

# Process Equipment for the Sulphur Industry

Solidification and Cooling Systems







## Solidification & Cooling Systems for the Sulphur Industry

The Berndorf Band Group has stood for quality and innovation in the fields of engineering and manufacturing since 1843. We continue to be a leading company in the sulphur industry with dozens of successful Cooling and Solidification System installations for the processing of sulphur and sulphur derivatives worldwide.

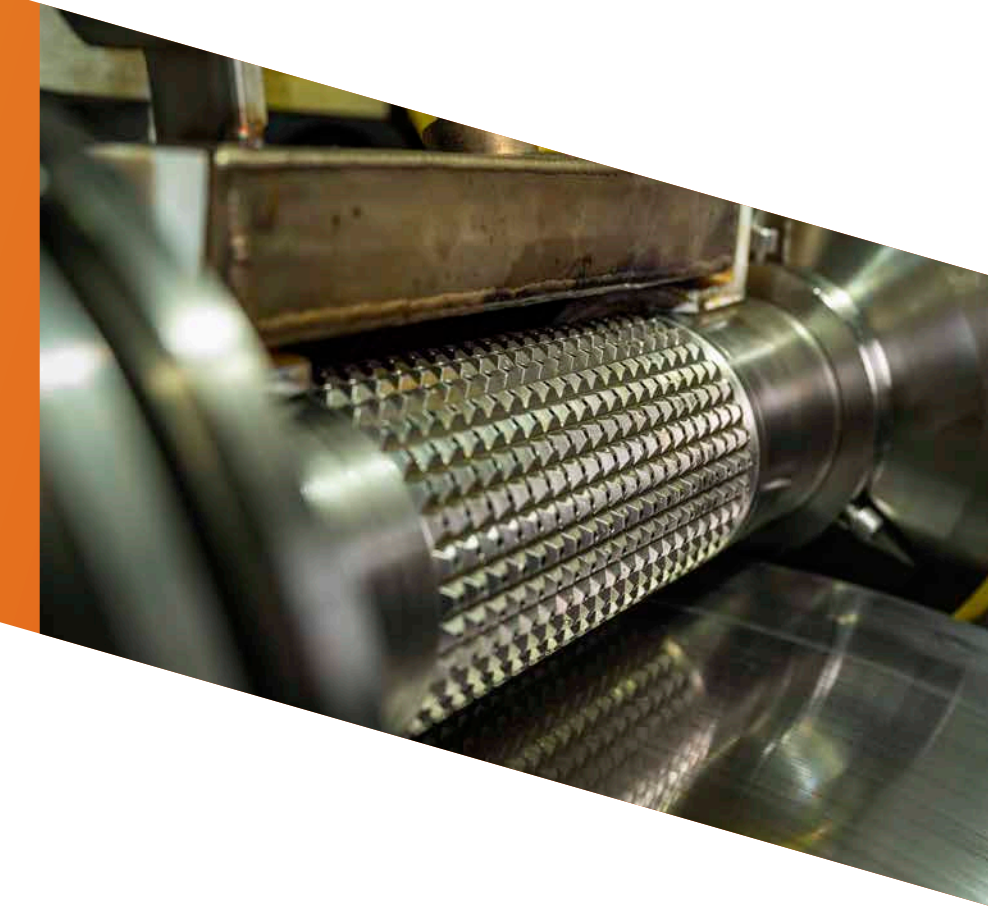
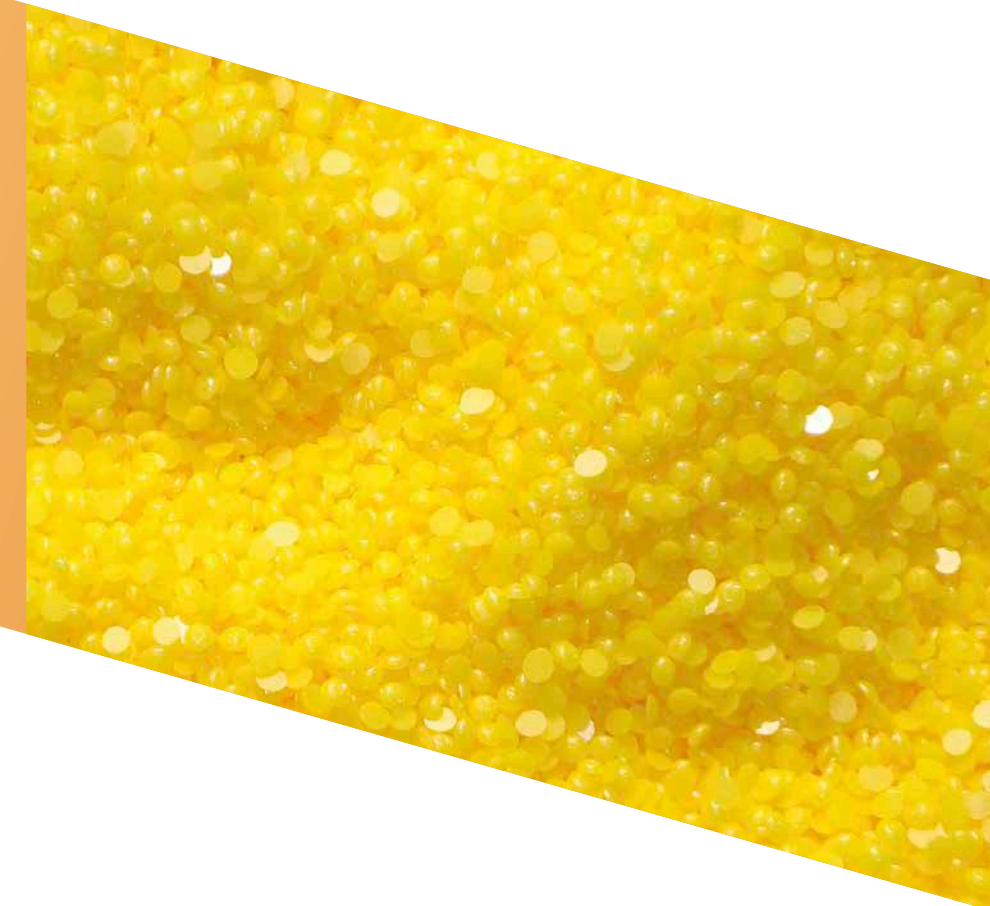
Our expertise extends far beyond the solidification process. Berndorf Band Group is your reliable partner for turn-key applications. Our expertise includes additional upstream and downstream processes, liquid sulphur handling, sulphur filtering, downstream material handling and bagging systems.

