Application & Dosing Operation Guideline of **Soluble Soybean Polysaccharide (SSPS)**

I. Basic Product Knowledge

1. Product Definition

Soluble Soybean Polysaccharide (SSPS) is a water-soluble polysaccharide food additive prepared from soybean residue via enzymatic hydrolysis, separation, purification and drying. Its main components include galactose, arabinose and rhamnose, with dietary fiber content **≥80%**. It appears as white to pale yellow powder, featuring low viscosity in aqueous solution, excellent acid resistance, heat resistance and salt tolerance. It owns core functions such as **protein stabilization**, **starch retrogradation resistance**, **water retention** and **anti-adhesion**.

2. Core Characteristics

Stability: Stable at pH 2.0~8.0; effectively protects milk protein and plant protein from aggregation and precipitation under acidic conditions (pH 3.5~4.5).

Rheological Property: Low viscosity and refreshing taste, different from viscous colloids such as pectin and CMC.

Processing Adaptability: Tolerates high-temperature sterilization at 121℃/30min and freeze-thaw cycles, suitable for multiple processing scenarios.

Regulatory Compliance: In accordance with **GB 2760-2014**, it can be applied in dairy products, rice & flour products, frozen food, baked food, beverages and other categories; maximum dosage **≤10.0g/kg** (**≤6.0g/kg** for dairy products).

3. General Pre-treatment Specification (Applicable to All Fields)

Dissolution & Preparation: Dry blend SSPS with white granulated sugar or maltodextrin at a ratio of 1:5~1:10 to avoid caking; use purified water at 40~60℃, sprinkle powder slowly under high-speed stirring (800~1200r/min) and stir for 15~20min until fully dissolved; control mother liquor concentration at 5%~10%, stand for 30min for defoaming after dissolution, then filter with 100~200 mesh to remove impurities.

Dosing Timing: Add in the middle batching stage for liquid systems, adjust acidity and homogenize after fully mixing with protein and starch raw materials; directly mix with dry materials such as flour and rice powder for solid systems to ensure uniform dispersion; add before sterilization for high-temperature systems to avoid degradation under prolonged high temperature.

II. Dosing Method & Operation Specification by Application

(I) Acidic Protein Beverages (Fermented Milk, Lactic Acid Bacteria Beverages, Plant Protein Beverages)

1. Core Functions

Stabilize protein particles in acidic environment, prevent precipitation and stratification, and improve taste freshness.

2. Applicable Products

Flavored fermented milk, active lactic acid bacteria beverages, acidic soybean milk, peanut milk, walnut milk and similar products.

3. Dosing Parameters

Dosage: 0.2%~0.5% (2~5g/kg); **≤6.0g/kg** for fermented milk, **≤10.0g/kg** for plant protein beverages.

Compound Formula: Optimal stability with **SSPS 0.25% + Pectin 0.1% + PGA 0.03%**.

Key Process: Dissolve SSPS in purified water at 40~50℃ to prepare 5% mother liquor; add milk/plant protein, sugar and emulsifier, mix for 10min; adjust acidity to pH 3.8~4.2 at low temperature (10~20℃) to avoid instantaneous protein aggregation; homogenization: Primary 20~25MPa, Secondary 5~8MPa at 60~70℃; sterilization: 95℃/300s or 121℃/15s, fill after cooling below 25℃.

4. Operation Key Points

Acid adjustment rate **≤0.5pH/min**, adopt gradient acid adjustment by adding citric acid solution stepwise; avoid direct mixing with high-valence calcium and magnesium ions to prevent chelation and flocculation; store finished products at 2~6℃, avoid light and high temperature to accelerate precipitation.

(II) Rice & Flour Products (Noodles, Rice Noodles, Instant Rice, Frozen Rice & Flour Products)

1. Core Functions

Anti-adhesion, starch retrogradation resistance, water retention and gluten enhancement, improve rehydration property and extend shelf life.

2. Applicable Products

Fresh wet noodles, dried noodles, non-fried instant noodles, instant rice, frozen dumplings/wontons, rice noodles.

3. Dosing Parameters

Dosage: 0.1%~1.0% (1~10g/kg), **≤10.0g/kg**.

