
- Nylon is commonly used to help prevent flex and abrasion cracks.

    - Biaxially oriented nylon has traditionally been used as the outer film substrate for institutional shred bags because it is extremely tough. Nylon also provides the oxygen barrier.
    - There has been some migration to incorporating nylon into the blown sealant film and using polyester as the outer film substrate because it reduces the cost of the finished structure. If this is done, EVOH is incorporated into the sealant film co-extrusion to provide the oxygen barrier.

Withstanding the Distribution Cycle

Waste Reducer

- Some cheese companies use boxes with the inside surface coated with a water-based coating to smooth the board which minimizes abrasion during transit.
- The common industry term is Michelman coating because Michelman is the primary company that has supplied this type of coating to the corrugated industry.
- This coating is not wax so the case is recyclable. It typically increases the case cost up to 5%.

New Product Offerings that Reduce Waste

- Smaller retail package sizes
- Reclose features such as zippers
- Product sold in the form in which the consumer will use it
    - Evolution from chunks only to a variety of forms: cubes, slices, shreds, snack sticks, crumbles, etc.

Retail Shredded Cheese Film

Adhesive Lamination	Extrusion Lamination
48 ga Polyester	**48 ga Polyester**
Ink	**Ink**
Adhesive	**LDPE**
2.0-2.5 mil EVOH Coex Film	**1.5-2.0 mil EVOH Coex Film**

<u>CRITICAL PROPERTIES</u>

- Oxygen Barrier
- Stiffness
- Caulkability around zipper flange
- COF (coefficient of friction)
- Laser Score for Easy Opening

Foodservice Shredded Cheese Film

60, 90, or 100 ga Biax Nylon
Adhesive or LDPE
1.5-2.0 mil LLDPE-mPE Coex film

48 ga Polyester
Adhesive
2.0 mil nylon-EVOH-mPE Coex film

CRITICAL PROPERTIES

- Oxygen Barrier
- Stiffness
- Hot Tack
- Abuse Resistance

Natural Chunk & Slice Film

(“Hayssen” Film)

48 ga. Polyester
Ink
EVOH Coex
55 ga OPP
21-28#/ream EVA

48 ga Nylon or Polyester
Ink
Adhesive or LDPE
1.5-2.5 nylon-EVOH-EVA Coex Film

<u>CRITICAL PROPERTIES</u>

- Oxygen Barrier
- Flex Crack Resistance
- Caulkability

Natural Swiss Cheese Film

48 ga Biax Nylon
Ink
LDPE
60 ga OPP
21-28 #/ream EVA

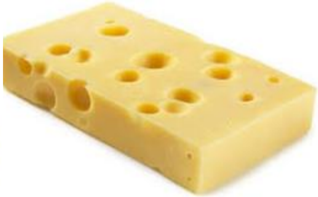
48 ga Nylon or Polyester
Ink
Adhesive or LDPE
2.25 Nylon-EVA Coex film

CRITICAL PROPERTIES

- CO_2 Permeability to allow CO_2 to escape
- Flex Crack Resistance
- Caulkability

Swiss Cheese needs to ‘breathe’

Requires less barrier than other cheese types



String & Snack Cheese Film

Top Web (Non-Forming)

48 ga Polyester
Ink
Adhesive
2.0-2.5 mil EVOH Coex Film

3.0-4.0 mil Bottom Web (Forming)

Not a lamination, typically cast or water quenched extrusion

mPE
EVOH
Nylon
Polypropylene or nylon

<u>CRITICAL PROPERTIES</u>

- Heat Resistance (Top Web)
- Oxygen Barrier
- Peelability
- Top & Bottom Web Compatibility
- Formability (Bottom Web)

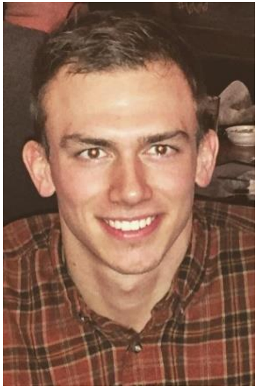
End of Packaging Life Advancements

Waste Reducer

- Technology is now commercial from Dow (RecycleReady) to make an EVOH film that can be recycled through existing waste streams.
- Laminations with polyester or nylon are not yet recyclable so to make the package recyclable the EVOH sealant needs to be laminated to a polyethylene-based film (typically HDPE-based for temperature resistance and stiffness).
- Products are on the market in 100% recyclable pouches and development has begun on cheese films.
- The back of each pouch is printed with the How2Recycle store drop-off label (www.how2recycle.info). This graphic explains to consumers that clean, dry pouches can be recycled at plastic-bag drop-off locations at supermarkets and other retail stores.