## Solutions for the Sulphur Industry

Berndorf Band Group covers equipment for the entire production process - from receiving the molten sulphur to solidification, including handling of pastilles, to storage of the sulphur, bagging and/or loading onto trucks or rail.

## Engineering and Consulting Services

The Berndorf Band Group offers a wide range of engineering and consulting services. A team of experts is available to support you in all areas including plant layout design, equipment specifications, and process or technology improvement.



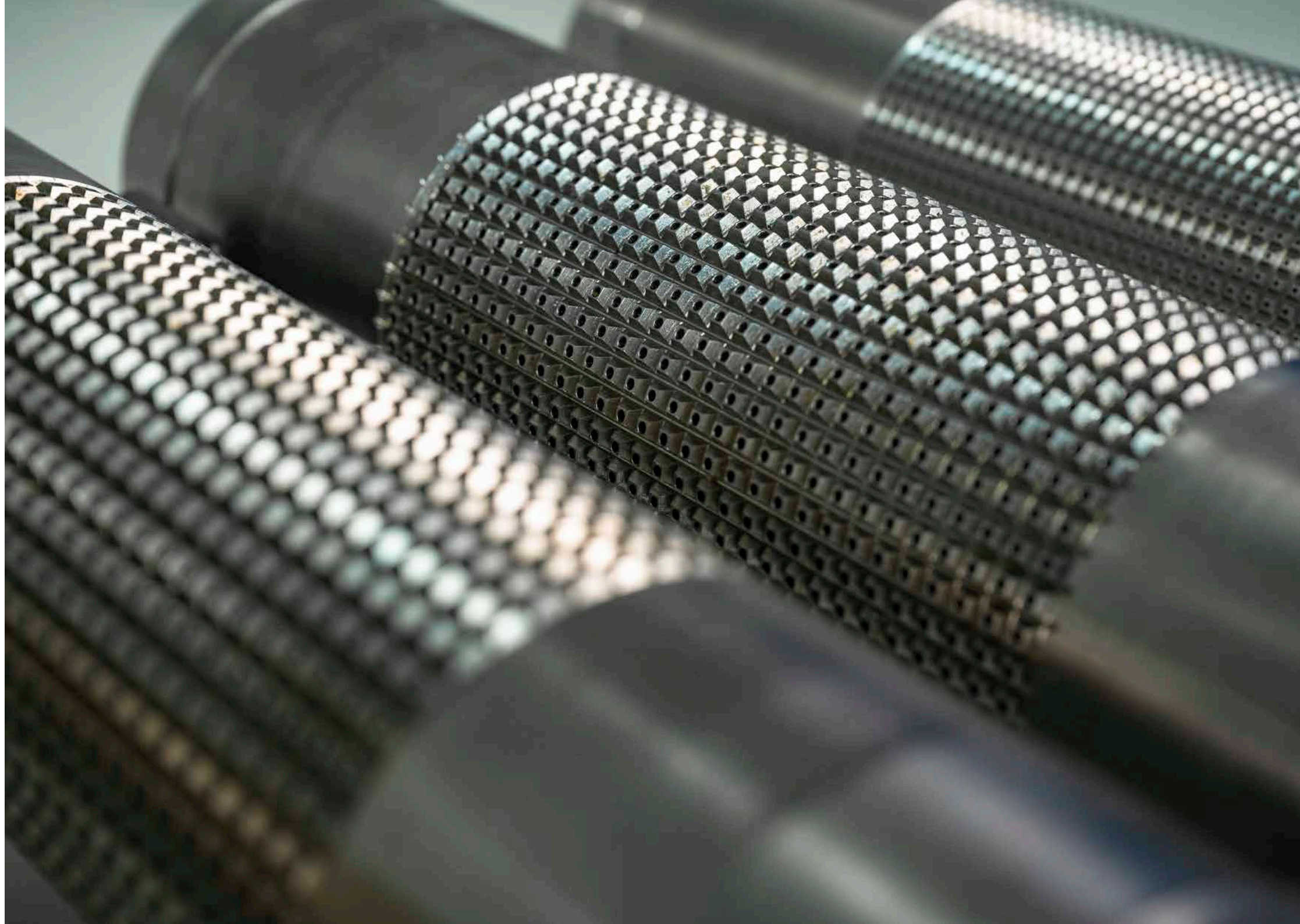


## Sulphur Industry

For an optimal pastillation process, the molten sulphur product must be continuously fed at 130 °C to 140 °C | 266 °F to 284 °F and metered by a sulphur supply pump directly to a jacketed duplex filter before entering the mixing tank. We recommend placing a jacketed duplex filter with wire mesh baskets in the product feed line before the depositor.

The filter will ensure optimal performance of the **BernDrop® AD200** depositor. Afterwards the filtered molten product is transferred to the **BernDrop® AD200** unit at the specified pressure by means of a jacketed pipeline complete with all necessary instrumentation and valves heated by hot steam (or oil). This ensures the product remains in molten form throughout the process.

Each Berndorf Process Equipment System consists of a Steel Belt Cooler equipped with a **BernDrop® AD200** pastillation head which provides uniform size of drops deposited on the running Steel Belt. The rotational speed of the shell is synchronized with the belt speed so that the drops fall on the moving Steel Belt to ensure the pastilles are regular and well-shaped.



