Operation Guide for Mannitol Addition Methods in Application Fields

Preface

This guide aims to provide standardized and professional operational guidelines for the application and processing of **mannitol** to technical personnel, R&D engineers and production managers of downstream enterprises in food, pharmaceutical, feed, daily chemical and fine chemical industries.

Mannitol is a hexahydric alcohol ingredient with unique properties, featuring **low sweetness, low hygroscopicity, texture modification, anti-crystallization, shape stabilization, osmotic pressure regulation and freeze-drying protection**. It also boasts stable chemical properties, excellent compatibility, and extremely high safety for food and pharmaceutical use, making it suitable for industrial production and processing of various product categories.

Accurate mastery of mannitol's physicochemical properties, domestic and international compliance standards, and scenario-based process adaptation logic is the core key to stabilizing finished product quality, cutting production costs, avoiding production compliance risks, and realizing formula iteration and innovation.

This guide systematically sorts out the full-process standardized application specifications of mannitol from five core dimensions: **global regulatory compliance, physical property selection by category, full-scenario process SOP, compound synergistic strategy, and quality risk control**. It can be directly used as a standard professional technical manual for large-scale production, new product R&D, quality control review and process optimization of enterprises.

Chapter 1 Cornerstone of Global Regulatory Compliance

The safety of mannitol for food and pharmaceutical use has been certified by authoritative institutions such as **JECFA and FDA**, with clear safety intake and usage standards formulated. It is listed as a compliant general ingredient and pharmaceutical excipient in most countries and regions worldwide, allowing industrial application in accordance with Good Manufacturing Practice (GMP).

Regulations in different regions have differentiated requirements in scope of use, limit standards, labeling specifications and pharmaceutical qualification. Industrial production and import & export trade must strictly comply with the compliance norms of the target market.

1.1 China (GB Standard System)

● Regulatory Basis: Implements **National Food Safety Standard Food Additive Mannitol (GB 1886.177-2016)**; pharmaceutical grade complies with the mannitol standard for pharmaceutical excipients in Volume IV of the **Chinese Pharmacopoeia 2025 Edition**.

● Scope of Application: In accordance with **GB 2760 Standards for the Use of Food Additives**, mannitol can be used as a sweetener, anti-caking agent, stabilizer, texture modifier and freeze-drying protectant. It can be added in appropriate amounts as required by production (GMP) in various foods with no mandatory limit. Meanwhile, it can be legally applied in pharmaceutical excipients, feed additives, daily chemical excipients and fine chemical raw materials.

● Label Warning: In accordance with **GB 7718** specifications, mannitol is an osmotic sugar alcohol. Excessive single intake of more than **20g** by adults may easily cause abdominal distension, diarrhea and gastrointestinal peristalsis disorders. For products with high single consumption such as compressed candy, sugar-free lozenges, solid beverages and portable snacks, the warning statement **"Excessive consumption may cause abdominal distension and diarrhea"** must be labeled; enhanced warning labels are required for children's snacks.

1.2 Codex Alimentarius Commission (CAC / Codex Alimentarius)

● Regulatory Basis: INS No. 421; JECFA sets its ADI value as **"Not limited"**, and it is officially included in the FNP Food Additive Specification Standard List.

● Scope of Application: Included in the General Additives List of GSFA Table 3. It can be added in appropriate amounts following GMP guidelines in sugar-free confectionery, bakery products, frozen desserts, solid beverages, dietary supplements and other categories.

● Core Reminder: CAC standards serve as the universal benchmark for global food trade. For exports to countries and regions following Codex standards such as Southeast Asia, Africa and South America, ingredient addition, quality inspection review and compliance filing must be uniformly completed in accordance with this framework.

1.3 European Union (EU Regulation)

● Regulatory Basis: EU basic food additive regulation (EC) No 1333/2008, additive code **E421**.

● Scope of Application: Applicable to all food categories permitting polyol additives, following the **quantum satis** principle with no fixed upper limit for addition.