RECYCLEREADY TECHNOLOGY
for store drop-off recycling by DOW

Jacob Cornillie



Jay’s experience with Tyson began as an intern where he focused on Jimmy Dean breakfast and Sara Lee sweet goods brands. As a Packaging Engineer, Jay is responsible for all packaging on the Ball Park brand, which includes hotdogs, frozen burgers/meatballs and beef/turkey/pork jerky. Jay is a graduate of Michigan State University, with a degree in Packaging, and is from Byron, MI.

Meat Packaging
IFT Food Packaging Webinar

Jay Cornillie – Packaging R & D

Tyson Foods

03/02/2017

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Subcategories within CPG Meats

- ## Fresh Poultry

  - Turkey or Chicken
  - Raw, cut from animal and packaged raw with no further processing
  - Generally only the protein itself, no additional components
  - <u>**Refrigerated or Frozen**</u>

- ## Fresh Meat Products
  - Beef or Pork
  - Raw, cut from animal and packaged raw with no further processing
  - Generally only the protein itself, no additional components
  - <u>**Refrigerated or Frozen**</u>

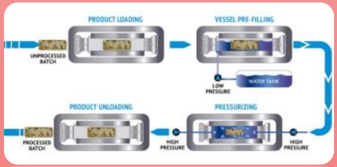
- ## Prepared Meat Products
  - Ready to eat products that have been further cooked/processed
  - Fully coked and considered safe to eat directly out of package
  - May be protein only, or protein with other food components (i.e. starches, veggies).
  - <u>**Refrigerated, Frozen, or Shelf Stable**</u>
  - I.e. Fully cooked sausage products, protein-centric meal type products (breakfast sandwich), beef jerky

Overarching Technologies in Shelf Life Extension for Meat Products

- Vacuum Packaging
  - Draw oxygen out of package and seal under vacuum to prevent re-entry of oxygen.
  - Prevents oxidation of meat product.

- Modified Atmosphere Packaging
  - Pull vacuum to eliminate oxygen, backflush with CO2 and/or Nitrogen to preserve product integrity (i.e. lunchmeat).
    - Nitrogen – Inert gas
    - Carbon Dioxide – Controls headspace, microbial inhibitor

- Anti-Microbial films
  - May increase shelf life of meat product
  - <u>Challenge –</u> To be truly effective, must contact entire surface of product
- Oxygen Scavenging Films
  - Would accomplish same purpose as scavenger sachets that go in jerky packages
- High Pressure Processing (HPP)
  - Product is packaged, and subsequently exposed to extremely high pressures
  - Non-thermal processing (refrigerated temps)



- Consumer Level
  - Individually packaged units (i.e. vacuum sealed chicken breasts)
  - Zipper packs or peal/reseal
  - Time – temperature indicators – Give consumer information on the environments that the package has been exposed to

Fresh Poultry - Refrigerated

- Spoilage Mechanisms
  - Microbial activity – primary method of failure (causes off odor/sliminess)
  - Oxidation – Causes off odor
- Package Requirements
  - Package may or may not have "functional" barrier
  - <u>Tray overwrap style pack</u> – Foam tray with absorbent pad, shrink film overwrap
    - Generally requires moisture absorbent pad
    - Example – Tyson Fresh Chicken
  - <u>Vacuum Sealed Package –</u> Flex/flex or flex/rigid vacuum package
    - Individually packaged vacuum flex/flex chicken breasts in master bag
    - "Darfresh" vacuum sealed tray

Fresh Poultry - Frozen

- Spoilage Mechanisms
  - Oxidation – fats oxidize, change color
  - Moisture loss/dehydration - visual "freezer burn"
- Package Requirements
  - Functional barrier package ***not*** required.
  - Key is controlling package headspace
    - Minimize product exposure to minimize spoilage
- Technologies for Shelf Life Extension
  - Eliminate package headspace (for water diffusion)
    - Vacuum sealed individual units (i.e.
    - Water enrobing (not commonly used)

