



Nut processing.
Innovative process solutions.

Sustainable solutions for the nut industry.

Efficient processing that is safe for food.



Bühler has appropriate process solutions for all processing stages, from goods in to the finished end product – all highly efficient and in compliance with strict food safety standards.

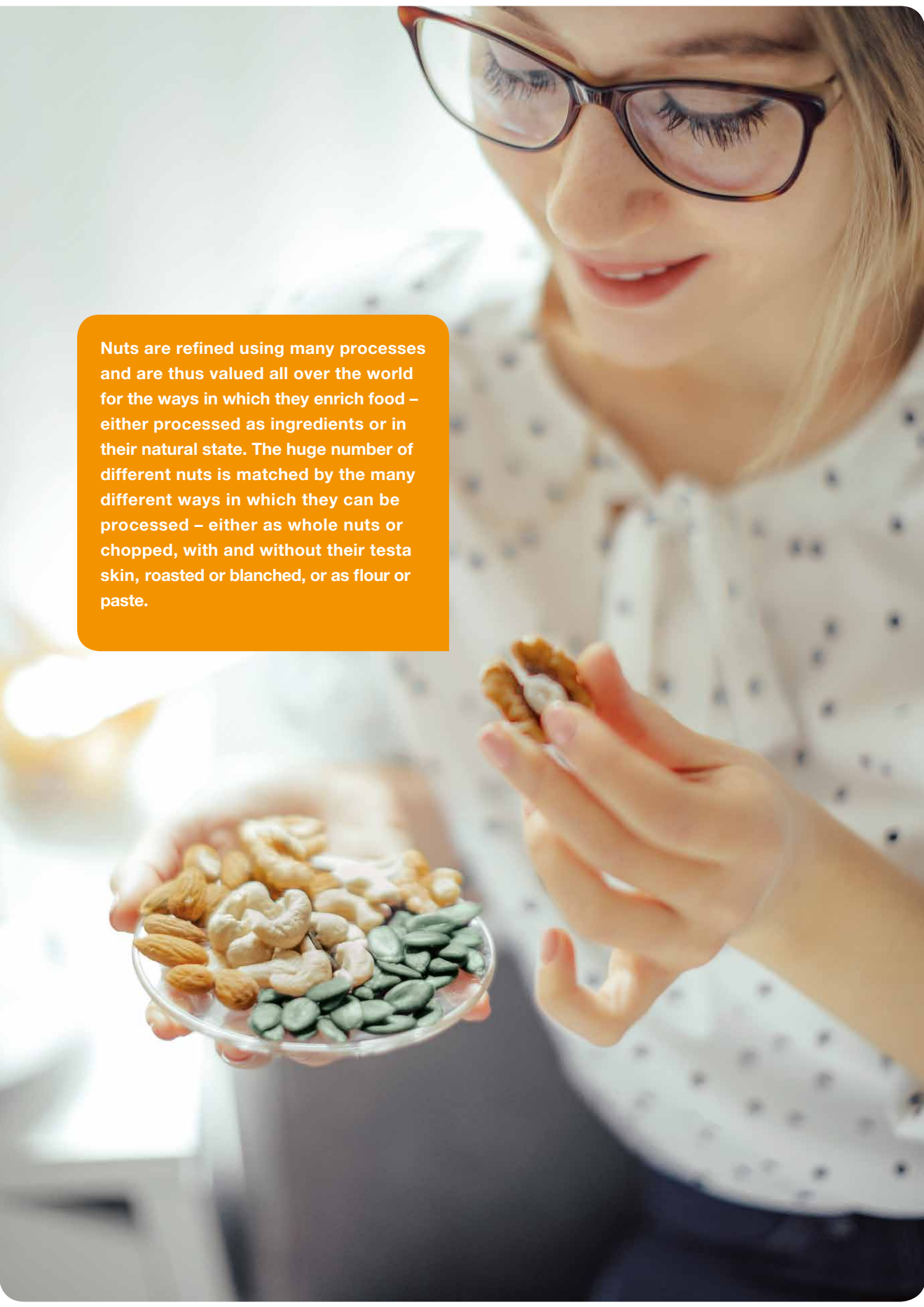
Bühler has many years of experience in the industrial processing of nuts: hazelnuts, peanuts, cashews, pistachios and almonds are treated with great care. In the course of this, Bühler provides solutions for individual process stages and complete systems, including extremely modern automation solutions – all from one single supplier.

