PATTERN FAILURES

Plagued with Problems by Design

Occasionally you will encounter a system or component that develops a history of pattern failures that can elude your best efforts. Problems or premature failures can result from a manufacturing defect with a component, a problem due to the design of the system, or a secondary system malfunction may lead to a premature component failure. When the industry encounters the same failures or circumstances, then most likely you are dealing with a design issue. It is unlikely that multiple manufacturers of the same part would make the same manufacturing mistakes. Identifying and acknowledging these issues early on are imperative in making an accurate diagnosis in a timely manner, and in maintaining good customer relations.

GM trucks and SUVs equipped with the Vortec engine are good examples of an ignition system that has developed some common failures that would be considered a normal characteristic. Distributor cap and rotor contamination, resulting in a misfire condition and stored misfire codes, has become a common occurrence. The codes may be cylinder-specific or random misfire codes. It is not uncommon to remove the distributor cap on one of these engines and observe heavy deposits of a white or tan powdery residue. The distributor caps used on these applications are susceptible to more than just contamination problems. Read on for a thorough description of some of the problems and possible solutions.

POOR DISTRIBUTOR VENTILATION

The aforementioned ignition system has encountered excessive levels of distributor cap corrosion, resulting in internal arcing and misfiring. Many technicians are of the opinion that the type of metal used in the construction of the terminals is the reason for the heavy concentrations of deposits and misfire conditions. This is not the case. GM has acknowledged what we have suspected all along, that the corrosion condition and the heavy deposit formation is the result of *inadequate ventilation* in the distributor housing. The gases collect in the distributor cap and housing, and in the presence of heat and high voltage, form corrosive deposits, resulting in internal arcing and misfire conditions. When these conditions are present, the cap and rotor will usually reflect the presence of a white or tan residue on the inner walls of the cap and rotor, and the terminals will be encrusted (see illustration 1). The contaminants are conductive and can promote a misfire condition, resulting in misfire codes being stored in the diagnostic memory.

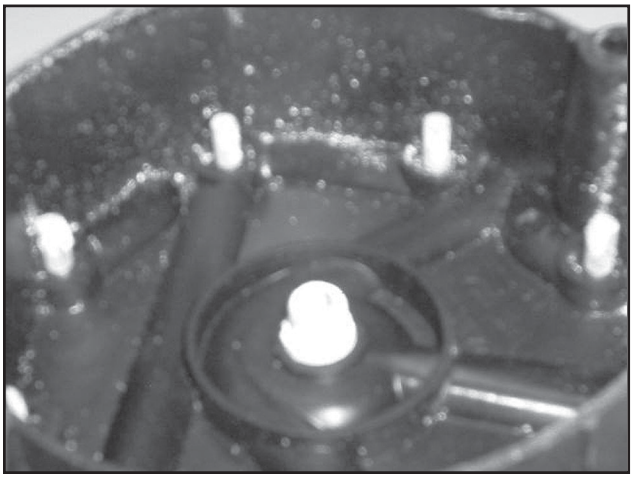

ILLUSTRATION 1:
LIGHT CORROSION DUE TO POOR VENTILATION

Inspect the base of the distributor and the distributor shaft for the presence of rust. While the distributor housing is made of plastic, you are looking for an accumulation of debris from other internal metal components. Components that are affected by corrosion should be replaced. The accumulation of debris in the distributor housing can restrict the ventilation screens. Most technicians are not aware that this style distributor is fitted with vent screens, as the distributors on these applications seldom have to be pulled for service, with the exception of replacing the intake manifold gaskets. The vents are positioned at the base of the distributor and are almost impossible to see with the distributor mounted in the engine (see illustration 2). In fact, the screens are easily missed while viewing the distributor on a work bench. The two vent screens are approximately the diameter of a pencil eraser and they are easily plugged when debris is present. The frequency in which they plug increases with vehicle mileage. Naturally, as the engine wears, the blow-by gases increase, thus an increase in the gases collected in the distributor housing. A malfunc-

tion in the PCV system can produce the same results. The vent screens should be washed with a solvent, such as brake clean, and any contamination expelled with air pressure. Wear safety glasses to prevent an eye injury. These conditions have prompted GM to release two revised distributors that incorporate larger air-flow screens for improved ventilation. GM recognizes 2001–2003 trucks and SUVs equipped with 4.3L, 5.0L or 5.7L engines as being the recipients of the revised distributors. Our research shows that both distributors (V-6 P/N 93441559 and V-8 P/N 93441558) can retrofit applications back to 1996. The list prices of the distributors from GM are $303.78 for the V-6 and $447.75 for the V-8. Considering the cost of the replacement distributor, many opt for a clean-up of the existing distributor.

