Engine technologies present new **benefits and challenges.**

Many mechanical developments designed to reduce emissions and improve efficiency place added stress on lubricants and fuel systems.

Dan Peterson | VICE PRESIDENT, TECHNICAL DEVELOPMENT

In recent years, mandated emissions reductions and new fuel economy standards have been the major drivers for new engine technologies. Application of improved engine technologies is accelerating to meet these mandates, challenging lubrication and fuel systems to operate accordingly. Two of the most common recently improved engine technologies include turbochargers and gasoline direct injection.

Turbochargers

Turbocharged engines have gained popularity with vehicle manufacturers for their ability to maintain or increase engine power while simultaneously increasing fuel economy. Turbochargers work by harnessing hot exhaust gases to drive a compressor, which in turn pressurizes air from the intake system to generate more engine power. Since turbochargers are continually exposed to hot exhaust gases, they stress lubricants far beyond other areas of the engine. High temperatures create the potential for localized sludge and deposit build-up in critical areas, which can lead to damage to the turbocharger and other parts of the engine if not lubricated and maintained correctly. Some engines equipped with turbochargers require warm-up and cool-down periods to avoid coking, which is when motor oil becomes baked onto the internal parts of the turbocharger.

According to BorgWarner Turbo and Emissions Systems, 90 percent of all turbocharger failures are due to one of the following causes:

1. Penetration of foreign bodies into the turbine or compressor
2. Dirt in the oil
3. Inadequate oil supply (oil pressure/filter system)
4. High exhaust gas temperatures.

These failures can generally be avoided with regular maintenance. Maintaining the air intake and filter, for example, helps keep the system running cooler and ensures that no random foreign material gets into the turbocharger.

Many new turbocharger-equipped engines are designed to be consumer friendly and require little, if any, special intervention. For example, the new Ford EcoBoost™ engine has two water-cooled turbochargers that continually circulate coolant after engine shut-down to ensure the turbo is sufficiently cooled to prevent coking. Although this addresses some of the immediate issues, oil debris and localized excessive oil temperatures can still cause long-term issues.

Gasoline Direct Injection Engines

Gasoline direct injection (GDI) engines are becoming more widely used by vehicle manufacturers because, like turbochargers, they can maintain engine power while also increasing fuel efficiency. In a GDI engine, fuel is injected directly into the combustion chamber rather than the intake side of the engine. GDI technologies from different manufacturers vary and component design is slightly different depending on the company. Some GDI engines have exhibited problems with carbon build-up on the intake side of valves. Oily residues build up over time and deposit on the back side of intake valves causing loss of engine horsepower, sluggish operation and poor fuel economy.

One of the larger concerns is the potential for clogging fuel injectors. GDI systems operate under very high pressures and temperatures. The fuel injector resides inside the combustion chamber, so it is exposed to continuous cycles of high heat and pressure followed by cold-soak periods. This is a much more severe operating environment and deposit issues are more common than in engines with injectors on the intake side. Since GDI systems depend on high pressures to atomize the fuel, any disruption of flow through the small injector openings creates noticeable issues. This problem is so prevalent that a GDI deposit test was designed specifically to predict deposit formation and impact on fuel flow.

So, with more change comes more issues and opportunities. Increased use of turbochargers places more stress on lubricant and filter technology. Lubricants must hold up to excessive temperatures created by use of these systems, and they must be able to quickly pull heat away from lubricated areas. In addition, oil filtration is critical as these systems continuously operate under high load and rpm. A slug of dirt particles in engine oil can tear up key bearing components quickly. Seems like a problem specifically designed for AMSOIL motor oils and high-efficiency filters.

GDI technology has many benefits, but some significant issues. The pressure-cooker that is created by high temperatures, high fuel pressures and smaller fuel injector openings can certainly cause new issues for drivers. Varying fuel quality also creates another opportunity for AMSOIL fuel additives to help prevent or eliminate the issue. ■

Neglected Equipment:
Air Compressors

Many people and businesses own small air compressors that are used for tasks such as inflating tires and balls, spraying paints and varnishes and running air tools like nailers, impact wrenches and air ratchets.

Oil-lubricated home compressors are typically powered by an electric motor that is connected to the pump unit either directly or by a belt. When the electric motor turns the pump unit a piston creates a vacuum as it travels down the cylinder and pulls air through the inlet port. As the inlet valve closes and the piston travels up the cylinder, air is compressed and pushed through the discharge port and into the tank.

The tank is filled with compressed air until it reaches a preset pressure, at which time the motor and pump shut off until the pressure in the tank drops to a predetermined point and needs to be filled again.

Although driven by an electric motor, oil-lubricated piston-type small air compressor pump units contain a crankshaft, valves, pistons, piston rings and bearings that require lubrication. Like the engines found on push mowers, compressors of this type often rely on a splash lubrication method to protect parts against wear.

Compressor maintenance is not a high priority for many people. Compressor units tend to be used only on an intermittent basis, and the oil is rarely, if ever, checked or changed. However, like any other engine, it is important to check the oil level occasionally and top it off if necessary to ensure optimum equipment protection and performance.

Compressor Oil Challenges

The challenges faced by compressor oils include the following:

- Reduce friction and dissipate heat. The more the pump unit runs, the hotter it becomes.
- Resist sludge and varnish to keep valves from sticking or leaking.
- Minimize foaming. Foam is a common byproduct of splash lubrication systems, leading to overheating and oxidation problems.
- Corrosion and rust control. Water is a natural byproduct of compressed air, often working its way into the compressor oil and leading to rust and corrosion problems in the pump.
- Good cold-temperature performance for units used in cold climates.

PC Series Synthetic Compressor Oil

Engineered to meet the tough demands of industrial compressor applications, AMSOIL PC Series Synthetic Compressor Oil provides outstanding protection and performance for small compressor applications. PC Series Compressor Oil incorporates the highest quality, thermally stable synthetic base stocks and premium non-detergent, ashless additives for maximum protection at high temperatures and pressures, lasting up to eight times longer than petroleum oils.

- Helps improve operating efficiency
- Resists viscosity increase from oxidation
- Contains anti-foam additives to resist foam and reduce heat, oxidation and wear
- Anti-rust fortified to help prevent rust and corrosion
- Resists varnish, carbon and acid formation ■