KÖLLEMANN

CONVEYING, PROCESS &
ENVIRONMENTAL TECHNOLOGY

Company
Products
Engineering
Service
Contact

# OUR COMPANY – WHO WE ARE AND WHAT DRIVES US.

**KÖLLEMANN GmbH** in Adenau stands for customer-oriented process solutions in all areas of conveying and processing engineering.

Our fields of business: For more than 60 years, we have been operating in all areas of the chemical industry, energy and power plant technology, the cement industry and in the iron, steel and aluminium business and other ores as well as anode production. Our solutions are also used in any segment, where reliable conveying, heat treatment, cooling, mixing, metering, or feeding of bulk materials and shutting off of process chambers is required.

## QUALITY

The experienced employees of KÖLLEMANN in plant design, engineering, project management, design, production and service ensure our high-quality standards. Customised solutions to problems in continuous processes, in which potentially explosive, aggressive, abrasive or sensitive bulk products are processed are just as much our strength as the production of process components that guarantee you careful product handling and, due to their conservative design, have a long service-life.

KÖLLEMANN is certified in accordance with ISO 9001:2015 and additionally certified in the area of environmental management in compliance with ISO 14001. Furthermore, we have all the necessary approvals to manufacture pressure vessels in conformity with AD2000 or EN 13445.

## ENGINEERING

Our highly qualified engineers and technicians provide you with comprehensive and competent advice for each task. Our product portfolio contains customer-oriented solutions, we produce almost no standard products in volume. This means for our customers that we create and produce each machine as a 3D model according to your specific requirements and can thus offer the best solution for each application.

We are also rising to new challenges: in the field of environmental technology, KÖLLEMANN already features many applications. For example, we help to recover heat energy in the production of cement, which has low $CO_2$ emissions (see page 14), as well as in the drying of sewage sludge, in order to make efficient use of the energy it contains.

## CUSTOMER ORIENTED SOLUTIONS

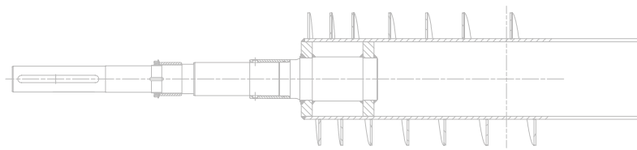
Our actions are focused on meeting your progressing requirements. Each KÖLLEMANN product is precisely adapted to the customer's industry and application: from the engineering through to the assembly of the ready to dispatch machine.

## SERVICE

**ASSEMBLY/COMMISSIONING**
Proper skilled installation is the best way to ensure that our products are installed in your plants without a hitch. We will be pleased to carry out the assembly, installation and commissioning for you.

**MAINTENANCE**
Our customers can also rely on us to for maintenance work on KÖLLEMANN products. We can provide the service directly on site or carry out overhaul or repair work in our factory, according to your needs.

**FULL-SERVICE AGREEMENTS**
We do offer full-service agreements specified to your individual needs. We take care of the servicing, maintenance and repairs of our own and as well as third party products.



# PREHEATER.

**KÖLLEMANN preheaters** are used to heat up petroleum coke. Petroleum coke is a residue formed as a by-product of petroleum refining and is made of almost pure carbon. KÖLLEMANN preheaters perform the heating process and heat the product from at least 0°C to approx. 200°C. The heated petroleum coke is then mixed with hot pitch in a kneader. The paste formed is then pressed into a block shape. These blocks are then baked and represent the anode, which is used in the Hall-Héroult process (electrolysis) for the reduction of aluminium.

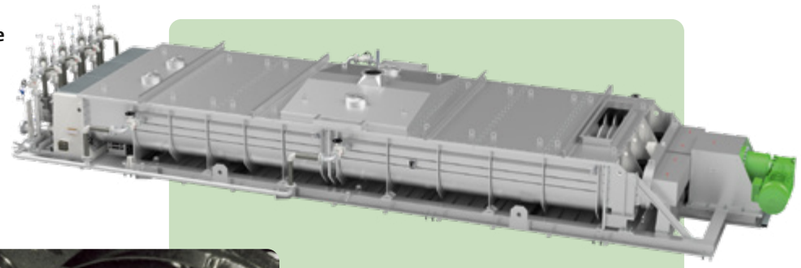
Due to their state of the art design KÖLLEMANN preheaters stand out from other available products on the world market. This design offers decisive advantages for maintenance, life, efficiency and required space. By applying the hollow flight principle our preheaters offer maximum performance within the smallest possible space. The modular insulation is on one side maintenance friendly due to rapidly removable panels and insures on the other side by minimizing radiation losses best possible exploitation of the supplied heat.

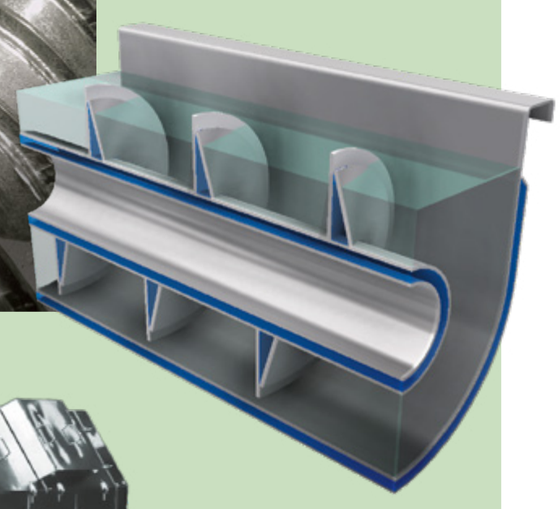
One challenge mastered by extensive development is the compensation of the thermal expansion of the worm shaft, which is completely absorbed by the especially developed KÖLLEMANN carbon bearings, with the smallest possible maintenance work and costs. The tongue-shaped shaft passages enable individual worm shafts to be replaced easily without dismantling the end wall or the other shafts. This minimises downtime significantly.

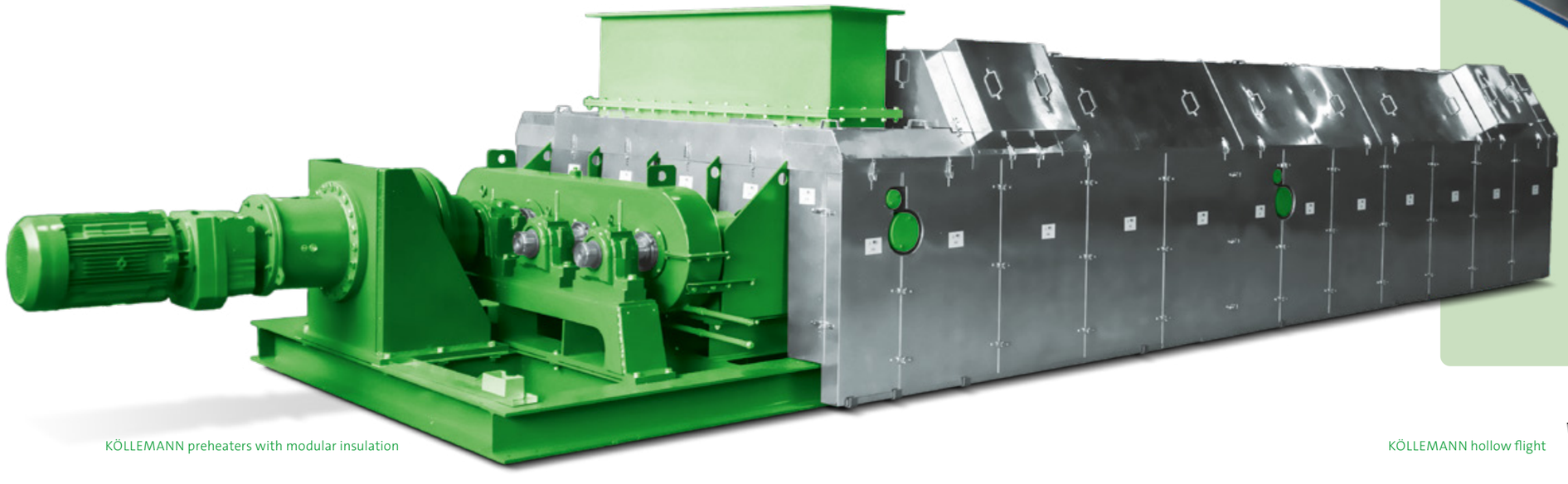
The product range extends from preheaters with a throughput rate of 5 to 60 t/h. On request, the delivery is completed by including especially adapted piping with modular insulation, enabling connections to a central inlet and outlet point. All necessary valves, flow meters and temperature measurements can be delivered or will be installed on demand.

