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KS Kolbenschmidt GmbH

New casting technology reduces the weight of gasoline pistons

KS Kolbenschmidt GmbH has refined its Liteks lightweight piston design concept in connection with the new KS 309 high-performance piston alloy for gasoline pistons. This aluminium alloy has been steadily improved since it was first introduced and in its current form increases not only the material strength, but also enables the casting of very thin wall thicknesses thanks to its outstanding flow characteristics. Prototypes manufactured from this alloy are currently undergoing all the usual comprehensive engine tests and at the same time are being examined at the in-house engine friction test bench with regard to their friction-reducing effectiveness.

Fully cast wall thicknesses of only 1 mm can be produced thanks to the improved flow and casting features of the KS 309 alloy and the usage of a new and specially developed casting process. The process is moreover used in the enhanced development of the Liteks design in order to reduce the case wall thickness to 2 mm – this thickness is necessary due to piston stiffness requirements. This allows almost 30% reduction in piston weight compared to the standard design, all without sacrificing working life.

The high-temperature alloy demonstrates large durability improvements at temperatures above 250 degrees; an approx. 25% higher fatigue limit is achieved at a typical piston crown temperature of about 300 degrees. Endurance tests have furthermore shown that the new material has significantly less residual deformations and wear rates.

Intense friction tests with the floating liner method

Aside from weight reduction, the Liteks light weight design concept with the new alloy also manifests a significant reduction in friction within the piston system. Because a significant share of the mechanical frictional losses in the engine is caused by friction within the piston system, optimizing these losses represents a solution approach with high potential. This is currently being examined at the KS Kolbenschmidt in-house friction test bench, which enables precise descriptions of the friction between pistons, piston rings and cylinder liner, thus giving a perfectly comprehensive tuned power cylinder system with respect to friction and weight.

The in-house engine test bench is equipped with a fired single-cylinder engine according to the floating liner principle, which can be operated up to 3000

revolutions per minute. Equipped with sensitive friction sensors, the friction between piston rings, pistons and cylinder liner can be measured and recorded. Due to feature variations, even the slightest differences in total friction behaviour can be reliably identified. Thanks to this system competency, KS Kolbenschmidt is able to offer its customers optimized one-source solutions.