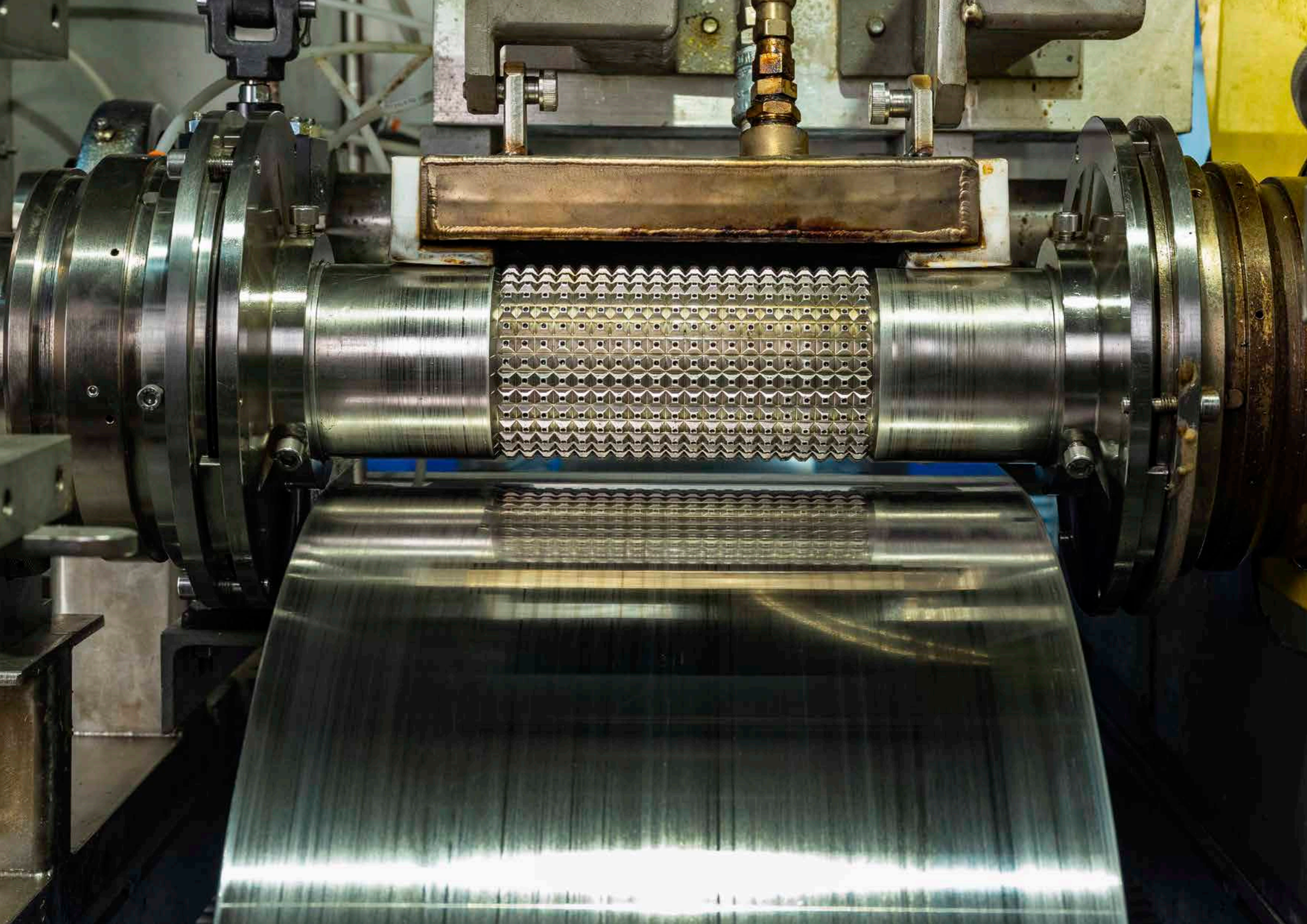
Solidification of the pastilles formed on the Steel Belt occurs due to heat transfer caused by cooling water being sprayed on the underside of the Steel Belt. This is a dry process, the cooling water never encounters the sulphur product.

Each **BernDrop® AD200** is provided with a safety covered hood with doors for inspection and maintenance. In addition to the **BernDrop®** hood, the first cooling zone within the Cooling System is enclosed as well to provide for efficient fume and warm air removal. Sulphur vapors and dust, which are produced by sulphur solidification, are evacuated by an exhaust ventilation system that conveys the air outside the building or working area.

To avoid drops sticking to the Steel Belt, a thin layer of release agent is applied to the running Steel Belt at the feeding terminal before the product is deposited on the Steel Belt. The release agent is prepared and kept mixed in a release agent mixing tank.

