Product Innovation For Getting The Most Out Of HPP

Barb Stuckey & Candice Lin, Mattson
Introductions:
Barb Stuckey
Candice Lin
Mattson

Part I: Basics of HPP Product Development
Part II: The Logistics of HPP Development
Part III: A comparative sampling
Q&A
YOUR PRESENTERS

BARB STUCKEY
President & Chief Innovation Officer - MATTSON
Author - TASTE: Surprising Stories & Science About Why Food Tastes Good
Instructor - Fundamentals of Taste at San Francisco Cooking School
Forbes Contributor - I write about the business of food

CANDICE LIN
MATTSON
Project Manager, Product Development & Food Field Immersions
Masters in Food Science
Expert in new product development in the natural foods and organic sectors
Leads Mattson Field Food Immersions
Prior to Mattson, Candice was a Sea Otter and Sea Bird Biologist
We Are

An employee-owned food-focused firm of 65 strategists, scientists, scale-up specialists, and more with a common passion for food helping clients—both large and small—create amazing new food & beverage products.
We FILL

PIPELINES WITH CONCEPTS and PRODUCTS
We EVOLVE

COMMODITIES INTO VALUE-ADDED PRODUCTS
OUR BELIEF

A GREAT PRODUCT IS YOUR ULTIMATE COMPETITIVE ADVANTAGE
We develop products for every category, consumer need state, technology, temperature state, culinary tradition, and channel of distribution.
Bakery Concepts—Purchase Intent and Key Measures

- **Morning Bakes**, **Snack Crisps**, and **Toasted Duets** were the top three performing concepts. These concepts exceeded an average purchase intent norm and had the highest expected purchase frequency compared to **Daybreak Bakes**.

- **Daybreak Bakes** was the least favored concept and scored below two of the three purchase intent norms.

<table>
<thead>
<tr>
<th>BAKERY CONCEPTS</th>
<th>Mattson Norma</th>
<th>Morning Bakes</th>
<th>Snack Crisps</th>
<th>Toasted Duets</th>
<th>Daybreak Bakes</th>
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</thead>
<tbody>
<tr>
<td>Sample Size</td>
<td>48</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Purchase Intent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Definitely would buy</td>
<td>29%</td>
<td>42%</td>
<td>43%</td>
<td>34%</td>
<td>36%</td>
</tr>
<tr>
<td>Probably would buy</td>
<td>35%</td>
<td>51%</td>
<td>48%</td>
<td>36%</td>
<td>30%</td>
</tr>
<tr>
<td>Might or might not buy</td>
<td>69%</td>
<td>77%</td>
<td>71%</td>
<td>72%</td>
<td>56%</td>
</tr>
<tr>
<td>Probably would not buy</td>
<td>7%</td>
<td>10%</td>
<td>74%</td>
<td>8%</td>
<td>11%</td>
</tr>
<tr>
<td>Definitely would not buy</td>
<td>3%</td>
<td>1%</td>
<td>1%</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>Weighted Purchase Intent*</td>
<td>70</td>
<td>92</td>
<td>82</td>
<td>87</td>
<td>61</td>
</tr>
<tr>
<td>Uniqueness (% Tip 2 Box)</td>
<td>69%</td>
<td>52%</td>
<td>42%</td>
<td>65%</td>
<td>65%</td>
</tr>
<tr>
<td>Ranking</td>
<td>Ranked 2nd</td>
<td>Ranked 3rd</td>
<td>Ranked 3rd</td>
<td>Ranked 4th</td>
<td></td>
</tr>
</tbody>
</table>

*See Appendix for WPI Calculation

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**Daybreak Bakes — Frequency of Use by Variety**

Q. How often would you expect to buy each of the following varieties of Daybreak Bakes? (% very/somewhat often)

- **Fruits & Nuts: Blueberry and Almond** 51%
- **Fruits & Nuts: Cranberry and Walnut** 42%
- **Steelcut Oats with Maple Brown Sugar Raisins** 33%
- **Fruits & Nuts: Apricot, Pecan and Raisins** 30%
- **Ancient Grains: Quinoa, Amaranth and Millet** 19%
- **SuperSeed: Sunflower, Pumpkin and Chia** 18%
- **Sprouted: Whole Wheat, Barley and Millet** 15%
WORKING ON TODAY'S HOTTEST CATEGORIES, LIKE PLANT-BASED FOOD
CONSUMER INSIGHTS & PD ACROSS PLANT-BASED FOOD CATEGORIES

vega

Lightlife

Boca

Dominex

Angel Bowls

Boca Essentials
THE PATH TO INNOVATION

1. Identify an Opportunity
2. Learn From Consumers
3. Develop Theoretical Concepts
4. Test Concepts with Consumers
5. Ideate & Explore

