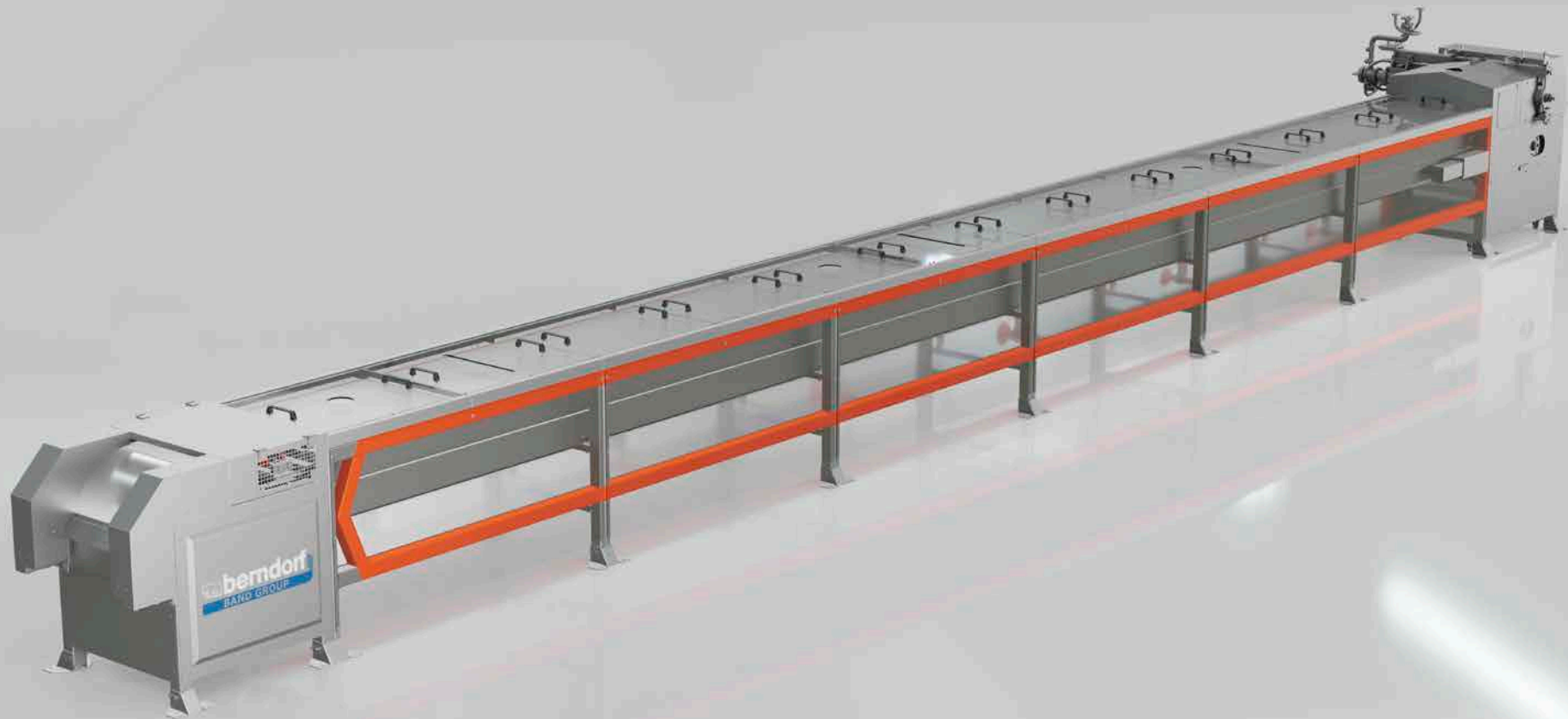


Process Equipment for the chemical industry

Solidification and Cooling Systems



Solidification & Cooling Systems for the chemical industry

As your total solution provider, Berndorf Band Group offers complete packages to meet your demands. Berndorf Band Group is the reliable partner for your process from feasibility studies and tests to engineering, design, manufacturing, construction and installation of your Solidification and Cooling System.

Berndorf Band Group has successfully provided Process Equipment for the solidification of sulphur, waxes, resins, hot melts, and powder paint to the chemical and petrochemical industries.

Test centers are located worldwide to provide individual production tests to reproduce and optimize your processes. With these tests, you can discover the advantages of Berndorf's Process Equipment on site.



We offer our customers a wide range of machinery equipment and comprehensive engineering services as well as testing capabilities for the chemical industry.



