

# Par-baking Technology

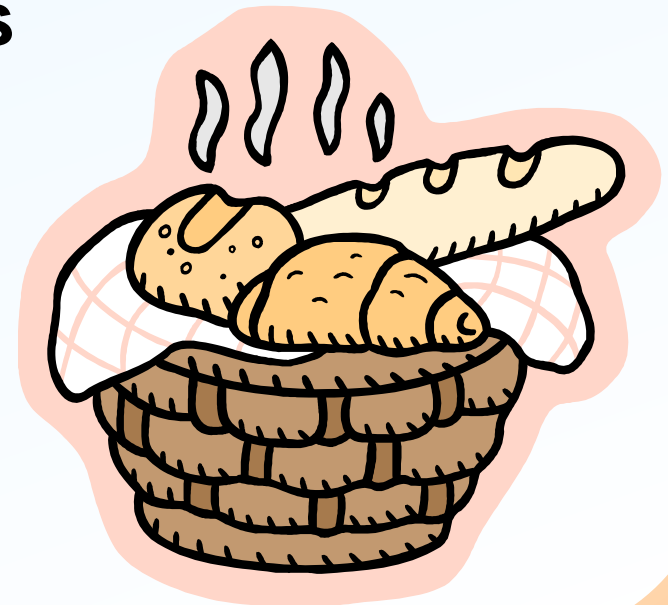


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[www.aibonline.org/schoolofbaking](http://www.aibonline.org/schoolofbaking)

# Par baked Products

- What is it?
  - Product which is **partially baked**, to the point where it holds its shape but has minimal crust color.
  - A second bake establishes crust color.
  - Can be baked and served hot.
  - Also called **pre-baked**



# Why make?

- Reduces the **skill level** needed to “bake” the product
- Centralizes the production of product to fewer facilities
- Potential cost savings
- Convenience of “fresh” product



# Why NOT Par-baked?

- Reduced eating **quality** compared to fresh baked
- Shelf life limitations
  - Higher moisture content encourages **mold growth**



# Who buys par-baked?



**Consumers**



**In-Store  
Bakeries**



**Food  
Service**

# Production of Par-baked

- Mixing and make up of products similar to fully baked product.
- **Critical difference** of par-baked product is **baking**
  - Need to “set” the structure (rigidity)
  - Without developing crust color
  - Approximately 90-95% of starch gelatinization

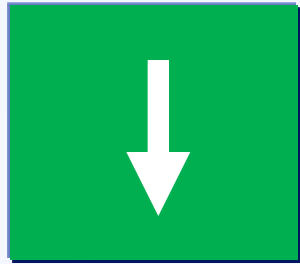


# Rigidity vs. Crust Color



Rigidity	Crust Color
<ul style="list-style-type: none"><li>● Formula<ul style="list-style-type: none"><li>● Richer ingredients reduce rigidity</li></ul></li><li>● Oven temperature<ul style="list-style-type: none"><li>● Higher oven temperatures “set” the structure</li></ul></li><li>● Baking time<ul style="list-style-type: none"><li>● More time increases rigidity</li></ul></li></ul>	<ul style="list-style-type: none"><li>● Formula<ul style="list-style-type: none"><li>● Less ingredients that brown (milk, eggs, sugar)</li></ul></li><li>● Oven temperature<ul style="list-style-type: none"><li>● Lower oven temperatures delay color</li></ul></li><li>● Baking time<ul style="list-style-type: none"><li>● Less time avoids color</li></ul></li></ul>

# Formula changes



- Lower water absorption
- Reduced sugar
- Strengtheners (gluten & oxidants)



- Mold inhibitor increased
- Emulsifiers increased for strength and softness

# Types of products

Soft dinner  
rolls

Pan  
breads

Hearth  
breads

Crusty  
rolls

Others?