Fresh Meat - Refrigerated

- ## Spoilage Mechanisms
  - Microbial activity – primary method of failure (causes off odor/sliminess)
  - Oxidation – Causes off odor
- ## Package Requirements
  - Package may or may not have "functional" barrier
  - <u>Chub Pack</u>
    - For ground beef or pork products. VFFS tube with wire crimped ends.
  - <u>Tray Overwrap Pack</u>
    - Foam tray with absorbent pad, shrink film overwrap
    - Generally requires moisture absorbent pad
    - Example – Private label fresh beef
  - <u>Vacuum Sealed Package –</u> Flex/flex or flex/rigid vacuum package
    - Individually packaged vacuum flex/flex chicken breasts in master bag
    - Vacuum Skin Pack (VSP) – Flexible film vacuum sealed to rigid tray
  - <u>Modified Atmosphere Tray Pack</u>
    - Tray that is MAPed with oxygen to increase "blooming" (redness) of beef
- ## Technologies for Shelf Life Extension
  - "Mother Bag" – Vacuum sealed master bag containing individual sell units. When opened at store level, sell units are exposed to oxygen and become "red"

Fresh Meat - Frozen

- Spoilage Mechanisms
  - Oxidation – fats oxidize, change color
  - Moisture loss/dehydration - visual “freezer burn”
- Package Requirements
  - Functional barrier package ***not*** required.
  - Key is controlling package headspace
    - Minimize product exposure to minimize spoilage
- Technologies for Shelf Life Extension
  - Eliminate package headspace (for water diffusion)
    - Vacuum sealed individual units (i.e.
    - Water enrobing (not commonly used)
    - Reseal-able packaging (i.e. zipper pack) – allows consumer to reclose pack and minimize freezer burn

Prepared - Shelf-Stable

- Spoilage Mechanisms
  - Jerky
    - Mold (in presence of oxygen)
    - Flavor degradation, dehydration
  - Dried Sausage - Oxidation
  - Requirements - Whole Muscle Jerky / Dried Sausage
    - High-barrier package required (i.e. multi-layer metalized or EVOH films)
    - Modified atmosphere within package – gas flush or vacuum, low oxygen residuals
    - Product must meet certain water activity criteria
  - Requirements - Canned meats
    - Product is canned (solid aluminum with coated inside)
    - Cans are retorted (exposed to high temp, pressure)

Prepared - Refrigerated

- Spoilage Mechanisms
  - Microbial activity – primary method of failure assuming oxygen has been removed from package.
    - Causes off odor/sliminess
  - Oxidation – Causes off odor
- Package Requirements
  - High-barrier package required (i.e. multi-layer metalized or EVOH films)
  - Controlled atmosphere - MAP or Vacuum Package (low oxygen required)
  - Examples:
    - Lunchmeat
    - Hotdogs
    - “Snack Packs”

- Technologies for Shelf Life Extension
  - High Pressure Processing (HPP)
  - Sausage/Link Product – “QX” Process
    1. Product is partially cooked
    2. Product is packaged and vacuum sealed
    3. Packaged product is ran through a hot water bath, cooking completed in package

Prepared - Frozen

- Spoilage Mechanisms
  - Oxidation – fats oxidize, change color
  - Moisture loss/dehydration - visual “freezer burn”
- Package Requirements
  - Functional barrier package ***not*** required
  - Key is to control desorption of water from product
  - Examples:
    - Breakfast Sandwiches
    - Corndogs
    - Frozen Breakfast Sausage
- Technologies for Shelf Life Extension
  - Eliminate package headspace (for water diffusion)

Lora N. Spizzirri

Lora N. Spizzirri is Vice President of Packaging Solutions at 915 Labs. She manages the Packaging Solutions Program from design to production, translating packaging visions, strategies and customer requests into projects and programs. To establish its Packaging Solutions Program, 915 Labs has partnered with some of the leading packaging suppliers in the world to offer a range of stock and customized packaging solutions optimized for MATS and MAPS. In addition to leading the development of MATS and MAPS packaging formats and functional materials, Lora manages the internal packaging team at the 915 Labs Center of Excellence. Lora has significant experience as a research and development executive in the food and beverage industry and has worked for several major food companies, including General Foods and the Kraft Foods Group. Most recently, as the Director of Packaging Research and Design at Kraft, she led a team of engineers and scientists in creating a strategy to leverage the research capabilities of the company's strategic suppliers, resulting in significant cost savings. She also led a renovation of Kraft's iconic Philadelphia Soft Cream Cheese product line including a reformulation, packaging redesign and shelf display improvements that led to a nine percent increase in revenues in the first year post-launch.