Roasting is one of the most important methods for processing nuts. This is why Bühler can offer an unparalleled portfolio and process knowledge. Regardless of whether the throughput is low or high or continuous or batch processing is used, all Bühler's roasting systems deliver excellent, consistent quality thanks to the unique air circulation systems. Different blanching, chopping and grinding systems complete the range that offers energy-saving and low-cost processing of nuts and oilseeds.

Food safety is Bühler's primary concern. The Solano SSP pasteurization procedure is highly innovative and works in a unique way, reducing the level of Salmonella in almonds, nuts and seeds very effectively and avoiding harsh processes that may damage the nuts.

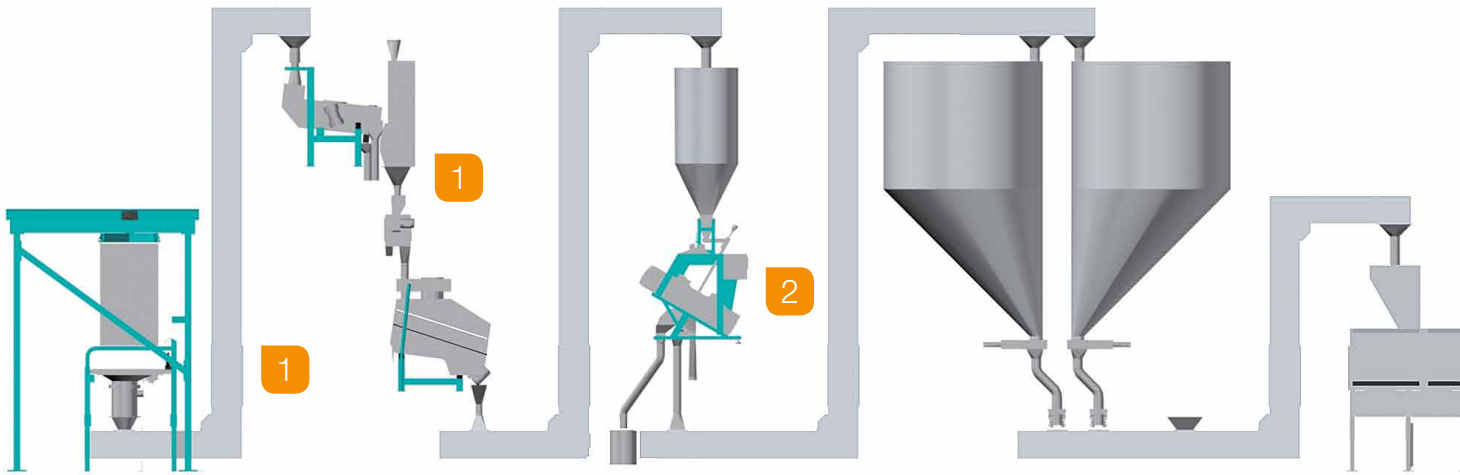
Optical sorting solutions provided by Bühler SORTEX® also ensure that only perfect raw materials are subsequently used for processing, with foreign materials, damaged and decaying nuts reliably segregated.

However, Bühler offers more than just leading-edge technologies. Thanks to its extensive range of services and network of representatives in 140 countries, Bühler assists its customers at their premises with technicians and spare parts, training courses and test facilities for process and product optimization.

A close-up photograph of a woman with blonde hair and glasses, wearing a white polka-dot blouse. She is looking down at a clear glass bowl filled with various nuts, including almonds, cashews, and pistachios. In her other hand, she is holding a walnut, which she appears to be cracking or examining. The background is softly blurred, showing a kitchen setting with a white teapot and a glass. An orange text box is overlaid on the left side of the image.

Nuts are refined using many processes and are thus valued all over the world for the ways in which they enrich food – either processed as ingredients or in their natural state. The huge number of different nuts is matched by the many different ways in which they can be processed – either as whole nuts or chopped, with and without their testa skin, roasted or blanched, or as flour or paste.

The value chain at a glance. From goods receipt to the finished product.