# Sample Formula of Brown 'N Serve Rolls



Sponge	%
Flour (11.5-12.5% protein)	60
Water	34.8
Compressed Yeast	2
Mineral yeast food	0.5
SSL or monoglycerides	1.0

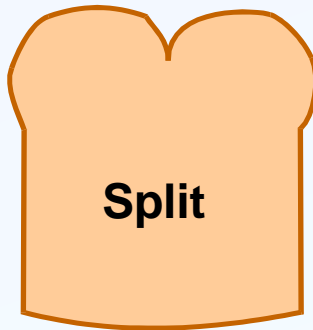
Dough	%
Water	24.2 (59)**
Salt	2.1
Sugar	10
Soy Oil	5
Milk solids	3
Calcium propionate	0.35
ADA	20 ppm
Ascorbic Acid	60 ppm



**\*\*Percent represents total absorption.**

# Make-up of Brown 'N Serve

- **Dividing – less weight than fully baked**
- **Moulding**
  - **Several variations**



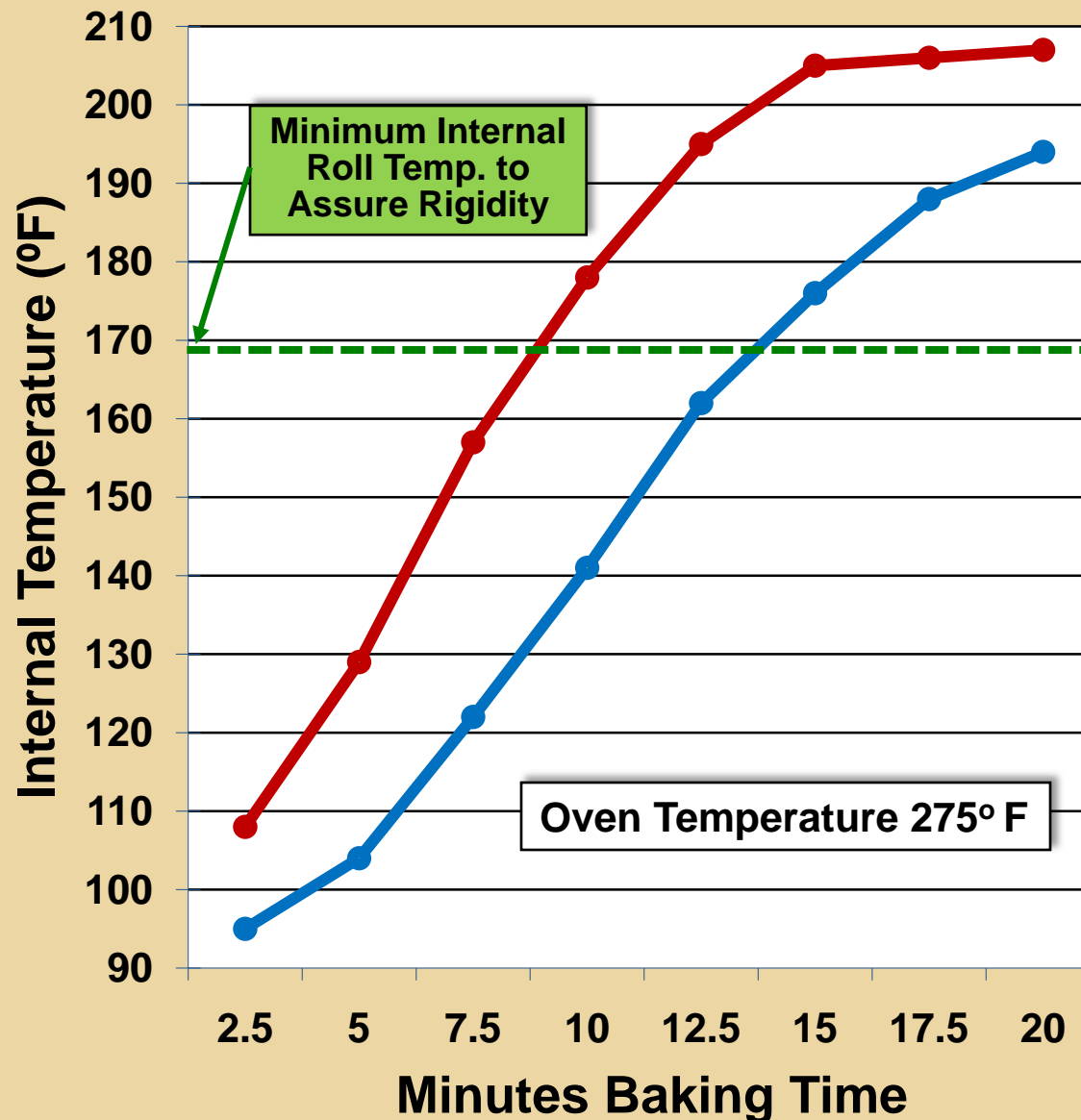
- **Rolls are produced today mainly by using a cutter or stamp.**