Gernot Binder
President, Berndorf Band Engineering GmbH

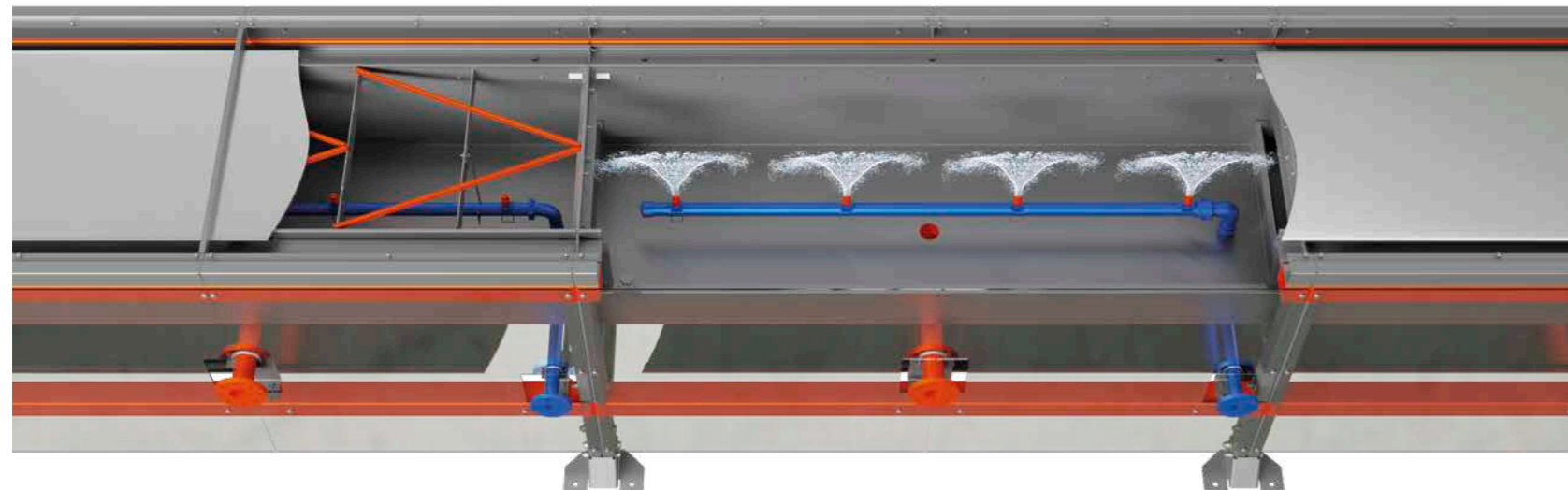
Cooling Systems

Single and Double Steel Belt Coolers are used for a wide range of production processes to solidify molten products from previous processes.

Berndorf Cooling Systems offer a state-of-the-art indirect cooling process, effectively removing product heat and optimizing product solidification. The cooling water is collected in an integrated stainless steel reservoir which can be re-circulated using a pumping system. The Belt System is kept at the ideal process temperature by means of a well-thought-out Cooling System.

Extra cooling zones can be adapted to enable a controllable cooling process. Thanks to the sophisticated construction of the total installation, highly qualified chemical or pharmaceutical products can be produced economically to your exact specifications. All our Cooling Systems are supplied with large orifice, quick disconnect, spray nozzles that spray cooling water in a full square spray pattern, designed for maximum cooling efficiency and maintenance free operation.

Materials such as waxes, resins, hot melts and adhesives in the shape of pastilles, strips, flakes, plates or sheets can be produced with Process Equipment.



Single Belt Cooler (SBC)

The SBC can produce a variety of products including pastilles, flakes and strips because all available Feeding Devices can be installed. The entire cooling section can be operated with different temperature zones allowing adaptation to process specific cooling curves to achieve superior product quality. The cooling water is reused in a closed water circuit and therefore does not pollute the environment. Additionally, an air hood on the product side can be used for additional cooling to increase the production capacity.

- » All Feeding Devices (flakes, pastilles, strips)
- » Environmentally friendly due to closed water circuit
- » Additional cooling hoods to increase the production capacity & to control room conditions around the Belt



Double Belt Cooler (DBC)

Berndorf Double Belt Coolers are used for increased capacity and processing products which tend to curl away from the Belt. Since the product is located between two chilled surfaces, a faster cooling process resulting in a higher capacity can be achieved with the same overall cooler length. Additionally, it enables effective cooling of thick products at high production rates. Like the SBC, the DBC can be operated with different temperature zones to achieve superior product quality using the closed water circuit.

