Topics 1

Series:

Award-winning Products

1. 2007 Japan Powder Metallurgy Association Awards

(1) New product award, materials section

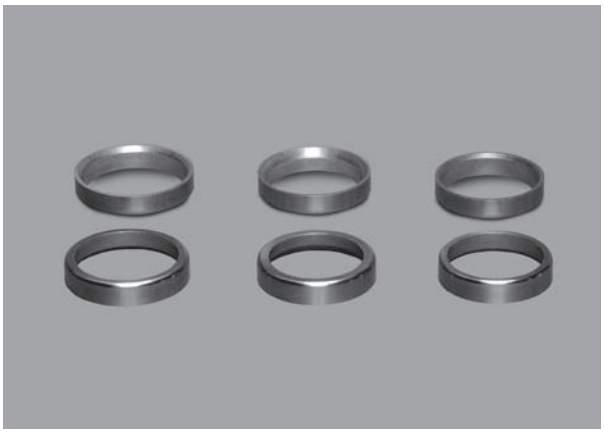
"High Wear Resistant Valve Seat Material for Compressed Natural Gas (CNG) Engines"

This material is a high wear resistant valve seat material to be applied to CNG engines in which 50% of a newly-developed Co-50Mo-9Cr-3Si hard particle is added to a Mo steel matrix, and CrS is precipitation-dispersed as a solid lubricant.

Against the background of environmental protection and the recent steep rise in crude oil prices, study of alternative fuels is progressing. CNG engines, which use compressed natural gas, are enjoying increasing demand as clean engines with virtually zero emission of harmful exhaust gas components and reduced CO_2 emission.

Running condition for valve seats in CNG engines, however, is the most severe one in any type of engines due to the dry sliding environment, and as a result, metal-to-metal contact leading to adhesive wear is initiated easily.

In this development, it is recognized that adhesive wear is reduced by adopting a Mo steel matrix material indicating high hardness even at higher temperature, high wear resistance is achieved by 50% addition of a newly-developed hard particle, and high lubricity is secured by adopting CrS, whose lubricating phase embedded firmly in the matrix due to precipitation dispersion.



As a result, it is possible to mass-produce valve seats with satisfactory wear resistance for the application to the most advanced CNG engines, which was not attained by conventional materials. For the user, thus, the new material contributes to improve engine durability and to reduce maintenance frequency.

The development of the valve seat material for CNG engines under severe use conditions, which was the result of the synergetic development effort including the matrix, hard particles, and solid lubricant, won the award as newly-developed product. The developed material is expected to expand applications to clean engines predicting higher growth in the future.

(2) New product award, materials section

"High Performance Sinter-Forged Aluminum Alloy"

This material is an Al-Zn-Mg-Cu aluminum alloy aiming at improvement of high strength properties, which is applied to connecting rods for general engines using the sinter-forging technique.

As conventional sintered aluminum alloy materials, extruded materials and sinter-forged materials have been produced using Al-Si-based powders obtained by the rapid solidification method. Extruded materials, however, have cost concern due to low material yield and longer production processes, and sinter-forged materials have disadvantage of lower strength, respectively.

In this development, a unique premixed powder was developed based on the composition of commercial alloys optimized the contents of the various component materials and the combination of the mixed powders with innovative blending method to prevent segregation of the components during compacting and fluctuations in the composition during sintering. The developed material is composed of the material design concept of using Al-Zn-Mg material with CrB hard particles to guarantee the strength and adding pure aluminum powder to improve wear resistance and compactibility. Thus, the new technology connecting rods substituting newly developed material for conventional aluminum forged one (wrought material) are adopted to developing new engines.

In comparison with wrought forged materials, as a result, higher strength was achieved simultaneously with cost reduction. In particular, the fatigue strength of the product was improved by more than 18%, enabling 20% higher output in engines with these connecting rods.

This product is recognized for the development of an economical raw material powder independent of the rapid solidification method and achievement of remarkable higher strength than conventional sintered aluminum alloys. It is expected to be expanded for applications in the wrought aluminum materials market.