# Proofing of Par-baked



- Give hearth style products full proof
- Richer products or Brown-N-Serve rolls give  $\frac{3}{4}$  proof
  - More oven spring at lower bake temperatures.
- Avoid dry proof conditions

# Temperature of Proof Box Affects the Temp. of Dough and Time of Baking to Rigidity



Data courtesy of  
General Mills, Inc.

# First Bake Conditions

- Target **internal temperature** is 170° to 180°F (77° to 82°C)
  - Sets rigid structure
- Bake time and oven temperature depend on size of the product
  - Two strategies for baking
    1. High temperature, less time
    2. Lower temperature, more time
  - Choice based on surface area



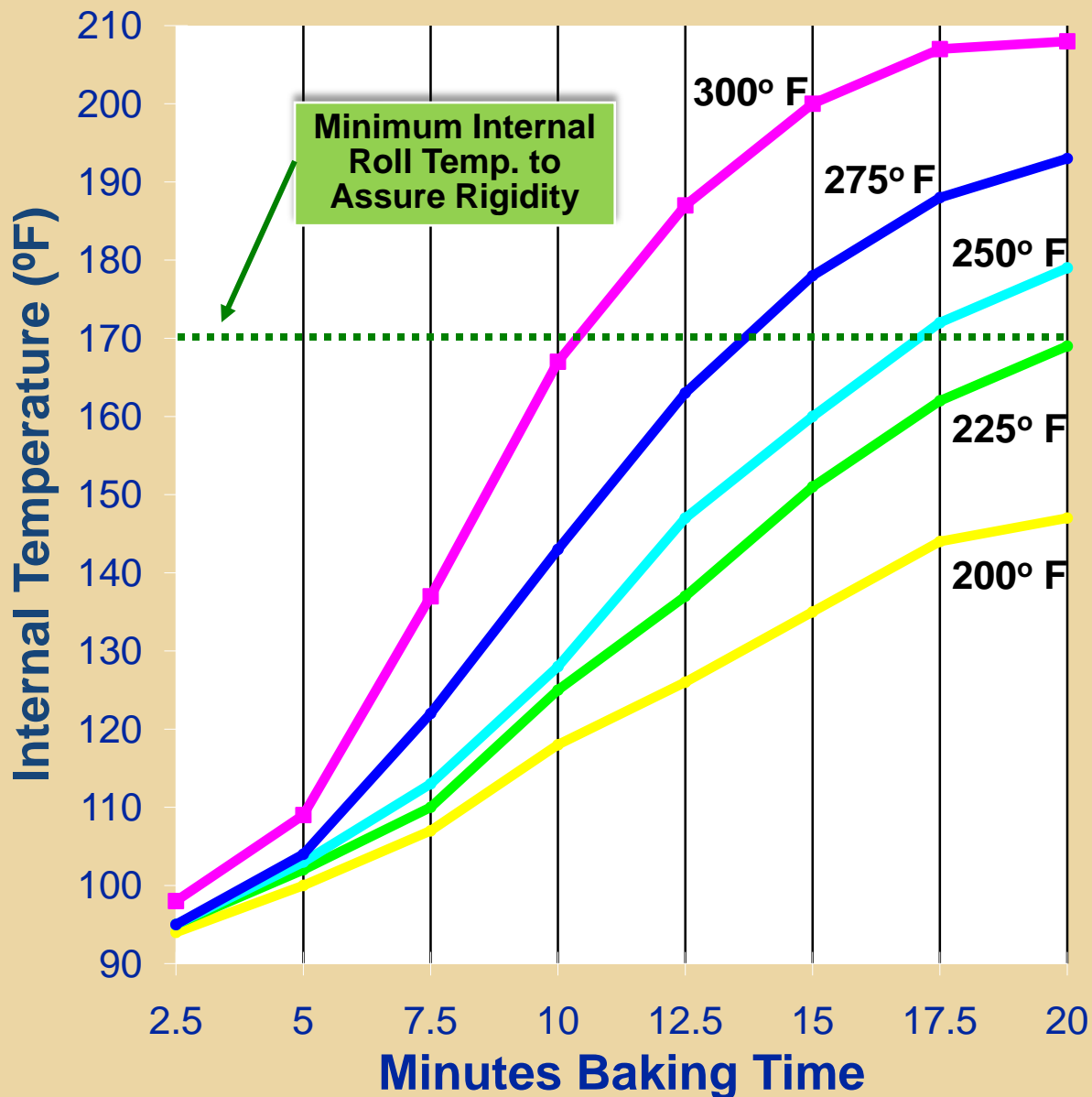
# First Bake Conditions

continued

- For **larger products** or richer formulas
  - Recommended oven temperature is 250° to 300° F (121° to 149° C)
- For **smaller products** or leaner formulas
  - Recommended oven temperature is 400° to 420° F (204° to 211° C)
- Baking time is as long as possible without crust color formation



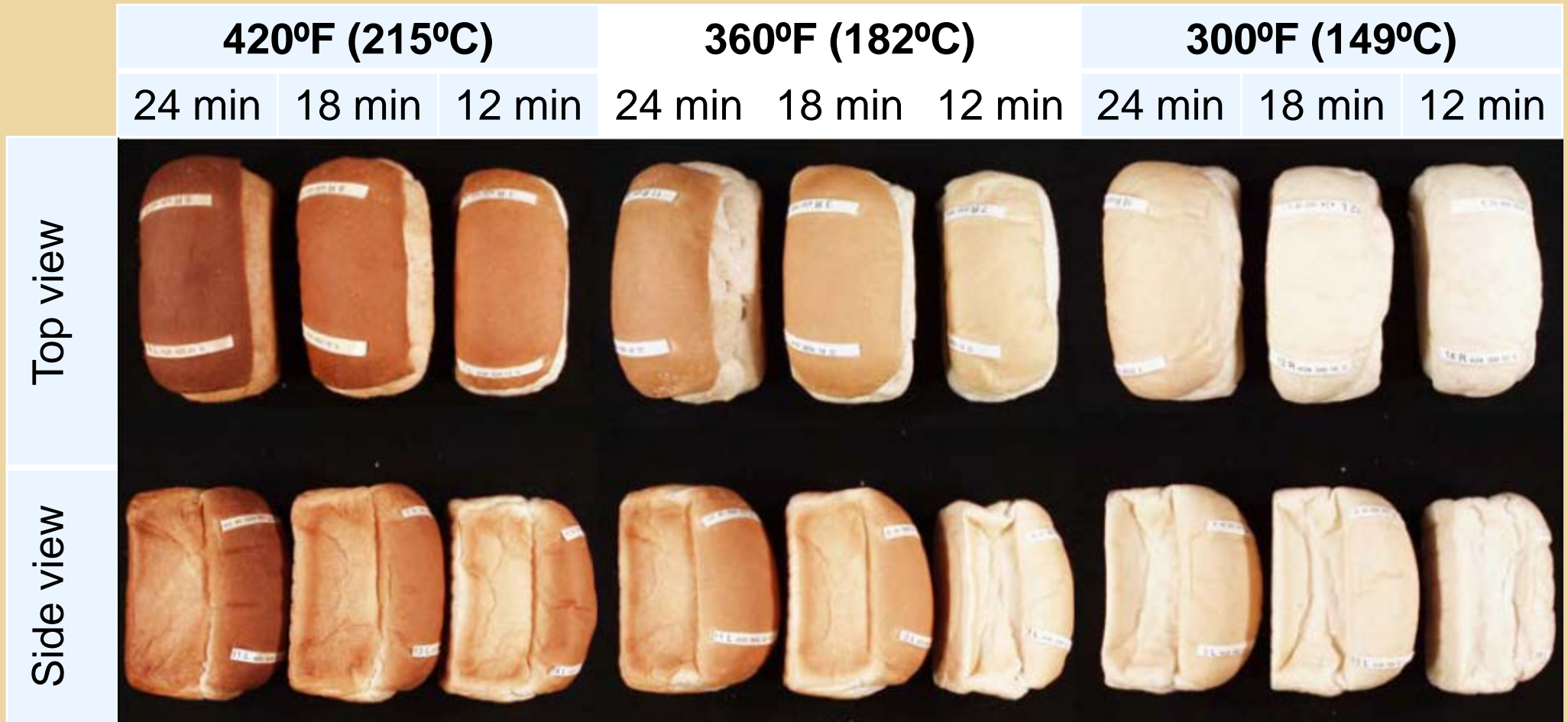
# Effect of Baking Rolls at Different Oven Temp.