Process Route:

Dry Blending Method: Dry mix SSPS with flour/rice powder for 10~15min at 300~500r/min;

Water Dissolution Method: Dissolve SSPS in dough mixing water (concentration 0.5%~1%) at 30~40℃;

Dough Mixing: Water content 30%~35%, mixing time 15~20min, dough proofing 20~30min;

Forming: Calendering, cutting, steaming (95~100℃/3~5min), washing and cutting;

Frozen Rice & Flour: Add 0.3%~0.5% SSPS during dough mixing to improve wrapper toughness, crack resistance and anti-adhesion.

4. Operation Key Points

Medium molecular weight and low esterification degree SSPS is most suitable for rice & flour products with optimal anti-aging effect; For instant rice: add 0.2% SSPS before steaming to improve dispersion and inhibit retrogradation; For fresh wet noodles: **SSPS 0.3% + edible alkali 0.1%** for anti-adhesion, gluten enhancement and fresh-keeping extension.

(III) Baked Food (Bread, Cake, Pastry, Biscuit)

1. Core Functions

Improve expansion rate, optimize texture, maintain moisture and softness, delay starch aging and prolong shelf life.

2. Applicable Products

Toast bread, cakes, European-style bread, frozen baking dough, high-fiber pastries.

3. Dosing Parameters

Dosage: 0.5%~1.5% (5~15g/kg), **≤10.0g/kg**.

Process Steps: Dry Material Mixing: Dry blend SSPS with flour, sugar and leavening agent for 10min; Beating: Add water, eggs and oil, stir at high speed (1000~1500r/min) for 5~8min; Fermentation: Bread dough at 28~30℃ with humidity 75%~80% for 60~90min; Baking: Bread 180~200℃/25~35min, Cake 160~180℃/20~30min.

4. Operation Key Points

Bread: 1.0%~1.5% SSPS improves specific volume, reduces hardness and delays aging for 3~5 days; Cake: 0.5%~1.0% SSPS enhances foaming property, keeps moist taste and mellow flavor; High-fiber Baking: **SSPS 1.0% + Dietary Fiber 2%~3%** to supplement fiber without affecting taste.

(IV) Frozen Food (Ice Cream, Surimi, Frozen Prepared Food, Frozen Dessert)

1. Core Functions

Water retention and locking, freeze-thaw resistance, inhibit protein denaturation, improve expansion rate and optimize ice crystal structure.

2. Applicable Products

Ice cream, ice lolly, fish ball, surimi products, frozen meat products, frozen pudding.

3. Dosing Parameters

Dosage: 0.2%~1.0% (2~10g/kg), **≤10.0g/kg**.

Ice Cream Process: Batching: Dissolve SSPS (0.3%~0.5%), sugar, milk powder and emulsifier in water at 45~55℃; Homogenization: 15~20MPa at 65~75℃; Aging: 2~4℃ for 4~8h; Freezing: Temperature -3~-5℃, expansion rate 80%~100%; Quick freezing: Quick freeze below -35℃ and store at -18℃.

Surimi Products: Surimi Grinding: Add 0.3%~0.6% SSPS, mix with salt, sugar and starch for 15~20min; Forming, steaming (90~95℃/10~15min), cooling and quick freezing.

4. Operation Key Points

Ice Cream: SSPS replaces part of CMC and pectin to reduce viscosity, deliver refreshing taste and refine ice crystals; Surimi: Enhance water holding capacity, crispness and elasticity, reduce thawing water loss rate; Frozen Prepared Food: Prevent wrapper cracking, improve gluten strength and optimize reheating taste.

(V) Meat & Prepared Food (Ham Sausage, Meatball, Braised Marinated Food, Vegetarian Meat Products)

1. Core Functions

Water retention, thickening, emulsification, improve tenderness, reduce oil separation and enhance slicing property.

2. Applicable Products

Low-temperature ham sausage, tribute balls, vegetarian meat, braised marinated products, low-fat meat products.

3. Dosing Parameters

Dosage: 0.2%~0.8% (2~8g/kg), **≤10.0g/kg**.

Process Steps: Dissolution: Prepare 5% SSPS mother liquor with 50℃ water and stir until fully dissolved; Chopping/Grinding: Add SSPS mother liquor, salt, sugar and phosphate during raw meat chopping, mix for 10~15min; Curing: Cure at 0~4℃ for 4~12h; Forming, steaming (85~95℃/20~30min), cooling and packaging.

4. Operation Key Points

Low-fat Meat Products: **SSPS 0.5% + Soy Protein 2%~3%** to enhance water retention and tenderness; Vegetarian Meat Products: Replace partial starch to improve elastic

and crisp taste and reduce water precipitation; Braised Marinated Products: Add 0.2%~0.3% SSPS in late marinating stage for thickening, gloss improvement and water retention.