Liquid sulphur characteristics	
Operating temperature	130 °C to 140 °C   266 °F to 284 °F
Density @ P, T, kg/m <sup>3</sup>	1,770 - 1,800
Viscosity, mPa-s	8 @ 140 °C
Sulphur content, % weight	At least 99.5 %
H <sub>2</sub> S content	10 - 20 ppm
Operating pressure	3 bar

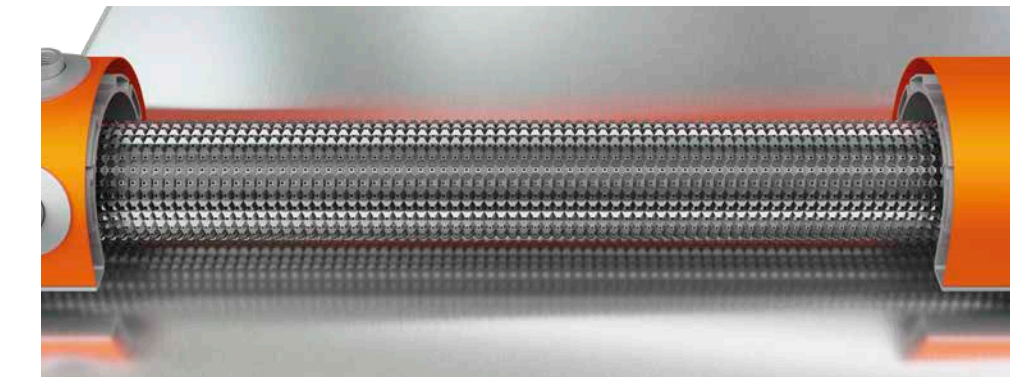
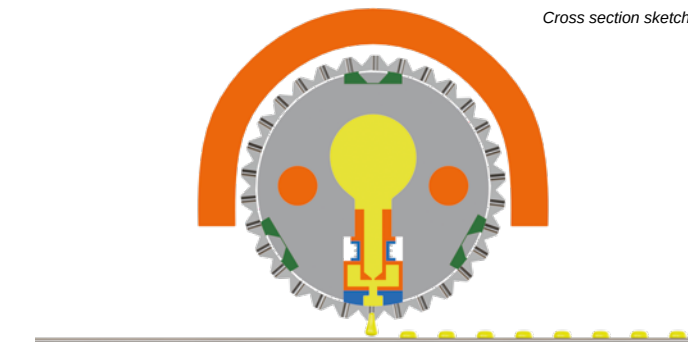




## BernDrop® AD200 - the Solution for Sulphur Solidification

The **BernDrop® AD200** is the world's preferred Feeding Device for the solidification of sulphur and sulphur derivatives. Due to the rotating, special shaped shell design, it can achieve production at higher speeds than the competition. As a result, the **BernDrop® AD200** eliminates the possibility of product deposits on the outer surface of the shell. Any product which remains on the shell surface is forced to the peak to join the next drop.

In addition, this increased surface area causes forced convection, which pre-cools the product and slightly increases viscosity. The result is more capacity and less work for the operator and maintenance staff. The shell design enables a production of sulphur and sulphur derivative pastilles without refeed bar and external seals. Consequently, the **BernDrop® AD200** has the advantage of lower operating costs.



- » Raised shell for optimal pastille quality
- » Refeed bar and external seals not required
- » High production rates and low operating costs
- » Easy accessibility for service and maintenance