- Rigid in 10 min. but danger of crust coloration.
- Rigid in 14 min., no coloration, considered optimum time and temp.
- Rolls rigid, could have been removed at 17 min.
- Barely rigid, difficult to remove from pans.
- Non rigid rolls, collapsed and doughy.

Data courtesy of General Mills, Inc.

# Effect of Baking Pan Breads at Different Oven Temp.



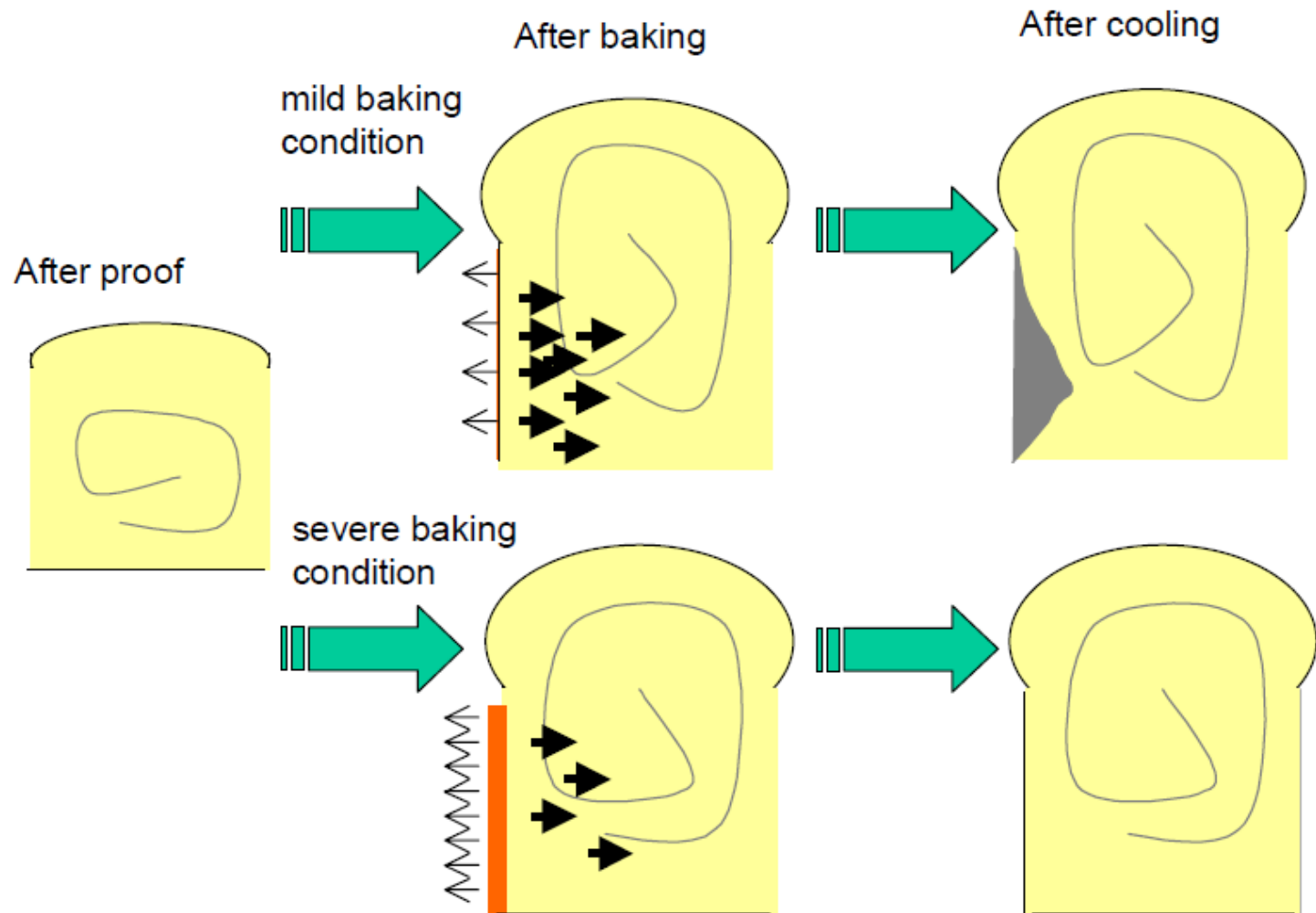
From: Pai & Walker (June 2004) AIB Technical Bulletin (vol 26 iss 6)