● Special Provisions: In sugar-free dietary supplements, meal replacement powders and functional lozenges, the EU limits the total daily mannitol intake of adults to no more than **20g**. Functional claims such as **"stabilize product texture, resist moisture deterioration, and mildly regulate taste"** are allowed for legal labeling.

1.4 United States (FDA)

● Regulatory Basis: Classified as a **GRAS (Generally Recognized As Safe)** substance, included in 21 CFR 172.804, and also listed in the FDA compliant inventory of pharmaceutical excipients.

● Scope of Application: Can be added as needed in food, dietary supplements and oral preparation excipients, strictly following GMP production specifications.

● Label Warning: In accordance with FDA labeling regulations, if the conventional single serving mannitol intake of a product exceeds **40g**, the English warning statement **"Excess consumption may cause gastrointestinal upset"** must be marked.

Compliance Red Line

Import and export products are prohibited from directly adopting the domestic unlimited GMP addition rule. It is necessary to accurately match the target market's food classification standards, addition limits, labeling specifications and pharmaceutical excipient qualification requirements, complete compliance verification and qualification filing in advance, and thoroughly avoid risks such as trade review failure, product removal from shelves and compliance penalties.

Chapter 2 Scientific Selection: Characteristics and Application Orientation of Different Mannitol Forms

Commercial mannitol on the market is mainly divided into three mainstream types: **crystalline granular mannitol, ultrafine powder mannitol and spray-dried mannitol**. The three types differ significantly in hygroscopicity, solubility, compressibility, thermal stability and dispersibility. Accurate matching with production process selection is the core prerequisite for ensuring finished product quality, reducing production loss and minimizing process failures.

1. Crystalline Granular Mannitol

● Physical Properties: White orthorhombic crystalline particles; food/pharmaceutical grade purity ≥**99.0%**; melting point 166-168℃, boiling point 295℃; extremely low hygroscopicity (hardly absorbs moisture under normal temperature and pressure); excellent chemical stability, high temperature resistance and decomposition resistance; no Maillard browning reaction; sweetness is about **50%-55%** of sucrose; low dissolution heat absorption with mild refreshing taste.

● Core Application Scenarios: Suitable for conventional dry production processes such as ordinary compressed candy, chewable lozenges, solid granular health products, feed additives and general oral preparations; ideal for products with high requirements on powder moisture resistance and product stability.

2. Ultrafine Powder Mannitol

● Physical Properties: Fine and uniform powder (D50 30-70μm); purity ≥**99.2%**; low dust emission and excellent dispersibility; quickly soluble in warm water and weak alcohol systems; far superior compressibility and fluidity to ordinary crystalline particles; outstanding moisture resistance.

● Core Application Scenarios: High-end pharmaceutical direct compression, freeze-dried preparation excipients, instant solid beverages, refined compound ingredients and sugar-free ultrafine powder snacks; adapted to precision powder production processes requiring high accuracy, high uniformity and low breakage rate.

3. Spray-Dried Mannitol

● Physical Properties: Spherical porous powder structure; moderate bulk density and excellent fluidity; high porosity and strong adsorption capacity; good adhesion and thermal stability; resistant to caking and compatible with various high-speed automated production equipment.

● Core Application Scenarios: High-end freeze-dried pharmaceuticals, biological preparation protectants, functional chewable tablets, precision compound food ingredients and high-end daily chemical powders; the preferred raw material for pharmaceutical freeze-drying and high-speed tableting processes.

4. Selection Decision Tree

● Is the product for freeze-dried preparations or high-speed precision tableting processes?

o Yes → Prefer spray-dried mannitol

o No → Proceed to the next step

● Is the product for ordinary dry powder, conventional tableting or feed ingredients with focus on moisture resistance and stability?

o Yes → Prefer crystalline granular mannitol

o No → Proceed to the next step

● Is the product for instant powder and refined compound ingredients requiring high dispersion and high uniformity?

o Yes → Prefer ultrafine powder mannitol

o No → All three forms are optional; select according to production cost, equipment precision and storage conditions

Chapter 3 Scenario-Based Application Processes and SOP Key Points

3.1 Sugar-Free Confectionery and Chocolate Products

3.1.1 Hard Candy

(1) Functions and Dosage: Acts as a sucrose substitute sweetener, anti-crystallizer and texture stabilizer; inhibits sanding and whitening of hard candy, improves finished product transparency and hardness, and enhances taste freshness. Recommended addition amount: **10%-30%** of total dry base.

