Food Packaging Workshop: Modified Atmosphere Packaging (MAP)

Modified Atmosphere Packaging (MAP) extends shelf life by altering gas composition inside packaging. This presentation covers MAP principles, applications, benefits, and limitations, focusing on food safety and shelf life.

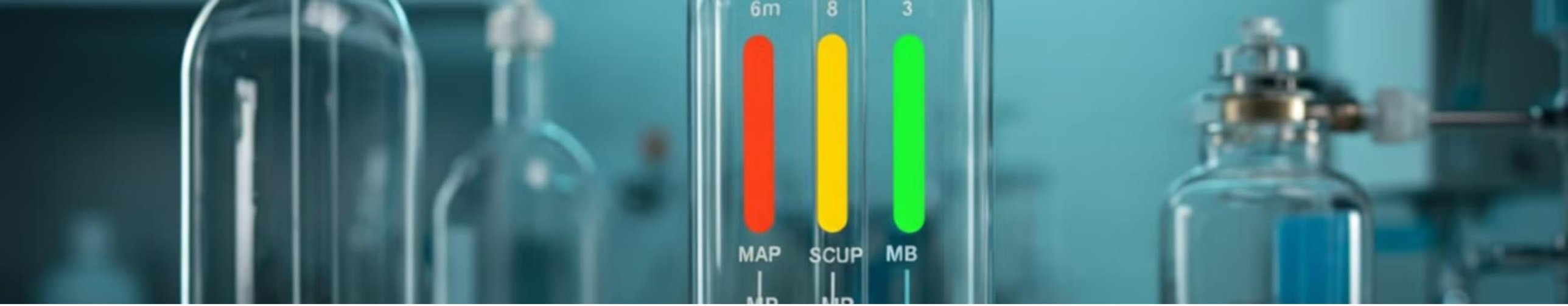
Materials and Equipment

Equipment

- Tray holder and sealer
- Gas supply: Nitrogen (N2), Oxygen (O2), Carbon Dioxide (CO2)

Products

- Dried fruits (air-dried and freeze-dried)
- Commercially available MAP-packaged products



Principles of MAP

Oxygen (O2)

Supports respiration but accelerates oxidation and microbial growth.

Carbon Dioxide (CO2)

Inhibits microbial activity and slows spoilage.

Nitrogen (N2)

Inert gas that displaces oxygen to prevent oxidation.

Key MAP Configurations

1 **Low Oxygen (LOX)**

Reduces oxidation and rancidity. Common for fresh meats, poultry, and seafood.

2 **High Carbon Dioxide (HICAP)**

Inhibits microbial growth in fresh-cut fruits and vegetables.

3 **Low Oxygen & High Carbon Dioxide (LOX/HICAP)**

Controls both oxidation and microbial activity in ready-to-eat meals and salads.

4 **High Nitrogen (HIN)**

Prevents oxidation in snacks, nuts, and cereals.

Applications of MAP

Product	Shelf Life in Air	Shelf Life in MAP
Fish and Seafood	Up to 4 days	Up to 6 days
Raw Red Meat	Up to 4 days	Up to 8 days
Fresh-Cut Fruits/Salads	Up to 5 days	Up to 10 days
Prepared Ready Meals	Up to 5 days	Up to 21 days

Benefits of MAP

Extended Shelf Life

MAP can increase shelf life by up to 5 times compared to conventional air packaging.

Reduced Food Waste

Longer durability minimizes spoilage during transportation and storage.

Fewer Preservatives

MAP reduces or eliminates the need for artificial additives.

Enhanced Product Quality

Maintains color, texture, flavor, and nutritional value over time.

Limitations of MAP

1

Seal Integrity

Rips or punctures compromise the protective atmosphere, leading to rapid spoilage.

2

Cost

Higher initial costs for equipment like gas mixers and sealing machines.