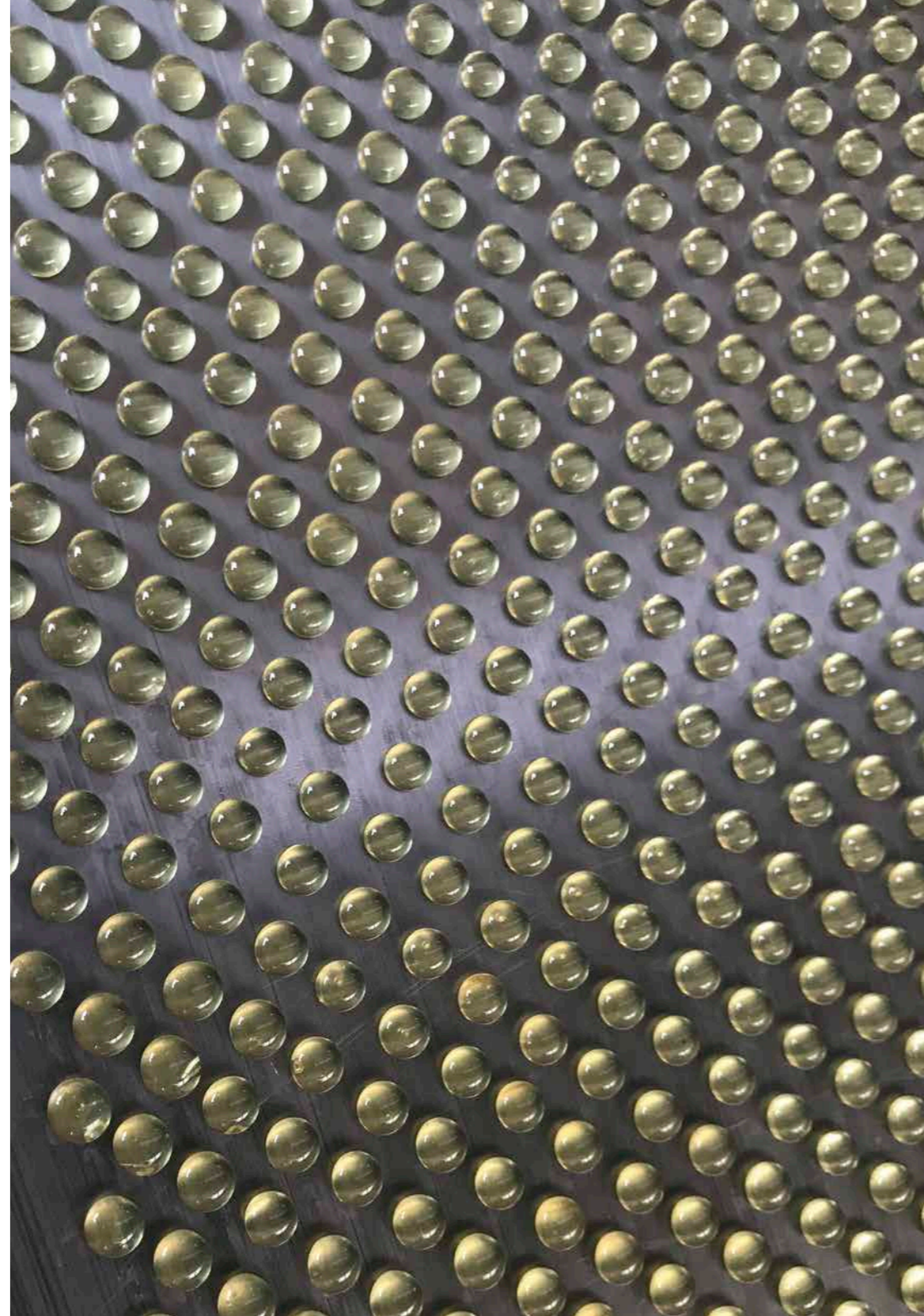
- » Product curling is eliminated
- » Increased production rates since the product is between two cooling Belts

Feeding Devices

A variety of Berndorf Feeding Devices have been developed to meet different process requirements for a wide range of products. The versatile application possibilities enable the production of materials from low to high viscosities and a melting temperature of up to 250 °C | 482 °F.

Our **BernDrop®** Devices pump the product through a continuous material flow into the inner chamber of the Pastillator, the stator. The pre-distribution pipe as well as the seal and metering bar distribute the material uniformly over the entire production width to the rotating outer shell. A variety of rotating shells and metering bars are available to meet product-specific requirements. The diameter of the produced pastilles is mainly determined by the hole size, flow rate and rotational speed of the shell. If required, different pastille sizes can be achieved by adjusting the flow rate.

Additionally, Berndorf Band Group provides Feeding Devices like the **BernFlow®**, which feed the raw material continuously in sheet form to the Steel Belt surface. On the discharging side, a Breaker, Cutter or Mill is required for controlled crushing of the product to flakes.



BernDrop® with refeed bar*

The **BernDrop® EF200** and the **BernDrop® AD300** are Pastillators with a smooth perforated shell and a refeed bar, which are advantageous for products that tend to accumulate on the outer shell. The heated refeed bar collects this excess material and redistributes it back into the holes of the shell.

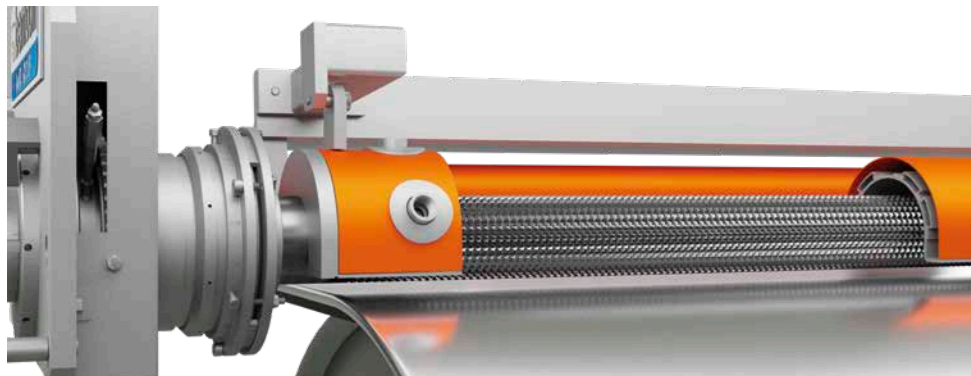
Optional:

- » Swivelling of Pastillator for easy maintenance
- » Higher security to avoid Belt damage
- » Quick lock and positioning system