Cleaning/transport

Tailor-made, reliable and efficient solutions:

- Cleaning and transportation within the system
- Separation of undesirable elements
- Pneumatic or mechanical conveyors
- Implementing projects of all sizes all over the world



Optical sorting

Improvement to food safety and quality through:

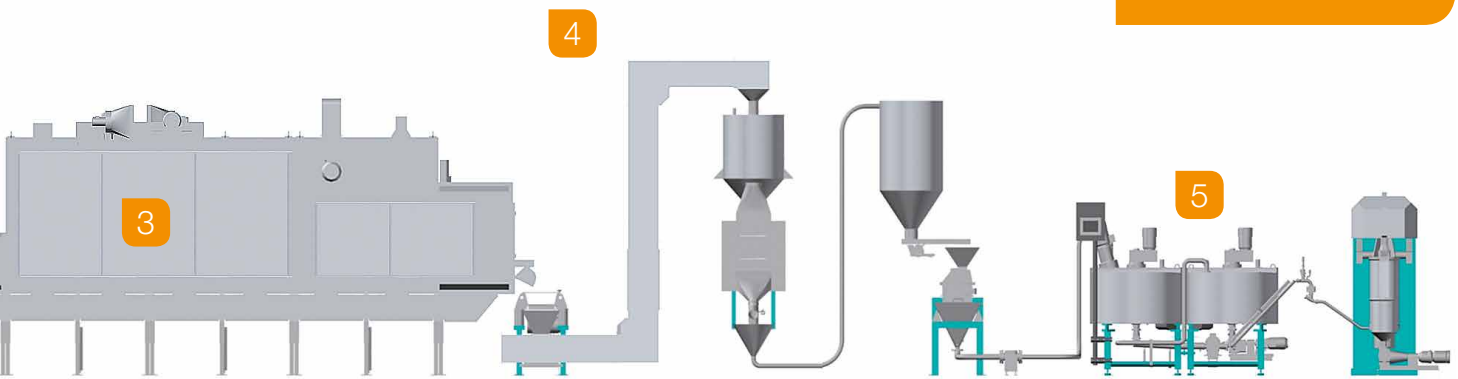
- Removal of foreign materials and rotting or harmful nuts
- Sorting by size/shape
- Removal of blanched nuts that are discolored or where the skin has not been removed
- Reduction of aflatoxins through efficient removal of affected nuts



Roasting

- Batch-operated roasters for demanding roasting qualities or continuous driers and roasters for high throughputs of up to 20,000 kg/h
- Unique air circulation systems for excellent and consistent product quality, color and moisture content

Complete nut line with central automation: Every process step is significant when processing the raw materials into valuable nut products.



Pasteurization

- Gentle pasteurization of more than 5-log units
- Suitable for all types and shapes of nuts and oil seeds
- Performance of up to 1,500 kg/h per process zone
- Pasteurization and roasting possible in one system
- Patented and TERP-accepted pasteurization method

Size reduction/ grinding

- Size reduction and grinding of nuts into fragments, flour or pastes
- Very fine ground pastes with fineness of less than 20 µm possible
- Stable process, even for different product qualities

Automation

- WinCos® automation solution for the control and monitoring of production systems
- Tried-and-tested visualization process and extensive interfaces and functions
- Recipe-controlled processes for uniform product quality and batch traceability

Tried-and-tested cleaning and handling solutions. **From infeed to bagging.**



Tubular push conveyor TUBO



Separator classifier with aspiration channel

Cleaning and handling solutions for nuts are a central element in operational efficiency, product quality and the traceability of a production line. With Bühler, customers benefit from a comprehensive range of solutions and global engineering experience in plant construction.

The gentle conveying and efficient cleaning of raw and processed nut products are key process steps for medium-sized and large production facilities.

Whether they are provided in sacks, big bags or containers, nuts must be available in the right quality for further processing. Modular cleaning solutions separate dust, stones and other foreign matter very efficiently and gently with a strong and accurate adjustable aspiration system.

For transport between individual stages of the process, Bühler makes use of a wide range of available technologies depending on the purpose and requirements, for example

pendulum bucket conveyors, pneumatic conveying systems, vibration conveyors or the innovative and patented tubular push conveyor TUBO.

