POLARIS™ Laboratories

Proper Glycol Concentration

TECHNICAL BULLETIN

Proper coolant glycol levels are necessary for adequate boil point control at high engine operating temperatures. Although pressure caps are now designed for up to 16 pounds of pressure and caps can raise a coolant's boil point by 2.7°F at sea level, a coolant that's properly formulated at 50% antifreeze can raise it another 12°F to 15°F.

Therefore, it is important to note, that when flushing a system, as much as one-third of the rinse water can remain in the engine block and passages diluting the new coolant's proper formulation. To correct a weak glycol level, first determine the actual percentage of glycol present using a refractometer. As an example, let's say the reading was at 40%. A level of 50-60% is necessary for adequate boil point control – 55% at higher than sea level elevations.

Correcting Low Glycol Levels

The following mathematical equation calculates how much coolant you need to drain and replace with coolant concentrate:

G_c = Current Glycol Concentration (%)

G_t = Target Glycol Concentration (%)

C = System Capacity (in Quarts, Liters, or Gallons)

D = Amount of coolant to Drain and glycol concentrate to add (in like units)

$$D = C \times \left(\frac{G_t - G_c}{100\% - G_c} \right)$$

The amount of coolant to drain and glycol concentrate to add is equal to the system's capacity times the target glycol concentration minus the current glycol concentration divided by 100% minus the current glycol concentration.

Example - Glycol Level Too Low:

The glycol concentration of a 40-quart cooling system is 40%. We want to adjust the glycol concentration to 50%.

G_c	= Current Glycol Concentration (%)	=	40%
G_t	= Target Glycol Concentration (%)	=	50%
C	= System Capacity (in Quarts, Liters, or Gallons)	=	40 Quarts
D	= Amount of coolant to Drain and glycol concentrate to add (in like units)	=	? Quarts

$$D = 40 \text{ Quarts} \times \left(\frac{50\% - 40\%}{100\% - 40\%} \right)$$

$$D = 40 \text{ Quarts} \times \left(\frac{10}{60} \right)$$

$$D = 40 \text{ Quarts} \times 0.17$$

$$D = 6.7 \text{ Quarts}$$

Drain 7 quarts of *coolant* and replace with 7 quarts of *glycol concentrate*. When adding glycol concentrate to correct low glycol levels, measurements can be simplified by rounding up. When adding water to correct high glycol levels, simplify by rounding down.

Correcting High Glycol Levels

G_c = Current Glycol Concentration (%)
G_t = Target Glycol Concentration (%)
C = System Capacity (Quarts, Liters, or Gallons - use the desired units)
D = Amount to Drain and Amount of Water to Add (same units as C)

$$D = C \times \left(\frac{G_c - G_t}{G_c} \right)$$

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The amount of coolant to drain and water to add is equal to the system's capacity times the current glycol concentration minus the target glycol concentration divided by the current glycol concentration.

Example - Glycol Level Too High

The glycol concentration of 10-gallon cooling system is 60%. We want to adjust the glycol concentration to 50%.

G_c	= Current Glycol Concentration (%)	=	60%
G_t	= Target Glycol Concentration (%)	=	50%
C	= System Capacity (in Quarts, Liters, or Gallons)	=	10 Gallons
D	= Amount of coolant to Drain and glycol concentrate to add (in like units)	=	? Gallons

$$D = 10\ \text{Gal} \times \left(\frac{60\% - 50\%}{60\%}\right)$$

$$D = 10\ \text{Gal} \times \left(\frac{10\%}{60\%}\right)$$

$$D = 10\ \text{Gal} \times \left(\frac{10}{60}\right)$$

$$D = 10\ \text{Gal} \times 0.17$$

$$D = 1.7\ \text{Gal.}$$

Drain 1.5 gallons of *coolant* and replace with 1.5 gallons of *distilled water*. When adding water to correct high glycol levels, measurements can be simplified by rounding down.