

# UNDERSTANDING Basic Lubrication Regimes

A lubricant's primary function is to provide a durable film that controls friction and wear between surfaces; however, the level of protection it provides is dictated by the condition or "regime" it works under. Lubricants operate under three common lubricating regimes:

- 1) Hydrodynamic (full-film)
- 2) Elasto-Hydrodynamic
- 3) Boundary

## Hydrodynamic Lubrication

A hydrodynamic, or full-film, lubrication regime exists when two surfaces are completely separated by an unbroken lubricant film. The lubricant's viscosity assumes responsibility for the majority of wear protection; additives play a limited role. Although full-film lubrication does not generally allow metal-to-metal contact, abrasive wear or scratching can still occur if dirt particles penetrate the lubricating film.

Engine components operating under a full-film lubrication regime include the crankshaft, camshaft and connecting rod bearings, and piston pin bushings. Under normal loads, transmission and rear-axle bearings also operate under a full-film regime.

## Elasto-Hydrodynamic Lubrication

An elasto-hydrodynamic lubrication regime exists when a sudden reduction of the oil film causes a temporary increase in viscosity. When viscosity increases, the film can become rigid, creating a temporary elastic deformation of the surfaces. The lubricant's viscosity and additives work together to protect surfaces in an elasto-hydrodynamic regime.

Anti-wear additives are often relied upon to protect engine bearings in high-load conditions, while both anti-wear and extreme-pressure additives work to protect gears in high-load conditions.

## Boundary Lubrication

A boundary lubrication regime exists when occasional metal-to-metal contact takes place between surfaces, and the surfaces are almost entirely dependent on the lubricant's additives to provide protection.

Anti-wear additives protect the cam lobes, cylinder walls and piston rings in engine high-load conditions, while anti-wear and extreme-pressure additives protect ring and pinion gears in rear axles.

AMSOIL synthetic lubricants are carefully formulated with the optimum blend of top-quality base stocks and additives, ensuring components receive outstanding protection.

## Hydrodynamic Lubrication

SURFACES SEPARATED BY BULK LUBRICANT FILM



Boundary Film  
Bulk Lubricant

## Elasto-Hydrodynamic Lubrication

BULK LUBRICANT AND BOUNDARY FILM PLAY A ROLE



Boundary Film  
Bulk Lubricant

## Boundary Lubrication

PERFORMANCE ESSENTIALLY DEPENDENT ON BOUNDARY FILM



Boundary Film  
Bulk Lubricant