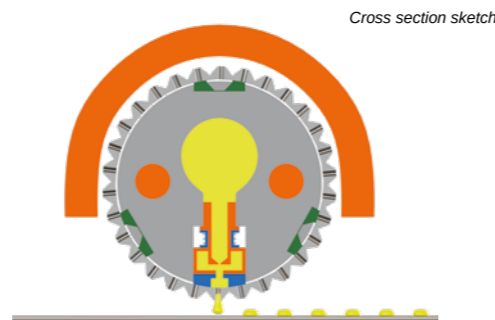
- » Smooth outer shell with a heated refeed bar to avoid excess material with higher viscosity
- » Enhanced safety in parts handling
- » Easy accessibility for service and maintenance

*Regional differences in technical design may occur



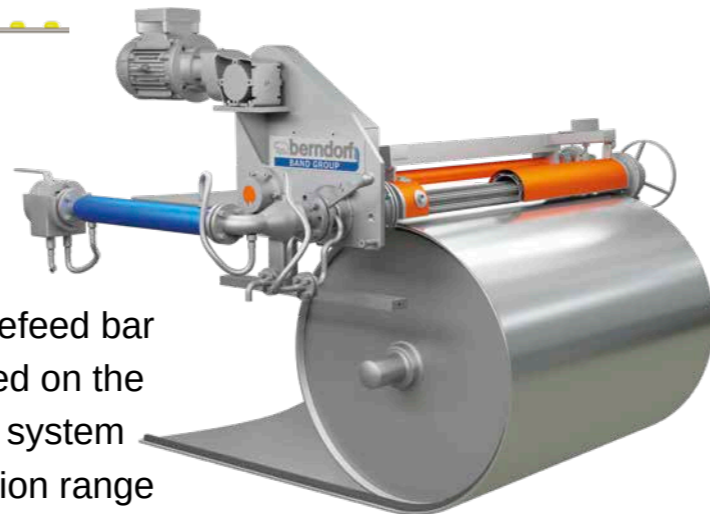
BernDrop® with raised shell, no refeed bar

The **BernDrop® AD200** is a Pastillator equipped with a raised shell which does not utilize a refeed bar. This special shell design is primarily used for low and medium viscose products. This results in lower maintenance due to the reduction of installed wear parts and, in many cases, higher potential machine speeds due to the lack of frictional forces of the refeed bar.



Optional:

- » Smooth shell with refeed bar can also be operated on the **BernDrop® AD200** system to increase production range



- » Geometry of outer shell allows elimination of refeed bar
- » Lower maintenance due to reduction of wear parts
- » Higher possible machine speeds

The following Feeding Devices produce a sheet of molten product on the Steel Belt. With a Breaker at the discharge end, the manufactured product sheet can be sized to the required flake size.

BernFlow®

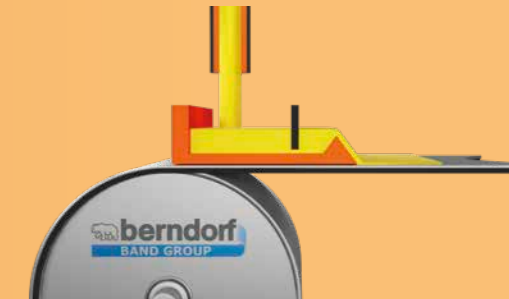
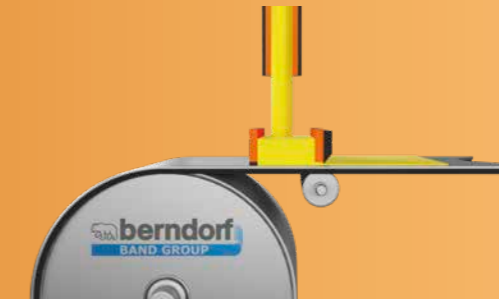
The **BernFlow®** frame structure is equipped with adjusting screws making it possible to assemble the Feeding Device with sliding rails and housing for fume extraction. To regulate the product thickness within the required tolerance, an adjustable knife is located at the bottom of the Feeding Device.

Casting Box

The heated Casting Box is a three-sided device made of stainless steel. Depending on product characteristics, the system can be heated by means of electric, thermal oil or steam heating elements which can be set up to 250 °C | 482 °F. The thickness of the product is determined by manually adjusting the distance between the front gate of the Casting Box and the Steel Belt. The Casting Box can accurately hold product tolerances for thin products of only a few millimeters and has no limitation on thicker products.

Overflow Weir

The Overflow Weir Feeder can be heated with steam, hot oil, or electricity and is suitable for low to medium viscosity products. The Weir is used to pump the product into the tank, and when the level exceeds its volume, the liquid overflows onto the Steel Belt. As a result, the liquid level is established and controlled by the feeding pump. Overflow Weirs are extremely efficient and provide a layer of product on the Steel Belt without any moving parts.



