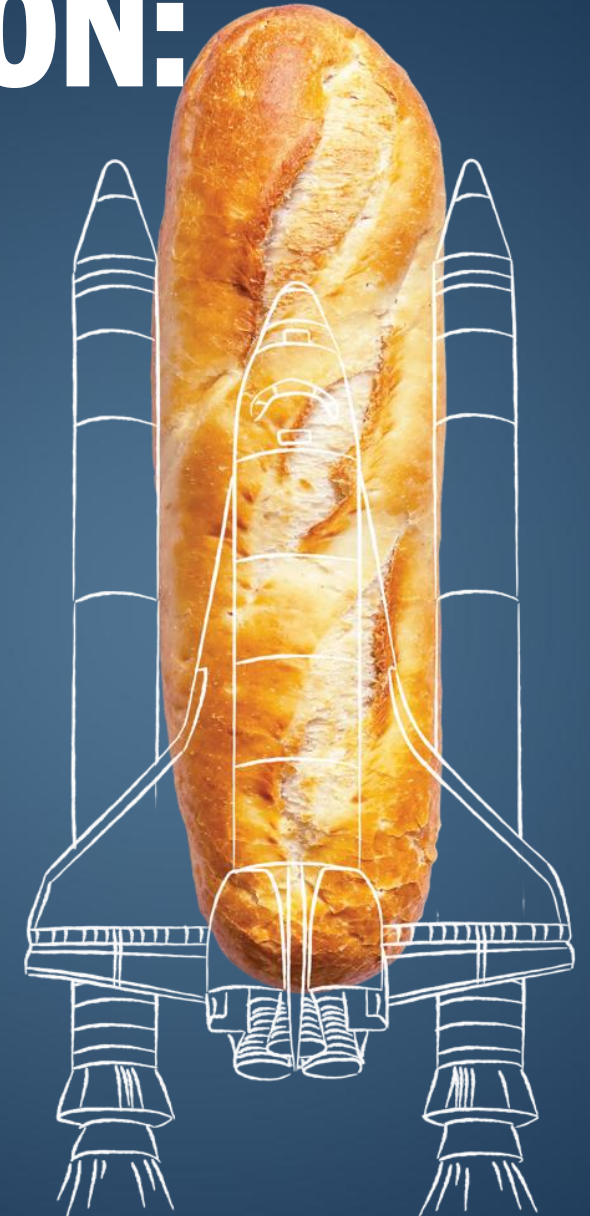


# MONITORING & VERIFICATION:

## Process Food Safety Final Product Quality Control

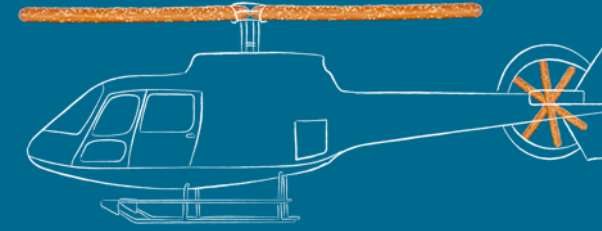
Scott G. Houtz, C.E.M., C.E.P., C.I.A.Q.P.



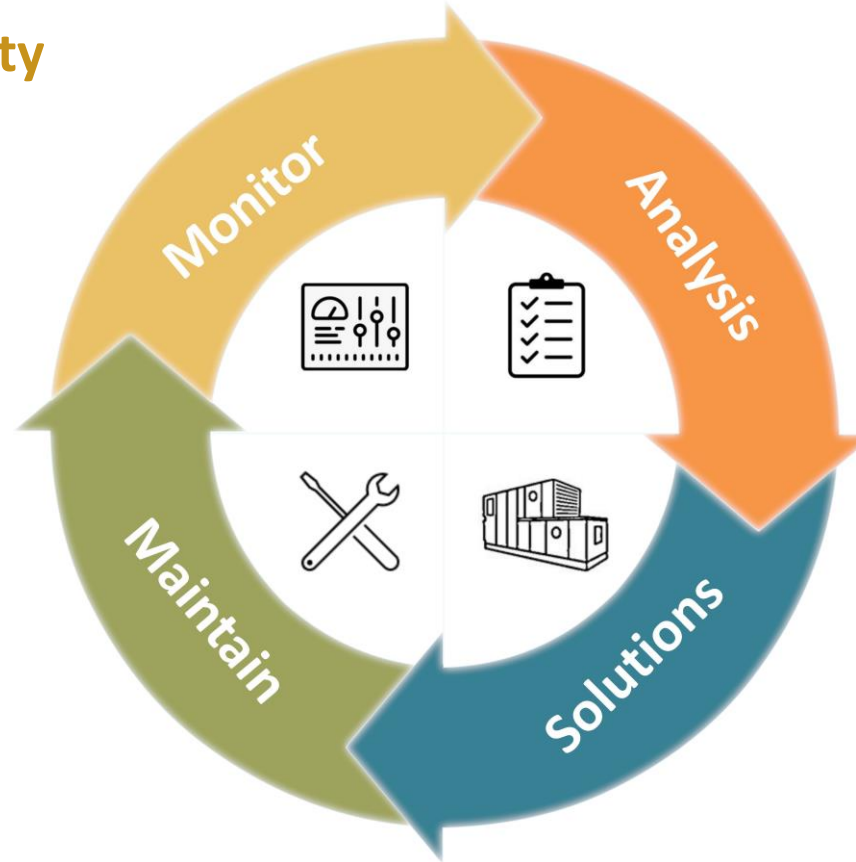
EDUCATION: SEPT. 17-21, 2022  
EXPO HALL: SEPT. 18-21, 2022  
LAS VEGAS CONVENTION CENTER



