SubsTech's sister website Smooth Sliding [http://www.smoothsliding.com] provides independent engineering consulting services that help you to solve engine bearing related issues: failures, material selection, geometry design and optimization of hydrodynamic conditions.

Smooth Sliding [http://www.smoothsliding.com] is an engineering consulting company run by Dr. Dmitri Kopeliovich:

- Director of Research & Development of King Engine Bearings [http://www.kingbearings.com].
- World leading expert (25 years of experience) in design, technology and materials for Engine bearings in applications such as automotive, renewable energy, aviation, racing and others.
- Founder and owner of SubsTech (Substances & Technologies) [http://www.substech.com] – a leading professional website on Materials Science and Engineering.
- Author of numerous scientific and engineering publications and patents.
- Founder and owner of Smooth Sliding [http://www.smoothsliding.com].

For further information and for requesting consulting services please visit our sister website Smooth Sliding [http://www.smoothsliding.com].

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Effect of low viscosity oils on engine bearings

Dr. Dmitri Kopeliovich

Low viscosity oils produce less friction and therefore decrease the fuel consumption and combustion gas emissions.

One of the consequences though of lowering oil viscosity is a decrease of the minimum oil film thickness.
The shaft surface is getting closer to the bearing surface.
This increases the failure threat level of such factors as surface roughness, shaft grinding irregularities, oil borne foreign particles and geometrical distortions and misalignments.
Direct metal-to-metal intermittent contact between the surfaces occurs more frequently.
The wear rate is increased due to the direct metal-to-metal contact.

In this case seizure resistance of the bearing material becomes more important.

The lead based overlay of the conventional tri-metal bearing has a very good seizure resistance, and if the misalignments, shaft grinding defects, etc. are very small, a tri-metal bearing will work perfectly with low viscosity lubricant.
However if the dimension of the geometrical defect is close to the overlay thickness (0.0008”/0.020mm), the overlay is worn fast in some bearing areas and the intermediate layer is exposed.
The intermediate layer has some level of emergency seizure resistance but this level is definitely insufficient for normal bearing operation.

The AlSnSi bearings are much more tolerant to the geometrical defects due to the large thickness of the bearing alloy (~0.01”/0.25mm).
Very good seizure resistance of AlSi alloy is achieved due to the hard silicon particles, which continuously polish the shaft surface and therefore prevent seizure.

Another problem of low viscosity oils is associated with the distribution of oil pressure over the bearing surface.
Oil viscosity does not exert influence on the average pressure however it does affect the value of the pressure peak. The pressure distribution in low viscosity oil is less uniform – the peak pressure is higher therefore the load applied to the bearing material in this particular area is higher.
This may cause fatigue if the fatigue strength of the material is insufficient.
The effect of low viscosity oil on the pressure distribution may be compensated by a decrease of the bearing clearance.

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