



LEAHY·WOLF

Lubricating specialists since 1946



## Base Oil Comparison

In the development of hydraulic and engine oils, there are two base oils Group I and Group II from which Leahy-Wolf products are formed. The key difference in properties between these two grades, involves saturation, the viscosity index, and clarity of the oil. The higher the saturation, the better the oil holds up without breaking down. The higher the viscosity index, the higher the stability of the oil across a wide range of temperatures. Group II oil is considered the premium oil due to both a high saturation level and a high viscosity index.



*The difference in these two base oils is also evident to the naked eye.*

*The purer oil, Group II, is clear, whereas Group I oil has an amber color due to impurities in its molecular structure.*

### There are a number of other key differences in these two base oils.

The Group II oils have low temperature fluidity, which means they resist gelling or solidification at low temperature. Group II based engine oils work well in cold start-ups because the premium oil more quickly lubricates the top end of the engine. Hydraulic lubricants made from the Group II oils have better flow at colder temperatures. This helps to eliminate both cavitation (or lack of oil coverage) and foaming.

### Group II oils are also more oxidation resistant.

Group II oils are also more oxidation resistant. At high temperatures, the Group II oils experience little, if any, thermal breakdown, thus avoiding deposit formation and clogging of the filtration system.

### The Group II base oils are low in volatility and have a high flash point.

The impurities intrinsic to Group I base stocks are not stable in the liquid state at high temperatures or low pressures, causing molecules to volatilize into the vapor state.

***The key difference in properties between these two grades, involves saturation, the viscosity index, and clarity of the oil.***

***The higher the saturation, the better the oil holds up without breaking down.***

# Problems Encountered in Machinery

## Formation of Deposits

Volatility in an engine crankcase can result in lubricant molecules passing into the combustion chamber, disrupting the lubricant boundary as they pass between the cylinder and liner, and eventually becoming consumed in the combustion process, often resulting in deposit formation.

## Vapor Formation

In a hydraulic system, as pressurized fluid is forced through a restricted orifice into a larger area, pressure drop occurs and molecules behave as if heated. Those volatile species, which are less stable in a liquid state, will vaporize.

## Foaming and Oxidation

In a hydraulic application, entrained gases can result in foaming and loss of load-carrying capability. If the hydraulic system is put under load and the gaseous impurities are pressurized back into a liquid state, heat is released into the system. The increased heat results in an immediate decrease in viscosity, and loss of lubricant film thickness. Over time, heat stresses contribute to oxidation, polymerization and deposits.

**Lubricants made from the Group II oils have better flow at colder temperatures.**



Base Oil Properties	Group I	Group II
% Saturation	97	99.9
Color	Amber	Clear
Viscosity Index	95	100+
Low Temperature Fluidity	adequate	good
Oxidation Resistance	adequate	excellent
Contaminant Suspension	adequate	good
Low Volatility/High Flash Point	adequate	excellent

### **Problem:**

*An engineer observed that foaming and oxidation of the hydraulic fluid in the machinery was occurring at operating temperatures. In addition, the oil was thick in cold temperatures.*

### **Solution:**

*A Leahy-Wolf representative recommended one of their Group II (premium) oils for this application. Group II oils perform at an optimum level, regardless of what conditions may exist in the work environment.*