(2) Addition Process

(2.1) Addition Timing: Add in the middle of the sugar melting process after the basic syrup and purified water are completely dissolved; avoid prolonged high-temperature

boiling.

(2.2) Operational Key Points

- Dissolution: Turn on constant-speed stirring, heat the system to 75-85℃, slowly add mannitol powder, and keep stirring for 5-10 minutes until fully dissolved with clear solution free of particles and precipitation. Compared with other sugar alcohols, mannitol has a moderate dissolution rate with no need for pre-dissolution.
- Boiling: Filter the materials and transfer to a vacuum boiling pot; control the final temperature at 145-160℃. Relying on mannitol's excellent high temperature resistance and anti-crystallization properties, it thoroughly inhibits sanding, delamination and whitening of hard candy during storage, improving finished product transparency and stability.
- Cooling and Forming: Cool quickly to 105-115℃ after boiling, complete strip drawing, forming and air cooling setting to stabilize the internal crystal structure and enhance finished product crispness.

(2.3) Notes: Mannitol has extremely low hygroscopicity; single use leads to relatively high brittleness of hard candy, which can be balanced by compounding a small amount of maltitol. Strictly control boiling vacuum throughout the process to avoid excessively high residual moisture causing soft taste and reduced stability. Mannitol does not trigger Maillard reaction with clear finished color; legal pigments should be added in the late boiling stage for coloring.

3.1.2 Soft Candy/Gel Candy

(1) Functions and Dosage: Serves as a gel stabilizer, taste regulator and water separation inhibitor; balances gel system hardness, prevents soft candy deformation, collapse and water precipitation, enhances taste freshness and reduces stickiness. Recommended addition amount: **8%-25%**.

(2) Addition Process

(2.1) Addition Timing: Add during the mixing stage of the syrup system after colloids such as pectin, gelatin and carrageenan are fully hydrated and dispersed.

(2.2) Operational Key Points

- Dissolution and Mixing: Preheat the jacketed pot to 65-75℃, add mannitol and auxiliary ingredients for constant-speed stirring and dissolution; slowly inject the homogenized material liquid into the colloid solution and stir at low speed for 10-15 minutes to ensure complete integration of sugar alcohol and colloid system and stabilize the gel network structure.
- Boiling: Control the final atmospheric boiling temperature at 95-108℃. Utilize mannitol's low hygroscopicity to balance soft candy moisture and avoid moisture absorption adhesion, deformation and softening of finished products.
- Pouring and Drying: Cool and gel the poured material liquid, then stand and dry in a low-temperature and low-humidity environment to precisely control dehydration

rate and ensure bouncy, firm and well-shaped soft candy.

(2.3) Notes: Prohibit high-temperature feeding in a strong acid colloid system, which may easily damage gel toughness. Keep the production workshop humidity stably controlled at **RH 45%-60%** to avoid risks of moisture absorption, adhesion and mildew of finished products.

3.1.3 Compressed Candy

(1) Functions and Dosage: Used as filler, flow aid, flavor corrector and binder; greatly improves powder fluidity and compressibility, masks bitter and peculiar odors of functional raw materials, enhances tablet hardness and smoothness, and provides moisture and breakage resistance. Addition amount: **20%-90%**.

(2) Addition Process

(2.1) Addition Timing: Add simultaneously with all dry raw materials such as acidulants, flavors, lubricants and functional powders in the overall powder mixing process.