## DATA

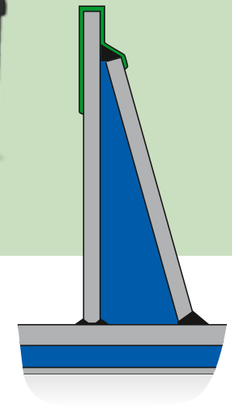
- **Throughput rate up to 60t/h (currently, might be increased later)**
- **Product temperatures up to 220°C**
- **Modular insulation**
- **The entire unit is placed on a solid frame, no individual foundation**
- **The world's largest machines are made by KÖLLEMANN**







KÖLLEMANN preheaters with modular insulation



KÖLLEMANN hollow flight

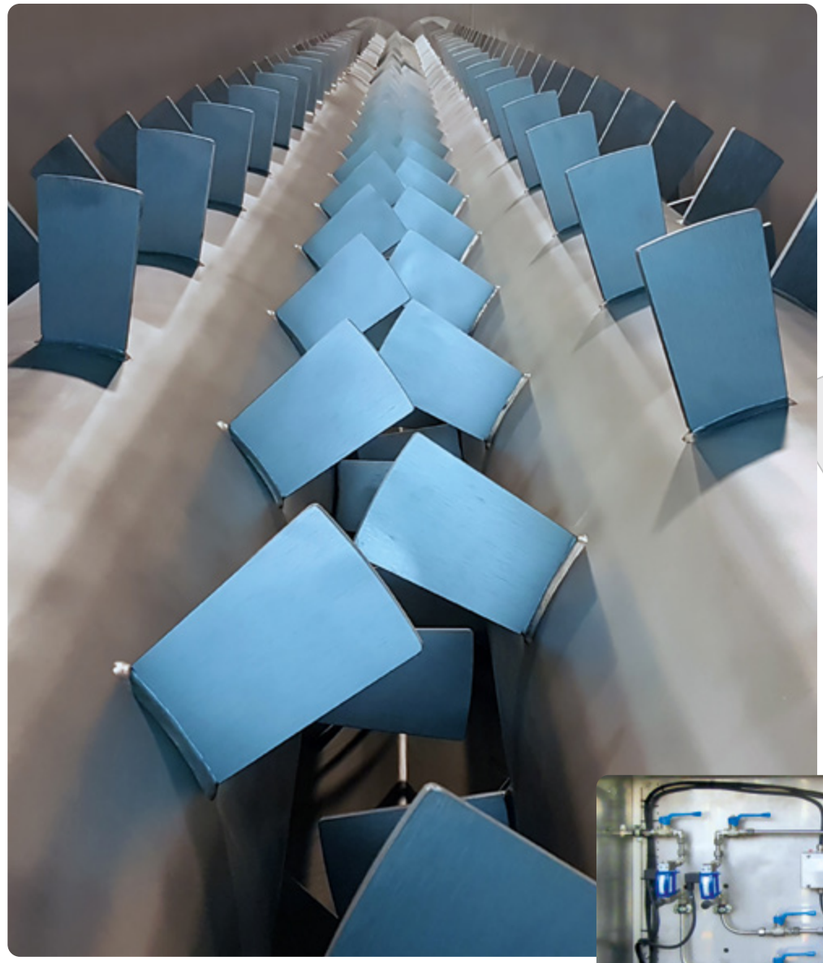
# POLYMER ADDITIVE MIXERS.

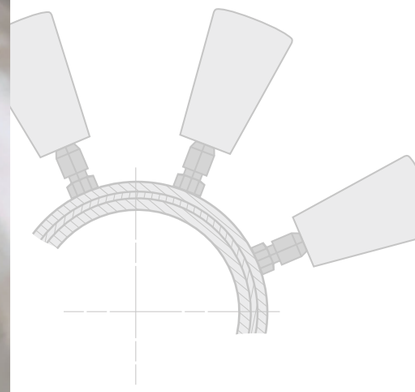
**KÖLLEMANN polymer additive mixers** are generally used to mix plastic products such as HDPE (high-density polyethylene) and PP (polypropylene) or olefins.

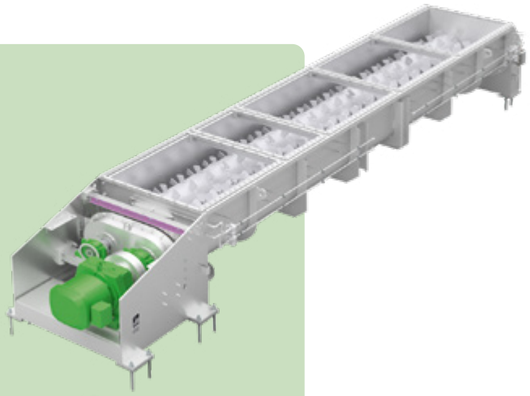
In most cases the mixer is installed upstream of the extruder, which takes the mixture of raw product and diverse additives and produces pellets for use by end customers. Through large surfaces and perfected engineering for the design of the tool geometries, a controlled and high-quality mixture is achieved and at the same time, unwanted heating-up of the product is avoided.

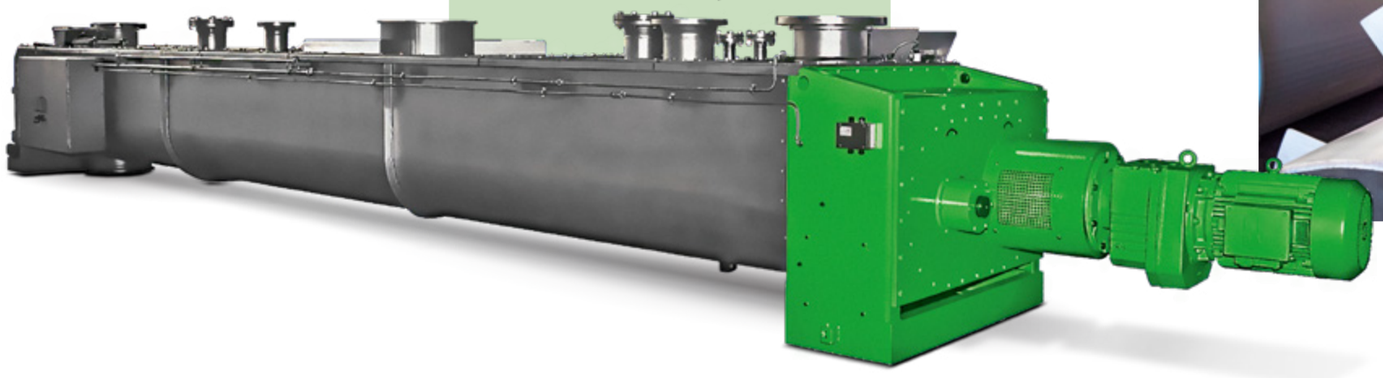
To ensure explosion protection, even in the standard version, it is possible to use nitrogen purging to safeguard the product chamber and the shaftpassages against the ingression of oxygen and to produce an inert atmosphere. We use nitrogen flowmeters with HART signal, pressure measurement in the product chamber and speed monitoring to satisfy growing standards regarding monitoring and control.

We offer an additional bag filter with automatic, differential pressure-controlled cleaning placed in the outlet area to avoid any overpressure in the product chamber due to upstream or downstream components and due to the nitrogen application. All instruments required are housed in a user-friendly, protective and visually appealing stainless-steel control cabinet.









