Engineering Deep Dive: The Steel Belt Technology Behind Shanghai Biquick's High-Performance Cooling and Curing Systems

Precision Water Spray Cooling for Uniform Thermal Control and Higher Solidification Yield

LOGO FOR BPS/EPS

CALIFORNIA, CA, UNITED STATES, August 18, 2026 /EINPresswire.com/ -- Shanghai Biquick Process Systems Ltd. (BPS), operating under the ESP brand and headquartered in Pudong, Shanghai, designs and manufactures steel belts for thermal processing equipment used in chemical pastillation, powder coating flaking, food baking and chocolate cooling. With a 2,000 m² facility and a 40-person team that includes a 15-member R&D group, the company produces an estimated 50–80 tons of steel strip per year and supplies 5–8 integrated steel belt cooling or forming systems annually. BPS positions itself as an engineering partner for OEMs and processors that need application-specific steel belt performance rather than a catalog commodity.

This article examines the three core engineering layers behind BPS steel belts: material selection, cooling and curing process design, and the customization capabilities that allow steel belts to be adapted for chemical, food and precision conveying applications. It also explains the technical parameters that buyers should evaluate when sourcing steel belts for sulphur pastillators, resin coolers, chocolate conveyors, tunnel ovens and related systems.

Steel Belt Fundamentals: Why the Belt Is a Process Component, Not Just a Conveyor Surface

In cooling and curing systems, the steel belt functions as both a transport surface and a heat exchanger. The belt carries a molten or semi-fluid product through a controlled temperature zone, and because the belt is continuously moving, heat transfer efficiency and flatness directly affect product uniformity, throughput and yield. A steel belt that fails to meet flatness tolerances can cause uneven product thickness; a weld seam with poor fatigue resistance can shut down a continuous production line.

Industrial steel belt systems are widely used in processes such as sulphur pastillation, wax pastillation, epoxy and polyester resin cooling, powder coating flaking, chocolate conveying, and baking tunnel ovens. The performance requirements differ by process: chemical applications demand corrosion resistance and high-temperature stability; food applications demand hygiene compliance and easy cleaning; precision conveying applications demand dimensional accuracy and low elongation.

The global market for steel belt conveyors was valued at approximately USD 1.75 billion in 2025 and is projected to grow at a CAGR of 6.7% through 2034, according to Research and Markets. This growth reflects broader adoption of continuous processing lines in chemicals, food and new energy manufacturing.

Material Engineering: Selecting the Right Steel Grade for the Process

The steel grade determines the belt's thermal limit, corrosion resistance, tensile strength and surface behavior. BPS offers several material families, each with a defined application envelope.

Stainless Steel Belts (301, 302, 304, 316L and higher alloys)

Stainless steel belts are the most common choice for food-grade and chemically exposed processes. The high nickel and chromium content provides corrosion resistance, while the austenitic structure retains ductility across a wide temperature range. BPS supplies stainless steel belts with what it describes as high strength, high flatness, food-grade hygiene, excellent thermal conductivity and durable circular welding.

For food applications—chocolate cooling conveyors, candy cooling lines, bakery tunnel ovens and steamed cake production lines—BPS uses 304 or 316L stainless steel, with surfaces finished for FDA/CE food-contact compliance. For chemical processes that require resistance to acidic or alkaline media, BPS can supply 316L, 310S, duplex stainless steel or nickel-based alloys such as 718.

Carbon Steel Belts

Carbon steel belts are typically selected for high-temperature applications where extreme corrosion resistance is not the primary requirement. BPS lists carbon belt chemical composition with a nominal carbon content of 0.65–0.75%, silicon 0.15–0.30%, manganese 0.60–0.90%, and chromium maximum 0.20%. This composition provides high strength and good thermal conductivity, making it suitable for baking and other food factory applications where mechanical durability matters.

In chemical pastillation, carbon steel belts are used where the product chemistry is compatible with carbon steel and where high thermal cycling is expected. The choice between stainless and carbon steel is therefore a joint function of product corrosivity, temperature profile and cleanability requirements.

PTFE-Coated Steel Belts

For sticky products such as chocolate, syrup, paste, colloid and powder, BPS offers PTFE-coated steel belts. The PTFE coating provides an extremely non-stick surface, food-grade safety, resistance to high and low temperatures, corrosion resistance, and a smooth surface that is easy to clean. The substrate retains the strength and stability of the steel belt while the coating reduces demoulding force and product adhesion.

PTFE-coated belts are not a single universal product; the coating thickness and surface texture can be adapted to the viscosity and release characteristics of the specific material being processed.

