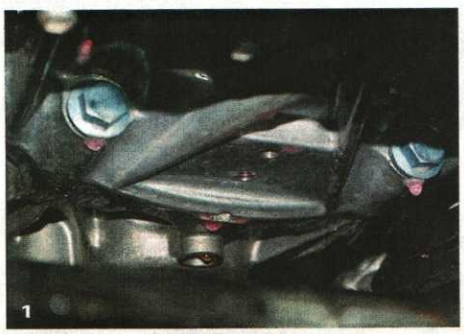
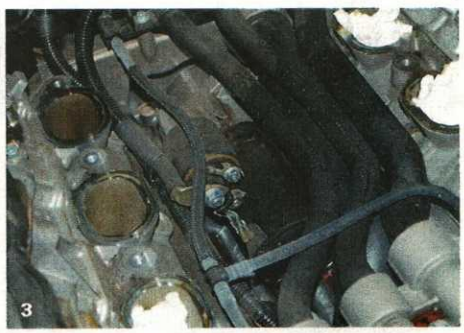
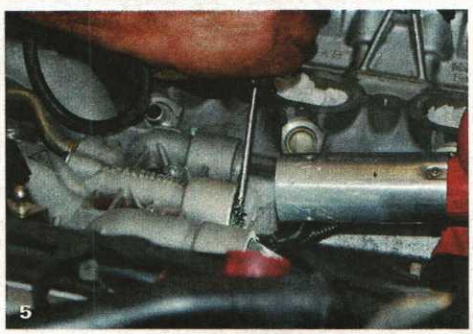
Cayenne V8 Valley Coolant Pipes

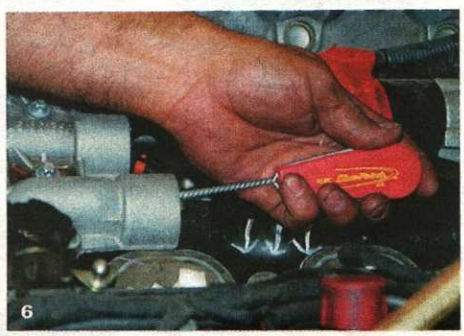
How to prevent a major expenditure in pre-2008 V8 Cayennes

BY **TONY CALLAS** AND **TOM PRINE**









Coolant leaking from rear of V8 and torque converter area (1). Underbody panels also act as catch pans (2). With intake manifold out, coolant in the valley area and wet plastic pipes can be seen (3). Heat gun applied to thermostat housing while pressure is applied to extract the pipe (4). Cleaning out remnants of old plastic pipe and rubber O-rings; heat continues to be applied to help remove old material (5). Using small wire brush to clean out inside bore of thermostat housing (6).

The December 2010 issue's *Tech Forum* reviewed some of the common problems that can affect pre-2008 Cayennes. One of the more serious issues identified in the article was leaking valley coolant pipes, a potential failure point in all models equipped with a V8.

The valley area of the engine is located below the intake manifold, between the right and left cylinder heads and the front and rear of the engine block. Four plastic pipes are installed in this area, three small and one large. These pipes are designed to transport engine coolant between the front and the rear of the engine.

At some point in time, it is possible for one or more of these plastic pipes to fracture and allow engine coolant to flow into the V8's valley area. As the valley area fills, the coolant should encounter two small drains located at the rear of the engine. These allow collecting coolant to escape into the transmission's torque converter (bell housing) area and then spill into the underbody paneling.

Should this occur, a timely diagnosis and quick repair is imperative. Both the starter and transmission torque converter seal are potential secondary casualties if exposed to the corrosive coolant. As always, the ultimate victim will be your wallet: The replacement of a torque converter seal or starter is no small matter. Fortunately, you can avoid that outcome by arming yourself with an understanding of the issue, a watchful eye for symptoms, and quick action in the event of a failure. Doing so can literally save you thousands of dollars.

