**Cavitation initiation and squeeze film in piston-liner assemblies under boundary lubrication**

1Polychronis Dellis\*

*1I* *National Technical University of Athens (NTUA), School of Mechanical Engineering, Department of Mechanical Design and Automatic Control, Zografou Campus, Athens, Greece*

**Abstract**

As the oil film thickness between the piston-ring and liner is minimized close to the dead centers in a piston-liner assembly, it is important to evaluate the different parameters affecting the lubricated surface interaction. Measured parameters, such as friction, need to be optimized and reduced together with studying cavitation initiation and development, which in turn, limits load carrying capacity. Squeeze film is able to provide load support of the lubricated conjunction and it appears as oil film thickness at the dead centers, where the piston velocity is zero. The minima of the minimum oil film thickness measurements shift a few degrees of crank angle from the dead centers but at the same time cavitation emerges in its initial form on the diverging side of the piston-ring assembly and also diminishes on the other side. This oil film behaviour interacts with the surface roughness geometry (at low λ ratios) when lubrication is boundary or mixed and lubricant chemistry comes to play as the additive molecules, for the case of multigrade lubricants interact, also, with the contacting surfaces. On one hand, these additives help with lowering friction peak values and on another are prone to shearing, providing larger cavitation areas in the form of string cavities when the oil film is fully developed and lubrication is hydrodynamic, adding also to power losses. This work tries to identify a link between cavities formation and diminishment close to the dead centers, the squeeze film shift and the lubricant properties via a parametric study of speed, load, temperature and ring geometry. The experimental technique of visualisation is a quick, efficient and effective way to test different lubricant samples and compare their performance in terms of physical, chemical properties and cavitation initiation and development throughout the stroke. This parametric study offered valuable results enabling the performance of each lubricant to be assessed.