(VI) Solid Beverages & Health Food (Protein Powder, Meal Replacement Powder, Dietary Fiber Supplements)

1. Core Functions

Solubility aiding, dispersion, anti-caking, supplement dietary fiber and improve reconstitution stability.

2. Applicable Products

Whey protein powder, soybean protein powder, meal replacement powder, solid milk tea, dietary fiber granules.

3. Dosing Parameters

Dosage: 1.0%~5.0% (10~50g/kg), **≤10.0g/kg**.

Process Steps: Dry Blending: Multi-stage mixing of SSPS with protein powder, maltodextrin and sugar (100~200 mesh); Granulation (Optional): Wet granulation with SSPS as binder to improve particle uniformity; Drying: Hot air drying at 60~80℃, moisture **≤5%**; Sieving and packaging.

4. Operation Key Points

Reconstitution Stability: 1%~2% SSPS enables fast dissolution in cold/hot water without precipitation and stratification; High-fiber Products: 3%~5% SSPS with dietary fiber content **≥15g/100g**, complying with health food standards; Anti-caking: **SSPS 2% + Silicon Dioxide 0.1%** to improve storage stability.

III. Quality Control & Abnormality Handling

1. Quality Detection Index

Appearance: White to pale yellow powder, no caking and peculiar odor;

Solubility: **≥98%** (5% aqueous solution, 60℃);

Viscosity: **≤50mPa·s** (5% aqueous solution, 25℃);

Protein: **≤5%**, Moisture **≤8%**, Ash **≤8%**;

Microorganism: Total plate count **≤1000CFU/g**, Coliform **≤30MPN/100g**, no pathogenic bacteria detected.

2. Common Abnormalities & Solutions

2.1 Dissolution Caking

- Main causes: Too fast powder sprinkling and insufficient stirring.
- Solutions: Pre-blend SSPS with white granulated sugar; sprinkle powder at low speed with high-speed stirring to ensure uniform dispersion in water and avoid local high concentration caking.

2.2 Precipitation in Protein Beverages

- Core causes: Insufficient SSPS dosage, excessive acid adjustment speed and low homogenization pressure.
- Solutions: Increase SSPS dosage to about 0.3%, adopt gradient acid adjustment to control rate, adjust homogenization pressure to 20~25MPa to stably disperse protein particles and avoid precipitation.

2.3 Sticking of Rice & Flour Products

- Main causes: Insufficient SSPS dosage and excessive dough moisture.
- Solutions: Add 0.3% SSPS matched with 0.1% alkaline water, appropriately reduce dough mixing moisture to enhance anti-adhesion and improve product texture.

2.4 Collapse of Baked Food

- Main causes: Excessive SSPS addition and over-fermentation.
- Solutions: Strictly control SSPS dosage not exceeding 1.5%, optimize fermentation time and temperature to avoid unstable structure and collapse caused by over-fermentation.

2.5 Large Ice Crystals in Frozen Food

- Main causes: Incomplete SSPS dissolution and insufficient aging time.
- Solutions: Ensure full dissolution of SSPS in batching, extend aging time to 4~8h, adopt quick freezing process to reduce ice crystal formation and improve taste.

3. Storage & Shelf Life

- **Storage Conditions**: Store in cool, dry and ventilated place at temperature **≤25℃** and relative humidity **≤65%**, keep sealed and moisture-proof;
- **Shelf Life**: 12~18 months for unopened products; use up within 3 months after opening.

IV. Safety & Compliance Requirements

1. Strictly comply with **GB 2760-2014**, no over-range or over-dose application.
2. Raw Material Acceptance: Inspect manufacturer qualification and test reports (content, microorganism, heavy metals).
3. Production Record: Completely record dosage, process parameters and test results, keep records for more than 12 months.
4. Labeling: Mark **Soluble Soybean Polysaccharide** or **Soybean Polysaccharide** on food labels.

V. Operation Summary

With the characteristics of **low viscosity**, **high stability** and **multi-scenario adaptability**, **Soluble Soybean Polysaccharide (SSPS)** has become a core additive in food industry. The core operation essentials are: accurately control dosage, standardize dissolution process, match key parameters by application field and implement strict quality control. In actual production, fine-tune parameters according to product formula and equipment conditions, carry out pilot and semi-industrial tests for optimization before mass production, so as to ensure application effect and regulatory compliance。