Nitrogen piping

## DATA

- **Mixer length up to 14,500mm (distance from inlet to outlet)**
- **Without internal bearings**
- **Practically maintenance-free**
- **Throughput rates >200m³/h**
- **Minimum nitrogen consumption**

# SELF-CLEANING SCREW-HEAT EXCHANGERS.

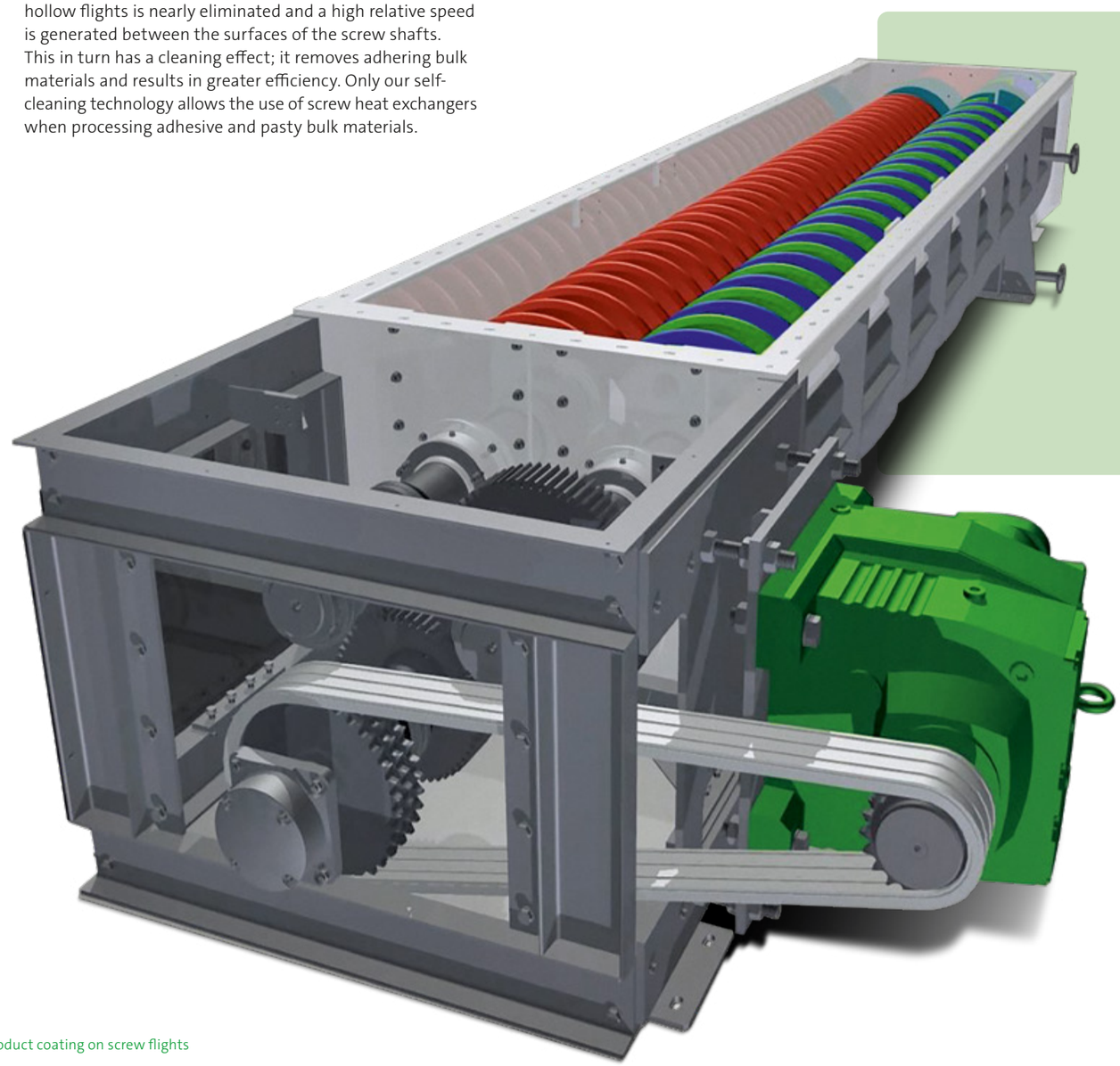
With **KÖLLEMANN screw-heat exchangers,** bulk materials receive the perfect thermal treatment. KÖLLEMANN self-cleaning screw heat exchangers differ with their special design from the standard models available on the world market. The proven hollow flight principle in combination with the well-proven self-cleaning system is key to the success of our product.

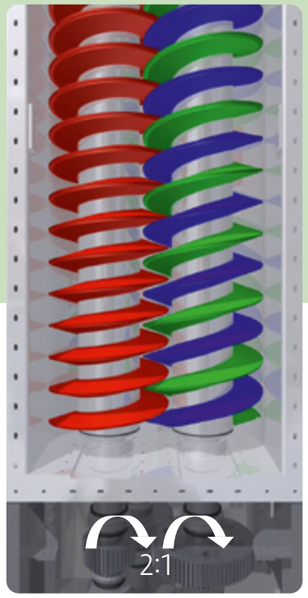
As some bulk products tend to form adhesions and tend to be bridging, they often build an insulating layer on the hollow flights. Depending on the condition of your bulk product, sludge or paste, the self-cleaning provides a proven, reliable option for the screw-heat exchanger, which ensures uniformly clean hollow flight surfaces. As these constitute the main surfaces for heat transfer, efficient operation can thus be ensured.

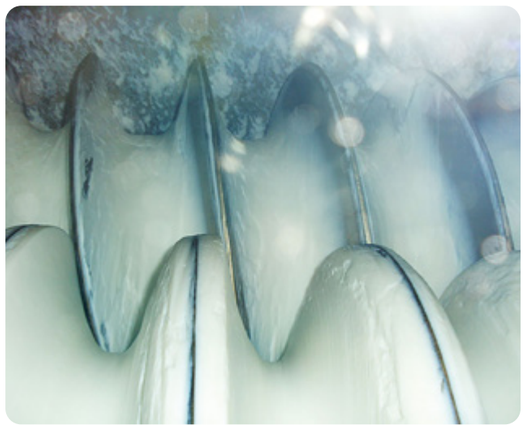
By using a special geometry, the gap in-between the hollow flights is nearly eliminated and a high relative speed is generated between the surfaces of the screw shafts. This in turn has a cleaning effect; it removes adhering bulk materials and results in greater efficiency. Only our self-cleaning technology allows the use of screw heat exchangers when processing adhesive and pasty bulk materials.

To achieve the above-named properties, the specially designed shafts are operated with equidirectional rotation, a speed ratio of 2:1 (shaft 1 to shaft 2) and relatively small spacings.

The temperature range of the screw-heat exchanges extends from 1200°C (cooling) to over 220°C (heating) with heat transfer media temperatures above 350°C.





Product coating on screw flights

## DATA

- **Forced mechanical cleaning**
- **High shear forces**
- **Clean surfaces ensure efficient energy transport**
- **Speed ratio of the shafts 2:1 (same rotational direction)**
- **Conveyed material consistence up to Vaseline-like/silicone**

# COOLING-SCREW CONVEYORS

**KÖLLEMANN cooling-screw conveyors** are used for the cooling of all kinds of bulk materials and pasty media. Specialised cooling screw conveyor products are available for different application areas and bulk material formulations. It is suitable for all applications where not only careful handling of the bulk product is required, but also strict separation of cooling medium and bulk product. KÖLLEMANN cooling screw conveyors can be used, among other things, for bottom ash, fly ash, sewage sludge, cement, salts, plastics, pyrolysis waste, cyanide, and pastes of all formulations.

Due to their design, KÖLLEMANN screw-heat exchangers differ from the standard models available on the market mainly due to the proven and tested hollow flight principle, which combines several advantages. The most outstanding advantage is the achievable power density – compared to energy transfer via shaft tube and trough (housing) only, the hollow flight principle reaches a far greater transfer performance. This results in higher efficiency, or rather a smaller machine is required for a specific output and applications within higher output ranges are made possible by the hollow flight principle.

The application and temperature range of the cooling screw conveyors extends up to 1,200°C. Through active cooling of all surfaces touched by the product, long service life and low material impact can be accomplished.