# SOLUTIONS TO AIR MANAGEMENT

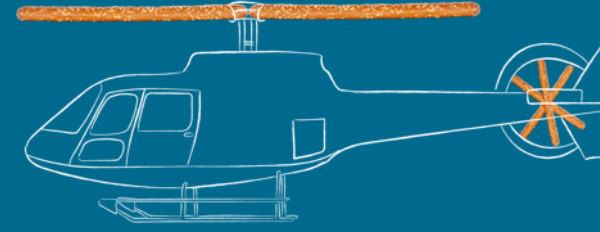


- Temperature & Humidity
- Wind Speed Dynamics
- Particulates & Molds
- Pressurization
- Air Filtration
- UV Lighting
- Control Components
- Ventilation Equipment



- Existing Applications
- Food Safety & Quality
- Process Enhancement
- Occupant Air Quality
- System Design
- Energy Efficiency
- Focused Investment
- Facility Control

# MONITORING AIR MANAGEMENT

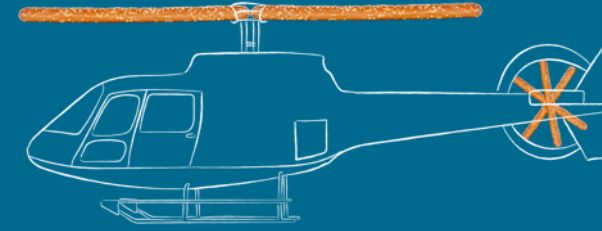


## Environmental Performance Indicators (EPI's)

- Temperature
- Humidity
- Pressurization
- Particulates & Molds
- Wind Speed Dynamic
- Carbon Monoxide
- Outdoors & Indoors
- Push-Information
- Verification
- Multi-Platform Reporting



# ANALYSIS AIR MANAGEMENT

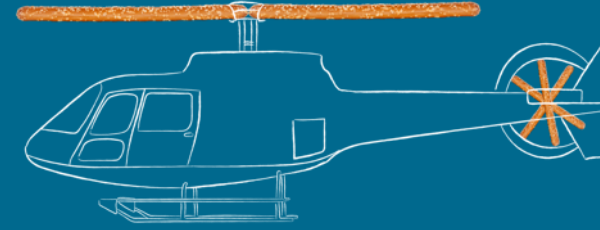


## Facility Analysis Discovery and Verification

- Existing Systems Application
- Investigate Problem Areas
- Space Air Movement
- Food Safety & Quality
- Process Enhancement
- Indoor Air Quality
- Occupant Heat Stress
- Eliminate Assumptions
- Climatic Impact
- Facility Construction