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915 LABS

Next Generation Packaged Food Thermal Processing

Lora Spizzirri, VP Research and Development

3-2-17

Today's Objective

Overview of how MATS/MAPS processing is combined with packaging technology to deliver extended shelf life, high quality RTE meals and reduce food waste.

Agenda

Technology Overview

Benefits and Opportunities

Packaging Performance Requirements

Future Developments

Technology Overview

Microwave Assisted Thermal Sterilization (MATS)

Microwave Assisted Pasteurization Systems (MAPS)

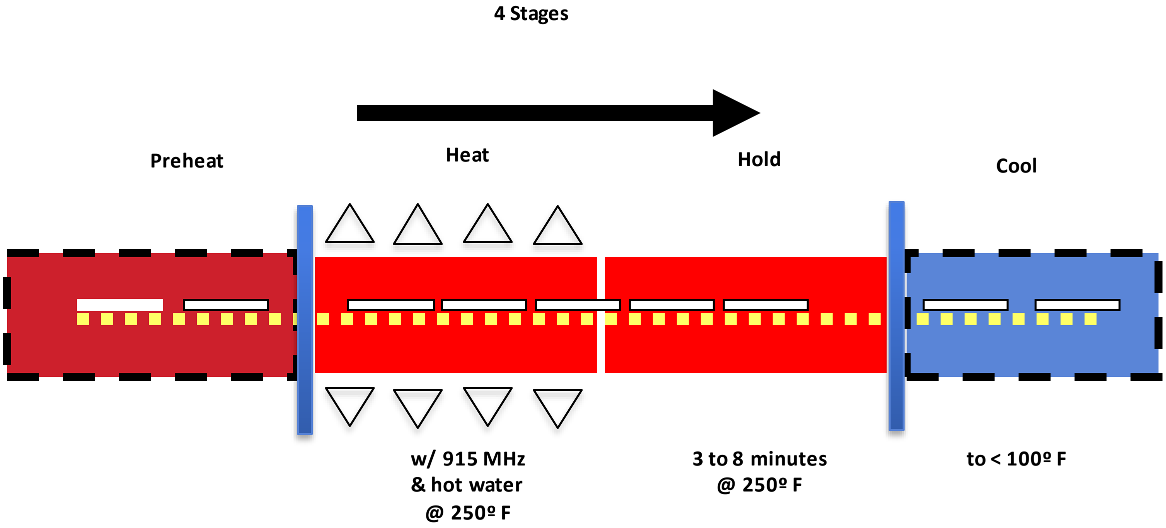
Microwave-Assisted Thermal Sterilization (MATS)

- Packaged food is simultaneously heated externally by pressurized hot water bath, and internally by patented microwave
- Food reaches sterilization temperature very rapidly, and is held at temperature for a minimum time, significantly reducing heat damage due to long process times
- Foods can be safely stored and distributed at room temperature permitting a variety of distribution methods
- Capable of processing a wide variety of food types and recipes
- Provides equivalent shelf life to re-tort, with higher quality and higher nutritional value and with few or no additives
- Only microwave sterilization technique accepted by the US FDA

Microwave-Assisted Pasteurization System (MAPS)

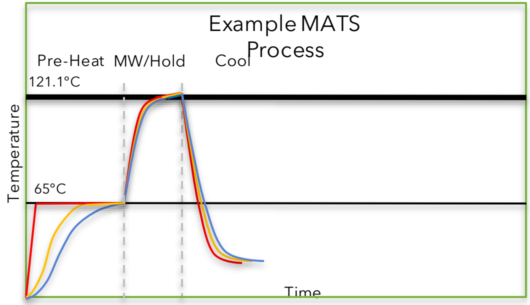
- **Additional application of microwave technology for rapid pasteurization**
- **From 70ºC for 2 minutes, to 90ºC for 10 minutes, depending on application**
- **Produces very high quality foods with long refrigerated shelf life reducing waste and spoilage**
- **Same consistent heating pattern provides an additional intervention step – the ability to demonstrate a log kill of listeria, e.coli, salmonella, norovirus, and other pathogens**
- **Large market potential with CPG refrigerated product lines, supermarket prepared foods, restaurant chains, convenience stores, nursing homes, hospitals, school food programs and more**