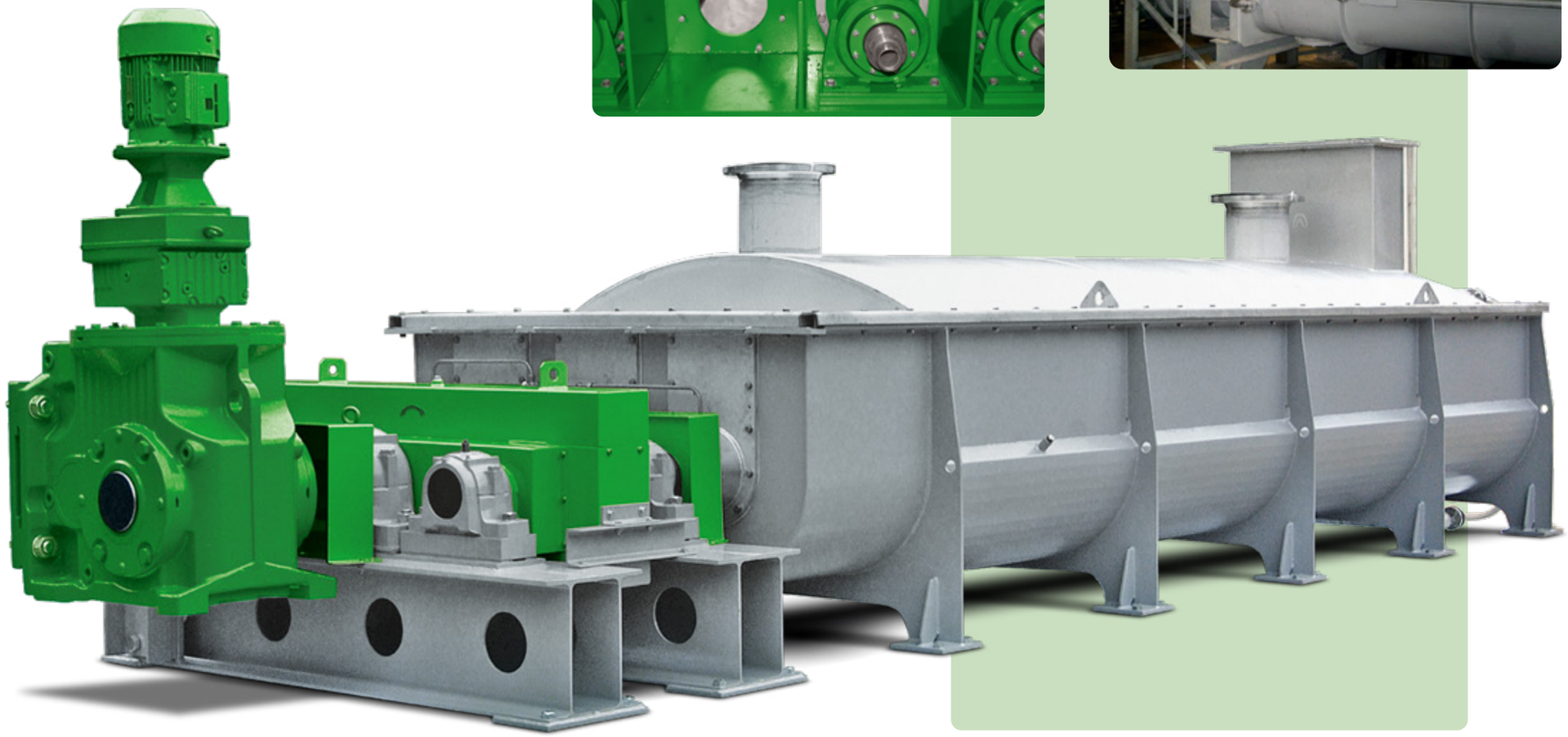
There are hardly any limits to their use – direct removal from the fluidised bed is just as easy for KÖLLEMANN cooling screw conveyors as their use in cooler cascades to gently control the temperature of large volume and mass flow rates. The proven KÖLLEMANN self-cleaning principle is advisable for use with highly adhesive or pasty bulk products. Thanks to the perfected shaft geometry, good conveyability of problematic bulk materials and outstanding heat transfer is possible.

Due to production in accordance with standards for pressure equipment directives, a high degree of safety in ensured in handling the heat transfer media.

## DATA

- **Suitable for temperatures up to 1200°C**
- **Use of proven and tested hollow flights**
- **Safe and reliable separation of heat transfer medium and bulk material**
- **Single or multiple shaft version**
- **Suitable for all bulk materials**
- **On request, with piping, fittings and valves**

Individually removable shafts



# HEATING-SCREW CONVEYOR DRYERS.

**KÖLLEMANN heating screw conveyors** are typically used for heating, drying or the heat treatment of all types of bulk products such as petroleum coke, pasty media, dust, pastes and sludges. KÖLLEMANN heating screw conveyors introduce a defined quantity of heat into the product to heat or melt it, to evaporate liquid components or to start or end a reaction.

KÖLLEMANN heating screw conveyors are different from other products available on the world market due to their well thought-through design, which provides decisive advantages for maintenance, life, efficiency and the space required. Our heating screw conveyors offer through use of the tried and tested hollow flight principle maximum performance in the smallest possible space. The modular insulation is extremely maintenance-friendly, thanks to the quickly removable panels and ensures the best possible utilisation of the process-heat added, by minimising radiation losses.

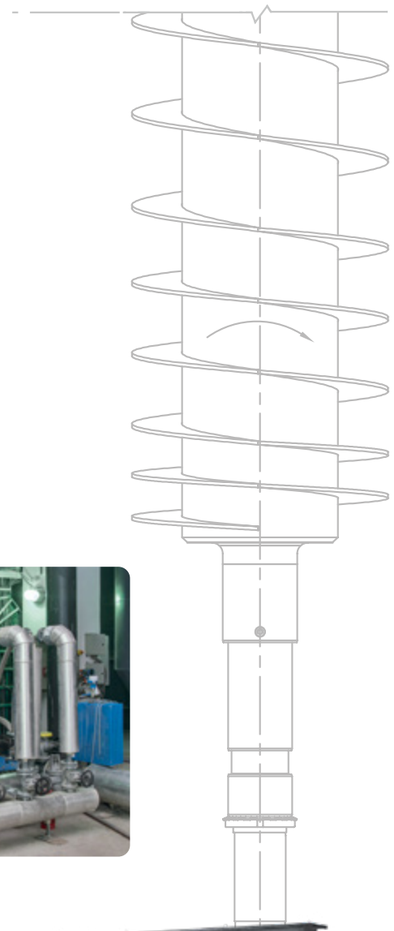
One challenge mastered by extensive development is the compensation of the thermal expansion of the worm shaft, which is completely absorbed by the especially developed KÖLLEMANN carbon bearings, with the smallest possible maintenance work and costs. The tongue-shaped shaft passages enable individual worm shafts to be replaced easily without dismantling the end wall or the other shafts. This minimises downtime significantly.

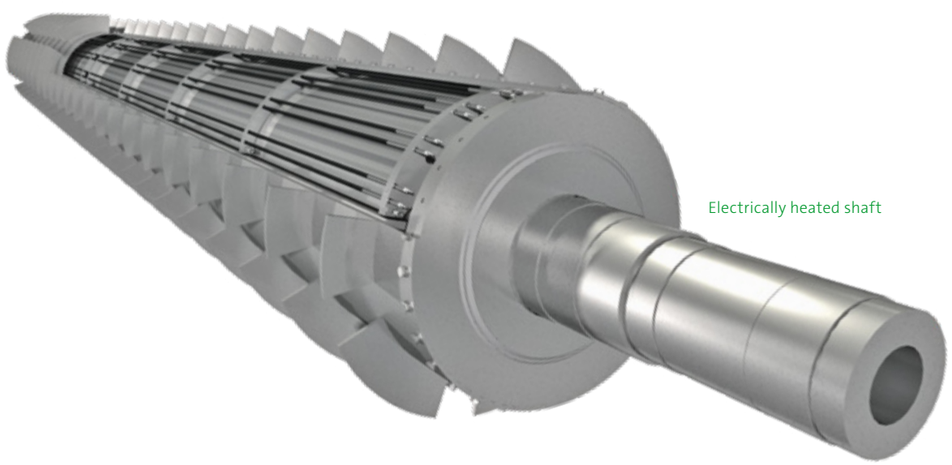
The product range extends from heating screw conveyors and dryers with a throughput rate of a few kg/h up to 60t/h – on request, the delivery is completed by including especially adapted piping with modular insulation, which enables connection to a central inlet and outlet point. All necessary valves, flow meters and temperature measurement devices are optionally already installed upon delivery as part of the scope of supply.

To integrate the heating screw conveyors into the planning of your plant in the best possible way, a large number of heat sources can be used, such as heat transfer oils and steam under various conditions.