- Identity Design
- Product Design & Development

Scale-Up
Launch
Commercialization
Package Design & Development
Brand Development

Identify a Commodity & Explore for a Value-Added Product with a Premium Brand
SINCE 1977, MATTSON HAS BEEN THE SILENT PARTNER BEHIND SOME OF THE MOST INNOVATIVE BRANDS IN THE MARKET
YEARS OF EXPERIENCE EXPLORING HPP ACROSS CATEGORIES

Salad Dressings

- Juices
- Coffee Beverages
- Plant-Based Beverages
- Deli Meats + Cheese
- Salad Dressing
- Salsa
- Potatoes
- Pasta Sauces
- Baby Food
- Sausage
- And others
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PRODUCT DEVELOPMENT CONSIDERATION

THE BASICS
THE PHONE RINGS

Seeking a new platform for growth
MITIGATING HPP RISK

What HPP Does
• Reduces microbiological load
• Keeps food as close to fresh as possible

What HPP Does Not
• Eliminate microbiological load
• Does not sterilize
• i.e. not able to be held ambient
What HPP Does Not

- Eliminate microbiological load
- Does not sterilize
- i.e. not able to be held ambient

Clostridium botulinum

No
PRODUCT DEVELOPMENT CONSIDERATIONS

05 BASIC OF DEVELOPMENT

FLAVOR
TEXTURE
COLOR
SHELF LIFE
FOOD SAFETY
PRODUCT DEVELOPMENT CONSIDERATION

FLAVOR
#1 CONSUMER REASON FOR REPEAT PURCHASE?

I like

the way it tastes.
Why HPP?

“Consumers are seeking foods that are ... made with simple recognizable ingredients...”

-Todd Putman, GM Campbell’s Fresh
Why HPP?

Consumers want fresh flavors
And interesting combinations

HPP enables use of delicate ingredients that change with thermal processing
Cilantro & other green herbs
Citrus
Melons
Leafy greens
Why HPP?

Some flavors just don't work with acidification

Like cucumber juice that tastes like pickle brine!

Or, that don't work with acidification
- Cucumber juice, anyone?
Why HPP?

Demanding Consumers
They’re food-savvy
They demand bold, complex flavors

HPP enables flavor explosions!
• Flavor is more robust
• Flavor becomes instantly “balanced”

HPP enables flavor explosions!
Flavor is more robust
Flavor becomes instantly “balanced”
PRODUCT DEVELOPMENT CONSIDERATION

TEXTURE
**TEXTURE: WHOLE FRUIT AND VEGETABLES**

- Optimal for products w/particulates like noodles, pasta, veg
  - Al dente pasta
  - Al dente veg
  - Even chunks of cheese!

- Even if you start with fresh ingredients, thermal processes are sub-par versus HPP
  - Fresh tomatoes, carrots, etc.
  - Fresh herbs
  - *Side-by-side sampling at end!*

**Texture Concerns**

Vegetables, i.e. onions can become translucent
→ odd → maybe not right process
PRODUCT DEVELOPMENT CONSIDERATION

COLOR
SAVORY, VEGETABLE FORWARD BEVERAGES...
WITH BRILLIANT COLORS

Yes, you could do aseptic gazpacho, but not in green flavors like Gazpacho Verde or Beet
COLORS THAT SURVIVE THE PROCESS

Guava, banana, and avocado Puree all have similar color (and flavor) as fresh puree after HPP

Formulate with “natural colors” that will survive HPP, but could wash out, or brown under thermal process conditions.

Guacamole retains fresh color for up to 45 days processed through HPP versus non HPP

Bolder and more vivid colors in vegetables and fruit products

2 López-Malo, et al., 1999; Palou et al
COLORS THAT SURVIVE THE PROCESS

Red (i.e. berry) jams have superior color from HPP vs. heat treatment.

