



WORLD WIDE WEAVE

An all-round concept

MAXFLOW - A compact filtration system for the production of rolling elements

At KRS-MARABU Ball and Roller Technology GmbH production rolls, literally: As a leading manufacturer of rolling elements this company with longstanding traditions is much in demand as a supplier for the automotive, mechanical, and plant engineering industries as well as their well-known suppliers. Competing successfully in these markets requires a maximum of productivity, precision and quality. KRS-MARABU offers a flexible customer-oriented product range, yet produces 24 t of balls and 6 t of needle and cylindrical rollers daily, and is thus fulfilling these requirements without difficulties. Modern technology and advanced production processes ensure the economic success of the company. The owner-managed company in Barchfeld near Eisenach places great importance on continuous process improvement. One of their latest measures is the use of the MAXFLOW compact filtration system provided by GKD – Gebr. Kufferath AG – for their double face grinding processes. Here the cooling lubricant filtration system, especially designed for machining processes, achieved a significant performance increase by combining filtration and briquetting in one unit.

It's Rolling Right

Over 150 years ago in 1863 KRS Wälzkörpertechnologie started out with the production of knives and cutting tools. In 1937 the ball production commenced and six years later in 1943 the production of needle rollers started. In 1995 the current owner Peter Seigert took over the company



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and in 2003 the brand Marabu was incorporated. 260 employees generate an annual turnover of around 35 million euros with three key production areas. The balls produced by KRS-MARABAU are made of high-quality roller bearing and special steels, glass, or ceramics and have become indispensable in numerous industries. The 0.4 mm diameter balls are used for example for the production of miniature bearings or for the stationery industry. The 250.0 mm balls ensure that large bearings roll properly. The automotive industry counts on needle and cylindrical rollers made of 100Cr6 chromium steel or stainless steels by KRS-MARABU to be used in engines and cardan shafts. In mechanical engineering they are mainly used in bearings and linear guiding systems. The needle rollers range from 2.0 to 19 mm in diameter and 3.6 to 40.0 in length. Cylinders with diameters from 2.5 to 20.0 mm and a length of 5.0 to 40.0 mm are used for more challenging production requirements. They are ground in increments of μm with a straight face end or as special parts, for example, with a groove for a locking ring. The rolling elements provide the highest precision and finish quality to ensure the compliance with the low tolerances required. In order to ensure the required resilience and durability of the products, all process steps have to fulfil high quality requirements. Moreover, KRS-MARABU's production planning faces additional challenges, such as increasingly short delivery times, varying batch sizes, increasingly complex parts with a range of varying shapes and sizes. Therefore, precise tool design and completely secure, yet flexible processes are becoming more and more important here.

All-round precision

KRS-MARABU's production process from the raw material to the finished needle or cylindrical roller is highly complex: Depending on the required product diameter, first the raw material is cut to length. While the bar



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material is cut to measure, high-speed shearing machines are used for wires. After de-burring and cleaning, the blanks are hardened in a fully automated flow-through system. A furnace heats them up to 850°C before they are quenched in a 70°C oil bath and tempered to final hardness in the tempering furnace. During the subsequent diameter processing centre-less grinding is applied to shape the parts into the required diameter with tolerances of 2 µm. This is a tolerance range of 20 to 40 times thinner than human hair. Here KRS-MARABU applies a flow-through system as well. Depending on the quality requirements each blank goes through the centre-less grinding process several times. During the subsequent double face grinding process the cylinders are ground to the specified length on both sides by rotating grinding disks. Here the blanks are inserted in a transport disk and processed in parallel in a flow-through process. After slide grinding and repeated diameter processing by centre-less grinding they achieve their perfect super finish through short-stroke honing.

For parts with less than 4 mm in diameter or with especially high purity requirements, cleaning takes place in a spray cleaning machine. Standard parts are cleaned with corn grit in the so-called bowl vibrator and then dried. After a careful surface inspection – manually or automatically up to crack inspection – the parts are sorted in state-of-the-art sorting machines in diameter groups of 2 µm and length groups of 6 µm or also according to customer specific requirements and packaged in the company's own shipping department.