Advantages for the customer:

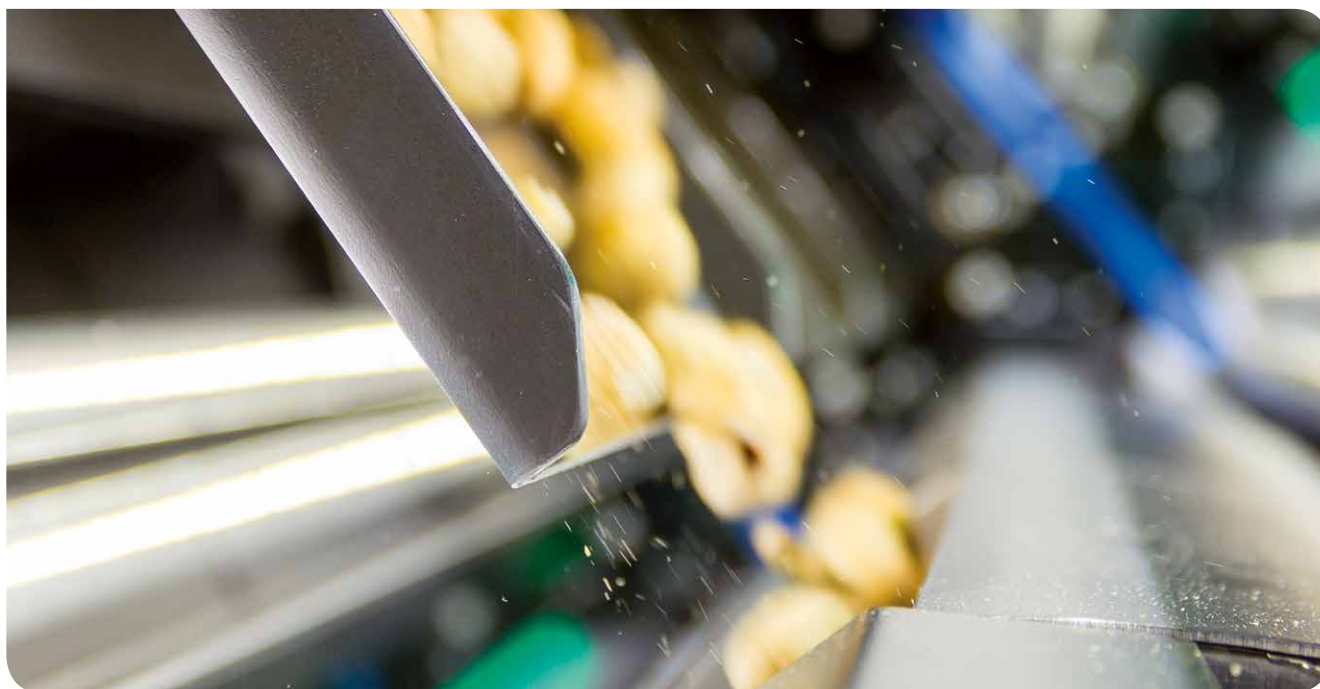
- Maximum nut cleanliness, even at high throughput
- System elements especially for nut applications
- All types of mechanical, pneumatic or combined conveying solutions available
- End products with consistently high quality



Bühler is a technology partner in many food-processing industries and holds a market-leading position in the processing of valuable raw materials to create high-quality products. As a provider of complete solutions, Bühler offers tried-and-tested solutions for the entire value chain – from goods in to storage of the end product.

Cleaning systems for hazelnuts

Sophisticated optical sorting solutions. **At all stages of the nut processing line.**



SORTEX® optical sorters are the first choice for nut processors who demand the highest standards in food safety, quality and yield. Equipped with cutting-edge camera and lighting technology, SORTEX® sorters are renowned for removing the most challenging defects and foreign materials at all stages of the nut processing line.

SORTEX® sorters have been at the forefront of pioneering optical sorting technologies since 1947. Equipped with breakthrough innovations including SORTEX® BioVision™, next generation InGaAsHD™, custom built color cameras and intelligent PROfile™ sorting technology, they are expertly built to target the most challenging nut processing concerns from the removal of gross and subtle color defects, same color foreign materials to the reduction of aflatoxin contaminated kernels – all with pinpoint precision and accuracy to protect your valuable yield.

SORTEX® highlights:

- Helps processors meet stringent safety standards through the segregation of nuts that are of inadequate quality or infected with *Aspergillus flavus* fungus
- Maximizes product value and yield through precise removal of unwanted product and foreign materials
- Provides a consistent stable performance, all day every day – minimizing downtime.



Bühler SORTEX® A

SORTEX® A range

Available in four variants including the MultiVision™, ColorVision™ and DualVision™ inspection systems and in three different frame sizes, the SORTEX® A range provides nut processors, no matter how big or small, with dedicated customized options to handle unique and challenging sorting requirements.

