

## **Carbon/Coking Deposits-Cause and Effect**

Carbon/coking deposits have been a problem for the Internal combustion engine since it was invented. It is a known fact that carbon/coking deposits in Internal Combustion Engines reduces engine performance, reduces fuel efficiency, shortens engine/equipment/parts life and increases engine out emissions.

In the quest to lower exhaust emissions, reduce pollutants in the atmosphere and increase engine efficiency. Due to ever increasing regulations, the manufactures are asking the Internal combustion engine to do more things it was ever designed to do. As a result, the carbon/coking deposit problem has become more frequent and severe, creating a whole new set of problems and challenges.

Listed below are the some of the basic primary reasons carbon/coking deposits develop in the IC engine. These are only six basic primary reasons. There are many more variables that can contribute to the carbon/coking problem which are not listed here.

Engine Carbon/Coking is going to happen to the IC engine to some degree or another. How severe and how fast these deposits develop in IC engine depends on how well the operator/owner understands and deals with the primary reasons below.

### **1) Engine Emission Controls-PCV, CCV, EGR and Cooled EGR**

The listed emission controls capture crankcase oil vapors and small amounts of exhaust fumes and re-direct them back thru the intake system of the Internal combustion engine. While they do contribute lower emissions. This does not come without a cost. These two systems also make significant contributions to engine carbon/coking deposits. These same systems are subject to carbon deposits and malfunction. The malfunction of these systems in today's modern IC engine, if not corrected quickly, can lead to anything from minor repairs to catastrophic engine failure. Modern day emission controls are mission critical to the proper operation of today's IC engine. When you see a check engine light it means see a professional ASAP.

### **2) Medium and High Volatility Engine Oils**

Modern day IC Engines operate more efficiently and run at higher temperatures than ever before. Modern day computer control and sensor technologies are primarily responsible for these advancements. Like the emission controls, this does not come without a cost. Modern day engine crankcase temperatures heat and vaporize the light ends of the engine oil creating oil vapors and mists. These vapors and oil mists in the crankcase are sucked out of the crankcase via the positive crankcase ventilation system and re-directed into the intake system of the engine to be burned off. We may recognize this as burning engine oil. However much of these vapors and mists adhere to the inside of the intake manifold and wind up as deposits on the intake valves. Many times these deposits can lead to drivability issues, performance and fuel economy losses. Much of this problem can be directly connected to the engine oil being used in the engine. The use of high quality chemically engineered low volatility engine oils can significantly mitigate this problem.

### **3) Engine Oil Soot Loading**

In Modern Day Gasoline Direct Injected Engines and Diesel Fuel Direct Injected Engines soot generation is just a matter of fact. To lower Nox emissions, the function of the Exhaust Gas Re-circulation system is to re-direct some of this soot back into the cylinders thru the intake system. Some of this soot goes past the rings. As it is going past the rings, it fouls carbons/cokes up the piston ring packs and reduces their efficiency. It also allows even more soot past the piston rings over time. The engine oil suffers from soot loading, meaning the soot pollutes the engine oil reducing its efficiency and shortening oil life.

### **4) Fluid aeration, cavitation and nucleation-entrained air generated in fuel, oil and cooling systems**

This is a problem that has been being observed for many years. A fish swims in water. A fish breaths Oxygen. Can you see the oxygen? No. That is because it is dissolved in the water. Just about all flowing/pumped fluids have a certain amount of entrained air/gases dissolved in the fluids. These dissolved gases in the fluids become even more problematic when they are flowing/pumped. Fluid system design can also play significant roles in these problems.

### **5) Maintenance schedules and how often your vehicle/engine is competently maintained**

With technology advances like Gasoline Direct Injection, Diesel Engine Powered Vehicles, Computer Engine, and vehicle control, vehicle/engine maintenance is becoming even more important than ever before. Gone are the days to doing maintenance and oil changes at home in the driveway. Today's modern vehicles/engines require factory/specialty trained technicians.

With better efficiency, better engineering and better design comes the need for professionally trained experts. The fact is if the technician is not professionally trained they can't make it in the Auto/truck/engine repair business today. The most reputable repair facilities will have continuing education for their technicians and training certificates posted in their facilities. The care and feeding of the vehicle/engine requires a professional. one needs to find a professionally up to date repair facility that they can have confidence in. Then make sure they visit them regularly or when needed.

### **6) Driving/operating Parameters-Engine over-fueling? Does your vehicle/engine get highway miles and operate under load?**

Some of the worst things one can do to their vehicle/engine is spend too much time in stop and go traffic or idling. This type of driving/operation can significantly carbon/coke up their engine very quickly. Another bad habit is hard acceleration. This over fuels the engine and leads to more problems including more carbon/coking build-up. The vehicle/engine likes steady load on it. Get it out on the highway and see the countryside. This helps minimize and keep the carbon/coking problems to a minimum.

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