MOTOR AGE®

Break Away from Traditional Brake Service

ADAS technologies make vehicle operation safer, so long as they are operating with the components they were designed to leverage

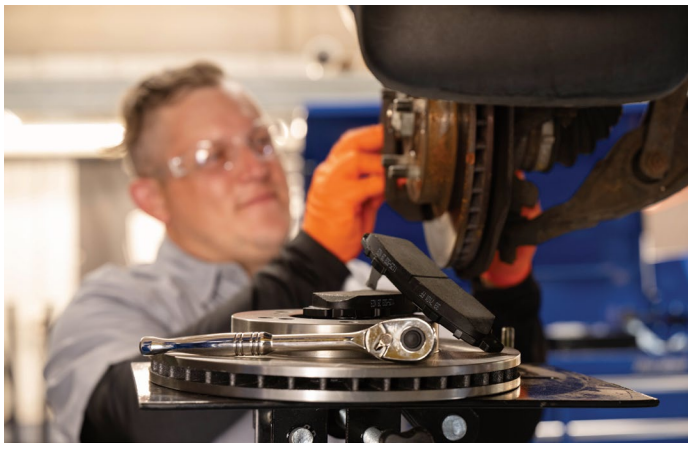
The safety aspects of today's vehicles make operating them more comfortable and safer than ever before, and we have science to thank for that. In fact, science is engineered into every aspect of the automobile we encounter. From the gear ratios of the driveline (that provide adequate horsepower/torque/fuel efficiency) to the bussed networks that speed the delivery of pertinent information, with a fraction of the weight of old hard-wired vehicles. It's these improvements, driven by science, that make today's vehicles truly remarkable.

But, like many other aspects of technology, these systems (along with the repairs technicians perform on them) are taken a bit too lightly. Something as seemingly simple to address as the base brake system might appear like business-as-usual, but an oversight could lead to significant issues.

The base brake system

It's common knowledge among technicians that brake systems on nearly every automobile rely on friction to slow the vehicle. What they may not realize is that science has shown that the frictional force converts the kinetic energy of the moving vehicle into heat. It's really that transfer of energy that slows or stops the vehicle.

The coefficient of friction is a calculation used by engineers to determine how easily two objects move past each other (like a brake pad and a brake rotor). Careful research and experimentation go into developing the compounds in both components that provide the characteristics needed to adequately slow the vehicle. The point is that a change in either affects how much friction is produced with the same amount of pedal effort.



So, engineers go to great lengths to carefully pair brake lining compositions with rotors/drums (the braking surfaces) and hydraulic fluid properties that allow the braking force to transfer from the pedal to the calipers/wheel cylinders effectively, without degradation from the heat generated.

Advanced driver assistance systems (ADAS) and brake mitigation

To reduce the number of car accidents, the National Highway Traffic Safety Administration (NHTSA) is in part responsible for the development and widespread implementation of ADAS systems like the following:

- Lane departure warning (LDW)
- Lane keep assist (LKA)
- Forward-facing camera (FFC)
- Millimeter wave radar
- LiDAR
- Ultrasonic parking sensors
- Rear-facing camera
- Side-facing camera

As mentioned, these systems are designed to assist the driver in maintaining a safe minimum distance from surrounding traffic and pedestrians. The technologies (in different combinations) allow the vehicle to typically react faster than the human brain can, making them standard on vehicle models newer than 2018.

One particular subsystem of ADAS is generically known as brake mitigation. This system is designed to apply the brakes automatically when the ECUs governing its operation determine a collision is imminent. Careful and almost real-time monitoring by multiple ADAS systems in combination allows this to occur in a fraction of a second.

For instance, the millimeter-wave radar, LiDAR, and/or forward-facing camera may all detect an object ahead on a collision course. Information is transmitted to the instrument panel cluster and the ABS/Traction controller to alert of the potential danger ahead.

The cluster provides a visual warning to the driver while the ABS/TRAC unit commands solenoids to isolate the hydraulic circuits from the master cylinder and simultaneously energize the pump to generate the needed hydraulic pressure at the wheels.

All this occurs in an instant, and at the necessary magnitude to not only stop the vehicle but also maintain directional stability. This is not only where that coefficient of friction comes into play, but also when we, as individual technicians and shop owners, need to be conscious of our parts choices during service and repair.

Consider the following

Nearly every single day, we are faced with a choice of products to use (the good, better, or best standard of brake lining). What's the difference? Arbitrarily speaking, one offers great longevity but can sometimes be more costly. One may be significantly less expensive but may also wear more rapidly. And the other might combine the best of both worlds —

longevity and cost efficiency. But instead of asking about the benefits, let's focus on the consequences.

There is a strong chance none of the above choices will serve you well unless they are specifically designed for the subject vehicle. All the calculations required by the ADAS ECUs that govern the brake mitigation system's functionality rely on the physics discussed earlier.

The applied pressure from the ABS/TRAC pump is determined by several factors, including the vehicle's current speed and how quickly it is approaching the object in the collision course. This same chosen pressure was selected because the engineers designed the software with the intent that the system leverage linings, rotors, and hydraulic fluids that meet the system's requirements. Change any one of those factors, and the equations don't work out properly, and compensation must occur. In other words, the system may not slow/stop the vehicle in time to prevent a collision.

Due diligence required

Look for brake linings, brake rotors/drums, and/or brake system fluid that meet OE specifications. The specifications required by the vehicle manufacturers for brake mitigation systems to function as designed are of the utmost importance.

It should go without saying that deviating from documented service procedures is not recommended. Read the manual and follow the instructions carefully.

Listening only to conversations about better brake performance, longer pad life, or less noise and dust could be a recipe for disaster. Be wise and select from components designed specifically for the subject vehicle. This also includes the hydraulic fluid for the brake system.

Following only the fluid's DOT rating is not enough. Manufacturers have more stringent tolerances for brake fluid formulations designed to work properly with the ADAS brake mitigation systems in use today.

Addressing the brake systems today is not so much different from years past. However, the attention to detail required is significantly more demanding. ***This is nothing we should be afraid of, just something to respect. Follow procedures, use the proper components and materials, and expect great performance from a properly functioning brake system.***

For more information, visit **autozonepro.com/brakes.**

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