(2.2) Operational Key Points

- Direct Compression: Prefer ultrafine powder/spray-dried mannitol; put into a V-type mixer or three-dimensional mixer and mix for 15-25 minutes with powder angle of repose ≤33°, featuring excellent fluidity compatible with high-speed tableting equipment. Finished tablets have uniform hardness, stable disintegration and smooth surface.
- Wet Granulation: For functional raw materials with low viscosity and poor moldability, pre-mix mannitol with main materials, prepare soft materials with purified water, granulate through 20-40 mesh sieve, dry at low temperature of 55-65℃, add lubricants for overall mixing and tableting after granule sorting, effectively reducing tablet cracking and loosening probability.

(2.3) Notes: Strictly control workshop environmental humidity at **RH < 45%**. Mannitol has excellent moisture resistance but should avoid long-term open storage. Detect powder moisture and angle of repose before tableting, and finely adjust equipment pressure to ensure finished product qualification rate.

3.1.4 Chocolate

(1) Functions and Dosage: Replace sucrose, inhibit fat blooming, refine texture, deliver refreshing taste, reduce sweetness cloying and improve chocolate storage stability. Recommended addition amount: **15%-35%** (proportion of non-fat cocoa solids).

(2) Addition Process

(2.1) Addition Timing: Add simultaneously with dry raw materials such as cocoa butter, cocoa powder and milk powder into refining equipment at the initial stage of refining.

(2.2) Operational Key Points

- Temperature Control: Keep refining temperature constant at 60-70℃. Mannitol features excellent thermal stability without decomposition or moisture absorption at high temperature, stabilizing slurry viscosity and preventing abnormal consistency, delamination and caking of chocolate slurry.
- Refining and Homogenization: Conduct continuous refining for 20-40 hours to control material particle size below 18μm. Rely on mannitol's fine dispersibility to create a silky and refreshing taste, and thoroughly inhibit fat precipitation, surface blooming and whitening during storage.
- Tempering and Forming: Follow the standard cocoa butter tempering curve; mannitol does not change fat crystallization properties. Mass production can be launched after stable trial parameters.

(2.3) Notes: Mannitol has low sweetness and needs to be compounded with high-intensity sweeteners to supplement sweetness. Strictly control refining temperature and duration to avoid material oxidation and flavor deterioration.

3.2 Bakery Products

3.2.1 Biscuits

(1) Functions and Dosage: Improve biscuit texture and crispness, delay moisture regain, adjust fresh sweet taste, extend shelf life and replace part of sucrose. Recommended addition amount: **2%-8%** (based on flour weight).

(2) Addition Process

(2.1) Addition Timing: Add simultaneously with dry raw materials such as flour, leavening agent and edible salt into the dough mixer at the initial stage of dough preparation.

(2.2) Operational Key Points: Pre-mix dry raw materials for 1-2 minutes to disperse mannitol evenly in the flour system, then add wet raw materials such as oil, egg liquid and purified water for dough kneading. Mannitol stabilizes dough moisture structure, reduces biscuit moisture absorption rate, maintains crisp taste during long-term storage without residual cloying sweetness.

(2.3) Notes: As a non-reducing sugar alcohol, mannitol does not cause Maillard browning, resulting in light color of baked biscuits. Product color and appearance texture can be optimized by finely adjusting baking temperature or adding a small amount of malt syrup.

3.2.2 Cakes/Breads

(1) Functions and Dosage: Finely adjust gluten toughness, balance product dry and wet texture, delay starch aging, reduce finished product hardening and optimize fresh sweet taste. Recommended addition amount: **1.5%-6%** (based on flour weight).

(2) Addition Process

(2.1) Addition Timing: Add simultaneously with dry raw materials such as flour and yeast improver at the initial stage of batter and dough stirring.

(2.2) Operational Key Points: In cake making, mannitol can be whipped synergistically with oil and a small amount of sucrose to improve batter expansion stability and reduce sweetness cloying. In bread making, add water and knead dough after uniform dry powder pre-mixing to refine internal tissue, delay air-drying and hardening of finished products and extend shelf life.

(2.3) Notes: When completely replacing sucrose, compound with high-intensity sweeteners to supplement sweetness. For insufficient coloring, finely adjust baking process or add legal color-adjusting auxiliary materials.