Both L values (Brightness) & a-value (redness) are improved for HPP.
SHELF LIFE

- Increase shelf life of deli salads
  - **Guacamole 3X**
    - 10 days non treated, 30+ days HPP\(^1\)
  - **Salsa 2X**
    - 14 days non treated, 30+ days HPP\(^2\)

- **Deli meats increase shelf life to 90 days**, reduce additives of sodium diacetates and lactates

- **Refrigerated yogurt beverages**, increase shelf life by eliminating spoilage microorganisms while it retains the probiotic organisms
  - Great for non-dairy companies entering category

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1 López-Malo, et al., 1999; Palou et al
2 Ohio State University Extension, 2011
Probiotic Bacterial Spores like *Bacillus coagulans* Ganeden BC\(^3\) resists High Pressure above 440 [Mpa] reduces the spoilage microorganisms thus extending shelf life while maintaining the starter culture.

For health
For label claims

Non treated cold filled yogurt beverage showed unacceptable levels of yeast and mold after 28 days, while HPP treated products remained acceptable up to 90 days. \(^1\)

Again, great for companies that don’t have dairy-type DSD

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PRODUCT DESIGN & DEVELOPMENT

10,000 SQUARE FEET OF DEVELOPMENT SPACE

30 MEMBERS OF CULINARY, R&D, SCALE-UP TEAM

2 PILOT PLANTS

REGULATORY INPUTS, COPACK SEARCH & COMMERCIALIZATION
PRODUCT DEVELOPMENT CONSIDERATIONS

THE LOGISTICS OF HPP DEVELOPMENT
Choose suppliers with documented processes in place!
Good Agricultural Practices (GAPs)
Good Manufacturing Practices (GMPs)

If initial micro load of unprocessed product high:
No guarantees post-HPP load will be acceptable
Could result in shorter shelf life
THE LOGISTICS OF HPP DEVELOPMENT: PROCUREMENT

Early package decision critical

Do this at beginning of project!
All must withstand water and pressure
Packages
Tamper evident seals
Closures
Labels

Even during benchtop development, test in chosen package
Understand your raw materials!

Safety

Initial micro-load
  Quality, i.e. “juice grade”
  Most suppliers assume there will be kill step

Understand inherent micro food safety risks and target organisms
  I.e. root vegetables *C. botulinum* risk
Understand your raw materials!

**Sensory**

Key attributes may be muted or amplified by HPP processing

Test on benchtop, then HPP, then re-adjust

Example:
- Sour ingredients can get more sour
- Bitter get more bitter
- Spices/heat can bloom
- Garlic: unpredictable
- Herbs need to be adjusted

But don’t trust us: you have to do the development and testing!
Formulation is Key!

• If possible, low pH is ideal

• If not, we always do a challenge study
  And warn clients of risk

• Trial and error is critical!
  Don’t do too many rounds of development
  before running through HPP
  Partner with HPP co-packer or research facility
  early for small scale testing

Challenges:
  Off notes
  Viscosity
  Marrying of flavors
THE LOGISTICS OF HPP DEVELOPMENT: BENCHTOP

Consider regulatory implication of ingredients
Processed ingredients = finished product cannot be considered fresh
Frozen puree = NOT fresh
Frozen lemon juice = NOT fresh
Can say, “Made with fresh apples”

Or, get clever with labeling ➔
THE LOGISTICS OF HPP DEVELOPMENT: BENCHTOP

Consider enzymatic activity of raw materials
Will enzymes be deactivated by HPP?
If not, pre-processing step required:
Blanching/other Heating
Acidifying
Enzymatic inhibitors
Harness the cumulative effect of multiple food safety hurdles!

- Low acid + HPP + refrigeration
- Identify critical control points on benchtop
- Build into benchtop process
THE LOGISTICS OF HPP DEVELOPMENT: TESTING

• Identify a third party micro lab:
  Establish baseline microbiological load
  Identify key target spoilage and pathogenic microbes during development

• Conduct shelf life testing of HPP’d benchtop-made samples
  Not perfect but, an early indicator of shelf life after scale up
  Validate benchtop study with plant-produced product
Safety

• HPP effective at reducing non-spore forming bacterial populations
• Does not inactivate bacterial spores like C. botulinum.