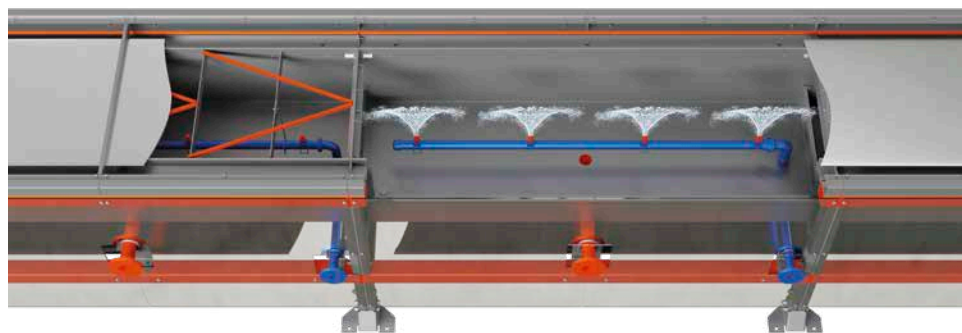
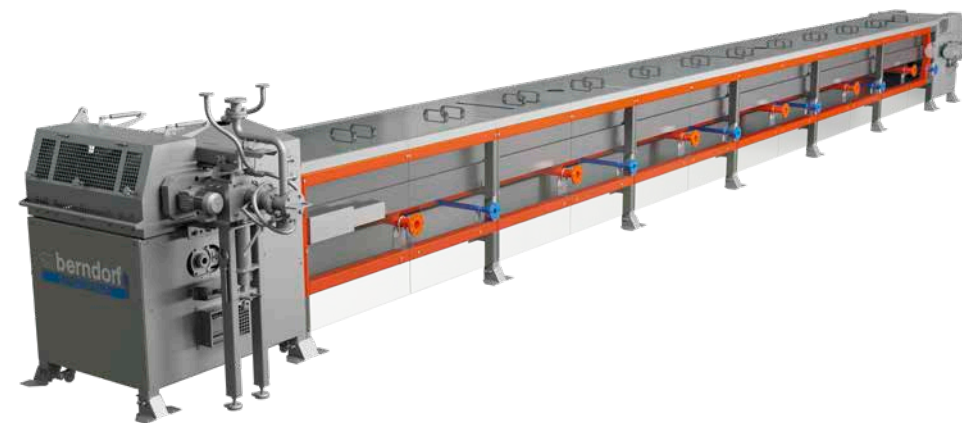


## Cooling Systems

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 of our Cooling Systems are equipped with a large orifice, quick disconnect and spray nozzles that spray cooling water in a full square spray pattern designed for maximum cooling efficiency and maintenance-free operation.



## Steel Belts for the Sulphur Industry - Physical and Mechanical Properties. Typical Values.

Material			NICRO 12.1	NICRO 94
Type			CrNi 17 7	CrNiMoN 22 5 3
Similar material		DIN AISI	1.4310 301	1.4462 -
Tensile strength	at 20 °C at 68 °F	N/mm <sup>2</sup> psi	1,150 166,800	1,400 203,100
0.2 %-offset yield strength	at 20 °C at 68 °F	N/mm <sup>2</sup> psi	950 137,800	1,050 152,300
Hardness		Rockwell HRC Vickers HV 10	37.0 360	36.0 350
Elongation 50 mm   1.97 in		%	18	9.5
Welding factor			0.70	0.65
Fatigue strength under reversed bending stress*	at 20 °C at 68 °F	N/mm <sup>2</sup> psi	480 69,600	450 65,300
Modulus of elasticity	at 20 °C	N/mm <sup>2</sup>	200,000	200,000
	at 200 °C	N/mm <sup>2</sup>	180,000	184,000
	at 68 °F	ksi	29,000	29,000
	at 392 °F	ksi	26,100	26,700
Density		kg/dm <sup>3</sup>	7.90	7.80
		lb/in <sup>3</sup>	0.29	0.28
Mean coefficient of thermal expansion	20-100 °C	10 <sup>-6</sup> m/m°C	16.0	13.3
	20-200 °C	10 <sup>-6</sup> m/m°C	17.0	13.8
	20-300 °C	10 <sup>-6</sup> m/m°C	-	14.2
	20-400 °C	10 <sup>-6</sup> m/m°C	-	-
	68-212 °F	10 <sup>-6</sup> in/in°F	8.9	7.4
	68-392 °F	10 <sup>-6</sup> in/in°F	9.4	7.7
	68-572 °F	10 <sup>-6</sup> in/in°F	-	7.9
	68-752 °F	10 <sup>-6</sup> in/in°F	-	-
Specific heat		J/g°C	0.50	0.50
		BTU/lb°F	0.12	0.12
Thermal conductivity	at 20 °C	W/m°C	15	15
	at 68 °F	BTU/hr ft°F	8.7	8.7
Specific electric resistance	at 20 °C	Ω mm <sup>2</sup> /m	0.73	0.80
	at 68 °F	μΩ in	28.74	31.50
Min. permissible operating temperature		°C	-196	-50
		°F	-321	-58
Max. permissible operating temperature		°C	250	250
		°F	482	482
Tensile strength at max. permissible operating temperature		N/mm <sup>2</sup>	940	1,130
		psi	136,300	163,900
0.2 %-offset yield strength at max. permissible operating temperature		N/mm <sup>2</sup>	770	990
		psi	111,700	143,600