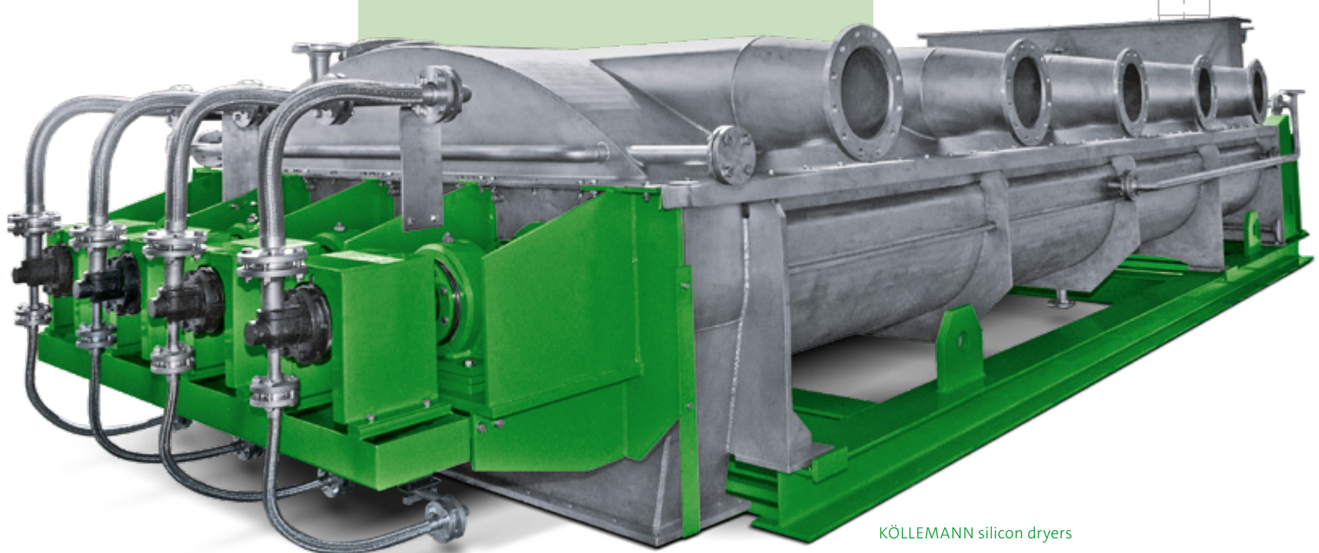
## DATA

- **Temperatures up to 450°C**
- **Optional modular insulation**
- **Optional with piping, fittings and valves**
- **Use of proven and tested hollow flights**
- **Safe and reliable separation of heat transfer medium and bulk material**
- **Single or multiple shaft version**
- **Suitable for all bulk materials**





Electrically heated shaft



KÖLLEMANN silicon dryers

# HEAT RECOVERY.

**KÖLLEMANN screw heat exchangers** can reuse the waste heat from industrial processes by means of heat recovery. Waste heat is the by-product of industrial processes that is normally released into the environment without being used.

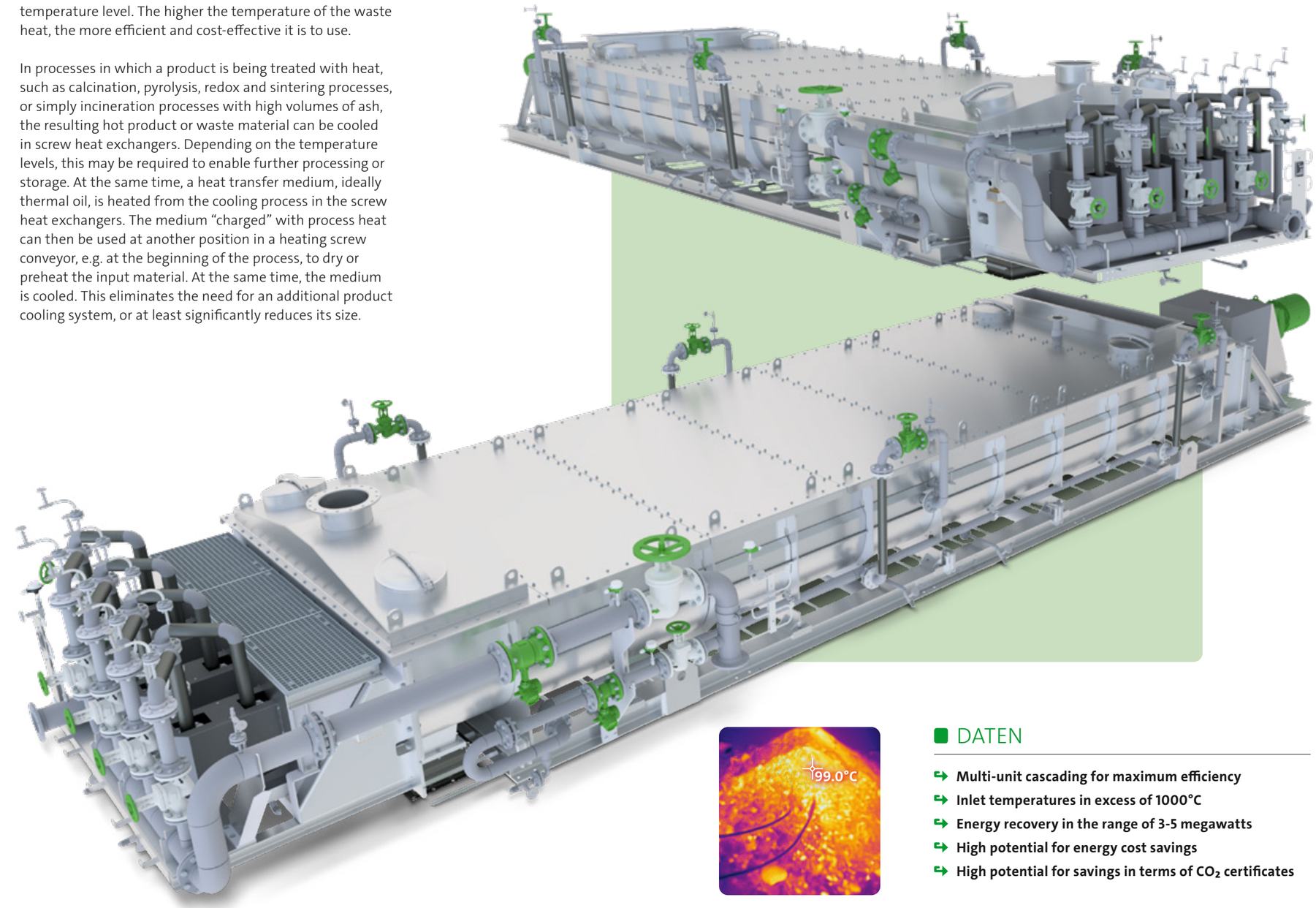
Heat recovery can save energy and reduce $CO_2$ emissions. The aim is to reduce the demand for new energy (primary energy). Here, KÖLLEMANN apparatuses can transfer and save energy in the range of megawatts.

KÖLLEMANN machines are capable of handling medium and high temperature waste heat ( from 150°C to over 500°C). It is preferable to use the waste heat directly where it is originated. If the waste heat is transferred to another location (e.g. via district heating networks), a portion of the energy is lost. Whether or not waste heat can be put to a good use depends on two factors: One is the quantity of waste heat, which means that the more energy is available, the better it can be used. While the second one are the temperature level. The higher the temperature of the waste heat, the more efficient and cost-effective it is to use.

In processes in which a product is being treated with heat, such as calcination, pyrolysis, redox and sintering processes, or simply incineration processes with high volumes of ash, the resulting hot product or waste material can be cooled in screw heat exchangers. Depending on the temperature levels, this may be required to enable further processing or storage. At the same time, a heat transfer medium, ideally thermal oil, is heated from the cooling process in the screw heat exchangers. The medium “charged” with process heat can then be used at another position in a heating screw conveyor, e.g. at the beginning of the process, to dry or preheat the input material. At the same time, the medium is cooled. This eliminates the need for an additional product cooling system, or at least significantly reduces its size.

Depending on the product, the cooling takes place in two stages. The first stage recovers energy by cooling the product to 200-300°C. Due to the high temperature, thermal oil is used as the heat transfer medium. In the second stage, the product is brought to its final temperature by means of water; here energy recovery may not be possible in every application.

By using the waste heat, energy costs can be reduced and the environment can be protected by reducing $CO_2$ emissions. In addition, there are lower costs for cooling the product and less dependence on external energy sources.



## DATEN

- **Multi-unit cascading for maximum efficiency**
- **Inlet temperatures in excess of 1000°C**
- **Energy recovery in the range of 3-5 megawatts**
- **High potential for energy cost savings**
- **High potential for savings in terms of $CO_2$ certificates**

# SCREW CONVEYORS.

**KÖLLEMANN screw conveyors** are used to convey dusty, grainy and flowing bulkmaterials. Their strengths are best used with free-flowing and conveyable materials such as sand, cement, granulate, ash and similar materials. However, our screws are also perfectly suitable for conveying problematic bulk materials such as potentially explosive, abrasive or adhering materials.