Technical facts of the feeding devices

| | BernDrop® with raised shell, no refeed bar | BernDrop® with refeed bar | BernFlow® | Casting Box | Overflow Weir |
|--|---|---|---|---|---|
| Shape of final product | Pastilles | Pastilles | Flakes | Flakes | Flakes |
| Viscosity | 2 - 10,000 mPa.s | 2 - 50,000 mPa.s | 2,000 - 50,000 mPa.s | 100 - 50,000 mPa.s | 100 - 4,000 mPa.s |
| Product temperature | max. 250 °C 482 °F Higher temperatures on demand | max. 250 °C 482 °F Higher temperatures on demand | max. 230 °C 446 °F Higher temperatures on demand | max. 250 °C 482 °F Higher temperatures on demand | max. 250 °C 482 °F Higher temperatures on demand |
| Heating medium | Hot water, steam or thermal oil | Hot water, steam or thermal oil | Steam or thermal oil | Electric, steam or thermal oil | Electric, steam or thermal oil |
| Typical applications | Sulphur, sulphur bentonite, resins, waxes | Resins, waxes, hot melts, adhesives and many more | Resins, waxes, hot melts | Resins, waxes | Resins, chemical additives |
| Standard widths for all Feeding Devices* | 300 mm 12" • 600 mm 24" • 800 mm 32" • 1,000 mm 40" • 1,200 mm 48" • 1,500 mm 60" | | | | |
| Materials | All materials in contact with the product are made of stainless steel (SS304 and SS316L) | | | | |

*Further widths available on request.

Downstream Devices

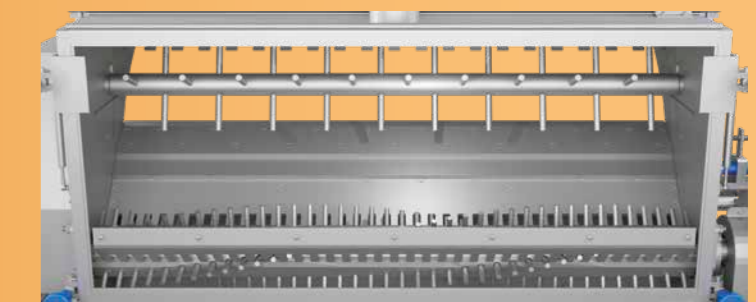
Product Breaker

The system consists of two Breaker shafts working together to produce randomly shaped flakes. The average desired flake size is approximately 6.35 mm | ¼", however, the size can be modified depending on the design and spacing of the bottom (fine) Breaker shaft.

All pins are fully welded to the Breaker shaft and are made of 316 stainless steel, while the housing is made of 304 stainless steel. Other types of Breaker available upon request. The end result of all our Breakers is a clean and durable system for a variety of products and industries.

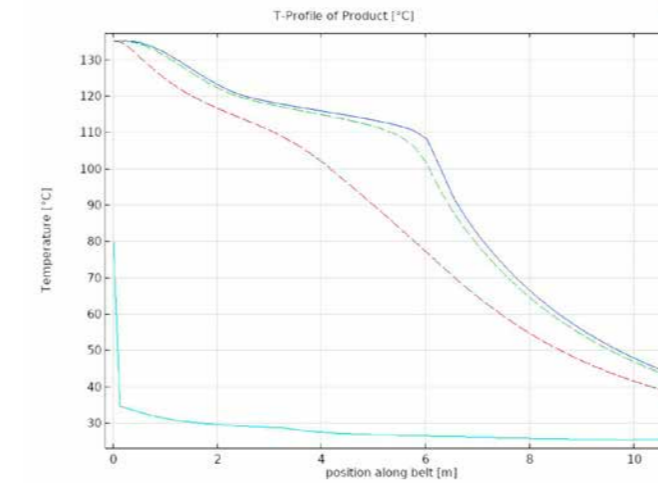


- » Easy access to breaker housing
- » Good ergonomics
- » Operability in complete safety



