The stuffing box packings consist of several single rings or pressed graphite yarns, which are mechanically braided into a narrow-meshed structure. An applied impregnation and high compression are used to close possible cavities. The graphite packs are inserted into the stuffing box cavity between the spindle and housing then clamped.

Diamond compacted reliably

Rolled surfaces create added value in power plant construction

For the sealing of moving spindles in casing or housing feedthroughs of power plant fittings, so-called stuffing boxes are used - more precisely stuffing box packings. How the emission rate of these safety-relevant density elements can be optimized was the focus of an AiF / VGB-supported research project of the Materials Testing Institute (MPA) Stuttgart. To this end, the research team used various surface coatings and treatments. Among other things, the rolling process of Baublies AG, located in Renningen, was examined during the project.

Valves are essential components and are of great operational importance for shutting down, regulating, securing and discharging the media in power stations as they ensure a safe process flow.
The mobile spindles, which are located inside the valves, are exposed to extreme loads during use and therefore require hard, oxidation and wearresistant surfaces. Under these conditions, the most important factor is that the spindles inside the fittings are pressed as tightly close to each other as possible over a large area in order to keep the media loss as low as possible. A tight fit is ensured by the stuffing box packings. These consist of several single rings or pressed graphite yarns, which are machined into a narrow structure. An applied impregnation and high compression are used to close possible cavities. The graphite packs are inserted into the stuffing box between the spindle and the housing and clamped. However, it may happen that there is too much friction between the spindle and the stuffing box, which leads to operational faults or, in extreme cases, to failures in a disproportionate manner: stuffing box bushes assume roughly 40 percent of all sealing compounds in plant technology, but they account for about 70 percent of the total emissions of valves.

PHOTO Left: In the tests without prior surface treatment by rolling, considerable graphite deposits were observed on the spindle. Since they are subjected to extreme loads during use, they require hard, oxidation and wear-resistant surfaces.

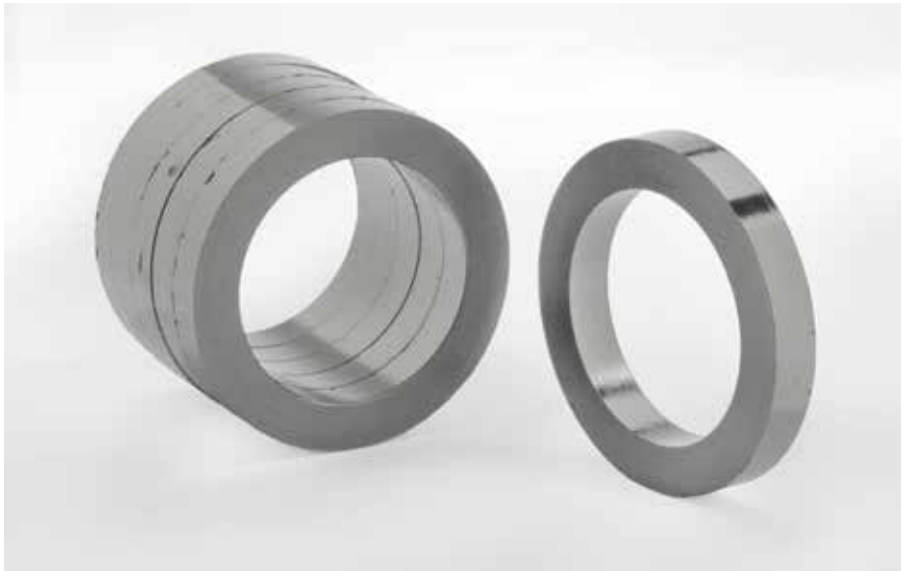
PHOTO Right: The test bench was designed to investigate the friction and sealing properties of the packaging materials. The tightness was measured in the spatially closed system of stuffing box housing, connected leakage device and shut-off valve, and the test medium used was nitrogen.

Baublies supports MPA research project

The material testing institute of the University of Stuttgart (MPA) used the Rolling Technology of Baublies AG for a research project on the „optimization of spindle seals in valves with regard to function and emission behaviour through surface coating". The main focus of the project was to investigate the frictional and sealing behaviour of coated valve spindles in hot water and steam, the usual mediums used in power stations.
Werner Ottens, responsible for the testing of stuffing box packings in the Sealing Technology Department at the MPA Stuttgart: „We were faced with the question of how we could give valves a longer service life and thus reduce costs for the respective operator. It was therefore interesting to see how Baublies' diamond burnishing process influenced the surface quality of the fittings."

