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## The Long-Lasting Brake Job: Can Your Brake Job Go 12, 000 Miles Without a Problem?

**Andrew Markel**

**7/1/2007**

All shops want to see a customer again, but not for a brake comeback. What is the magic number of miles that can separate a comeback from a service situation? In my opinion, the minimum is 12,000-miles. Even installing new friction, rotors and calipers will not ensure a long-lasting brake job. The long-lasting brake job is a process.

A quality brake job is about ensuring the quality of the work performed and is a mindset for management and technicians. It must be realized that a complete brake job is different for every vehicle and customer, but the objectives are the same:

1. Return the vehicle's braking performance to like-new condition or better;
2. Even pad wear for at least 12,000 miles;
3. No significant noise problems for at least 12,000 miles; and
4. The friction materials should match the customer's braking personality.

The benchmark of 12,000 miles represents the average consumer's mileage in one year. It is not a warranty number, only a guideline for the average customer's expectation for the average brake service at any price. If you cannot deliver 12,000 miles of trouble-free service, the customer might come back to complain or they might not come back ever again.

### **Performance**

When a vehicle is returned to a customer, its performance should be as good as when it was new, and in some cases, better. This requires your shop to look at the system as a whole. It also means that you must look at the quality of components you are installing. FMVSS135 is a minimum braking performance standard by the National Highway Traffic & Safety Administration (NHTSA). It's a tougher



*Some aftermarket manufacturers will spend millions in testing pads to see if they can go the distance.*

standard than the former FMVSS105 rules, which has forced the automakers to upgrade the brakes on some vehicle models so they can meet the new stopping requirements. One part of the new rule requires vehicles to stop within the same distance under the old FMVSS105 rule, but with 25% less pedal effort. To meet this specification, some manufacturers switched to more aggressive linings and larger brakes.

Regardless of what type of aftermarket friction material or rotor is used, the brakes must provide safe, reliable stopping power. Most friction product manufacturers do extensive laboratory and field testing to assure that they do.

### **Noise**

As the brake pedal is applied and the brake pads are squeezed against the rotor, vibration is produced. This vibration can have various frequencies that the customer might or might not hear. Brake noise is actually vibration that is occurring at a frequency that is audible to the human ear.

All brakes make noise or vibrate. The difference is that most brakes operate at a frequency that we can't hear. Vibration can occur between the pad, rotor, caliper or mounting hardware. The number of points where the vibration occurs will vary with the type of disc brake. The type of disc brake will also determine which causes will be more common.

The prevention of most brake noise complaints will boil down to performing quality brake service and using quality parts. We will discuss each of these potential problem spots and cover what should be done to prevent them.

If the mating between the pads and rotors isn't correct, a likely result will be a brake noise complaint. A huge variable in the brake service arena is the quality of the surface finish achieved when machining a rotor.

Dull cutting tips are the leading cause of poor rotor surface finish. How long the cutting tip will last depends on many factors. The quality of the bit will have a large impact on how long the bits will last. Paying a little extra for quality will provide long-term benefits that will far outweigh the increase in cost.

Many times the cutting tips are changed only after a noticeable change in surface finish is seen. What you have to ask yourself is, "what about the last three or four sets of rotors I just machined?"

### **Friction**

The friction material you select should typically provide the best combination of stopping power, fade resistance, noise and wear for that customer. Talk to the customer to find out what they use their vehicle for and what they expect from their brakes. Do not be afraid to up sell your customer into premium pads.

There are many different friction suppliers to choose from, and each supplier offers a number of different grades or types of friction material. You could choose to stay with one line for all applications or you may choose to use one grade for most vehicles and then another for those problem vehicles. There are lines of friction out there promoted just for the effect they have on brake noise. Only you can decide which way you go based on the level of the problem, what you can charge for the job and the cost and profit of the product.

Most high-quality pads incorporate such features as chamfers, slots and special shims

(integrally molded or stainless steel) to control noise and vibrations. It is critical to look for these features if you are looking for a line of friction material to stock in your own inventory.

### **Dusting**

Nothing looks worse than a relatively clean \$50,000 car or truck with black, grimy wheels. European luxury sedans are notorious for having dirty front wheels because of the black dust that's generated by their disc brake pads. The dust sticks to the alloy wheels giving them an unsightly appearance.

With some ceramic pads, the color of the material is a light gray so it is less visible on wheels (unlike some NAO pad materials that produce a dark brown or black dust that clings to wheels).

But, some manufacturers of ceramic pads claim the color of the dust is not that different in color than a semi-metallic pads. What they say is that the dust is not attracted to the wheel, due to the fact that the dust is electrically charged differently than the wheel. There's no way to eliminate brake dust entirely because all friction linings are designed to wear. If the pads didn't wear, they'd soon chew up the rotors - and pads are a lot cheaper to replace than rotors.

### **Shims and Anti-Rattle Clips**

Pad shims are used as an insulator between the pads and caliper. This serves to change the frequency of the vibration so brake noise is eliminated. Shims are typically a sandwich of metal and rubber-type coatings.