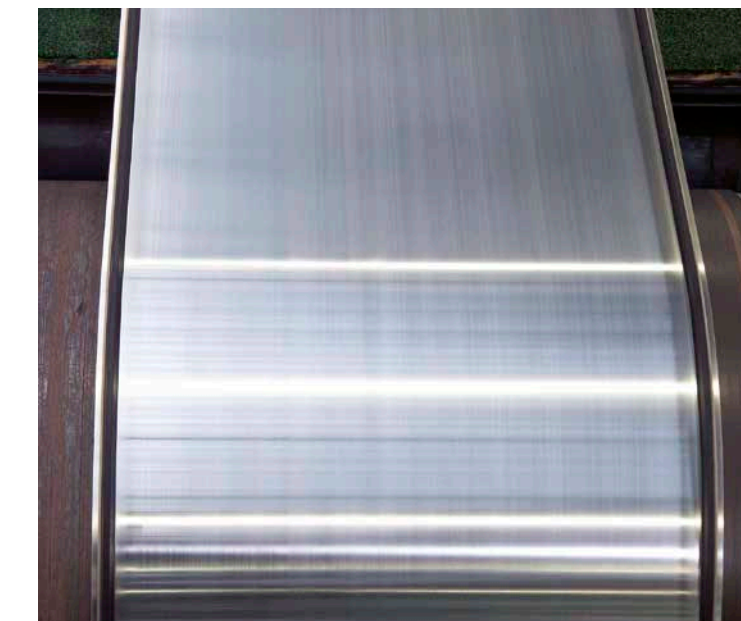
\*50 % of the test specimens withstand 2,000,000 load cycles. If not otherwise specified, the values given apply at room temperature. Subject to change due to technological progress. Errors and omissions excepted. Special materials available upon request.

## Vee-ropes & Retaining Strips

Berndorf Band Group guarantees perfect adhesion of Vee-ropes and 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



## Premium Forming of Pastilles

The Process Equipment of Berndorf Band Group meets the special requirements for the production of high quality pastilles. Experts are continuously developing our Solidification and Cooling Systems to meet the specifications of SUDIC premium quality.

Our main goal is to provide our customers with sulphur pastilles of the highest quality according to SUDIC standards and thus enable easy and safe transport of sulphur. Our customers can rely on the following when it comes to environment and safety.

- » Good flow characteristics as well as consistent high purity and quality
- » Uniform size and therefore good characteristics for blending and transporting
- » High angle of repose
- » Low dust and moisture content of the pastilles
- » Easy operation and maintenance of the entire portfolio
- » Minimal environmental impact
- » Maximum versatility and consistent quality

## SUDIC specifications

The Process Equipment of Berndorf Band Group meets the standard for premium quality sulphur pastilles.

- Mean size:** 2 - 5 mm
- Size distribution:**
  - < 5 %; > 4.75 mm
  - minimum 75 %; 2.4 - 4.4 mm
  - < 2 % smaller than 1.18 mm
  - < 0.1 % smaller than 0.3 mm
- Moisture:** < 0,5 % by weight
- Friability:**
  - < 1 % fines (< 0.3 mm) under stress level I
  - less than 2 % fines (< 0.3 mm) under stress level II
- Bulk density:**
  - Loose: > 1,040 kg/m<sup>3</sup>
  - Compacted/agitated: > 1,200 kg/m<sup>3</sup>
- Angle of repose:** > 25°



Berndorf Band Group is the world leader in producing environmentally friendly and innovative Process Equipment for the sulphur industry.




*Peter Riedl*  
President, Berndorf Belt Technology & SBS Steel Belt Systems USA



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](http://www.berndorfband-group.com)

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