Validation

• Challenge Study: with known pathogen of concern
THE LOGISTICS OF HPP DEVELOPMENT: SCALE UP

- Identify an HPP co-packer with:
  - Good Manufacturing Practices (GMPs)
  - Hazard Analysis Critical Control Point (HACCP)
  - Recall Capabilities
  - Food Defense Plans
  - Distributor Cold Chain Management
  - Quality standards for accepting or rejecting shipments of raw materials
  - Monitoring programs tracking raw material inherent seasonal variation

Schedule multiple full scale process tests at the co-packer to achieve batch to batch consistency

Validate critical control points identified in benchtop development
THE BREAKOUT SESSION

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**Part I: Drivers of HPP Product Development**

**Part II: The Logistics of HPP Development**

**Part III: A comparative sampling**
## COCONUT CARROT SOUP

100% Plant Based
Drink Chilled or Hot

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Supplier</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrot Coconut Soup:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>Filtered</td>
<td>44.66%</td>
</tr>
<tr>
<td>Organic Carrot Puree</td>
<td>Grimmway</td>
<td>33.00%</td>
</tr>
<tr>
<td>Organic Coconut Milk 17-19% Fat</td>
<td>Ciranda</td>
<td>12.00%</td>
</tr>
<tr>
<td>Organic Sweet Potato Puree</td>
<td>SVC</td>
<td>6.20%</td>
</tr>
<tr>
<td>PF LS Gluten Free Tamari</td>
<td>Kikkoman</td>
<td>2.60%</td>
</tr>
<tr>
<td>Unseasoned Rice Vinegar, 50 Grain</td>
<td>Mizkan</td>
<td>0.60%</td>
</tr>
<tr>
<td>Lime Juice Concentrate 400 GPL</td>
<td>VitaPakt</td>
<td>0.30%</td>
</tr>
<tr>
<td>Lemongrass, puree, frozen</td>
<td>SupHerb</td>
<td>0.20%</td>
</tr>
<tr>
<td>Ginger Puree, Frozen</td>
<td>George Chiala</td>
<td>0.20%</td>
</tr>
<tr>
<td>PF Sriracha Hot Chili Sauce</td>
<td>Kikkoman</td>
<td>0.12%</td>
</tr>
<tr>
<td>Coriander, Ground</td>
<td>Elite</td>
<td>0.04%</td>
</tr>
<tr>
<td>Onion Powder, Lo Bac</td>
<td>Elite</td>
<td>0.04%</td>
</tr>
<tr>
<td>Cumin, Ground</td>
<td>Elite</td>
<td>0.02%</td>
</tr>
<tr>
<td>Turmeric, Ground</td>
<td>Elite</td>
<td>0.02%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100.00%</td>
</tr>
</tbody>
</table>

**pH (pre process):** 4.30  
**T.A. (acetic acid):** 0.241%  
**Density:** 8.500  
**Brix:** 5.0  
**Zahn Cup (#2), sec:** 16 sec @ 46.8F
TOMATO SALSA

100% Plant Based

Salsa overtook ketchup as America’s number 1 condiment in 2013.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh Salsa:</td>
<td></td>
</tr>
<tr>
<td>Tomatoes, diced, 1/2&quot;</td>
<td>72%</td>
</tr>
<tr>
<td>Red Onion, diced 1/4&quot;</td>
<td>15%</td>
</tr>
<tr>
<td>Cilantro, rough chopped</td>
<td>4%</td>
</tr>
<tr>
<td>Jalapeno, ribs and seeds removed, 1/4&quot; dice</td>
<td>4%</td>
</tr>
<tr>
<td>Lime Juice, fresh</td>
<td>5%</td>
</tr>
<tr>
<td>Salt, Table</td>
<td>1%</td>
</tr>
<tr>
<td>Black Pepper, fresh grind</td>
<td>0%</td>
</tr>
<tr>
<td>Garlic, fresh pressed</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**pH (pre process):** 3.66

**T.A. (acetic acid):**

**Density:**

**Brix:** 6.4
THANK YOU!