This *Tech Forum*, then, will look at the problems associated with valley coolant pipe failures in 2003 through 2006 Cayenne S, Turbo, and Turbo S models.

All Plastics Are Not Created Equal

Today, more than 60 different plastic composite materials are utilized in the manufacture of automobile parts and components. The job requirement of a given part will determine which plastic composite type is best suited. Some parts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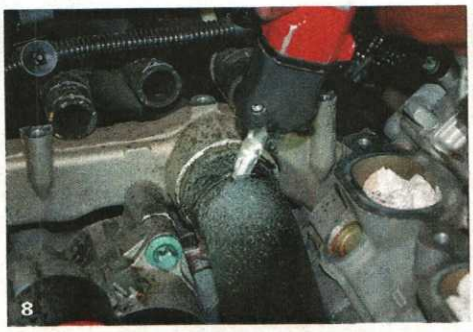
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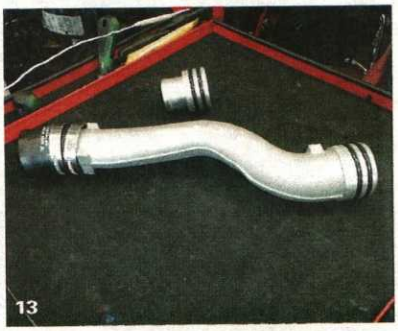
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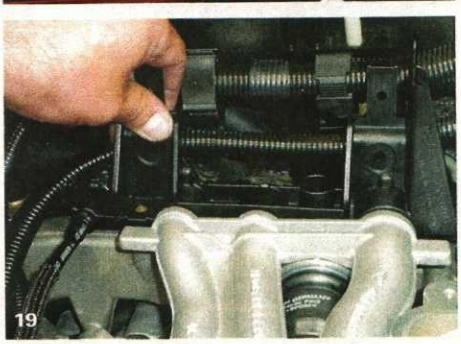
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need to move or flex without breaking while others must remain rigid or tolerate high levels of heat with no deformation. Whatever the required performance of the part, its fabrication is accomplished by a mixture of resins, polymers, plasticizers, etc. — and the combinations of these additives establish the characteristics of the completed part.

Like all automobile manufacturers, Porsche has utilized plastic components in its engine cooling systems for decades. When Porsche introduced its first water-cooled engines in the 924- and 928-series cars, most of the cooling system was aluminum. In the years that followed, plastic components became a very common substitute for aluminum in the cooling system, specifically for the coolant reservoir/expansion tank, radiator end tanks, and radiator fans.

As the plastics industry developed more robust materials, there was a dramatic increase in the use of plastics in the engine compartment. Today, many of the components that make up the engine's cooling, air intake, and oiling systems are made from plastics.

To be sure, there are many advantages to using plastic instead of metal parts. Plastic generally will not expand or contract as much as metal when exposed to heat or cold and can therefore provide a more consistent sealing characteristic. Plastic is also inert, meaning it will not alter the chemical makeup of coolant where aluminum will promote an increase in acidity levels. Plastic is lightweight when compared to metals, as well — something Porsche has always been conscious of.

Another area where plastics offer an advantage is in the manufacturing process. Plastic can be molded into incredibly complex shapes so parts can be designed and manufactured to fit into tightly confined areas. This helps designers better utilize the space available. Additionally, a process known as rapid prototyping be-

Thoroughly clean all mounting surfaces for new pipes and O-rings (7). Using an air saw, large lower pipe is cut at rear coolant manifold and engine block (8). Channel-Locks help remove metal ring at rear coolant manifold (9). Metal ring can be seen in place at front of engine (10). Vise-Grips attached to metal ring for removal; be sure to clean all inside surfaces and remove all debris from valley area (11). After removal, crack in pipe can be seen; coolant loss would be significant under heat and pressure (12). Lower aluminum coolant pipe replacement parts including pipe, hose, clamps, and adapter with O-rings; note: O-rings are included with pipe, adapter is not (13). Locating aluminum adapter at rear coolant manifold for installation; note Optimal Paste on O-rings (14). With large coolant pipe in place, rubber hose can be moved into place and the hose clamps tightened (15). Upper three-pipe manifold prepared for installation with application of Optimal Paste to O-rings (16). Upper manifold in position, ready for installation (17). Installation of new vent line to coolant reservoir is required in most cases because the old part breaks during removal (18). Installing upper mounting bracket for three-pipe manifold; bracket has provisions for attachment of reservoir vent line as shown. Reinstallation of intake manifold (19).