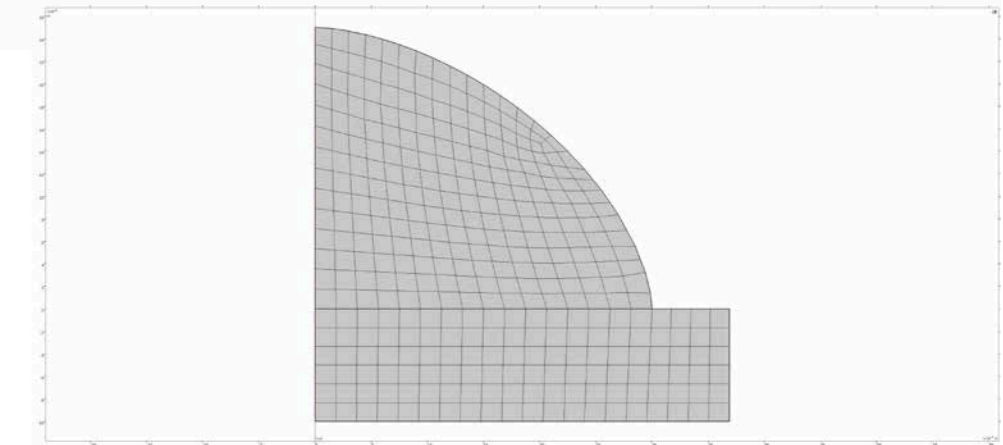
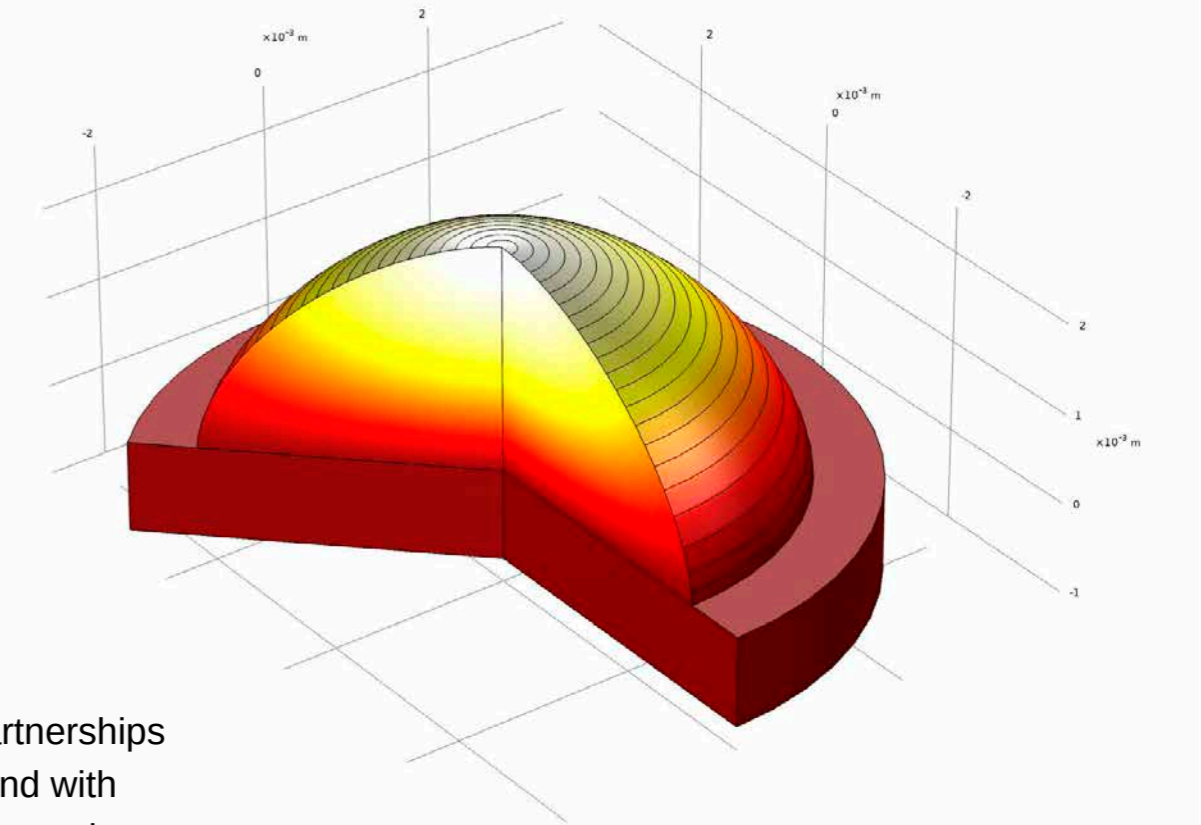
Application area of Process Equipment

| | | | | |
|--------------------------------|---|----------------------------|---|---------------------------|
| Low viscous / Basic chemicals | Resins | Waxes | Oleo chemicals/fat chemicals (acid, alcohol, amide, ester stearate) | |
| High viscous / Basic chemicals | Adhesive | Resins | Waxes | Hot melts |
| Fine chemicals | For production of micropastilles down to 0.8 mm diameter (up to 36 mm) - i.e. additives, UV stabilizer, waxes | | | |
| Special chemical products | Corrosive (i.e. aluminum sulphate, calcium & magnesium chloride) | Abrasive (with suspension) | Subcooling melts | High temperature products |
| Black chemical products | Bitumen | Pitch | Asphaltene | |
| Powder paint | Powder paint | | | |



Simulation tools

The Berndorf Band Group relies on long-term partnerships with its customers. Our efforts therefore do not end with the implementation of our Belt Systems but go beyond. A simulation tool has been developed especially for the optimization of customer processes, which allows the virtual variation of cooling zone temperatures in order to show the effects on production. This development enables our customers to draw valuable conclusions even before expensive investments are made. Our knowledge and expertise will ensure your success.



Steel Belts for the chemical industry - physical and mechanical properties. Typical values.

