

Embrittling Experiences

By Mike Perkins

BMW CCA Technical Advisor

Owner - Bavarian Machine Specialties

There are times I believe all of my new customers are predestined to end up on my doorstep due to an angering experience with their BMW. In this particular instance, the potential customer was moving from San Francisco to Houston. She had just received a thorough Inspection II from a reputable shop in the Bay Area and was secure in the belief that her 1997 328i was in completely reliable shape. A little more than 100 miles away from Houston, without any notice, the car experienced a severe overheat problem. Within seconds, the temperature gauge shot into the red and steam poured out from under the hood. She did the correct thing by immediately pulling off the road and shutting the engine off but as she sat stranded on the side of I 10, she couldn't help but wonder how her well-maintained car could have done this to her. The type of problem she encountered is something you have either experienced, heard about, read about, or will have happen to you if you own a 10 year old or newer model BMW.

Up until the last decade, I would have been accurate in my initial phone diagnosis by presuming a coolant hose had popped. However, as of about 1991, BMW entered the new age of the latest technology in plastic injection molds. Plastic is a wonderful innovation; it has improved everyone's life in some way. With this in mind, I do not mean any disrespect to the purveyors of plastic when I say in some cases, plastic is a cheap substitute. Plastic parts in automobiles have been touted for saving weight and improving the overall design. However, I would suggest that the biggest net gain is not the durability of the product, rather the ease of manufacturing and the associated costs. This fact alone should be upsetting and is certainly part of the trend. Technology is great when the consumer receives a better product at a lower price. However, when the product is cheaper to manufacture but costs the end user the same or more and doesn't last as long, it is simply a manufacturer's problem.

The 1997 328i did what so many other BMW's I've seen have done. The coolant hose to the radiator didn't "pop" or even come loose, the neck of the radiator that the hose attaches to simply broke off. This problem is far too common on all models since the early 90's and is what BMW refers to as "plastic embrittlement". The plastic has heated up and cooled down enough times to create a brittle condition in the plastic of the radiator. Add to this condition the stress of an upper radiator hose that lightly tugs at the radiator neck every time the engine revs and eventually the plastic will snap off. Almost all of the coolant is purged from the system rather quickly at this point and for those who think they can make it to the next exit or the gas station, the decision is usually fatal for the motor. I have seen this type of failure on cars that are just 4 years old. Be advised that this "plastic" problem is not limited to just the radiator. On any given model there are at least 5 plastic "time-bombs" waiting to go off and that is just in the engine cooling system. The disturbing part is that it seems that BMW or its' plastic manufacturers have forgotten how to make plastic. For example, the first plastic tanked radiators were used on a 1979 528i. These radiators were never replaced for this same problem and usually lasted 10 years. Eventually, when we did replace them, it was because the crimp seal was leaking or we couldn't properly clean out the core. This brings up another issue, you don't "rod out" plastic radiators (as you did with brass radiators), so every year the heat dissipation problem becomes a bigger concern, and in Houston, that puts the car at a disadvantage. In my shop, cooling system plastic parts are now viewed as "wear items". This means cooling system parts that are susceptible to sudden failure have a replacement cycle much like you would do with brake pads.

Consider the following list of cooling system wear items to be susceptible after 4 years or 50,000 miles:

- Radiators on all models should be inspected and tested for cracks in the plastic tanks and especially around the upper hose connection. Most will need replacement to be safe. Some Behr replacement radiators are available with an aluminum collar inside the neck to reinforce the stress area. There are also aftermarket radiators that have no plastic but have proved to have other reliability issues. In addition to radiator neck problems, 96 and newer 7 series cars also suffer from a leak around the o-ring at the plastic hose fitting. Replacing an entire radiator because of seepage around an un-fixable fitting or a suspect radiator neck is a tough pill to swallow but carefully consider the alternative.
- Water pumps on all M50/M52 engines manufactured up until 10/96 on 3 and 5 series cars came with a plastic impeller. Most of these have either been replaced by now or have self-destructed. If you still have an original water pump, have it removed and inspected. The impeller splits along the water pump shaft and the impeller will generally "freewheel". This causes an odd heat up problem that is usually mis-diagnosed as a faulty thermostat. In extreme cases, the impeller simply disintegrates leaving lots of little plastic pieces throughout the engine cooling system. BMW upgraded all of these pumps to a stamped steel impeller but third generation pumps now have a composite material impeller. Time will tell.
- Coolant reservoirs on all models have a tendency to warp and to even split open. 5 and 7 series up through 1995 will split along the seam and the steel collar inside the reservoir hose neck will work its way out allowing the neck to break off. Reservoirs on 3 series will warp around the cap area and not seal against the cap o-rings properly. In extreme cases, coolant will stream out around the cap after the car is shut off as the cooling system heat soak quickly builds. 96 and newer 7 series reservoirs break apart internally and eventually split open.
- Fan shrouds on all 5 & 7 series cars will simply crumble to the touch after several years. In extreme cases, a piece will come off, hit the fan blade, and become a projectile (hopefully missing the radiator).
- Thermostat housings are an especially sore subject depending on which model you own. For those who own a 99 and newer 3 or 5 series car with the M52 TU engine, you know what I mean. The plastic thermostat housings were not reliable and by now almost every one has been replaced under warranty. On 5 and 7 series cars, up to 1995, plastic thermostat housing covers split and leak along the seam and can be mistaken for a water pump leak. All E36 3 series thermostat housings are a plastic composition which will eventually crack. It is interesting to note that there are aftermarket replacement housings available in aluminum if you don't want to install the plastic part. BMW has even gone back to aluminum thermostat housings in some cases, such as 1996 and newer 7 series.
- Auxiliary water pumps on all 5 and 7 series cars are also plastic. They are notorious for breaking off at the inlet hose neck. Added heat from the engine exhaust manifold and tension from the hose exacerbate the problem.

It is important to note that once an overheat condition occurs the embrittlement effect is accelerated due to extreme thermal loading. In other words, when you have one overheat situation, fix the system, not just the failed part, especially if the car is already within the window of susceptibility. It has been suggested to me that a five year old BMW is an "older car" and this kind of situation should be expected. My point of reference, however, is conditioned by the large number of customers who drive 10 year old BMW's and expect it to be as reliable today as it was new. If this kind of failure is to be expected, it is my job to alert people of the potential issues, averting any inconvenience or added expense.

BMW is not alone with its plastic woes. All manufacturers are using more and more plastic to fit where traditionally cast aluminum was doing the job. For example, intake manifolds on a majority of BMW engines are a plastic mold. These pieces warp or crack causing engine vacuum leaks, running problems, and check engine lights. Yes, they are lighter but the resonance from valve noise through the plastic manifolds is a lot louder which requires additional sound insulation. There are always trade offs as cars evolve and we should make ourselves aware of the positives as well as the negatives. I fear the trend is for all manufacturers to further the plastic snap together process. Consider the numerous engine, interior and body trim pieces that are now plastic. Removing snap-in plastic pieces after 5 or 6 years means replacing them because they will break once disturbed. From the car makers stand-point, plastic is cheaper to use, lighter and easier to recycle. From the repair stand-point, it is a conflict of design. Why put so much effort and engineering into the drive train, body, and suspension systems when key plastic pieces jeopardize the entire package?

I still believe BMW manufactures one of the best cars in the world and does so with an eye toward new innovations. A lot of these innovations are what make the cars so special to us. Plastics and composites will certainly be a big part of those innovations for the future. It may be that the plastic embrittlement lessons of the nineties will mean more durability for this decade.