3.3 Beverages, Dairy Products and Frozen Desserts

3.3.1 Flavored Beverages/Yogurt

(1) Functions and Dosage: Soften flavor, buffer sour and astringent taste, stabilize liquid system, inhibit protein precipitation and enhance mellow and refreshing taste of beverages. Recommended addition amount: **0.5%-4%**.

(2) Addition Process

(2.1) Addition Timing

- Neutral/weakly acidic beverages (pH > 3.5): Add synchronously in the initial sugar batching stage.
- Strongly acidic beverages (pH < 3.5): Add in the aseptic blending stage after sterilization and cooling to avoid slight degradation risk under high-temperature acidic environment.

(2.2) Operational Key Points: Preheat purified water to 50-60℃, slowly add mannitol under constant-speed stirring; after full dissolution, add stabilizers, sweeteners, flavors and other auxiliary materials in sequence, mix with main material liquid after filtration and homogenization to ensure uniform and stable system without delamination and precipitation.

(2.3) Notes: Avoid prolonged high-temperature boiling. Aseptic equipment must be guaranteed for post-addition in acidic beverages; short-term pasteurization can be carried out if necessary to prevent microbial contamination and beverage deterioration.

3.3.2 Ice Cream

(1) Functions and Dosage: Lower system freezing point, refine ice crystal structure, inhibit large ice crystal formation, improve smooth and refreshing taste and reduce freezing delamination. Recommended addition amount: **1.5%-7%** of total mixture.

(2) Addition Process

(2.1) Addition Timing: Dissolve synchronously with milk solids, stabilizers and sweeteners in the mixture preparation and material melting stage.

(2.2) Operational Key Points: Pre-mix mannitol with dry powder auxiliary materials and add into liquid raw materials such as milk and cream under low-temperature stirring at 35-45℃ for full hydration and integration; heat up to 65-70℃ for pasteurization, cool down rapidly to 4℃ for low-temperature aging after homogenization.

(2.3) Notes: Compound with special ice cream colloid stabilizers to maximize ice crystal refinement and solve problems of rough taste and freezing caking. Can be combined with erythritol to enhance refreshing taste.

3.4 Pharmaceutical and Feed Industry

3.4.1 Oral Tablets/Granules/Freeze-Dried Preparations

(1) Functions and Dosage: Serve as pharmaceutical filler, freeze-drying protectant, flavor corrector, flow aid and stabilizer; mask irritating peculiar odors of raw drug materials, improve tablet moldability and surface smoothness, and stabilize protein structure of freeze-dried preparations. Addition range: **10%-95%**.

(2) Addition Process

(2.1) Addition Timing: Add simultaneously with raw drug materials, disintegrants, lubricants and other excipients in the overall powder mixing and freeze-drying batching processes.

(2.2) Operational Key Points

- Direct Compression: Select pharmaceutical grade spray-dried/ultrafine powder mannitol; pre-mix with raw drug materials for direct compression, compatible with high-speed pharmaceutical equipment. Finished tablets feature uniform hardness, stable disintegration time limit and excellent moisture resistance.
- Wet Granulation: For raw drug materials with strong peculiar odor and poor moldability, use mannitol as carrier, prepare soft materials with purified water, dry and granulate at low temperature ≤70℃, mix and tablet after granule sorting for efficient odor masking and improved preparation stability.
- Freeze-Dried Preparations: Add in precise proportion during batching; rely on mannitol's structural stability to protect bioactive ingredients and avoid freeze-drying collapse and activity loss.

(2.3) Notes: Strictly control pharmaceutical workshop humidity at **RH＜40%**. Complete compatibility stability tests of mannitol with raw drug materials and acid-base excipients in advance to avoid risks of storage discoloration and drug efficacy attenuation.

3.4.2 Functional Feed

(1) Functions and Dosage: Improve feed palatability, mask raw material peculiar odors, enhance powder fluidity, delay feed oxidative deterioration and protect the activity of trace nutrients. Recommended addition amount: **0.8%-3%**.