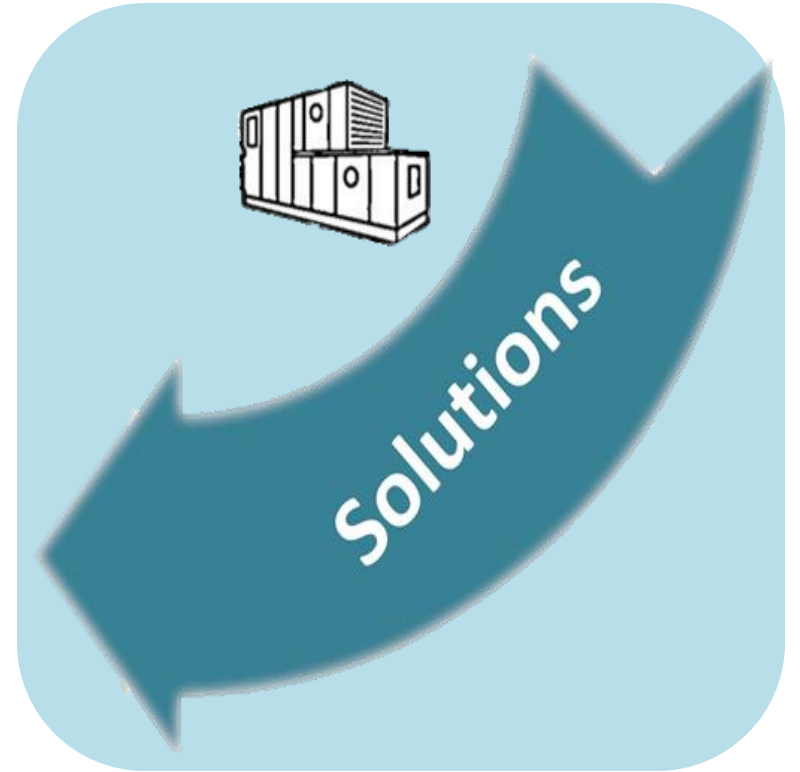


# SOLUTIONS AIR MANAGEMENT

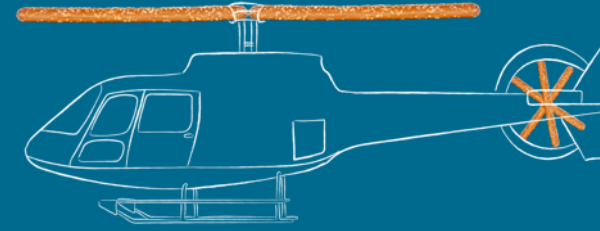


## Implementation with Facility Integrated Control

- Synergistic System Design
- What Goes Out?
- Focused Investment
- Energy Efficiency
- Facility Control
- EPI Performance Driven
- Industrial HVAC
- Air Exchange Ventilation
- Allergens
- Special Spaces



# MAINTAIN AIR MANAGEMENT

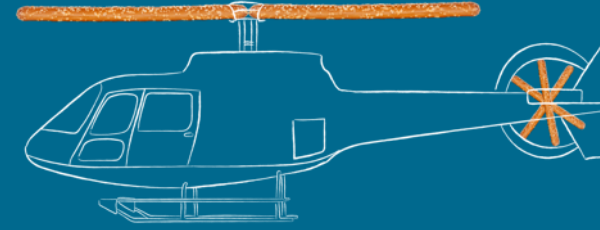


## Key Performance Data Monitoring Validation

- Protecting the Investment
- Food Safety Training
- Planned Maintenance
- HVAC Systems Maintain
- Air Filtration
- Integrated Controls
- UV Lighting
- Energy Management
- Emergency Response
- Facility Docks and Envelope



# MICROBIALS – BAD AIR MANAGEMENT



## Mold Spore Types

- Active vs. Dormient
- Seasonal and Geographic Factors
- Why Measure Outdoor Counts?
- Absence of Light-Moisture-Nutrient

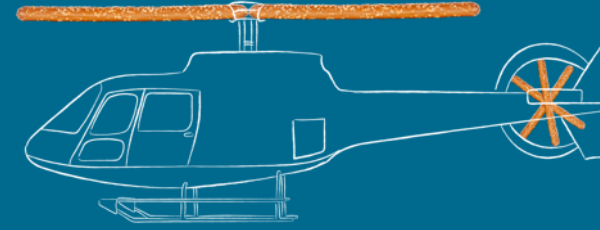
## Common Issues

- Food Safety Training (HVAC Guys)
- HVAC Unit Condensate
- Filtration Bypass
- EPI's Product Conditioning
- Open-Loop Control



*Atmospheric Molds reduce shelf life*

# PRODUCT CLEANROOM ENVIRONMENT



## Exposed Finished Product Zones

- Cooling-Packaging

## Construction

- Enclosures with Maintenance Access
- Environmental Control
- Operators and Material Flow