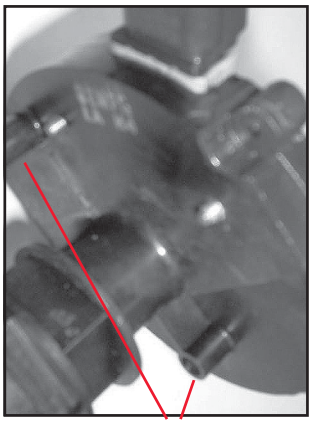

ILLUSTRATION 2:
SCREENS ARE POSITIONED AT DISTRIBUTOR BASE

MOISTURE ACCUMULATION

Convinced that moisture is collecting inside the cap and promoting misfire conditions, some technicians seal the distributor cap with silicone. Sealing the cap is not the solution and may actually worsen the condition, especially in cases where plugged vent screens are present, preventing the escape of the gases. The moisture condition may be influenced by the A/C system. On many applications, the A/C accumulator line is routed directly over the distributor cap (see illustration 3). The condensation from the line drips directly onto the distributor cap and housing. If you identify this condition, installing a foam sleeve over the accumulator line can minimize the moisture problem. Water dripping on a hot distributor cap can promote electrical tracking and arcing.

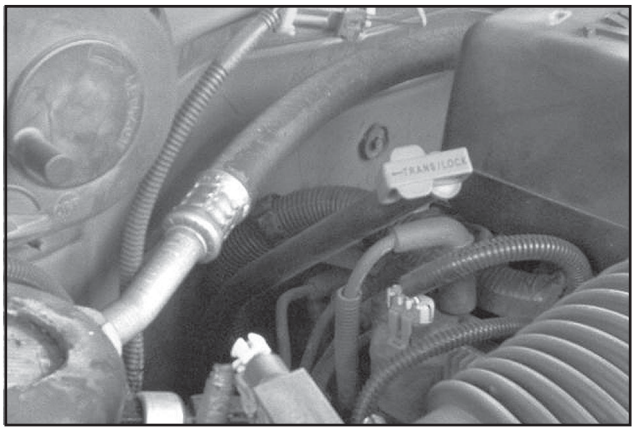

ILLUSTRATION 3:
A/C ACCUMULATION LINE DRIPS WATER ONTO CAP

LOW PROFILE DESIGN

The low profile design of the distributor caps for these applications is necessary, as the engine compartment space for the distributor is limited. On most distributor caps, the terminals are spaced a minimum of an inch apart. With this style cap, some of the terminals come within 1/8 inch of an adjacent terminal. The close proximity of the terminals makes manufacturing of the part a challenge. Any air or gas pockets in the plastic molding process can eventually result in high voltage arcing. The potential for arcing/flashover is great, while leaving little evidence the condition has occurred. The problems are further aggravated when high secondary circuit resistance conditions are present. Current takes the path of least resistance and often will arc to an adjacent terminal, creating a misfire condition. For example: Installing a new cap on a set of bad spark plug wires can lead to a premature failure of the cap.

In summary: The design of this distributor makes for an above-normal failure rate of caps and rotors. When diagnosing a performance problem on this ignition system, the cap and rotor should always be a first suspect, regardless of how long it has been on the engine. The high voltage terminals are molded into the plastic housing in close proximity, which is a manufacturing challenge. The manufacturer must consider terminal position and molding issues such as air and gas pockets in the plastic. The distributor has a history of inadequate ventilation, which prompts an accumulation of conductive deposits. When this occurs, the result is misfiring, an illuminated SES lamp and stored trouble codes. The cap is positioned directly beneath the A/C accumulator line, which can drip water onto the distributor cap.

Due to the design of the system, the distributor cap and rotor are destined for failure.

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