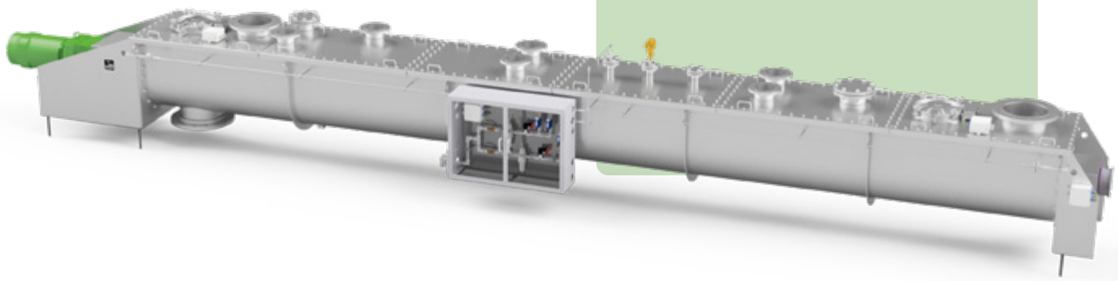
We will be pleased to help you to solve your conveying problems or to convey your goods. Our sales team is there to help you choose the suitable geometries and configuration.

Thanks to sophisticated engineering and our wealth of experience, KÖLLEMANN screw conveyors are an obvious choice, even for products that under normal circumstances could hardly be dealt with by a screw. Thanks to the proven and tested KÖLLEMANN self-cleaning principle, problem-free conveying is possible, even for adhesive bulk materials.

Our portfolio offers you suitable screw conveyor products for all areas of application.

## DATA

- **Length without middle bearing up to 14,500mm**
- **Diameter from 100mm to 1200mm**
- **Single or multiple shaft design**
- **Tubular or U-shaped trough**
- **Shaft geometry adapted to the bulk material**



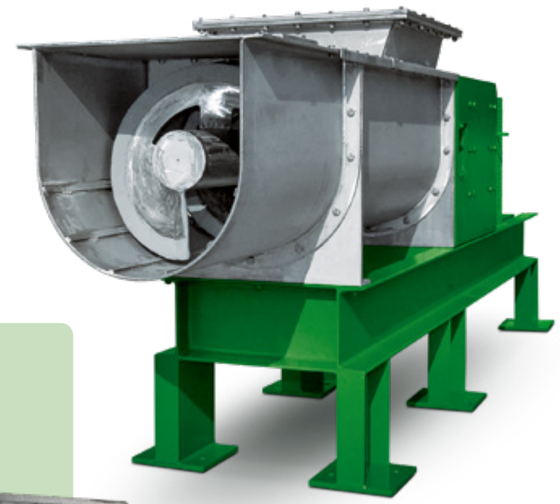
# FEEDING-SCREW CONVEYORS.

**KÖLLEMANN feeding-screw conveyors** are used to fill combustion chambers, calcining furnaces, fluidised bed systems and waste incineration plants. Even if the process conditions will not allow a bearing to be used at the end side (facing the process), charging screws are the optimum solution.

Thanks to our longstanding experience in this segment we have many possibilities for designing the geometry and configuration of the system: For example, it is possible to cool or – if the process requires – to heat individual parts or the entire machine to protect and maintain the structure. Abrasive bulk materials do not pose a risk to the life of the machine, as the varied options provide effective measures for preventing unwanted premature wear. Our product range includes versions with multiple shaft designs to satisfy the mass flow rate and cleaning requirements.

## DATA

- **Direct input into fluidised bed furnaces**
- **High-temperature resistance**
- **Optional structure cooling**
- **Bearings on one side only**



KÖLLEMANN high-temperature nickel ore charging screw

# ROTARY VALVES.

We produce specialised rotary valves for metering, sealing, feeding, discharging and measuring bulk products for sophisticated areas of application. Simple rotary valves operate according to the principle of volumetric conveying. Here the bulk product falls by gravity into the mostly star-shaped chambers in the inlet area of the rotary valve. By rotating the rotor, a defined quantity of bulk product is conveyed to the discharge area. A defined discharge rate sets in based on the rotary valve geometry and speed.

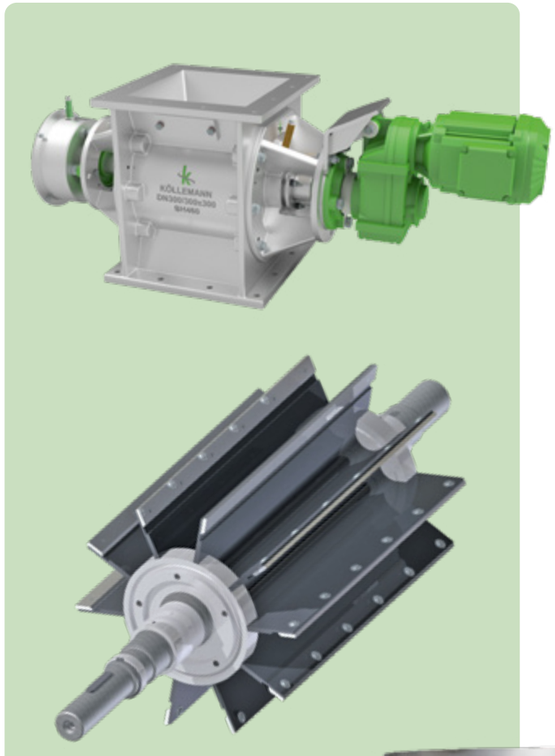
**KÖLLEMANN rotary valves** are used for different bulk materials, for example, ash, coal dust, cement, sewage sludge, plastics, crystalline acids, methyl cellulose, carbon black and other dusts and granulates.

Our product range covers all the required options, designs and materials. We offer a standard range made of cast iron in which, however, all parameters deviating from the housing can be configured to match your bulk product. However, welded constructions in all standard industrial material combinations constitute the largest area of application. Many options and specialized equipment are available to satisfy your specific needs regarding the bulk material and ambient conditions.

Among other things, we offer high-pressure and high-temperature rotary valves and forced clearing rotary valves for adhesive and bridging bulk materials that, depending on their intended use, can be heated or cooled or equipped with add-on features such as leakage air collectors and overfill protectors.

Thanks to our sophisticated design, we are able to provide standardised rotary valves for the cement and coarse material sector as welded constructions with short delivery periods and top quality at a competitive price.

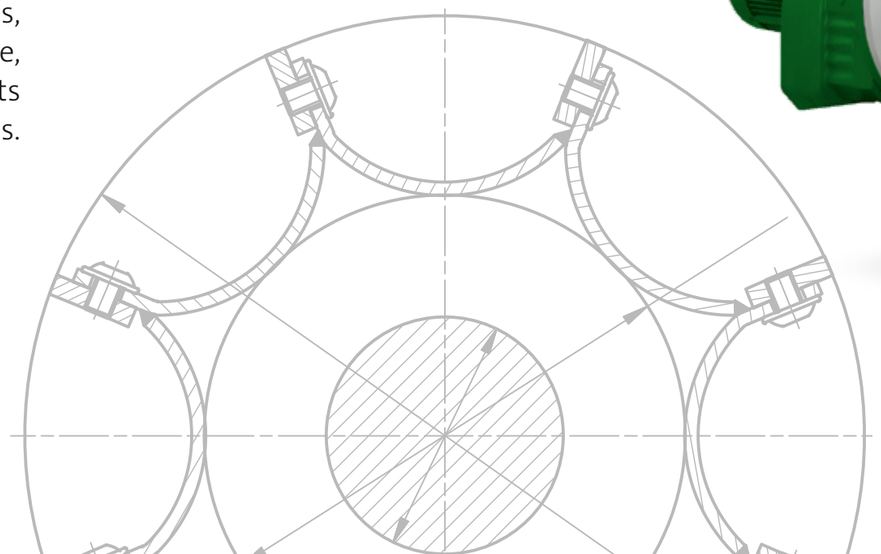
Use of an optional, replaceable, specially hardened inner linings or blade strips in KÖLLEMANN rotary valves counteracts premature wear and abrasion and additionally reduces maintenance work and costs. This version is particularly suitable for applications with high abrasive content in the bulk product. Especially in power plants, this can provide a decisive advantage for the life of the device, as most coals contain a noticeable fraction of stones or other abrasive substances.