# Challenges of Par-baked

- **Cooling and Packaging**
  - Product may be soft
  - Product may collapse or wrinkle on surface
  - Package needs to protect product
- **Shelf-life**
  - Mold control is important



# Mechanism for Collapse



# Cooling Methods

## ● Method #1

- Leave in pans 10 to 15 minutes out of oven to allow product to become rigid, then depan
- Do not allow rolls to sweat in pans

## ● Method #2

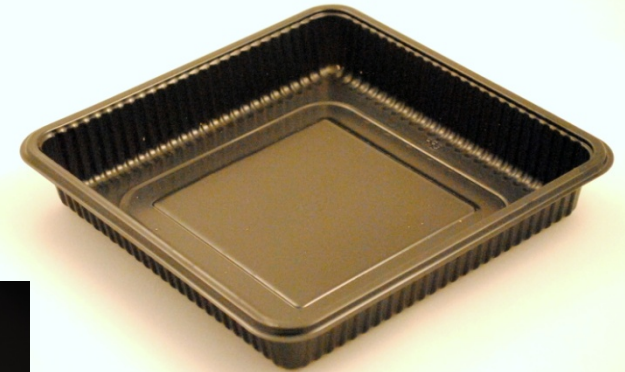
- Depan product immediately out of the oven and place in packaging trays for cooling
- Cooling time 30 to 40 minutes

# Cooling

- **Too cool** of temperature will produce excess moisture loss.
- **Too warm** of temperature will produce accelerated mold growth.
- **Target cooled temperature:**
  - 90° to 95°F (32° to 35°C)

# Packaging

- Needs to be rigid to prevent crushing in transit
- Soft breads and rolls may be packed in ovenable trays



# Storage

- **Room temperature (ambient) storage**
  - One to two weeks shelf-life
- **Refrigerated storage 35 – 40°F (1.6 – 4.4°C)**
  - Three to four weeks mold-free
  - Starch retrogrades (firms) most rapidly
- **Frozen storage**
  - Several months shelf-life
  - Moisture control important

# Mold Control

- Use of **mold inhibitors**

- In dough

- ➔ Calcium propionate, cultured starch or whey, vinegar

- On surface

- ➔ Sorbic acid or potassium sorbate sprayed as 10% solution after depanning

- **Oxygen removal from package**

- Modified atmosphere package (MAP)

- Oxygen scavenger



# Shelf-Life Considerations

- **Firming will occur over time**
- **First bake will impact moisture of product**
  - **Less moisture will firm and stale faster**
  - **Moisture above 37% delays firming**
- **Second bake refreshes BUT**
  - **Firming occurs more rapidly**
- **Emulsifiers improve shelf-life**
  - **Enzymes may cause gumminess**

# Second Bake Conditions

- **Oven temperature**
  - 400 – 425°F (204 – 218°C)
- **Baking time**
  - 5 – 10 minutes (to desired color).
- **Time and temperature vary with formulation**



# Second Bake Goals

1. **Soften product (reduce firmness)**
  - Minimum internal temperature for softness recovery is 131°F (55°C)
2. **Develop crust color (and flavor)**
  - Crust color forms when surface temperature is ≈302°F (150°C)