Completely new

High quality parts are ground to a surface roughness (Rz) of less than 2 µm during the double face grinding process as part of KRS-MARABU's length machining. To ensure these low tolerances not only the precise process design, but also the composition of the cooling lubricant is important. The



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grinding specialist from Barchfeld uses a cooling lubricant emulsion during this process, to transport shavings and abrasive grains (approx. 90-180 μm in size) from the polishing station to the filter system. Until a few years ago KRS-MARABU used a magnetic separator with a belt filter in a bypass system for the filtration of the cooling lubricant emulsion. Due to the fact that the magnetic separator mainly separated magnetic particles, but did not specifically filter the abrasive grains, a downstream sedimentation process was required. In early summer 2010 KRS-MARABU's responsible production engineers discovered the MAXFLOW compact filter system at a tradeshow. They were mainly interested in the pressing unit integrated in the system and the associate option to combine the process water filtration with the briquetting of the sludge. Especially the thus minimized carry-over of cooling lubricant found their favour because it meant a reduction in costs for the cooling lubricant and its' disposal. After the first contact to GKD the company from Barchfeld decided rather swiftly on the MAXFLOW CS 1000-503 filtration system with filter head and a round tank system with a volume of 1,200 litres. In addition to the integrated briquetting system, the compact filter distinguished itself through various other special features. The complete unit – housing, filter disks, and mesh - is made from stainless steel. The filter disk pack, vertically installed in the filter head, is surrounded in cross-flow by the process water contaminated with particles from the pre-grinding process. The filter disks are covered with blended mesh of type YMAX[®] designed for the specific process and allow for the filtration of 200 litres per minute with a filter mesh size of up to 5 μm . A dirt tank integrated into the clean tank effectively prevents deposits from accumulating at the bottom of the tank thanks to a tapered outlet. An automated backwash process removes the filter cake from the disks. All residues are also pressed automatically into dry briquettes in the system's own pressing unit and then discharged.



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All-round problem solver

After all details had been discussed the unit was set up and test runs were carried out. “It started off great,” praised Marc Niebergall, the responsible production engineer at KRS-MARABU. “Everything worked smoothly and the reliable filtration results surpassed our expectations.” A welcome side effect was the high retention rate of micro particles. Then, after two months, problems occurred completely unexpectedly when the grinding sludge did not form into a cake. Günther Pikos, GKD’s technical contact person responsible for KRS-MARABU, identified the problem very swiftly. The rough grinding sludge required to form the filter cake did not reach the filter disks because it already accumulated in front of the sieves of the machine outlets. This way only the finest particles reached the filter disk and blocked it. After thorough cleaning of the machines, tanks, and compact system and optimizing the return cycle MAXFLOW ran smoothly once again. For a second issue a few weeks later, also not caused by MAXFLOW, GKD again found the solution. The cleaning cycle became shorter and shorter and finally the disks blocked. The four double face grinding machines fed by MAXFLOW did not match favourably and mainly produced particles of the size of the filter mesh. This problem was solved by exchanging the filter disks, following GKD’s recommendation to cover the disks with a customer-specific mesh. This prevented the ultra-fine shavings from blocking the system. Since then MAXFLOW has been running smoothly to the full satisfaction of Marc Niebergall who praises the filtration specialist from Düren: “GKD has supported us in every phase with solutions and challenges make one grow above oneself.”



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Satisfaction all-round

Consequently, the overall conclusion regarding the decision to acquire MAXFLOW was very positive. The transition from the belt filter with magnetic separator and subsequent sedimentation to a compact filter system for the cooling lubricant cleaning during the length grinding process was a complete success. “The reliable separation of the particles ensures a significantly safer process for the high-quality parts.” The significantly lower carry-over of the cooling lubricant and the dry briquettes made of residual materials confirm that we have made the right decision. Another benefit is the low space requirement of the system.

Ready for the island

Thanks to the positive experience with the MAXFLOW compact filter system the grinding specialist from Barchfeld is considering the acquisition of a second system. An isolated application providing greater flexibility for centre-less grinding with regards to changing materials is planned. Currently, the abrasion dust produced during the centre-less diameter grinding is continuously removed from the cooling lubricant on a belt filter in the company’s own central system. Taking into account the high utilization customer specific changes in material affect the process efficiency. An independently operating MAXFLOW filter allows for immediate relief and more flexibility with regards to processing customer requests. “Additionally, required cooling lubricant tests would be made easier,” explains Marc Niebergall the company’s decision maker. He knows he is well looked after by the system supplier for filtration technology and plant engineering, GKD-CompactFiltration, and their technical adviser Günther Pikos, with regards to these plans.

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