# *Being Narrow Minded With Regard To Piston Ring Selection*



Motor State Performance Report Article By Jim Kaekel, Jr.

Piston and ring manufacturer's have learned over the years that there is significant horsepower and fuel economy to be gained by reducing internal engine friction caused by piston ring drag. It wasn't that long ago that 5/64" (.078") or 1/16" (.062") compression rings, coupled with 3/16" (.187") oil rings, were the only piston rings available for most domestic V-8's.

The auto manufacturers abandoned 5/64" compression and the accompanying 3/16" oil rings in favor of narrow, metric-sized rings. The GM LS, Ford Modular and late model Chrysler Hemi, use 1.5mm compression and 3mm oil rings. Small bore 4- and 6-cylinder engines are even better suited to narrow ring packs. Honda's 1.7L 4-cylinder has a 1.0mm (top), 1.2mm (second) and 2.0mm (oil) ring pack. Narrow rings have less contact area and reduced radial wall tension for a significant reduction in internal friction.

A small block Chevy 350 short block assembly with 5/64" compression and 3/16" standard tension oil rings requires roughly 30-35 ft./lbs. to rotate using a torque wrench. A similar assembly with .043" compression and 3mm low tension oil rings takes less than 10 ft./lbs. to turn over. Reducing friction leads to more horsepower.

Modern, narrow rings provide other benefits as well. They are lighter, which, at first glance, may seem insignificant, but in racing applications with engine speeds in excess of 8,000 RPM, the weight savings are truly beneficial. Piston ring "flutter", where the ring actually vibrates within the ring groove at high engine speeds, is also reduced. Narrow rings conform better to bore distortion, too, improving sealing.

Kevin Studaker of Total Seal Piston Rings says, "Improvements in piston quality, cylinder honing and related machinery are key in realizing the benefits of narrower rings." Many circle track and drag racers are currently having great success with .0325" (top), .0325" (second) and 2.0mm (oil) ring packs, according to Studaker. Made from stainless steel for durability, the rings are used with gas-ported pistons for an ultimate combination of reduced friction and improved combustion sealing. Although custom pistons are currently required for these particular rings, increasing usage is sure to bring about off-the-shelf piston availability in the near future.

Many piston ring sets are also offered with low tension oil rings with the same oil rails as a standard tension set but with an expander designed for a smaller cylinder bore. The oil ring's function is to remove oil from the cylinder walls and provide drain back through the pistons. Naturally, a higher tension oil package provides more oil control, while a low tension set provides less so low tension oil ring sets should never be used in street applications and only in racing engines with crankcase evacuation systems. Ultra-low tension oil ring sets are also available, but only for engines with a dry sump oiling systems and vacuum pumps.

Oil ring tension may be measured with a common fish scale. Install the oil ring package on a piston and insert the piston (less connecting rod) upside down in the cylinder bore which should be lightly lubricated. Push the piston downward until it's near the bottom of the cylinder. Hook the fish scale onto the piston pin and gently pull the piston up the bore. Ignore the scale reading as you start the pull, but make note of it after the piston begins to move upwards. Different oil ring packages, available separately from Total Seal and Federal Mogul/Speed-Pro, may then be compared in this manner.

When selecting piston rings for a race engine, the engine builder tries to achieve a perfect balance between reduced internal friction and ring seal and durability. There may be a slight increase in the amount of oil in the combustion chambers, on piston tops and on spark plugs if a low tension oil ring set is used. Engines with nitrous injection, a supercharger or a turbocharger should never use low tension oil rings because excessive oil in the combustion chambers leads to detonation and, ultimately, broken rings and pistons.

Proper ring selection is very dependent upon the engine's specific application so consulting with qualified technical personnel prior to purchase is highly recommended.