| Material | | | NICRO 12.1 | NICRO 22 | NICRO 31 | NICRO 52 | NICRO 52.6 | NICRO 85 | NICRO 94 | TITANIUM |
|---|-------------------------------|--------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|---------------|
| Type | | | CrNi 17 7 | CrNiMo 17 12 2 | CrNiTi 13 4 | CrNiCuTi 15 7 | CrNiCuTi 15 7 | CrNiMoN 25 7 4 | CrNiMoN 22 5 3 | Grade 2 |
| Similar material | DIN AISI | | 1.4310 301 | 1.4401 316 | 1.4313 - | - - | - - | 1.4410 - | 1.4462 - | 3.7035 - |
| Tensile strength | at 20 °C at 68 °F | N/mm ² psi | 1,150 166,800 | 1,100 159,500 | 1,080 156,600 | 1,150 166,800 | 1,550 224,800 | 1,350 195,800 | 1,400 203,100 | 390 56,600 |
| 0.2 %-offset yield strength | at 20 °C at 68 °F | N/mm ² psi | 950 137,800 | 970 140,700 | 1,050 152,300 | 1,100 159,500 | 1,500 217,600 | 1,250 181,300 | 1,050 152,300 | 275 39,900 |
| Hardness | Rockwell HRC Vickers HV 10 | | 37.0 360 | 33.0 330 | 33.0 330 | 37.0 360 | 48.0 480 | 39.0 380 | 36.0 350 | - 160 |
| Elongation 50 mm 1.97 in | | % | 18 | 12 | 5 | 8 | 6 | 6 | 9.5 | 20 |
| Welding factor | | | 0.70 | 0.65 | 0.95 | 0.95 | 0.80 | 0.70 | 0.65 | 0.95 |
| Fatigue strength under reversed bending stress* | at 20 °C at 68 °F | N/mm ² psi | 480 69,600 | 440 63,800 | 480 69,600 | 500 72,500 | 700 101,500 | 385 55,900 | 450 65,300 | 250 36,300 |
| Modulus of elasticity | at 20 °C | N/mm ² | 200,000 | 200,000 | 205,000 | 200,000 | 200,000 | 200,000 | 200,000 | 106,000 |
| | at 200 °C | N/mm ² | 180,000 | 180,000 | - | 188,000 | 188,000 | 186,000 | 184,000 | - |
| | at 68 °F | ksi | 29,000 | 29,000 | 29,700 | 29,000 | 29,000 | 29,000 | 29,000 | 15,400 |
| | at 392 °F | ksi | 26,100 | 26,100 | - | 27,300 | 27,300 | 27,000 | 26,700 | - |
| Density | | kg/dm ³ | 7.90 | 7.95 | 7.70 | 7.74 | 7.74 | 7.80 | 7.80 | 4.53 |
| | | lb/in ³ | 0.29 | 0.29 | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 | 0.16 |
| Mean coefficient of thermal expansion | 20-100 °C | 10 ⁻⁶ m/m°C | 16.0 | 16.5 | 10.8 | 10.9 | 10.9 | 13.0 | 13.3 | 8.5 |
| | 20-200 °C | 10 ⁻⁶ m/m°C | 17.0 | 17.5 | 11.2 | 11.5 | 11.5 | 13.5 | 13.8 | 8.9 |
| | 20-300 °C | 10 ⁻⁶ m/m°C | - | - | 11.7 | 11.7 | 11.7 | 14.0 | 14.2 | - |
| | 20-400 °C | 10 ⁻⁶ m/m°C | - | - | - | - | - | - | - | - |
| | 68-212 °F | 10 ⁻⁶ in/in°F | 8.9 | 9.2 | 6.0 | 6.1 | 6.1 | 7.2 | 7.4 | 4.7 |
| | 68-392 °F | 10 ⁻⁶ in/in°F | 9.4 | 9.7 | 6.2 | 6.4 | 6.4 | 7.5 | 7.7 | 4.9 |
| | 68-572 °F | 10 ⁻⁶ in/in°F | - | - | 6.5 | 6.5 | 6.5 | 7.8 | 7.9 | - |
| | 68-752 °F | 10 ⁻⁶ in/in°F | - | - | - | - | - | - | - | - |
| Specific heat | | J/g°C | 0.50 | 0.50 | 0.46 | 0.50 | 0.50 | 0.50 | 0.50 | 0.52 |
| | | BTU/lb°F | 0.12 | 0.12 | 0.11 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 |
| Thermal conductivity | at 20 °C | W/m°C | 15 | 15 | 21 | 16 | 16 | 15 | 15 | 20 |
| | at 68 °F | BTU/hr ft°F | 8.7 | 8.7 | 12.1 | 9.3 | 9.3 | 8.7 | 8.7 | 11.6 |
| Specific electric resistance | at 20 °C | Ω mm ² /m | 0.73 | 0.75 | 0.60 | 0.80 | 0.80 | 0.80 | 0.80 | 0.78 |
| | at 68 °F | μΩ in | 28.74 | 29.53 | 23.62 | 31.50 | 31.50 | 31.50 | 31.50 | 30.71 |
| Min. permissible operating temperature | | °C | -196 | -196 | - | - | - | -50 | -50 | - |
| | | °F | -321 | -321 | - | - | - | -58 | -58 | - |
| Max. permissible operating temperature | | °C | 250 | 250 | 350 | 350 | 350 | 250 | 250 | 250 |
| | | °F | 482 | 482 | 662 | 662 | 662 | 482 | 482 | 482 |
| Tensile strength at max. permissible operating temperature | | N/mm ² | 940 | 870 | 970 | 900 | 1,250 | 1,070 | 1,130 | 225 |
| | | psi | 136,300 | 126,200 | 140,700 | 130,500 | 181,300 | 155,200 | 163,900 | 32,600 |
| 0.2 %-offset yield strength at max. permissible operating temperature | | N/mm ² | 770 | 770 | 930 | 830 | 1,180 | 1,020 | 990 | 135 |
| | | psi | 111,700 | 111,700 | 134,900 | 120,400 | 171,100 | 147,900 | 143,600 | 19,600 |

Special materials available upon request.

*50% of the test specimens withstand 2,000,000 load cycles. If not otherwise specified, the values given apply at room temperature. Subject to change due to technological progress. Errors and omissions excepted.