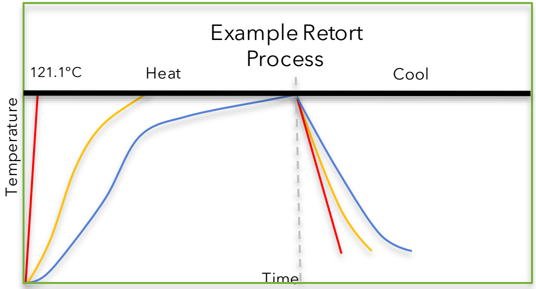
MATS Process Stages



MATS Process

- **Example MATS Process:**
  - Preheat: 65ºC, 15min
  - MW: 121ºC, ~3min
  - Hold: 121ºC, 8 mins
  - Pressure Cool: 10ºC, 9min
  - Atmospheric Cool: 10ºC, 9min
- **MATS can deliver:**
  - Delta T of <2ºC
  - No edge overheating
  - Extremely high quality





MATS-B100 Pilot Scale Batch System

Pilot-Scale Sterilization/Pasteurization

- up to 100 packages per hour depending on processing conditions, product formulation and package format.
- Typical output for product recipe and process development is between 30-50 packages per hour.

Sample Food Dishes by Students in Boot Camp

MATS vs Retort

Benefits and Opportunities

Microwave Assisted Thermal Sterilization (MATS)

Microwave Assisted Pasteurization Systems (MAPS)

Benefits and Opportunities – MATS and MAPS

- **Evolve meat, cheese and seafood from meal components to whole RTE meals**
- **Shelf life extension for prepared or refrigerated foods**
- **Food safety intervention step for prepared, refrigerated, frozen foods**
- **Migration of frozen products into refrigerated format with equivalent shelf life, better safety, better quality**
- **Migration of frozen or refrigerated products to ambient distribution and/or presentation to customer**
- **Game-changing quality and label improvement for existing shelf-stable products**
- **Wide variety of new shelf-stable products that were not feasible with traditional retort processing**

Packaging Performance Requirements

Optimized Packaging to Accelerate Development

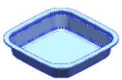
Key Design Parameters

1. Food Properties (Heat Capacity, Thermal Conductivity, Dielectrics):
Ability of food to absorb and evenly distribute microwave energy

Soup — Macaroni and Cheese — Salty Ham, Multi-compartment

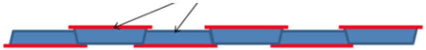
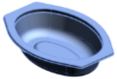
Easier → More Difficult

2. Package Structure (Shape, Depth, Materials):
Consistent depth of product in a package that optimizes performance



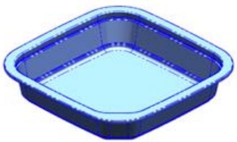
Easier → More Difficult

3. Package and Carrier Interaction (Nesting, Gaps, Width):
Minimizing gaps between packages, and optimizing carrier

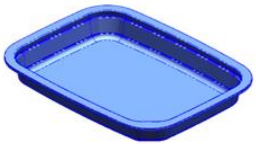




Easier → More Difficult

MATS Process Packaging Formats

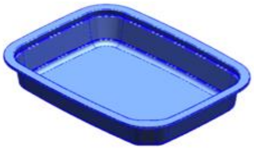


129mm x 129mm x 31.2mm
8.5oz (~250g)



171mm x 129mm X 25.7mm
10.5oz (~300g)

241mm x 125mm X 40mm
Bottom Gusset Pouch (~300g)



171mm x 129mm X 32.5mm
13.9oz (~410g)

171mm x 129mm X 32.5mm
12.7oz (~375g)

184mm x 133mm
Pillow Pouch (~230g)

MATS Packaging Performance Requirements

- Oxygen Barrier/WVTR Barrier without Foil – High barrier properties required for 1 year plus ambient shelf life
- **Heat and Deformation Resistance –** Packaging materials and design must withstand rapid increase to 275°F max and rapid cool to less than 100°F.
- **Vacuum/Headspace management –** Filling and sealing process must minimize headspace and entrained air to reduce package deformation during cooling and optimize heat penetration
- **Peel Seal/Burst Strength –** Seal integrity must balance strength to avoid burst packages in the process with a peelable seal for consumers.