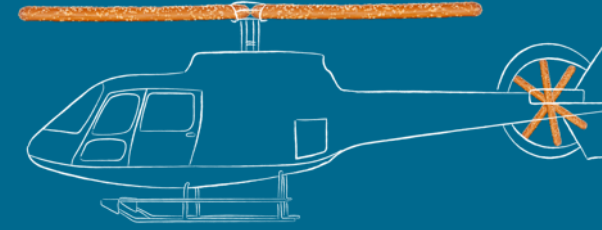
## Benefits

- Consistent Product Environment
- Airborne Protection
- Positive Occupant Environment
- Risk Management
- Recognition



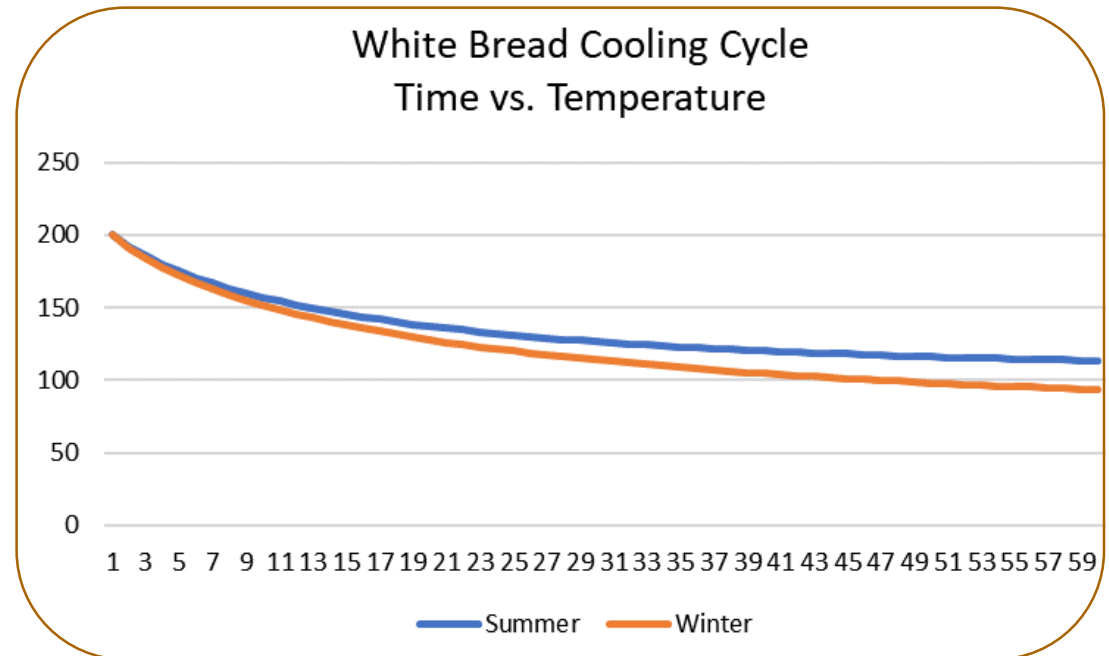


# PRODUCT COOLING – COMPARISON

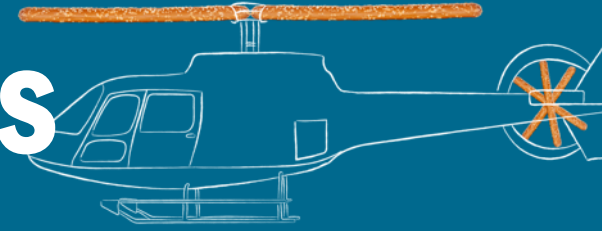


## Factors Related to Product Cooling?

- **Product Formulation and Geometry**
- **Time-Temperature-Humidity-Airflow**
- **Latent Heat vs. Sensible Heat**
- **Seasonal Variations**
- **Ambient vs. Conditioned Coolers**