came available in the late 1980s and is now utilized throughout the automotive industry. This is the process where physical parts are created in plastic or metal by machine directly from computer-aided design (CAD) drawings.

Most importantly, plastic's ultimate advantage is in cost savings. Plastic parts are easily molded in mass quantities where the time and cost to produce metal components would be unrealistic. The cost savings to both the manufacturer and consumer are significant.

However, in the philosophy of Yin and Yang, there is always a negative to a positive, and this appears to hold true regarding plastics in the engine compartment. While both plastic and aluminum work well in the hot environment under the hood, changes to the plastic begin to take place over time. In general, plastic parts can become increasingly brittle over years of operation as they are exposed to coolant and the cooling system's repeated thermal and pressure cycles.

The combination of heat applied to the plastic and coolant flowing through the pipes can cause certain chemical additives to leach out of the plastic, thus changing the chemical makeup of the material. These chemicals, sometimes called plasticizer additives, give plastic its strength and flexibility. As these additives dissipate, the plastic can fatigue or "age." In time, cracks in the material can develop.

What to Watch For

Your first clue that something is wrong with your Cayenne's cooling system may be a low coolant warning in the instrument cluster when starting, driving, or shutting off the vehicle. If you see a low coolant warning light come on in any car, you should have the issue investigated right away — but this holds especially true with 2003–2006 V8-equipped Cayennes.

Another clue is any amount of coolant visible on the ground under the car. Not to be confused with water condensation from the air-conditioning system, coolant will have a slight oily feel, a sweet smell, and is usually pink or green in color. Generally, parking overnight while the engine cools to ambient temperature will provide you the best opportunity to discover a coolant leak. If you ever find a significant amount of coolant on the ground, it is highly recommended that you not drive your vehicle but instead have it towed to a repair facility familiar with Cayennes.

The cause for a leak may be something completely unrelated to the valley coolant

pipes. This could include a coolant hose, radiator, water pump, etc. However, the only way to know is to locate the source of the coolant loss.

Cayennes are equipped with underbody paneling which aids in aerodynamic characteristics. Unfortunately, this paneling also acts as a catch pan for liquids that may leak from the engine or transmission areas. With the paneling in place, the liquid must fill the pan to the point of overflow before you will see a drop on the ground. The underbody paneling must be removed to make a credible diagnosis. In the case of a leak caused by valley coolant pipes, the coolant will be dripping from the area between the engine and the transmission — which can be seen only after the paneling has been removed.

The Upgrade

The demise of the original Cayenne V8's plastic valley coolant pipes is pretty much unavoidable; at some point, they will leak and require replacement. It is difficult to predict how long the pipes will last, but if your Cayenne is getting beyond the 60,000-mile mark, you may consider the pipes to be on borrowed time.

The single, large (lower) coolant pipe has been the most common of the pipes to fracture and leak. A visible crack will develop (see photographs) in the plastic. Under the heat and pressure of an operating cooling system, the loss of coolant can be significant. However, we have not seen or heard of any case where a plastic pipe has blown out catastrophically.

In February 2008, Porsche released a Technical Service Bulletin titled *Coolant Pipe Leaking* covering 2003 through 2006 Cayenne S, Turbo, and Turbo S models. The document introduces new pipes available from Porsche. Made from aluminum, they are intended to replace the original plastic components. The parts are shown in an exploded picture view along with identifying part numbers. This document is not a step-by-step instruction for the replacement of the pipes; it is a guide so that a technician knows what needs to be replaced. The components required for replacement are identified by the lower (large) coolant pipe and the upper three-pipe manifold for the heater system. The bulletin suggests that all of the identified components should be replaced, even if only one pipe is leaking.