Technologies Required to Meet Performance Requirements

Oxygen Barrier/WVTR Barrier without Foil

- Thermoformed trays
  - PP/Tie/EVOH/Tie/PP
  - Asymmetric structure improves O2 barrier
- Lidding
  - Barrier coated PET/BON/PP peelable sealant

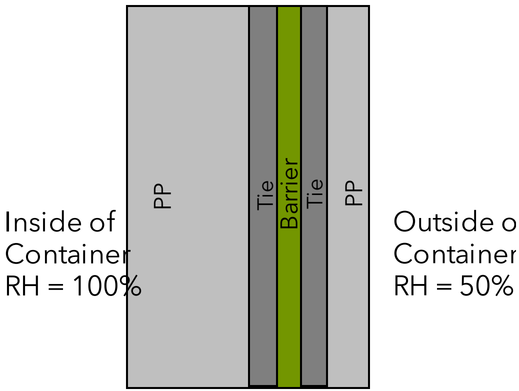
Heat and Deformation Resistance

- Trays – Resin designed to resist heat and deformation
- Lidding – Sealant engineered to resist heat distortion

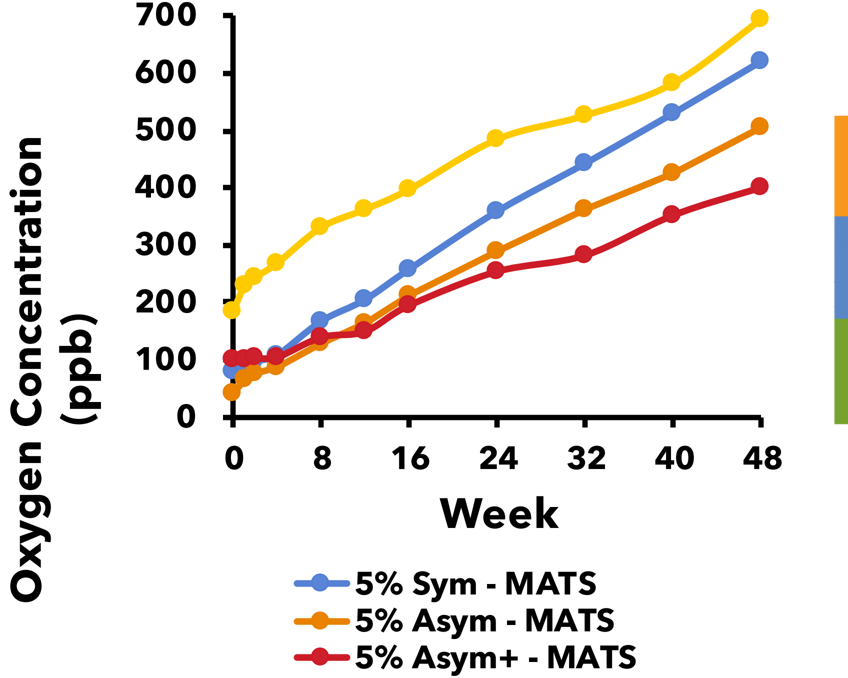
- **Vacuum/Headspace management**
  - Vacuum seal up to 500 mbar
  - N2 flush to extend shelf life

- **Peel Seal/Burst Strength**
  - Burst strength > 18 psi pre-process (restrained method)
  - Peel strength 1500 – 1800 g/cm post-process

MATS Packaging Optimization Example



Asymmetric Barrier Structure



Future Developments

Expanding Applications

Reheat Requirements

- Alternate tray/lidding materials to withstand oven reheat temperatures up to 400°F
- O2 scavenging technology for extended shelf life
- Regulatory requirements

Package Formats

- Spouted pouch
- MRE's – 3 year shelf life requirement
- Large format trays and pouches for food service applications
- Unique tray geometries

Q & A Session

Please submit questions in the Q & A box at the bottom of your screen.

Thank you for attending today's webcast organized by IFT's Food Packaging Division.

The recording of this webcast will be available within 48 hours in IFT's on-demand webcast catalog (ift.org/learnonline)