Showcasing Bühler innovation with new advanced inspection systems together with InGaAsHD and PROfile™ (shape) sorting technologies, the SORTEX® A range offers a profitable sorting performance with outstanding removal of gross and subtle color defects and foreign material as well as providing a uniform appearance with color, size and shape grading.

Also featuring Bühler's powerful SmartEject™ technology, auto-calibration, product tracking, sealed optical and control cabinets (IP5X) to guarantee a stable and reliable operation in the even the most dusty of nut processing environments.



Bühler SORTEX® E BioVision™

SORTEX® E BioVision™

The SORTEX® E BioVision™ is a revolution in nut sorting, featuring Bühler's breakthrough SORTEX® BioVision™ technology which targets the spectral and spatial differences between nut meats, shell and foreign material to detect hazardous foreign materials up to 50 % smaller and at higher processing capacities than any other industry solutions today.

The SORTEX® E BioVision™ can also be combined with Bühler's proprietary color, InGaAsHD and PROfile™ (shape) sorting technologies. Providing nut processors with an added layer of assurance by detecting color defects, shell and foreign material in the infrared spectrum and by shape, size and color characteristics.

The newly enhanced operating software also allows the sorter to run with one simple set-up for multiple nut varieties to minimize operator intervention and machine downtime. The built in climate control system also ensures the sorter operates at a consistent performance under changing ambient conditions.



Accept



Reject



Accept



Reject

Tailor-made roasting systems. **The perfect solution for every application.**



Bühler AeroRoast™ for processing peanuts in-shell

The roasting process is the key factor when creating the typical nut characteristics such as aroma, texture and product color. Hot-air roasting systems from Bühler are known for their high roasting quality and cover the requirements of both large and small nut processors perfectly.

Batch roasting

The Solano impresses with its exceptional flexibility: Batch operation with a fill volume of 1,000 liters per module permits a wide variety of roasting profiles for numerous nuts and oil seeds in different shapes. Furthermore, the specially developed and patented roasting process ensures that the various products have a long shelf life. The optional SSP pasteurization technology provides steam pasteurization of more than 5-log units in the case of vegetative microorganisms such as Salmonella.

Solano highlights:

- Huge flexibility with regard to roasting recipes and product diversity for numerous nuts and seeds
- Long shelf life of nuts thanks to tried-and-tested two-stage roasting process
- Optional 5-log pasteurization, independent of degree of roast
- Performance approx. 1,000 kg/h per process zone (product-/recipe-dependent)



AeroRoast™ – conveyor dryer and roaster for high throughputs



Barh RoaStar vertical roaster with two roasting zones and one cooling zone

With a fill volume of 70 to 100 kg and an attractive price, the Zonda 100 RS is for small roasting companies and newcomers to the market, who want to set themselves apart from the competition by offering the flexibility of special roasting profiles.

Zonda highlights:

- Huge flexibility with regard to possible roasting recipes
- Conductive drum heating for the development of special roast aromas
- Optional 5-log pasteurization, achieved through injection of water into the roasting drum (recipe-dependent)
- Performance approx. 100–150 kg/h (product-/recipe-dependent)



Zonda RS gourmet and craft roaster for small and midsize operations

Continuous roasting

The modular AeroRoast™, which can also be used for drying nuts, features a controlled dual-plenum air flow that ensures that air is distributed evenly over the entire conveyor belt.

AeroRoast™ highlights:

- Dual-plenum air flow for consistent roasting results
- Accurate air flow control for consistent thermal inactivation
- Large performance range from 1,000–20,000 kg/h

The Barh RoaStar modular vertical roaster guarantees extremely gentle treatment of nuts, as the product being roasted is transported purely by its inherent weight.

Barh RoaStar highlights:

- Saves space thanks to vertical design
- Few moving parts means less wear and less need for maintenance
- Energy-efficient thanks to optional heat recovery
- Performance range from 400–3,000 kg/h

Advantages for the customer:

- The ideal roasting system for every requirement
- Controlled, consistent hot-air roasting that is gentle on the product
- Tried-and-tested, long-lasting roasting systems
- High hygiene standards for safe operation

Solano SSP pasteurization system.

Efficient and gentle germ count reduction.



The Solano SSP pasteurizer permits efficient and gentle steam pasteurization of a wide range of granular products and also offers subsequent roasting in the same process zone. The patented pasteurization technology achieves inactivation of pathogenic microorganisms such as Salmonella by more than 5-log units.

