Par-baking Technology

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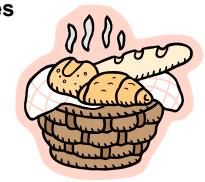
Par baked Products

- 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

● Formula
  ● Richer ingredients reduce rigidity
● Oven temperature
  ● Higher oven temperatures "set" the structure
● Baking time
  ● More time increases rigidity
	● Formula
	  ● Less ingredients that brown (milk, eggs, sugar)
	● Oven temperature
	  ● Lower oven temperatures delay color
	● Baking time
	  ● Less time avoids color

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

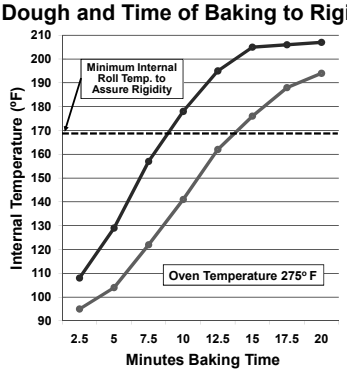
- Dividing – less weight than fully baked
- Moulding
  - Several variations

  - 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 ¾ 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

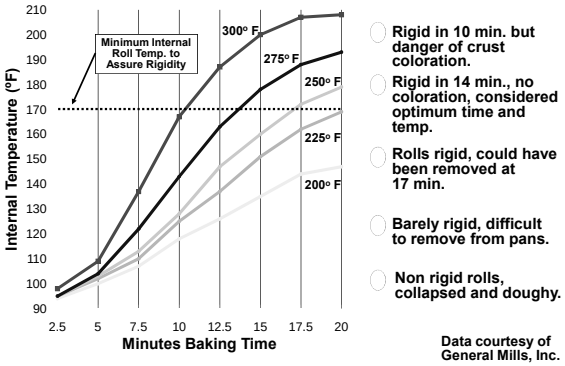
- **Target internal temperature is 170º to 180ºF (77º to 82ºC)**
  - **Sets rigid structure**
- **Bake time and oven temperature depend on size of the product**
  - **Two strategies for baking**
    1. High temperature, less time
    2. Lower temperature, more time
  - **Choice based on surface area**

First Bake Conditions

continued

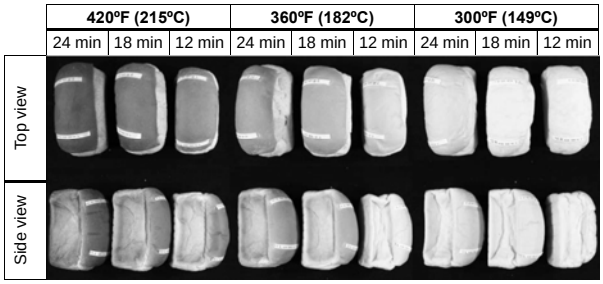
- **For larger products or richer formulas**
  - **Recommended oven temperature is 250º to 300º F (121º to 149º C)**
- **For smaller products or leaner formulas**
  - **Recommended oven temperature is 400º to 420º F (121º to 149º C)**
- **Baking time is as long as possible without crust color formation**

Effect of Baking Rolls at Different Oven Temp.



Data courtesy of General Mills, Inc.

Effect of Baking Pan Breads at Different Oven Temp.



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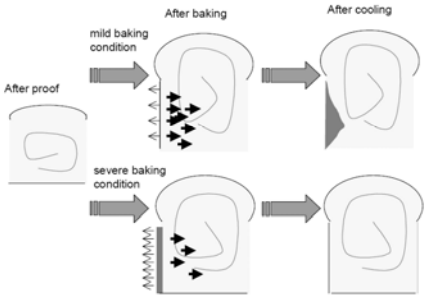
Challenges of Par-baked

- **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



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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:**
  - **90º to 95ºF (32º to 35ºC)**

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 – 40ºF (1.6 – 4.4ºC
  - 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 131ºF (55ºC)
2. Develop crust color (and flavor)
   - Crust color forms when surface temperature is ≈302ºF (150ºC)

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