The components for replacement of the large coolant pipe are as follows:

948.106.049.07, coolant pipe, 1 required.
999.512.389.01, hose clamp, 2 required.
948.106.240.00, hose, 1 required.
948.106.230.00, adapter, 1 required.
999.707.370.41, O-ring, 2 required.

The components required for replacement of the three-pipe manifold are:

948.106.059.05, coolant manifold, 1 required.
948.106.259.00, bracket (upper), 1 required.
948.106.269.00, bracket (lower), 1 required.
948.106.279.00, bushing, 3 required.

We highly recommend replacement of the plastic vent line connecting both cylinder heads to the coolant expansion/reservoir tank (Porsche part number 948.106.016.03). This line becomes brittle after years of operation and is easily replaced during the valley coolant pipe procedure. Doing so could save you an expensive headache later.

Another item to utilize for this job — and a great addition to your toolbox — is Optimal Paste (Porsche part number 000.043.204.68). This lubricant should be applied to all O-rings and rubber seals in the cooling and oiling systems during assembly except where no lube is recommended or allowed. Porsche refers to this product as grease; it is the same product

used at the factory during assembly.

Collateral Damage

Unfortunately, valley coolant pipe failure can cause collateral damage if it is not addressed in a timely manner. The starter motor is located in the valley area below the coolant pipes. Repeated exposure to coolant spraying from a damaged pipe in this confined area could penetrate into the starter and/or starter solenoid, causing damage. The starter may or may not fail immediately. Thus, if you're doing the coolant pipe upgrade, you may want to consider a preemptive starter replacement to avoid having to repeat the procedure again should the starter fail in the near future. You may also want to consider a new starter if your Cayenne is close to or past the 100,000-mile mark and still has its original starter unit.

The other and more serious problem is possible damage to the Tiptronic automatic transmission's torque converter seal. As coolant leaks into and builds up in the valley area, it will drain through two small holes located near the starter. The coolant is then directed into the area of the transmission's torque converter. With enough time and sufficient quantity, the coolant will attack and damage the seal's material — resulting in a torque converter seal that starts to leak transmission fluid.

Here's the really bad news: To access the torque converter seal, the transmission must be removed. If a faulty torque converter seal is not replaced, the loss of transmission fluid will persist because the fluid is continuously pumped through the torque converter during vehicle operation. If the fluid loss is allowed to continue and the fluid level falls below a critical point, the transmission can be damaged and may even require replacement. Watch out for this one.

Further Thoughts

Like other engines, the Cayenne V8 is intended to run within a specific temperature range regardless of ambient weather extremes or traffic conditions. If it's low on coolant, it can run hotter than normal and produce additional internal pressure, which may exacerbate wear on various system components. Maintaining the cooling system at its full efficiency will ensure proper operation, which is the best defense against unnecessary problems.

What are some good guidelines to follow? Keep the radiators clear of dirt and debris. Keep the cooling system full of Porsche factory coolant. We cannot overstate that "full" means to the full mark on the coolant reservoir at operating temperature, *but never above* — because overfull can also cause problems. Repair any leaks or other issues in a timely manner. Flush the entire system including the engine block and heater system every two to three years. Be sure to take the time to bleed as much air out of the system as possible.

All automobile manufacturers have experienced issues with the durability of plastics in their cooling systems, so one might conclude that these parts are not intended to last indefinitely. In the case of the Cayenne V8's valley coolant pipes, they appear to endure about as long as other plastic components under similar conditions. Porsche's aluminum pipes are working out well — so you may want to consider this upgrade if the intake manifold in your pre-2008 Cayenne is being removed for any reason. Sometimes it's better to beat a problem to the punch — and this is one of those times. Enjoy your Porsche.