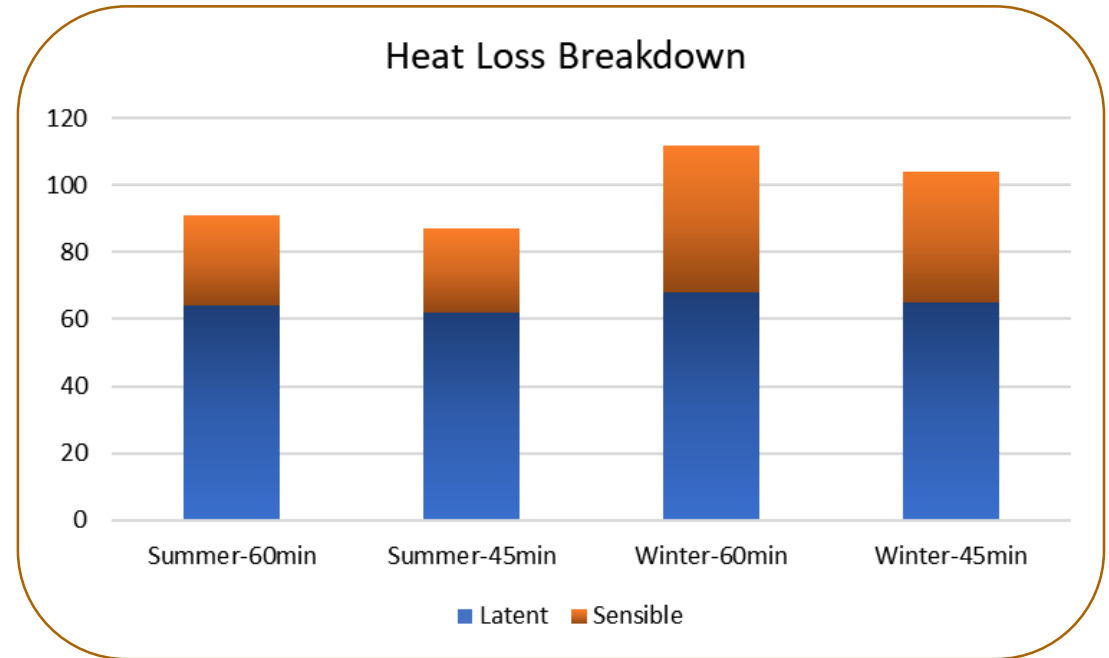


# PRODUCT COOLING – PROCESS RESULTS

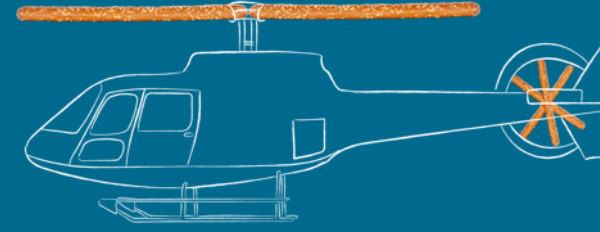


## Product Cooling Issues

- Product Appearance and Quality
- Increased Potential for Mold Growth
- Malfunctioning Process Equipment



# FACILITY FREEZING SYSTEMS



## Science in Relation to Dew Point

- **Absolute vs. Relative Humidity**

## Condensation & Icing Issues

- **Exit and Entry Conveyors**
- **Product Condensation**

## Production to Dock Interface Issues

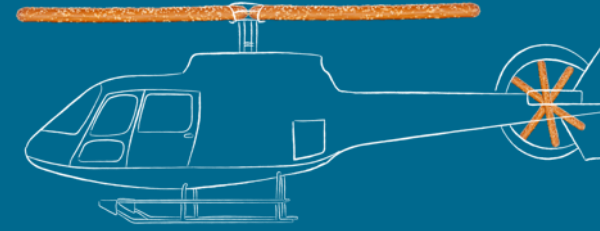
- **Defrost Loading**
- **Water on the Floor**