Effective and gentle

Efficient and gentle pasteurization in the Solano SSP is based on a germ removal by steam in a controlled batch process. The system gently achieves a reduction in the germ count by means of the controlled condensation of steam on the product surface.

This patented and technologically demanding process is characterized by two process steps: First, the product is pre-heated to a temperature just below the system's evaporation temperature. The subsequent injection of steam into the process chamber enables a reduction of more than 5-log units in just a few minutes for pathogenic germs such as Salmonella. This is made possible through the introduction of steam

simultaneously at more than 50 spots in the process chamber, which enables consistent and gentle pasteurization to take place.

Pasteurization and roasting in one system

The Solano SSP provides huge flexibility with regard to applications. In addition to pasteurization alone, the Solano SSP can achieve extraordinarily consistent roasting of a wide variety of products in batch operation, from small oil seeds such as sesame to large nuts. The innovative air distribution ensures homogenous introduction of energy on every product



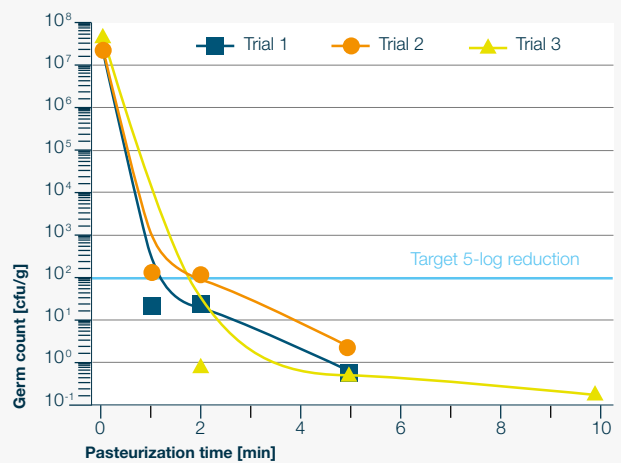
being roasted, leading to an optimum development of aroma and taste for the entire batch.

The two-step roasting process developed and patented by Bühler largely preserves the microstructure of the nuts and thus achieves an unparalleled shelf life: The speed at which nuts oxidize is reduced by a factor of 2.5 compared to conventional roasting processes. To achieve higher throughputs, several process zones can be modularly lined up on the Solano SSP.

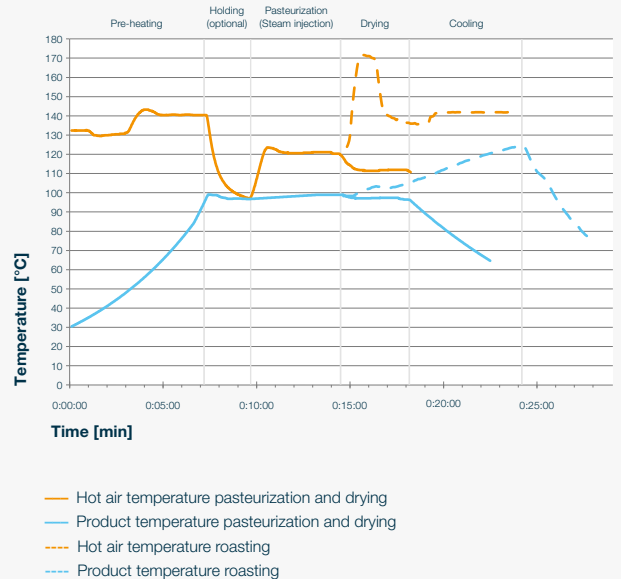
Advantages for the customer:

- Gentle pasteurization of more than 5-log units
- Suitable for all types and shapes of nuts, cocoa beans and oil seeds
- Performance of up to 1,500 kg/h per process zone
- Pasteurization and roasting possible in one system
- Patented and TERP-accepted pasteurization method

Log-reduction of *Enterococcus faecium* (Surrogate of *Salmonella* SE PT 30)