## DATA

- **Diameter from 80mm to 2300mm**
- **Optional Heating or cooling**
- **Optional replaceable sealing strips**
- **Optional replaceable anti-wear sleeves for the housing**

KÖLLEMANN
rotary valve DN 2300



# SELF-CLEANING ROTARY VALVES.

**KÖLLEMANN self-cleaning rotary valves** are ideally suitable for the metering, sealing, feeding and discharging and measuring of adhesive, bridging bulk products and products that tend to cause blocking. These include (among other things) moist coal dust, cement, sewage sludge, plastics and methyl cellulose.

Rotary valves operate according to the principle of volumetric conveying, i.e. gravity causes the bulk product to fall into the mostly star-shaped chambers in the inlet area of the rotary valve. The rotation of the rotor conveys a defined quantity of bulk product to the discharge area. A defined discharge rate sets in based on the rotary valve geometry and speed.

A scraper located below the rotor is driven with the help of a synchronisation gear. This forcefully removes the adhering bulk product mechanically, to achieve the best possible throughput and to avoid possible blockages.

Thanks to the precisely matched cleaning curve, KÖLLEMANN rotary valves achieve optimum pocket emptying performance with minimised adhesions and residues.

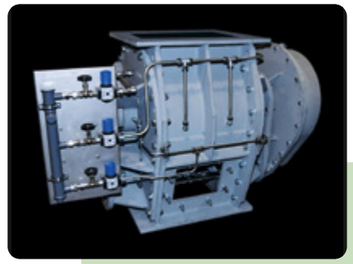
The forced cleaning offers controlled conveying of all bulk materials that could not be handled by a non-selfcleaning model.

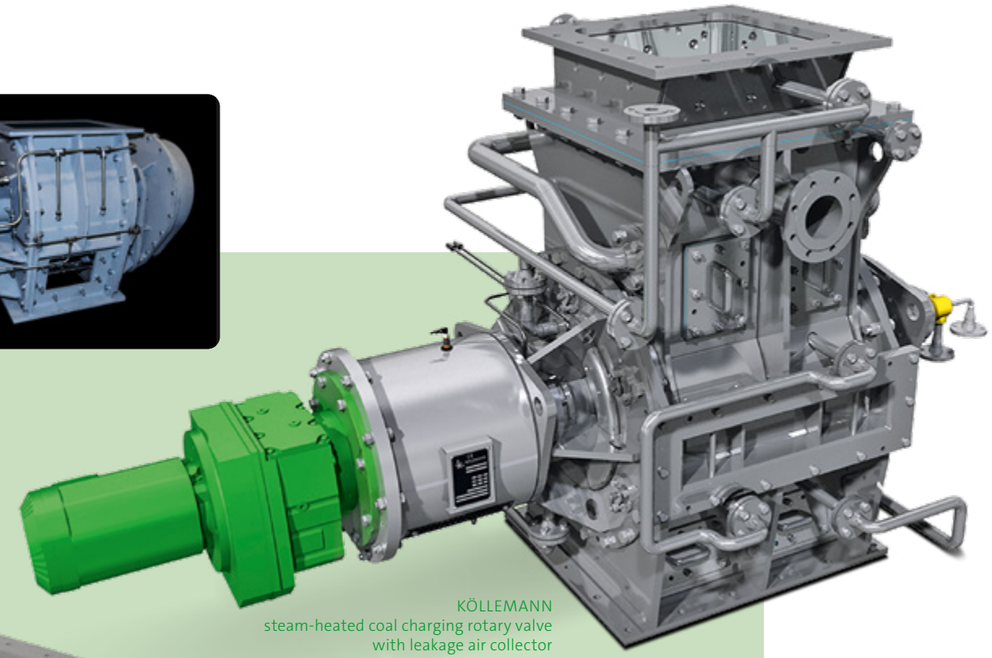
Our product range covers all the required options, designs and materials. Welded constructions made of all standard material combinations account for the largest number of products. A vast variety of options and special equipment are available to satisfy your specific needs.

Depending on the intended use, we offer heated or cooled selfcleaning rotary valves also with add-on features such as leakage air collectors and overfill protectors.

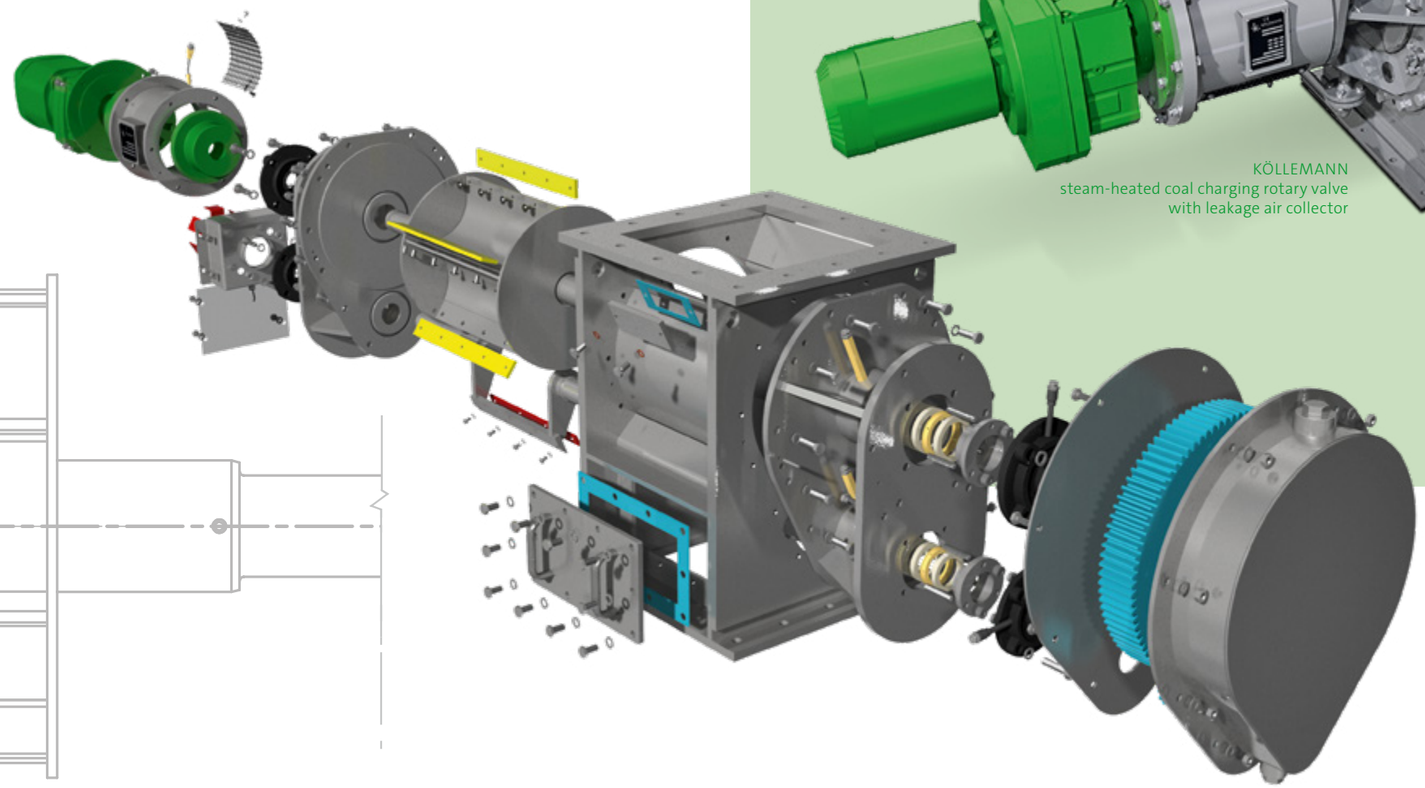
## DATA

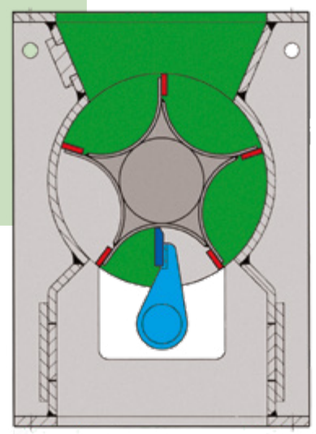
- **Forced mechanical cleaning**
- **Clearing arm with free passage (without internal shaft)**
- **Replaceable anti-wear strips**
- **Heating or cooling optional**