(2) Addition Process

(2.1) Addition Timing: Pre-mix with trace auxiliary materials such as vitamins and amino acids in the feed pre-mixing stage, then add into the main raw material mixing equipment.

(2.2) Operational Key Points: Strictly implement the equal increment pre-mixing method; first mix in small proportion with carriers such as corn flour and bran to prepare premix, then mix in batches into main raw materials to ensure uniform ingredient dispersion and avoid local excessive content.

(2.3) Notes: Prohibit long-term direct mixing with highly active heavy metal trace elements; separate feeding or coated trace elements are recommended to prevent failure of nutritional auxiliary materials and feed discoloration and deterioration.

Chapter 4 Compound Synergy Scheme and Common Problem Solutions

4.1 Sweetness Synergy and Flavor Improvement

Mannitol's sweetness is about **50%-55%** of sucrose, featuring pure and fresh sweetness without cloying aftertaste and clean flavor. Its single use results in weak sweetness; scientific compounding with high-intensity sweeteners can replicate the natural fresh sweet taste of sucrose, suitable for sugar-free, low-calorie and functional product formulas. The golden compound ratios are as follows:

- Mannitol + Sucralose:

10% Mannitol + 0.01% Sucralose; sweetness equivalent to 10% sucrose with pure flavor and no peculiar odor, suitable for confectionery, tablets and solid beverages.

- Mannitol + Aspartame:

10% Mannitol + 0.02% Aspartame; full and balanced sweetness, suitable for bakery products and frozen desserts.

- Mannitol + Stevioside:

10% Mannitol + 0.015% Stevioside (Reb A); effectively neutralizes the bitter aftertaste of stevia with fresh and mild taste, suitable for functional dietary supplements.

Operational Suggestion: Follow the equal increment pre-mixing principle for high-intensity sweeteners; first pre-mix evenly with a small amount of mannitol powder, then gradually expand the proportion for mixing to thoroughly solve problems of uneven sweetness distribution, local bitterness and insufficient sweetness.

4.2 Texture and Functional Synergy

- Compound with Dietary Fiber: Combine with water-soluble dietary fibers such as resistant dextrin and inulin to synergistically stabilize product texture, improve formula moisture balance, and support nutritional claims of **"low calorie, sugar-free and high fiber"**, suitable for healthy snacks and meal replacement powders.

● Compound with Polyols: Combine with maltitol and erythritol to balance system hygroscopicity, sweetness and texture hardness, make up for mannitol's high brittleness defect, and avoid product cracking and excessive hardness; widely used in soft candy, pastries and chewable tablets.

● Compound with Hydrophilic Colloids: Combine with pectin, gelatin and sodium carboxymethyl cellulose to strengthen gel network structure, improve gel toughness and stability, reduce water precipitation and collapse of soft candy and pudding, and optimize finished product appearance and taste.

● Compound with Pharmaceutical Excipients: Combine with microcrystalline cellulose and crospovidone to greatly improve tablet moldability and disintegration stability, reduce tablet cracking and loosening probability, suitable for various oral solid preparations.

Chapter 5 Quality and Risk Control Red Lines

1. Excessive Intake Risk Control

● Risk Description: Mannitol has extremely low intestinal absorption rate in human body with significant osmotic pressure effect. Single intake over **20g** for adults, over **8g** for children and over **3g** for infants may easily cause intestinal osmotic pressure imbalance, resulting in abdominal distension, borborygmus, diarrhea and gastrointestinal discomfort; special crowds have lower tolerance.

● Operational Guidelines: High-consumption products such as sugar-free snacks, lozenges, solid beverages and functional preparations must be labeled with gastrointestinal warning statements in accordance with national standard specifications; strictly control the addition amount of children's food and infant supplementary foods, prioritize reducing formula proportion to avoid consumption risks.

2. Key Process and Storage Taboos

● Maillard Reaction Characteristics: Mannitol is a non-reducing sugar alcohol without Maillard browning reaction, suitable for production of light-colored, transparent and high-cleanliness products. For colored bakery products, legal reducing sugars, color-adjusting auxiliary materials or finely adjusted baking processes are required.

