



# MEATBALL

Springier Bite • Cleaner Texture •  
Freeze-Thaw Stable

**Performance Phosphate Blends**  
for Modern Food Manufacturing

# Meatball Performance Result

Yield Maximization & Sensory Enhancement



## Executive Summary

This trial evaluated phosphate blend XF-M502N against the current market standards in a pork/chicken meatball emulsion matrix. The objective was to resolve texture defects [mushy/loose structure] and improve freeze-thaw stability. Key Finding: XF-M502N demonstrated superior protein solubilization, resulting in a tighter meat matrix with significantly improved elasticity [bounce] and reduced ice crystal formation compared to the control.



## Methodology

### Base Formulation [Emulsion]

- Meat Block: Pork [63.3%] + Pork Fat [20%].
- Hydration: Ice [10%] + Water [30-50%].
- Binders & Seasonings: Tested Phosphate [0.3%], Potato Starch [4%], Transglutaminase [0.3%], plus standardized salt, MSG, sugar, and black pepper.

### Processing Steps

- Preparation: Pork and pork fat ground to 4mm size. Ingredients weighed precisely using a balance.
- Emulsification [Homogenizer]:
  - a. Massage pork mince for 2 minutes.
  - b. Add the test Phosphate blend and stir for 5 minutes to begin protein extraction.
  - c. Add salt and stir for another 5 minutes.
  - d. Add the pork fat and water/ice, then fast-stir for 2 minutes to create a stable emulsion.
- Forming [Gelation]: Shaped into circles and set in warm water 60-65°C for 20 minutes to initiate the primary protein gel network.
- Cooking: Transferred to boiling water 100°C for 8-10 minutes.

### Evaluation

Immediate blind sensory testing performed by a 3-person panel, followed by freezing at -18°C to evaluate ice crystal formation and freeze-thaw stability.



# Efficiency & Profitability Benchmark

[per 1,000 g Minced Pork]

| Metric           | Market Standard #1                               | Market Standard #2          | XF-M502N                                                 |
|------------------|--------------------------------------------------|-----------------------------|----------------------------------------------------------|
| Texture Analysis | Loose structure; breaks easily upon compression. | Loose; lacks cohesion.      | Firm & Elastic: High 'bounce' recovery.                  |
| Mouthfeel        | 'Mushy' texture; lacks bite.                     | 'Mushy'.                    | 'Tight Meat Matrix:' Chewy and premium mouthfeel.        |
| Flavor Profile   | Detectable 'sour' off-notes.                     | Detectable 'sour' notes.    | Clean/Neutral: No acidic aftertaste.                     |
| Freeze Stability | High ice crystal formation, damaging texture.    | High ice crystal formation. | Excellent: Minimal ice formation; stable skin integrity. |

## Head-to-Head Results

Elasticity, Freeze-Thaw Stability, Sensory Texture



**Market Standard #1**  
Yields a 'loose' and 'mushy' meatball with sour off-notes

Exhibits weak emulsion stability during the mixing phase. The fragile protein network fails to bind water effectively, allowing free water to migrate and form large ice crystals during the -18°C freezing stage. It also introduces acidic chemical off-notes into the final meat matrix.



**Market Standard #2**  
A commercial drop-in replacement for the Thailand market

Engineered as a strategic regional replacement for the current market standard. It confirms equivalent baseline performance – proving the standard's texture and flavor limitations are inherent to the formulation class, not random variation.



**XF-M502N**  
Delivers superior elasticity [bounce] and a firm, premium bite

Engineered for superior protein cross-linking and emulsion stability, creating a significantly tighter meat emulsion. This strong matrix locks in hydration and resists ice crystal formation during freezing. Crucially, it is the only blend tested that achieves absolute flavor neutrality – zero sour off-notes.



**Blind Test** compare elasticity and sensory texture

## Commercial Recommendation



### Premium Technical Upgrade

Switch to **XF-M502N**. The only tested formulation that solves all three defects at once: eliminates mushy texture, removes sour off-notes, and resists ice crystal damage. One switch. Three problems solved.

# Performance Phosphate Blends for Meatball

Proven phosphate options for emulsified meats. Choose XF-M502N for superior elasticity, tight structure, and extended freeze-thaw stability.



## Product Overview and Key Specifications



XF-M502N

PREMIUM

**Designed for:** Superior protein cross-linking and emulsion stability.

**Best for:** Premium meatball lines requiring high 'bounce' and freeze-thaw resistance.

### Key outcomes:

Delivers a 'Firm' and 'Springy' texture with excellent chew.  
Resists ice crystal formation during extended -18°C freezing.  
Maintains absolute flavor neutrality, avoiding acidic off-notes.

### Technical Specifications:

Contains E450[iii], E451[i], E452[ii], E500[ii].

**Application:** Pork/Chicken Emulsion.

Optimized for: Forming in warm water [60-65°C] for 20 mins prior to boiling.

Choose XF-M502N when: Your priority is resolving 'mushy' texture defects and achieving a premium, high-bounce bite with excellent frozen shelf-life.



Price Competitive  
Seamless Drop-in



Premium Bounce  
Freeze-Thaw Stable

Need the right blend for your application?  
Request a sample, dosage guidance, or trial support  
from Additiv Technical Team.



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