Rolling as a surface finish

Rolling is the only non-cutting process for the finishing of metallic surfaces as an alternative to thermal or chemical processing. „In order to achieve the surface finishes of less than the norm Ra 1 µm required in the valve industry, we decided to use a diamond burnishing tool in this series of tests to finish the spindles. Particularly suitable for harder materials, their core values were enormously improved," says Andreas Hadler, CEO of Baublies AG.
For the process of diamond burnishing, a special type of rolling, a spring-loaded, spherically formed and finely polished diamond is inserted into the tool and exerts pressure over the workpiece surface. In the µm range, the displaced material volume flows from below up into the rising profile columns.
Since these enormous forces increase the residual stresses of the material, the burnished surface solidifies by five to ten percent. Plateaus are formed from the surface peaks by the forming process, which have a high percentage of contact area and a burnished rolled surface.
An important indicator of the surface texture is the average roughness Ra.
In addition, the Abbott curve, also known



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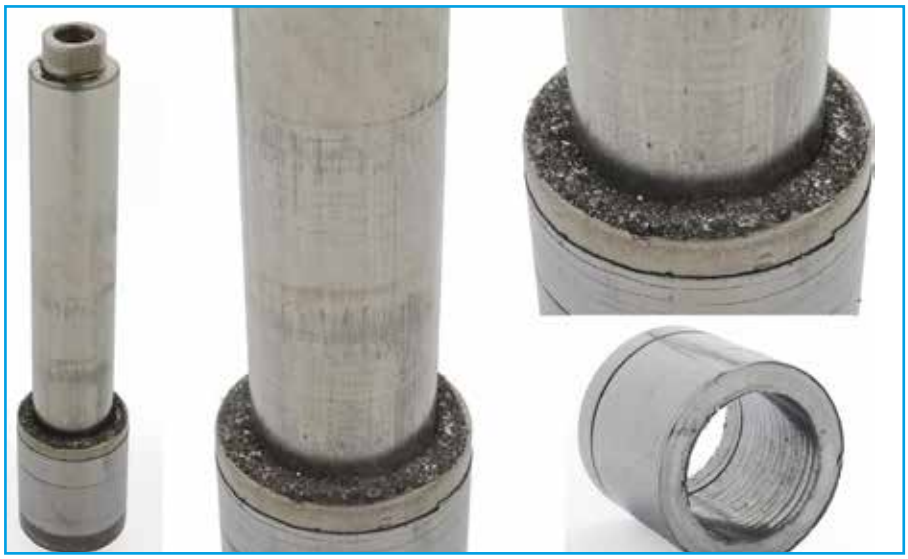


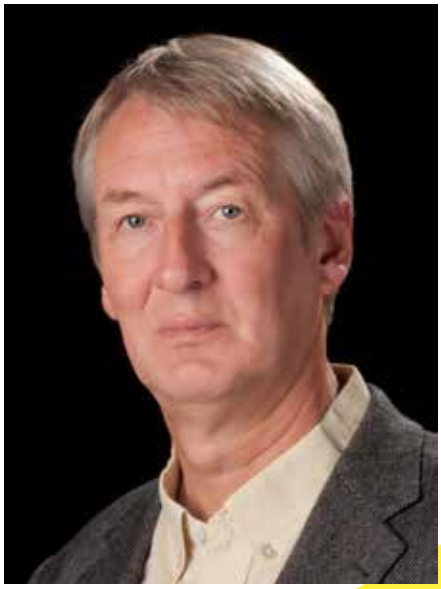
PHOTO Left: A spherically shaped and finely polished diamond is moved under pressure over the workpiece surface. By using these enormous forces, the inherent stresses of the material is increased, so that the burnished surface hardens by five to ten percent. This has a positive effect on the reliability of the function as well as on the emission rate of the valves.

as the bearing area curve or bearing curve, can be used. This represents different values: the value Rpk to the peak height, the depth of the groove Rvk as well as the core depth Rk.

The spindles which were previously treated differently, received excellent surface finishes as a result of the rolling. Among other things, the low roughness depths (Ra were 0.1 and 0.35 µm, respectively) and the high contact ratio as well as the absence of protruding material peaks, minimized abrasiveness. "In addition, the materials could be significantly strengthened and the surface hardness increased so that the wear was drastically reduced," explains Andreas Hadler. "Another positive effect of this reliable finishing method was the reduced corrosion susceptibility. Moreover, the rolled spindles tended to be much less prone to cracking. The low leakage rate and the axial surface pressure were also positively assessed, meaning that the spindles were very dense."

Environmentally friendly valves in the future

The result of the research project shows that the highly developed roller burnishing process from Baublies AG using diamond tools affects both the functional reliability and the emission rate of fittings. "Spindle seals in industrial valves can be optimized, resulting in denser, increased corrosion-resistant and more wear-resistant spindle surfaces. This results in less maintenance or longer maintenance intervals. In addition, there is a markedly reduced loss of media, which means that the power plant operator saves additional costs," says Werner Ottens.



Werner Ottens is responsible for the testing of stuffing box packings in the Department of Sealing Technology at MPA Stuttgart and supervised the project.

Andreas Hadler, CEO of Baublies AG..

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This article was published in
Drehteil + Drehmaschine, 01/2017

DREHTEIL + DREHMASCHINE