● Storage Conditions: All solid mannitol shall be hermetically stored in a cool, dry and ventilated warehouse under normal temperature and away from light. Despite extremely low hygroscopicity, long-term storage in high-humidity environments must be prohibited to prevent slight moisture absorption and caking. There is no liquid mannitol product, so anti-freezing treatment is unnecessary; seal after opening to avoid dust pollution.

3. Compatibility Stability Precautions

Prolonged high-temperature boiling is prohibited in a strong acid environment with **pH < 2.5**, which may easily cause slight degradation of mannitol and damage product flavor and system stability. Before adding new auxiliary materials into high-end pharmaceutical and feed formulas, small-scale and pilot-scale stability tests must be carried out to screen risks such as discoloration, caking, activity attenuation and drug efficacy loss.

Appendix 1 Quick Reference Table: Functional Property Comparison between Mannitol and Sucrose

Property	**Sucrose**	**Mannitol**
Relative Sweetness	1.0	0.50-0.55
Calorie (kcal/g)	4.0	2.1
Glycemic Index (GI)	65	≤3
Hygroscopicity	Moderate	Extremely Low
Maillard Reaction	Yes	No
Solubility (20℃)	Easily Soluble	Soluble (Low Dissolution Heat Absorption)
Moisture-Proof and Shaping Effect	Weak	Extremely Strong (Moisture Resistance, Anti-Caking, Stability Maintenance)

Appendix 2 Quick Troubleshooting Table for Common Problems

1. Phenomenon: Compressed candy cracking, loosening and rough surface

o Possible Causes: 1. Ordinary crystalline mannitol adopted with poor compressibility and fluidity; 2. Excessively high workshop humidity leading to slight powder moisture absorption; 3. Improper proportion causing unbalanced bonding system.

o Solutions: Replace with spray-dried/ultrafine powder mannitol, strictly control workshop humidity at **RH < 40%**, and finely adjust tableting pressure and auxiliary material proportion.

2. Phenomenon: Excessively light color and monotonous appearance of bakery products

o Possible Cause: Mannitol does not trigger Maillard browning and cannot independently produce baked caramel color.

o Solutions: Add an appropriate amount of malt syrup or glucose syrup, finely adjust baking temperature and duration, or use legal food pigments for coloring.

3. Phenomenon: Excessively hard texture and high brittleness of sugar-free candy

o Possible Cause: Mannitol features high hardness and strong crystallinity with excessively high single addition proportion.

o Solutions: Compound with maltitol and sorbitol to balance texture, finely adjust mannitol addition proportion and optimize boiling process parameters.

4. Phenomenon: Low sweetness and thin plain taste of finished products

o Possible Causes: Low sweetness of mannitol without scientific compounding with high-intensity sweeteners, or uneven compound pre-mixing.

o Solutions: Adopt high-intensity sweeteners according to the golden compound ratio in Chapter 4, strictly implement the equal increment pre-mixing process to ensure uniform ingredient dispersion.

Conclusion

As a classic polyol ingredient with **low glycemic index, low moisture absorption, high stability and high safety**, mannitol is widely applied in industrial production of food, pharmaceutical, feed and other fields by virtue of its excellent core properties including shaping, stability maintenance, flavor correction, anti-crystallization and freeze-drying protection.

The realization of its product value fully relies on accurate raw material form selection, standardized addition processes, scientific formula compounding system and strict production risk control.

All regulatory standards, process parameters and proportion schemes in this guide are derived from national standards, pharmacopoeia, international CAC, FDA authoritative specifications and mature industrial mass production experience.

Before mass production, enterprises must complete small-scale and pilot-scale verification combined with their own production equipment, product formulas and target market compliance requirements, finely adjust process parameters, and fully ensure stable product quality and compliance up to standard.

This guide can provide professional, practical and standardized technical support for enterprise new product R&D, process iteration, quality control and compliant production.