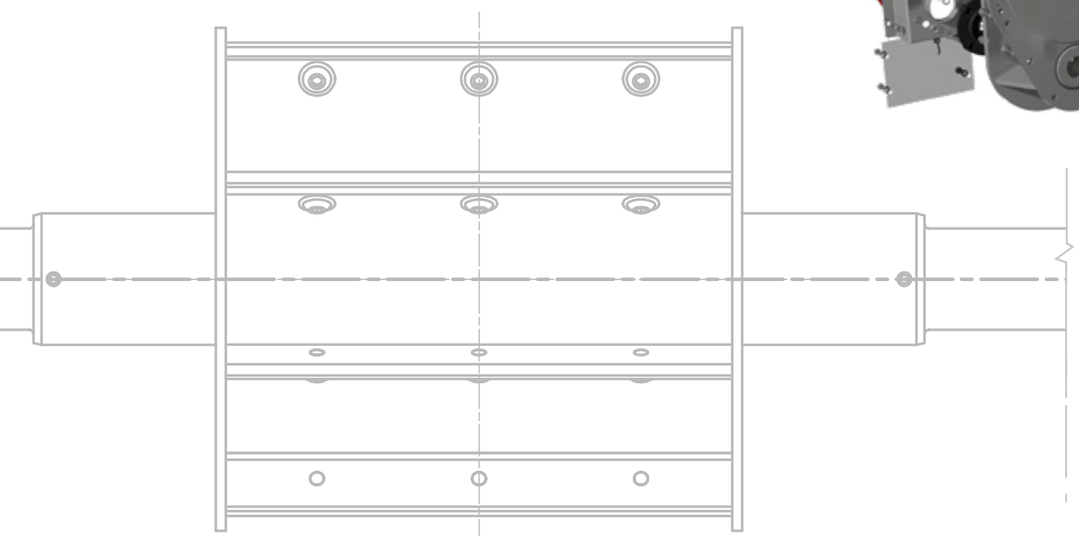




KÖLLEMANN
steam-heated coal charging rotary valve
with leakage air collector



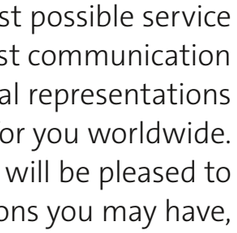


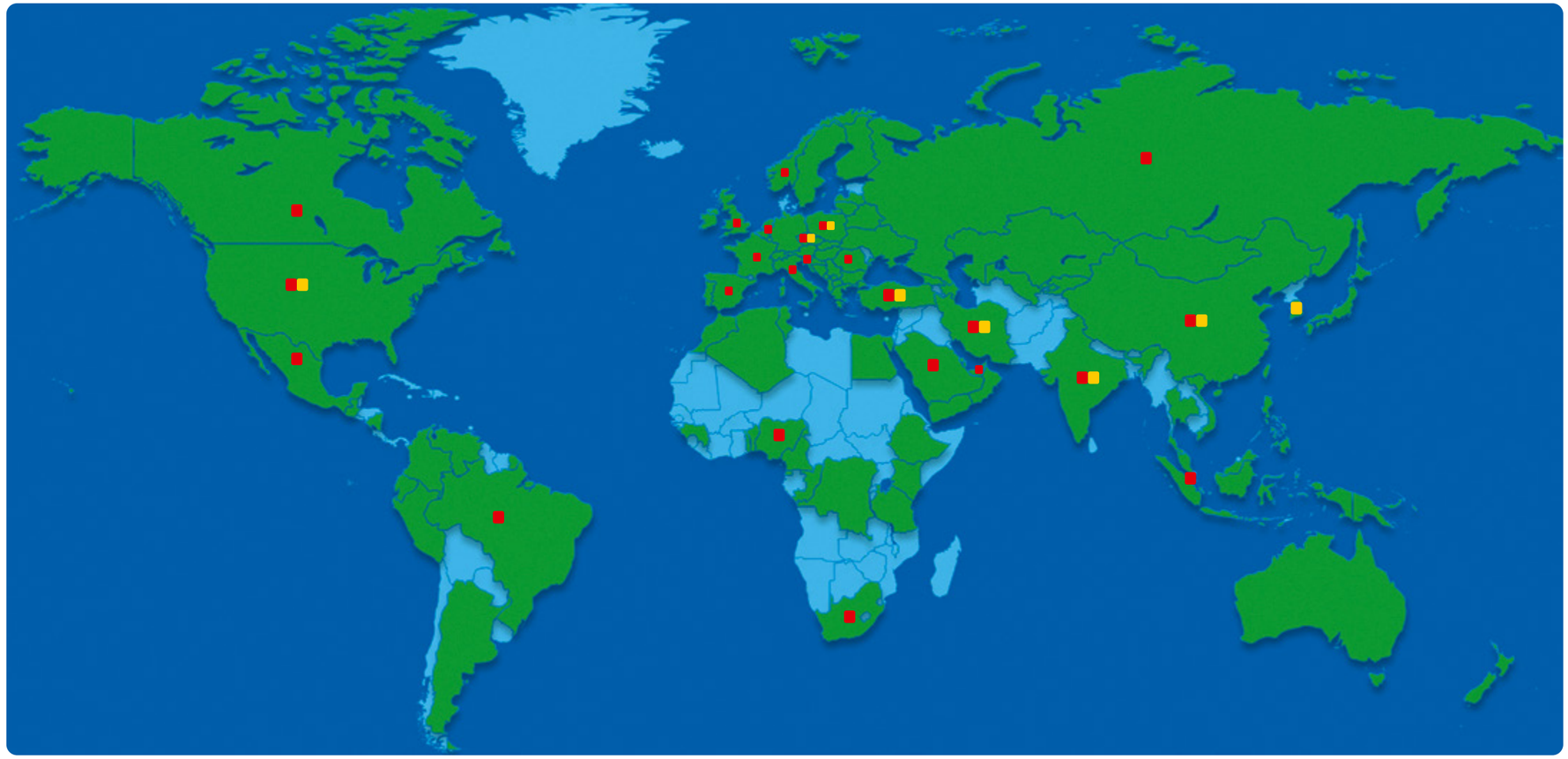


To ensure the best possible service and the shortest communication channels, our local representations are available for you worldwide. Our partners will be pleased to answer any questions you may have, process your inquiries regarding our products and offer you commercial and technical advice.

**KÖLLEMANN representations** are currently located in the following countries:

Arabian Peninsula / U.A.E.
China
India
Iran
Canada / USA
Poland
South Korea
Czech Republic
Turkey





KÖLLEMANN plants and machines are in use worldwide, and our engineers and service technicians also operate globally. The ■ green areas show the countries in which KÖLLEMANN equipment is in use, the ■ yellow markings indicate the above named representations, the countries marked ■ red are those in which our engineers and service technicians have worked to date. KÖLLEMANN works directly with end users or delivers the products to plant builders and EPC contractors, who integrate them into a plant. They include companies such as Bayer AG, Claudius Peters GmbH, Evonik Industries AG, Outotec GmbH, RWE AG, Schenck Process GmbH and SGL Carbon GmbH.

➥ **Current contact details**
**www.koellemann.de**
(Contact ▸ Representations/Partners)

## PREVIEW / FUTURE DEVELOPMENTS

**LiquiCore™ high-temperature screw heat exchanger**
As the chemical and aluminum industries demand ever higher process temperatures, conventional heat transfer media such as thermal oil and steam reach their limits. KÖLLEMANN has therefore developed LiquiCore™, a purely electrically heated screw heat exchanger. Integrated heating elements are embedded in a low-melting metal inside the hermetically sealed core of the screw shaft, distributing the heat quickly and evenly. This allows process temperatures of up to 650 °C – without thermal oil or steam. Typical applications include pyrolysis, calcination, high-temperature drying and the thermal desorption of pollutants such as PFAS.

**Sustainable sewage sludge recovery**
Sewage sludge must be thermally treated to finally use the phosphorus resource it contains. From an energy point of view, prior drying is useful, which can take place almost with energy-independence by using the waste process heat. The KÖLLEMANN self-cleaning system produces excellent results, despite the extremely adhesive conditioning of the sludge.

**Pyrolysis / torrefaction**
Use of alternative fuels and biomass to produce fuels and $CO_2$-neutral energy production is becoming increasingly important worldwide. Here KÖLLEMANN screw-heat exchangers can be used in many processes for optimisation (drying, preheating) or directly for the thermal reaction process. KÖLLEMANN develops adapted machines enabling the optimal coverage for the very specific requirements of the processes.

KÖLLEMANN
CONVEYING, PROCESS &
ENVIRONMENTAL TECHNOLOGY

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