Sophisticated Solutions for Simplified Labels

October 29-30, 2013 • Hyatt Lodge, Oak Brook, Illinois, USA

2013 Technology Snapshot Presentation

Introducing Novation Endura™
Functional Native Starch
By: Ingredion
Introducing NOVATION Endura™ 0100
functional native starch

LEASLIE M. CARR, MARKETING MANAGER, WHOLE SOME
NOVATION Endura™ 0100

- Next-generation process tolerance for more clean-label products than ever before
  - Whole new application areas for clean label from dairy to savory
  - Highest process tolerance of any functional native starch on the market
  - Stability during shelf life, including chilled and frozen storage
  - Extends the legacy of the more than 35 NOVATION clean label starches pioneered over the last two decades

- All the taste, visual and texture appeal consumers demand
  - Clean flavor profile that doesn’t mask delicate flavors
  - Desirable texture can be maintained through processing and shelf life, comparing favorably with modified-starch performance
Perfect for yogurt
Case Study

Non-Fat Stirred Yogurt

Formulating yogurts with clean label starches has often been challenging

- High temperature and homogenization parameters
- Starch functionality can be compromised, especially in downstream processing in which homogenization takes place after pasteurization

Challenges for the Industry:

- Process tolerance
- Shelf life stability (syneresis)
- Deliver acceptable texture
## Formulation and Process

### Process:
1. 190°F pasteurization temperature
2. 1740 psi total homogenization pressure

### Ingredients:

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultured Skim Milk</td>
<td>94.91%</td>
</tr>
<tr>
<td>Non-Fat Dry Milk</td>
<td>1.34%</td>
</tr>
<tr>
<td>NOVATION Endura™ 0100 Starch</td>
<td>3.45%</td>
</tr>
<tr>
<td>Gelatin</td>
<td>0.30%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ingredients</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Skim Milk</td>
<td>95.71%</td>
</tr>
<tr>
<td>Non Fat Dry Milk</td>
<td>1.34%</td>
</tr>
<tr>
<td>THERMTEX® or National™ 1333</td>
<td>2.65%</td>
</tr>
<tr>
<td>Gelatin</td>
<td>0.30%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>

### Nutrition Facts

- **Amount Per Serving**
  - Calories: 70
  - Calories from Fat: 0
  - % Daily Value:
    - Total Fat: 0%  (0g)
    - Saturated Fat: 0%  (0g)
    - Trans Fat: 0%  (0g)
    - Cholesterol: 0mg  (0%)
    - Sodium: 100mg  (4%)
    - Total Carbohydrate: 10g  (3%)
    - Dietary Fiber: 0g  (0%)
    - Sugars: 9g  (0%)
    - Protein: 7g
  - Vitamin A: 6%  (65mcg)
  - Vitamin C: 2%  (10mg)
  - Calcium: 20%  (200mg)
  - Iron: 0%  (0mg)

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:
- Calories: 2,000 (2,500)
- Total Fat: Less Than 65g  (80g)
- Saturated Fat: Less Than 20g  (25g)
- Cholesterol: Less Than 300mg  (300mg)
- Sodium: Less Than 2,400mg  (2,400mg)
- Total Carbohydrate: 300g  (375g)
- Dietary Fiber: 25g  (30g)
- Calories per gram:
  - Fat: 9
  - Carbohydrate: 4
  - Protein: 4

**INGREDIENTS:** Cultured Skim Milk, Non-Fat Dry Milk, Starch, Gelatin
Expert Descriptive Panel Evaluation of Stirred Yogurts at 1 and 7 Weeks

Week 1

Week 7
Rheological Measurements of Stirred Yogurts over 7 Weeks

All the samples gained in overall firmness/viscosity over the 7 week refrigerated shelf life due to the natural hardening of the yogurt’s protein network.
Conclusions for Yogurt

• NOVATION Endura 0100 starch can provide similar texturizing functionality in stirred yogurts as compared to chemically modified starches.

• Labels as “corn starch” allowing for a simpler, cleaner label to address consumer needs, without sacrificing performance.

• Equally important, the functional native starch maintains a stable desirable texture over typical refrigerated shelf life.
Perfect for spoonable dressing
Dressings were made simulating a typical process.
- Starch cooks were done in a boiling water bath (T = 98°C, t = 20 min.)
- Starch concentrations were chosen to deliver similar viscosities after the first shear step

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starch</td>
<td>x</td>
</tr>
<tr>
<td>Water</td>
<td>39.65 - x</td>
</tr>
<tr>
<td>Soybean Oil</td>
<td>30.500</td>
</tr>
<tr>
<td>Sugar</td>
<td>11.505</td>
</tr>
<tr>
<td>Vinegar (120 grain)</td>
<td>8.125</td>
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<tr>
<td>Egg Yolks</td>
<td>4.500</td>
</tr>
<tr>
<td>Salt</td>
<td>1.690</td>
</tr>
<tr>
<td>Mustard Powder</td>
<td>0.715</td>
</tr>
<tr>
<td>Paprika</td>
<td>0.065</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
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**NOVATION® Endura 0100:** x = 4.225%
**THERMTEX®:** x = 3.250%
Experimental Design

The experiment was based on extending shear time in a typical process.

- Shear was modeled with a high-speed bench-top mixer at 10,000 rpm
- Samples were evaluated at 4 levels of cumulative shear (0s, 60s, 120s, and 150s)
- The first two units of shear (60s to 120s) are typical of a normal process (correlated with colloid mill)
- The third unit (150s) represents excessive shear
Shear Tolerance

Dressing made with NOVATION Endura™ 0100 retained most of its viscosity at increasing levels of shear.

Procedure: Dressings were subject to shear over time using a bench-top, high speed mixer at 10,000 rpm.
Shear Tolerance

NOVATION Endura™ 0100 starch retains granular integrity similar to THERMTEX®

0 seconds  | 60 seconds  | 120 seconds  | 150 seconds

Endura 0100

Thermtex

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Conclusions for Salad Dressing

• Dressings made with NOVATION Endura 0100™ starch retain viscosity at high levels of shear similar to modified starch.

• NOVATION Endura 0100™ functional native starch retains granular integrity when subject to shear over time.

• Labels as “corn starch” allowing for a simpler, cleaner label to address consumer needs, without sacrificing performance.
Summary

• Patented clean-label innovation
• Process tolerance like never before for:
  – Dairy and dairy-based products, such as custards and yogurts
  – Savory products, such as spoonable dressings, frozen ready meals and UHT soups in aseptic packages
• Withstands high heat and high shear while offering clean taste and visual appeal
• Lets you achieve:
  – Front label claims of “Additive-free,” “All-Natural,” “No E-numbers,” etc.
  – Back label ingredient lists like that of a homemade recipe
Ingredion expertise

• The expertise you need to get your reformulated or new products to market faster
  – Our deep application, formulation, sensory and culinary expertise helps you quickly create new food concepts and address formulation and processing challenges
  – We work across all application areas through our Texture Center of Excellence in Bridgewater, NJ, the Food Creation Centre in Hamburg, Germany, and other facilities in Singapore, Shanghai and Sao Paolo, collaborating with you to achieve your goals
  – We help from start to finish, from consumer insights and concept ideation to sensory testing and formulation by our chef-scientists to manufacturing scale-up and label claims