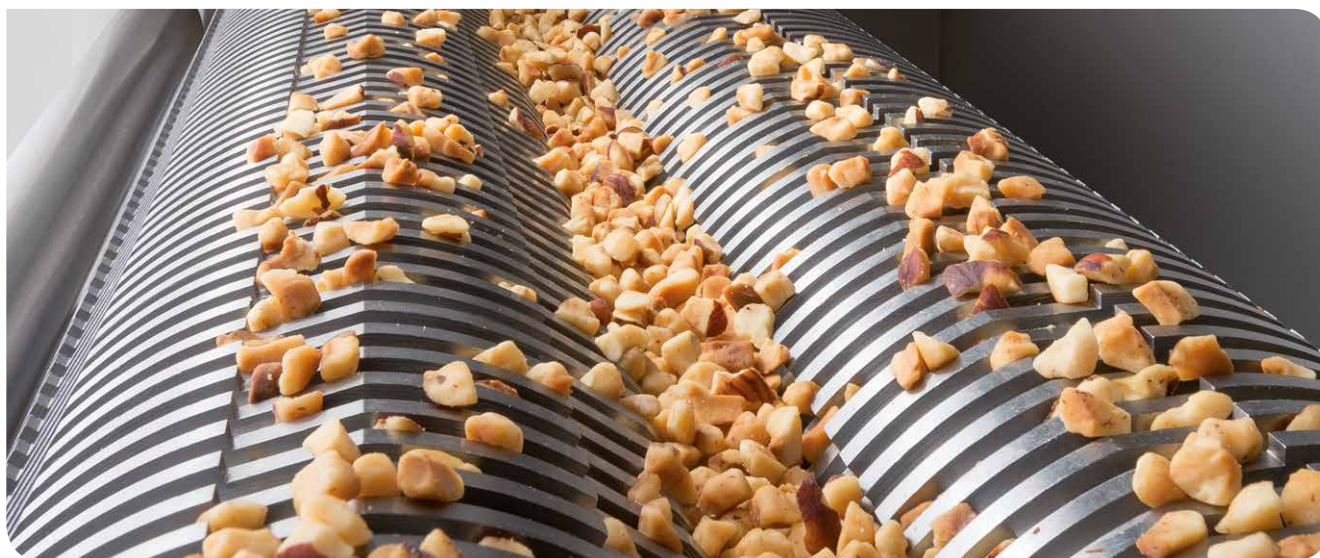


Temperature progression Solano SSP



Solano SSP

Size reduction and grinding. **Precise solutions from the technology leader.**



Barth CM chopping machine for chopped nuts

Bühler's technologies for grinding and size reduction are used around the world. The solutions for nuts include both small-scale mills for pregrinding and high-volume ball mills and roll refiners for fine grinding. All solutions are characterized by precision, energy efficiency and a high level of food safety.

Bühler's UniMill beater mill is designed for the efficient size reduction and grinding of nuts to nut flour and pastes. The application range includes roasted hazelnuts, almonds and other sorts of nuts, as well as chocolate, brittle, caramel and cocoa nibs.

The Barth CM chopping machine is used to produce nut pieces. This is an infinitely variable procedure, which involves crushing the nuts between rotating rollers. This process combined optimum yield with a wide range of particle sizes.

Compared to the cutting process, the Barth CM's energy consumption and maintenance costs are very low. In the crushing process, the product passes through three pairs of rollers arranged one above the other. Thanks to the special surface structure of the rollers, an extremely precise setting of the

desired particle size distribution from coarse to fine is possible – for optimum chopping results. Depending on the application, performance of 700 kg/h can be achieved.



SCS impact and shear mill



NOVA™ ball mill for nut pastes



Bühler SD roller mill for very fine nut pastes

Filling or spreading pastes

Bühler applies a combination of two tried-and-tested process stages for the efficient manufacture of nut pastes, which together offer the highest product quality. The nuts are liquefied to a pumpable compound during the pregrinding process. In the subsequent fine grinding process, the nut solids are ground to the required end fineness.

Bühler uses the UniMill beater mill or the SCS impact and shear mill for pre-grinding. The ball mills Nova S and Genomic™ proven in the chocolate industry, or various rolling technologies, are used in fine grinding. These solutions permit low process temperatures, a narrow particle size distribution and an end fineness of up to 20 µm.

Bühler also offers numerous components for dosing and mixing the dry or liquid ingredients. The sophisticated, tried-and-

tested solutions are suitable for small throughputs of a few 100 kg/h through to capacities with several thousand tons per hour.