## Facility HVAC System Impact

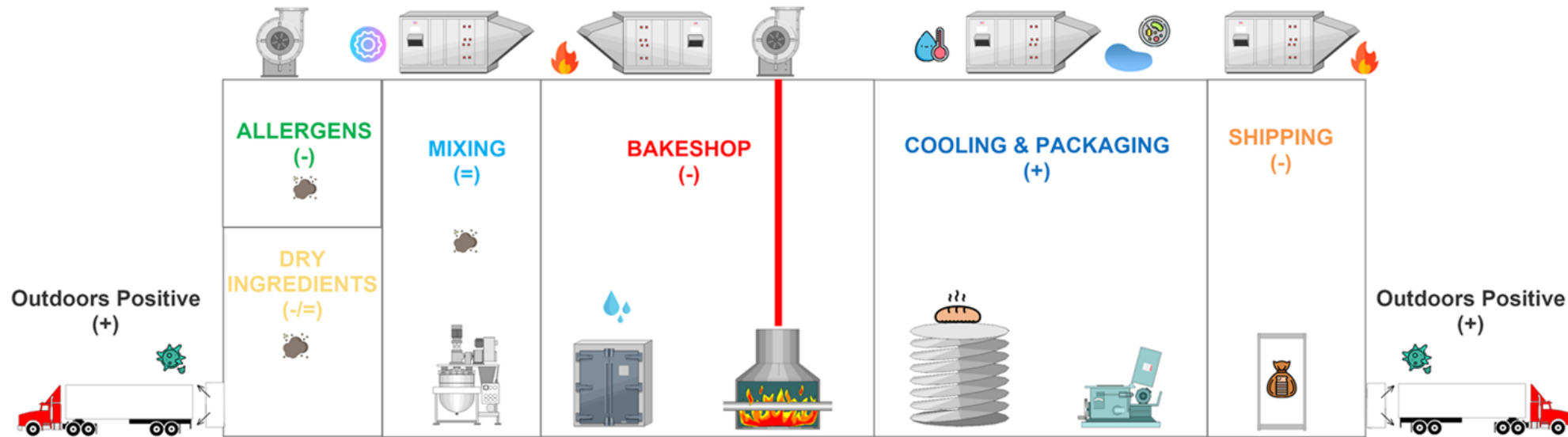
- **Mechanical Cooling vs. Ventilation**
- **Vestibules**



# SOLUTIONS TO AIR MANAGEMENT



## INDUSTRIAL BAKING FACILITY AIR MANAGEMENT



- Established EPI's
- Industrial HVAC
- Makeup Air Systems

- Exhaust Fan Types
- Control System
- Maintenance



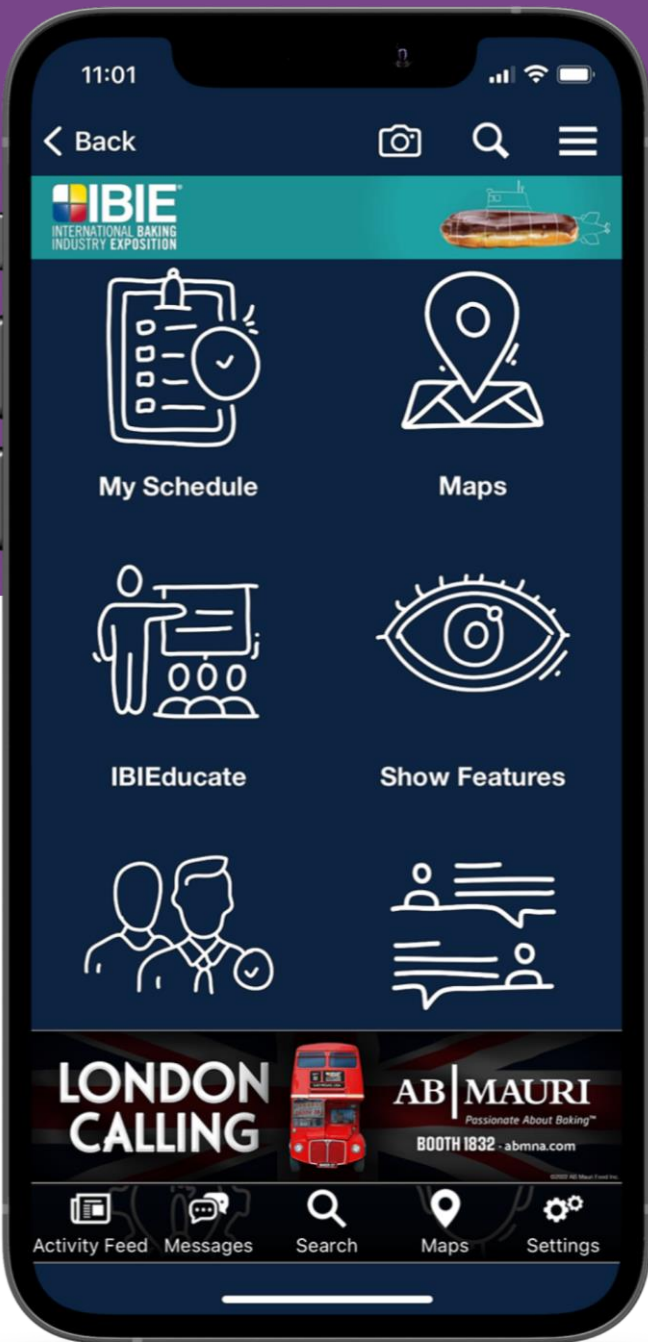
QUESTIONS?



**THANK YOU!**

Scott G. Houtz, President





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