The shims could be attached to the brake pad or they could be supplied as separate parts. Make sure your replacement pads are shimmed to match the OE pads and when servicing vehicles with separate shims, either reuse the shims, if in good condition, or replace them.

Do not reuse shims where the protective coating has worn off or if the shims are rusting and flaking. Do yourself a favor and add the cost of replacing the shims into your estimate now instead of giving them away later. You might want to look into stocking the most common shims in your store to avoid delays in getting them.

Some aftermarket shims use adhesive to bond the shims to the pad. The bond becomes stronger with heat and curing. Proper attachment of these types of shims requires a test drive that will heat the adhesive up so it bonds. If adhesive does not set properly, the shim "walks" or slips out from between the pad and caliper.

Other shims are designed to mechanically clip onto the back of the brake pad. These types of shims are designed to "float" between the caliper and pad. This can help to isolate noise and vibration.

Many lines of brake pads are starting to include anti-rattle clips and springs in the box. Anti-rattle hardware applies tension to pads so they fit snugly against the mounting bracket. These clips are essentially small springs made of steel. They are subjected to the same heating and cooling as rear brake hardware.

Simply cleaning and re-installing it won't be good enough in many cases. Some add an extra step of "re-tensioning" the clips by bending the tabs slightly. This may work for a short time, but won't provide a long-term solution.

## Caliper Hardware

Most vehicles use single piston floating calipers. Rubber bushings or sleeves in these calipers allow the caliper to move freely on brake apply and release. They wear over time and can increase the chances for brake noise. Careful inspection should be done and replacement should be suggested or required based on the findings. If the bushings or sleeves are too loose fitting, the caliper will be allowed to move too much. This will increase the chances for a brake noise problem.

## Lubricants

Part of the “complete brake job” is in the details. Using the right lubricants in the right places influences the longevity of the complete brake job. Lubricants also help to isolate vibrations and even brake pad wear.

Staying power is what special-purpose brake lubricants are supposed to have when the going gets hot. The front brakes on many FWD cars, as well as large SUVs, can get extremely hot when braking hard or braking repeatedly. Mountain driving, aggressive driving in stop-and-go traffic, off-road, towing a trailer, hauling a heavier than normal load, etc., can all increase the operating temperature of the brake system.

Under extreme driving conditions, some lubricants can't stand the heat and melt off, evaporate, oxidize or burn. That's why ordinary, general-purpose chassis grease should never be used for lubricating brake components. It won't hold up. What's needed is specially formulated, high-temperature brake grease that can withstand the heat, and also not harm rubber seals or plastic bushings. Petroleum-based lubricants should never be used for brake assembly work because mineral oils can cause seals to swell and fail.

There are many choices out there for brake lube and as many opinions of which ones to use. High-quality moly-lube should be used on all metal-to-metal surfaces and a high quality silicone lube on all metal-to-rubber parts. Use silicone on metal-to-rubber, the silicone repels moisture, and if used properly, will form a nice moisture barrier. This is the same position most major brake manufacturers take and it works well.

There are some basic rules of thumb to follow when using both lubricants. One is “a little goes a long way” or conversely, “too much is not always a good thing.” Brackets that come in contact with the pad should have a thin coat of moly-lube. The anti-rattle hardware needs a thin film to the surfaces that contact the brake pads.

## Calipers

Calipers should always be replaced in pairs, regardless of the condition of the non-affected side. Caliper piston seals don't last forever, and once they start to leak, it's the end of the road for the caliper and the pads. Fluid leaks are dangerous because they can lead to a loss of hydraulic pressure in the brake circuit that may cause the brakes to fail. Brake fluid leaking from a caliper can also contaminate the brake linings and cause them to grab or pull.

A caliper may also have to be replaced if it is sticking. Internal corrosion can cause pistons to jam or freeze preventing the caliper from working normally or releasing completely. External corrosion on the caliper mounts, bushings or slides can cause problems too by preventing a floating caliper from moving normally when the brakes are applied. The result here may be uneven pad wear, uneven braking, dragging or a pull. There are several options in the aftermarket when it comes to replacing calipers. The first option is to order a “bare” caliper that is remanufactured and includes hardware. This allows the technician options when it comes to sourcing the friction. The second option is to use a loaded caliper that includes friction.

**Quality Assurance**

After any brake job is completed, a test drive should be performed. A test drive can ensure the brake system is operating properly. It can also help you to spot other problems with the vehicle.

The other reason a test drive must be performed is to mate the pads to the rotors. This can be called “break in” or “burnishing” the pads. Burnishing also can help to transfer a layer of the friction material onto the rotor. Some manufacturers call this transfer-layer technology and it can help to increase the life of the rotor.

The number of stops a technician should make will vary. Also, check the box or with the manufacturer for their recommended burnishing procedure. This can help to prevent the customer from experiencing a burning smell when they first apply the brakes for the first 100 miles. When you deliver the vehicle to the customer, advise them not to do any severe braking for the first couple of hundred miles.

Some are also “pre-burnished” to eliminate many of the problems that can occur if the pads are not broken in properly.

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