Advantages for the customer:

- High-precision systems for optimum chopping and grinding results
- One-stop-shop solution for all process stages – from dosing and mixing through to cooling
- Systems for small (100 kg/h), medium and large (> 1,000 kg/h) throughputs
- Very finely ground pastes with a fineness of up to 20 µm possible
- High energy efficiency and food safety



SmartChoc™ grinding system with mixing units and horizontal ball mill

Global partner for complete systems. **Expert solutions from a single source.**



Every system for processing nuts is unique and requires customer-specific process solutions. Bühler plans, installs and automates complete lines for very different kinds of nuts in accordance with the customers' requirements – from the first planning phase to the time when successful production starts.

Bühler has knowledge of the entire value chain for nut processing – from delivery of the raw materials, cleaning and sorting to the debacterization, roasting, chopping and grinding process stages.

The solutions deployed are characterized by high efficiency, reliable operation and easy maintenance. User-friendly operation, product traceability and uncompromising safety are further plus points – regardless of whether individual process stages or entire systems are involved.

Bühler's extensive process knowledge of complex production lines is reflected in WinCos®, the modern system of automation. Tried-and-tested visualization concepts, numerous interfaces and practical functions make for simple and problem-free operation of systems and seamless monitoring of production. Recipe-controlled processes provide consistent product quality and ensure traceability of the goods produced.

Bühler is the right partner for technological challenges. As global plant engineers with experience in the implementation of projects of practically every size, Bühler knows the risks involved in installing and operating a system, has the relevant time management and can provide reliable business support.

Advantages for the customer:

- Experience in planning and implementing plant engineering projects globally
- All services from one single source, thus avoiding interface problems
- Extensive automation solution for process control and traceability
- Coordinated process steps for optimum yield and product quality

Services from Bühler.

Practice-based pilot plant and laboratory trials.

Bühler operates its own test facilities and laboratories for the food industry worldwide. Professional tests and analyses allow customers to make an accurate evaluation of the different process steps and their results.



Many very different processes can be tested and optimized at the Bühler's own test facilities in Europe, Asia and the USA. Experienced process engineers carry out pilot trials and test series with the customer prior to a decision on whether to buy.

Pilot plants enable trials to be carried out on a small industrial scale to optimize products or processes. These trials also provide an insight into the required dimensioning of the potential plant.

The Bühler central laboratory in Uzwil is the ideal point of contact for demanding analysis tasks and also offers services such as consulting, training and method development.

Advantages for the customer:

- State-of-the-art pilot plant for customer trials
- Product and process optimization
- Many years of experience in the field of nut processing
- Support from qualified food and processing engineers
- Interdisciplinary exchange with other areas of Bühler's expertise and with educational establishments

24 hours a day, seven days a week, worldwide. **Services for more productivity and safety.**

Customized maintenance, retrofitting and reconditioning packages ensure that machines are always state of the art. The advantage: customers can produce their articles profitably and safely even with older plants.

Bühler is represented in more than 140 countries, maintains its own production, development and service locations worldwide and is quickly on site when customers need support. Technicians procure spare quickly and install them professionally. Specialized Bühler service locations carry out extensive retrofits for existing systems in the nut industry.

Specially tailored training options enable smooth operation of the machines, allowing you to produce excellent product

quality with optimum throughput. The training courses help improve plant output and keep operating staff abreast of current technologies and safety standards – for labor law regulations as well as food safety.

Focus areas of the Bühler service range:

- Food safety
- Operator protection
- Operational reliability and quality consistency
- Overall equipment effectiveness (OEE)

North America

7 Sales offices
3 Manufacturing sites
6 Service stations
750 Employees



South America

6 Sales offices
2 Manufacturing sites
12 Service stations
400 Employees

Europe

35 Sales offices
10 Manufacturing sites
27 Service stations
5,100 Employees



Middle East & Africa

12 Sales offices
2 Manufacturing sites
15 Service stations
500 Employees

Asia

21 Sales offices
9 Manufacturing sites
19 Service stations
3,500 Employees

South Asia

5 Sales offices
1 Manufacturing sites
11 Service stations
550 Employees



Bühler is the world's leading technology partner when it comes to manufacturing cocoa, chocolate and nut products. The tried-and-tested production systems combine products of first-class quality and a high level of efficiency. Bühler services ensure that the systems will remain productive and operate reliably in the long term.

Bühler Barth GmbH

Daimlerstr. 6
D-71691 Freiberg am Neckar
Germany

T +49 7141 705-0
F +49 7141 705-100

bbar.info@buhlergroup.com
buhlergroup.com/nut-processing

170401_Nuts_EN_A4