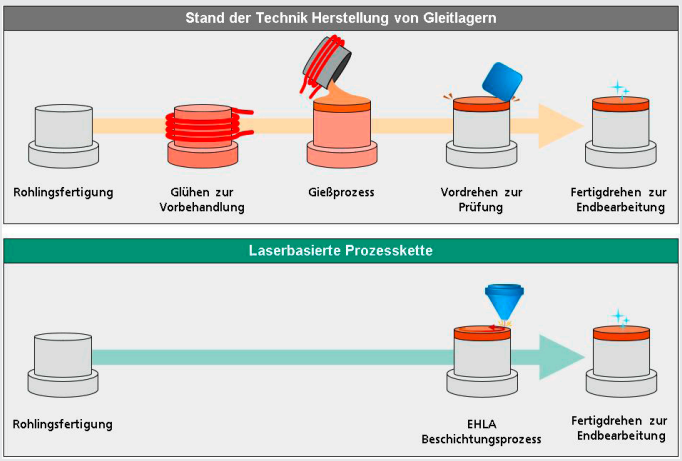

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ENVIRONMENTALLY FRIENDLY PRODUCTION OF TRIBOLOGICALLY HIGHLY STRESSED SLIDING BEARINGS BY MEANS OF EHLA

Task

Next to the rolling bearing, the sliding bearing is the most frequently used bearing type in machine and equipment construction. Approximately ten billion bearings (rolling and sliding bearings) are manufactured worldwide every year. In vehicles, five percent of fuel consumption is caused by mechanical losses, and one fifth is due to bearing resistance. In sliding bearings, the two parts moving relative to each other are in direct contact and slide on each other against the resistance caused by sliding friction. Self-lubricating lead-bronze alloys are commonly used as sliding materials to reduce frictional resistance. Since the EU has imposed restrictions on using lead (e.g. Regulation (EU) 2015/628 and the REACH list [4-6]), lead-free sliding materials will be required in the long term to protect people and the environment. Further savings potential can be unlocked by replacing the energy- and resource-intensive composite casting process used for processing the lead layers.

Method

Fraunhofer ILT has developed and qualified extreme high-speed laser material deposition (EHLA) to economically produce sliding bearings from lead-free sliding materials. In addition to a metallographic evaluation, the institute has analyzed tribological properties of these materials.

Results

The laser-based manufacturing process involves significantly fewer process steps than previous conventional process chains. The required use of energy and resources can be drastically reduced, thus achieving decisive ecological and economic advantages. In addition, EHLA achieves significantly higher process stability than the composite casting process. The sliding materials applied, such as copper-aluminum bronzes, have a metallurgical bond to the base body and a heat-affected zone of only a few micrometers.

Applications

The EHLA process chain demonstrated here is suitable for numerous other applications where highly stressed surfaces need to be protected, such as in bearing components in automotive, wind turbine, aerospace, agricultural, mining, railroad, marine and offshore applications, hydraulic motors and especially the axial piston pumps sector.

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1 Process chain comparison.

2 Coating process of the mating surface of a plain bearing using EHLA.

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DQS certified by DIN EN ISO 9001, Reg.-No.: DE-69572-01