High-Temperature and Special Alloy Steel Belts

BPS supplies high‑temperature and special alloy steel belts designed for demanding applications beyond the capability of standard stainless or carbon steels, with available grades including 301, 304, 316L, 310S, duplex, nickel alloy 718, and carbon steel. These belts offer exceptional resistance up to 1100°C, as well as resistance to deep cold, oil, water, and chemical corrosion, making them suitable for food, pharmaceutical, and chemical processes where conventional grades would fail. The product range covers thicknesses from 0.4 to 3.0 mm (with common gauges and ±0.02 mm tolerance), widths from 100 to 2200 mm (custom), and virtually any length, with seamless circular welding supporting single strips over 50 m. Standard working temperatures span −60°C to +250°C, while special alloys handle up to 1100°C; tensile strength typically falls in the 1100–1700 MPa range depending on grade and heat treatment, with flatness tolerance ≤0.02 mm/m, length tolerance ±0.05 mm per 10 m, and hole positioning accuracy ±0.01 mm. A wide variety of surface treatments (mirror, brushed, polished, frosted, anti‑stick food‑grade coatings, punching, slots, longitudinal welding, guide bars, flanging) and application areas—including chemical resin cooling, food processing, powder coating flaking, sulphur/wax pastillation, chocolate conveying, baking ovens, and precision assembly—further demonstrate the versatility of BPS steel belt solutions.

Cooling and Curing Process Engineering: How the Steel Belt Controls Temperature Uniformity

In steel belt cooling systems, the process objective is to remove heat from the product at a controlled rate while maintaining a uniform temperature across the belt width. If the cooling rate is uneven, the product can develop internal stress, surface defects or inconsistent particle size.

Water Spray Cooling and Heat Exchange Efficiency

Most industrial steel belt coolers use water spray or water bath cooling on the underside of the belt, with heat conducted through the steel and into the water. The thermal conductivity of steel, combined with belt thickness, determines how quickly heat moves from the product layer to the cooling medium. Thinner belts transfer heat faster but have lower rigidity; thicker belts provide greater mechanical strength and better flatness under load but slow the cooling rate.

BPS states that its stainless steel belts achieve high thermal conductivity of approximately 15–20 W/m·K in application case evaluations. In a new energy material drying and curing line, the company reported that this conductivity increased drying efficiency by 25% and reduced energy consumption by 18% relative to the customer's previous belt. The belt also operated without oil or dust release, meeting Class 1000 cleanroom requirements.

The selection of belt thickness is therefore a heat-transfer engineering decision, not merely a mechanical specification. A 0.8 mm belt may be appropriate for a chocolate cooling line where fast heat removal is critical, while a 2.0 mm belt may be required for a resin flaker where the mechanical load and product mass are higher.

Stabilization, Weld Leveling and Internal Stress Relief

BPS applies stabilization treatment to relieve internal stress and weld leveling to create a smooth, continuous joint. These processes are critical for two reasons. First, a belt with residual internal stress will tend to deviate or develop waves during operation, causing tracking problems and uneven product thickness. Second, the weld seam is the most failure-prone zone of an endless belt; if it is not properly leveled and stabilized, it can become a source of vibration, debris or premature fracture.

BPS reports that its weld fatigue life reaches at least 2 million cycles in food line applications, with dimensional stability characterized by elongation of no more than 0.2%. In a baking equipment OEM case, the after-sales failure rate was reported below 1% across a 3–5 year warranty period, with actual belt life of 4–6 years.

Anti-Deviation and Edge Control

Continuous steel belts must track accurately on the drive and idler drums. Anti-deviation treatment is a process customization offered by BPS, along with guide bars, baffles, flanging, side arc chamfering and fixture installation positions. For high-speed precision assembly lines, BPS supplied belts with hole position accuracy of ±0.01 mm, 10-meter cumulative tolerance below 0.05 mm and repeat positioning accuracy of ±0.05 mm. Those belts replaced imported steel strips, reduced cost by 45% and shortened delivery from 12 weeks to 3 weeks, while maintaining transmission efficiency of at least 98%.

Belt Types and Customization Capability: From Standard Strip to Process-Specific Design

BPS classifies its steel belt offering into product families that map to the secondary keywords commonly used by procurement teams: stainless steel belts, carbon belts, PTFE-coated steel belts, special requirement steel belts, and the process systems that integrate these belts. The company also explicitly includes pressed steel belts, electric steel belts, casting coating steel belts, wood OSB press belts and other specialty types under its special requirement category.

Stainless Steel Belts

These are the baseline product for food, pharmaceutical and chemical applications. Key features are high strength, high flatness, food-grade hygiene, excellent thermal conductivity and durable circular welding. BPS supplies stainless steel belts to chocolate and candy cooling conveyor manufacturers, bakery tunnel oven builders, steamed cake production lines and crab stick molding machines.

Carbon Belts

Carbon steel belts provide a combination of strength, thermal response and cost-efficiency. They are used in baking and other food factory processes where heavy loads, high temperatures or abrasive conditions make stainless steel less economical. The nominal composition of 0.65–0.75% carbon gives high hardness and wear resistance.