Steel Belt equipment

Vee-ropes & Product Retaining Strips

Berndorf Band Group guarantees perfect adhesion of Vee-ropes and Product Retaining Strips.

| Vee-rope-material | Operating temperatures |
|---------------------------------|--|
| Nitrile rubber | -20 °C to +100 °C -4 °F to +212 °F |
| Natural rubber | -60 °C to +60 °C -76 °F to +140 °F |
| Stainless steel spiral vee-rope | up to the max. permissible operating temperature of the respective Belt material |

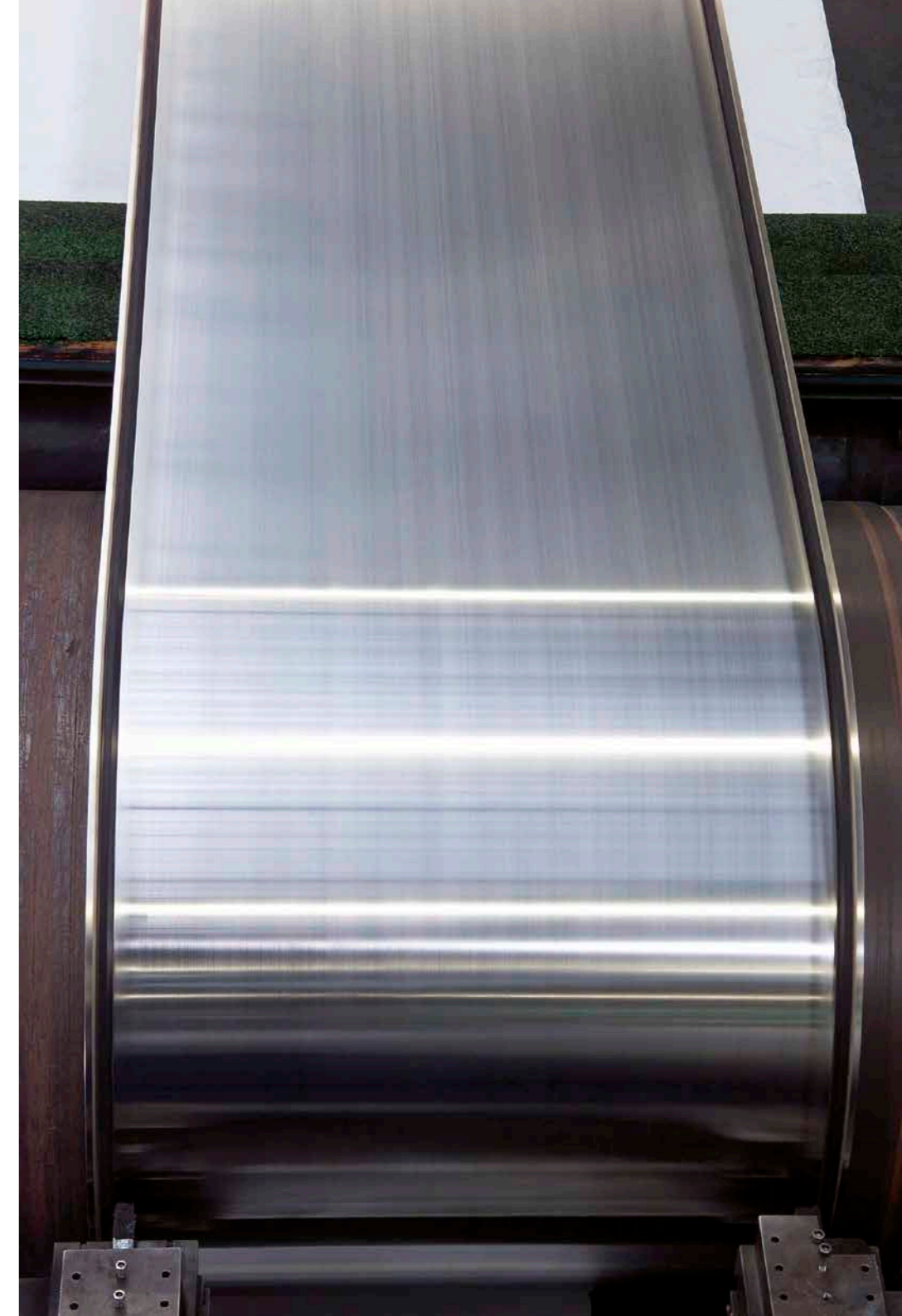
| Retaining Strip-material | Operating temperatures |
|--------------------------|--|
| Nitrile rubber | -20 °C to +100 °C -4 °F to +212 °F |
| Natural rubber | -60 °C to +60 °C -76 °F to +140 °F |
| Silicone rubber | -80 °C to +300 °C -112 °F to +572 °F |

Guiding/Supporting Sheaves & Drums

A wide range of Guiding/Supporting Sheaves and Drums as well as alternative Belt Tracking Systems are available to keep the belt tension aligned.

For further information including an overview of the Belt Tracking solutions please contact your Berndorf Band Group representative or visit


www.berndorfband-group.com.





The application areas for Steel Belts and Belt Systems of Berndorf Band Group are as broad and individual as your requirements. Give us the opportunity to discuss your goals in a personal meeting. Together we will find the right solution for your requirements.

Our worldwide sales and service network available on www.berndorfband-group.com

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