3

Product-Specific Requirements

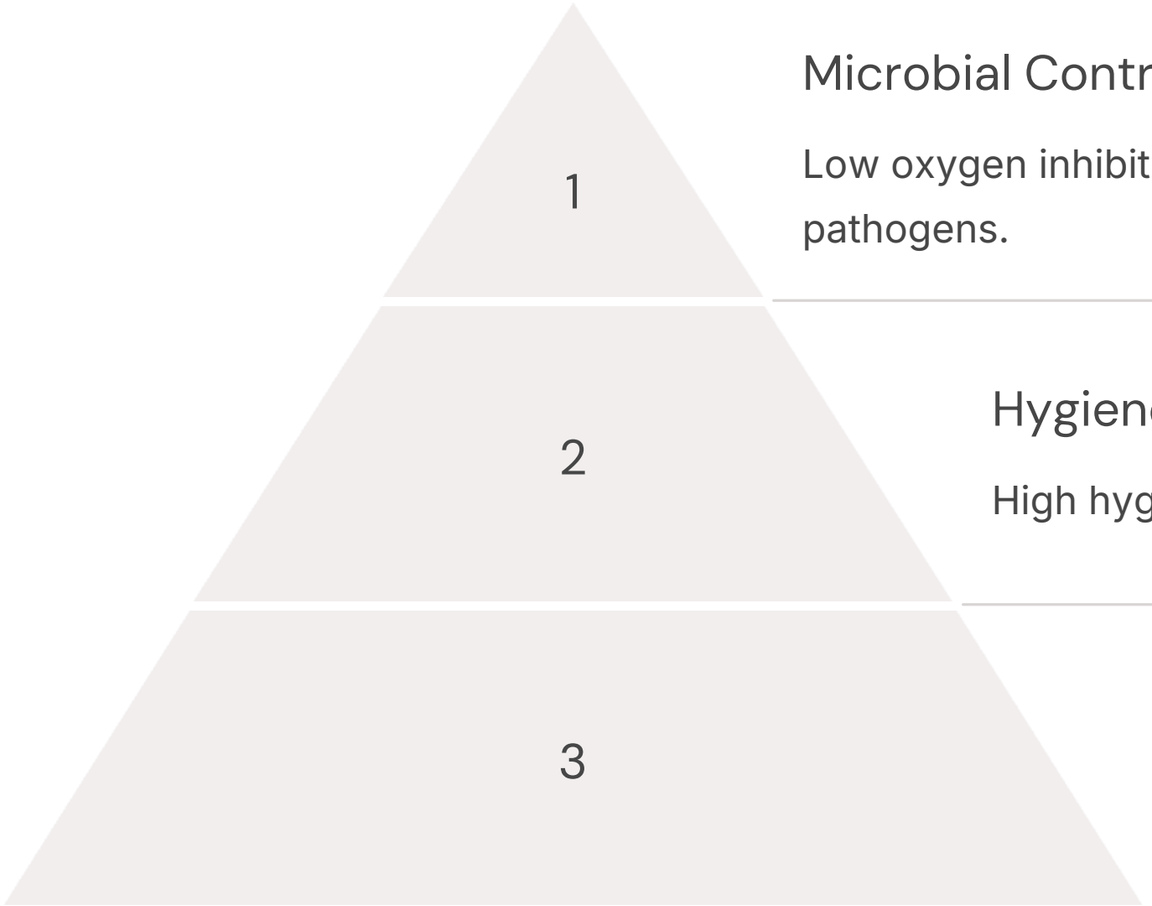
Gas mixtures must be tailored for each product type.

4

Microbial Risks

MAP cannot fully eliminate microbial growth risks without proper refrigeration.

Food Safety Considerations



Microbial Control

Low oxygen inhibits aerobic microorganisms but may allow anaerobic pathogens.

Hygiene Standards

High hygiene during production is critical.

Temperature Control

Continuous cooling is essential for maintaining product safety.

Sensory Impact of MAP

Color Preservation

Low oxygen environments maintain bright red meat color by stabilizing myoglobin levels.

Texture Retention

Prevents moisture loss in baked goods or crispness in snacks.

Flavor Stability

Reduces oxidative rancidity in high-fat products like cheese or nuts.

Comparison of Commercially Available Packaging

Packaging Type	Benefits	Limitations
Vacuum Packaging	Removes all air; prevents oxidation	Can deform soft products
Skin Packaging	Adheres tightly around product	Limited for fragile items
MAP	Tailored gas mixtures; extends shelf life	Requires precise gas control

Key Takeaways

Shelf Life Extension

MAP can extend shelf life by up to five times depending on the product type.

Food Safety

Proper hygiene, seal integrity, and refrigeration are critical for safe MAP use.

Applications

Suitable for a wide range of foods including meats, dairy, snacks, and produce.

Economic Impact

Reduces food waste while enabling global distribution but requires higher initial investment.

Consumer Benefits

1

Fresher Products

MAP maintains product freshness for longer periods.

2

Fewer Preservatives

Reduced need for artificial additives in food products.

3

Appealing Packaging

MAP allows for attractive packaging designs.

Economic Impact of MAP

5x

Shelf Life Increase

MAP can extend product shelf life up to five times.

30%

Waste Reduction

Estimated reduction in food waste through MAP technology.

$2B

Market Size

Projected global MAP market size by 2025.

Conclusion

Modified Atmosphere Packaging is a transformative technology enhancing food preservation while maintaining quality and safety standards. It extends shelf life, reduces waste, and meets consumer demands for fresh, high-quality food products.