PTFE-Coated Steel Belts

For processes involving sticky or viscous products, PTFE-coated steel belts lower the surface friction coefficient and improve release. The coating is applied to a steel substrate, so the belt retains its load-bearing capacity and dimensional stability. BPS lists chocolate, syrup, paste, colloid and powder handling as typical applications.

Special Requirement Steel Belts

Under this category, BPS provides belts that require punching, slotting, flanging, guiding edges, side arc chamfering, thickening, strengthening, sectionally widened and thickened construction, or integrated molding. These belts are used where the product needs vacuum holes, positioning holes, ventilation holes or attachment points for fixtures. The company also supports high-temperature service up to 1100°C, deep cold resistance, and oil-water or chemical corrosion resistance.

Process Customization: The ODM Engineering Model

BPS operates primarily in an ODM mode, meaning it designs the steel belt together with the customer's process equipment rather than only producing a strip to a generic spec. The company lists material customization, custom sizing, surface customization, hole/accessory customization, process customization and working-condition customization as its six core engineering capabilities.

Material options include 304/316L stainless steel, 718 nickel-based alloy and carbon steel in food-grade, chemical-grade or high-temperature-resistant grades. Widths can be set anywhere from 100 mm to 2200 mm; thicknesses from 0.4 mm to 3.0 mm with a tolerance of ±0.02 mm; and single strip circumference can exceed 50 meters. For standard dimensions with stock material, BPS states a lead time of 7–10 days; custom specifications take 15–20 days; urgent orders can be completed in 5–7 days with an additional fee.

Quality Control and Working-Condition Validation

The engineering value of a steel belt depends on consistent manufacturing quality. BPS describes a three-stage quality control process:

Incoming quality control (IQC): material spectral analysis, thickness/hardness/tensile strength testing, and surface defect inspection.
Process inspection (IPQC): full dimensional tolerance inspection, flatness and straightness testing, and weld appearance and non-destructive testing.

Final validation: dimensional, flatness and surface criteria are verified before shipment, and installation and usage acceptance is part of the procurement procedure.

For performance evidence, BPS cites several application cases. A powder coating manufacturer in the chemical/new materials sector accumulated more than 40 belts over multiple years, operating at 180–220°C. The customer reported that BPS belts resisted deformation and cracking that had occurred with ordinary steel strips, achieved flatness ≤0.02 mm/m, improved yield to 99.7%, and reduced total lifecycle cost by 40% compared with imported belts and 25% compared with ordinary domestic products.

In the new energy materials case, a lithium battery diaphragm manufacturer used more than 10 stainless steel strips in a dust-free environment at 160–200°C. The belt operated for 2–4 years without oil or dust release, met Class 1000 cleanroom requirements, increased drying efficiency by 25%, reduced energy consumption by 18%, and improved yield by 2–3%.

In food processing, a major baking/snack food group accumulated more than 120 BPS belts across multiple factories, using them in tunnel ovens for cookies, bread and pastries, as well as cooling lines. The group replaced imported steel belts, reduced cost by 35–50%, shortened delivery from 3 months to 2–4 weeks, and reported weld fatigue life of at least 2 million cycles with a 60% reduction in downtime maintenance.

Decision Framework for OEMs and Process Buyers

Buyers evaluating steel belts for cooling and curing systems should consider the following specification chain before requesting a quote:

Process temperature and media: Determine whether the product is acidic, alkaline, oily, food-contact or high-temperature. This decides whether stainless steel, carbon steel, specialty alloy or PTFE coating is required.
Mechanical load and belt stiffness: Calculate the product mass per unit area and any tension forces. This determines minimum thickness and tensile strength requirements.

Heat transfer requirement: Define the cooling rate and temperature uniformity target. Thinner belts conduct heat faster; thicker belts provide flatness and load capacity. The final choice is an engineering trade-off.
Flatness and tracking: For coating, flaking or casting processes, flatness tolerance directly controls product thickness. BPS specifies ≤0.02 mm/m flatness; for precise positioning, hole position accuracy of ±0.01 mm is available.
Weld quality: The endless splice is the longest-lived or shortest-lived feature of a belt. Ask the supplier to document weld fatigue performance and the stabilization procedure.

Cleaning and hygiene: For food or cleanroom use, confirm surface finish, material grade and

compliance with applicable food-contact standards.
Lead time and total cost: BPS reports 7–10 days for standard specifications and 15–20 days for custom specifications, compared with 8–16 weeks for typical imported belts. Faster delivery affects production ramp-up and spare-part inventory strategy.

Conclusion

Steel belt technology for cooling and curing applications is a specialized intersection of metallurgy, heat transfer and precision fabrication. Shanghai Biquick Process Systems demonstrates a full-stack approach: it controls the raw material selection, the endless welding process, the flatness and surface finishing, and the integration of the belt into pastillators, flakers, coolers, ovens and conveying systems. Buyers should evaluate potential suppliers using the same engineering criteria—temperature range, thermal conductivity, weld fatigue, flatness tolerance, customization capability and documented application performance—rather than relying on generic product descriptions.

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