Bendix Spicer Foundation Brake LLC
A Bendix CVS and Dana Joint Venture

THE CONSEQUENCES OF USING LOW-QUALITY, LOW-COST SPRING BRAKES: A LOOK AT THE CRITICAL ISSUES.

OEM Quality Spring Brakes Maintain OEM Parking Capability, Deliver Longer Service, Reduced Downtime, and Reduced Operating Costs Compared to Low-Quality/Low-Cost Alternatives

In the last several years, the commercial vehicle marketplace has been flooded with low-quality, low-cost spring brakes. With today's emphasis on protecting the bottom line, cost conscious consumers may purchase these lesser quality products without full awareness of their potential pitfalls in the areas of safety and performance. When choosing replacement spring brakes, it's important for fleet operators to know what to look for in terms of brake design and components.

Designing the spring for durability is critical, as a broken power spring remains the leading cause of spring brake malfunction. Any spring brake issue means certain vehicle downtime and increased maintenance costs.

Responsible for both service and parking brake applications, spring brakes are a critical component in a commercial vehicle's air brake system. The service side is used to slow or stop a vehicle, while the parking side holds a vehicle in place when parked.

The longevity and operability of the parking side of a spring brake rests on its ability to maintain sufficient force, over time, to hold a vehicle in place. The most critical component for providing this force is a large, powerful spring that, in normal operating conditions, stays compressed while the vehicle is in motion, and is released once the vehicle is parked. Designing this spring for durability is critical, as a broken power spring remains the leading cause of spring brake malfunction. Any failure means certain vehicle downtime and increased maintenance costs.

Fortunately, owners of new vehicles can rest assured that their vehicles will stay in place, as OEMs must certify that their braking systems meet Federal Motor Vehicle Safety Standard (FMVSS) 121 parking requirements. However, no such standards exist for aftermarket products, leaving the parking ability of low-cost aftermarket replacement spring brakes to chance.

To ensure that our spring brakes meet safety standards and deliver durability, reliability and safe operation, for years Bendix has subjected these products to extensive ongoing research and benchmark testing in order to compare elements related to such items as functional performance, corrosion resistance, and structural durability.

Among the battery of tests regularly undertaken, Bendix also conducts real world performance comparisons, of our spring brakes versus low-quality spring brakes in a "hill hold" situation. While vehicle manufacturers traditionally perform the FMVSS 121 park test using a drawbar, an alternative test for parking performance can also be measured on a hill with a 20 percent grade. Using a fully-loaded single axle park tractor, a driver moves the vehicle to the top of the grade and applies the parking brake to test how it holds on the hill. Bendix performed this test using its OEM-specified Bendix® EverSure® Spring Brake with No Touch Technology. The brakes held fast, and the truck did not move. Bendix then performed the test using a popular low-cost replacement spring brake. The results were concerning, as the truck almost immediately lost its hold and started to roll back down the hill. Video of this test can be found in the brakes and wheel-end section of the Bendix video channel on YouTube.com. To view the footage, visit www.youtube.com/user/bendixvideos.

This test demonstrates how low-cost chambers can fail to maintain sufficient force output to hold a vehicle in place. To avoid the uncertainty and safety risks that may be associated with low-cost, low-quality alternatives, fleets should look to durable, long-lasting OEM products that will help keep their vehicles on the road.

Protecting the Spring

With broken power springs representing the leading cause of spring brake malfunction, it only makes sense to protect the spring at all costs. This may be easier said than done.

For new vehicles, OEMs must certify that their braking systems meet Federal Motor Vehicle Safety Standard (FMVSS) 121 parking requirements.

No such standards exist for aftermarket products, leaving the parking force of low-quality spring brakes to chance.

A typical T30/30 spring brake is open to the environment via holes found on the park-side housing. These openings serve as entry points for contamination such as dirt, water, and de-icing chemicals. These corrosive contaminants can threaten the power spring. A damaged spring may cause a leak if the diaphragm gets punctured, or it may affect the stroke of the pushrod. Regardless of the damage, the failed unit will need to be replaced immediately.

Because of corrosion concerns, most spring brake suppliers coat the springs to provide some level of protection. However, the durability of such coatings is compromised in lower-cost designs, which tend to compress the spring such that the coils come in contact with one another. This type of design results in "coil clash," which can wear away the protective coating. Once the coating is worn, the bare spring is susceptible to corrosion, which can lead to breakage.

The best protection against premature spring coating wear is to avoid coil clash. If the coils don't rub together, the coating will last longer. That's the solution Bendix arrived at for its Bendix® EverSure® Spring Brake with No Touch Technology. The springs are designed to virtually eliminate coil clash, protecting the premium epoxy coating used on all Bendix power springs. This results in a longer lasting product and translates into fewer repairs, less downtime, and lower fleet operating costs.

Ensuring Parking Force Output

A secondary issue caused by over-compressing the spring is a rapid decrease in force output. This reduces any safety margin when parking a vehicle.

The increased height of the compressed spring in the Bendix® EverSure® Spring Brake design reduces stresses on the spring, allowing it to better maintain force output over time. This means drivers can park their vehicles with the same level of confidence for every stop.

When evaluating spring brakes, a force output test can be used to measure the amount of force the spring brake can produce throughout its stroke. This force output is measured against SAE International's recommendations. Having a high force output right out of the box is important, but equally important is a spring's ability to maintain high force output over time, as all springs will degrade due to repeated compressions. This loss of force over time is called sag loss.

Testing the force output of a spring brake out of the box and then after holding the spring in the compressed position for specific periods of time will provide an indicator of how much force output may be lost. Low-cost/low-quality spring brakes typically show low levels of force out of the box, sometimes just meeting or even falling below SAE's recommended minimums. Even worse, these units show greatly diminished force output capability after being compressed.

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Protecting the Center Seal

In addition to the power spring, another important feature on a spring brake is the center seal. This seal separates the service and parking chambers of the unit and serves two important roles:

1. Preventing leakage from one side of the unit to the other
2. Acting as a bearing that helps to guide the spring brake's pushrod

A robust and smart design of the center seal components is therefore necessary to reduce any issues resulting from damage or premature wear. Operating a spring brake places a large amount of force on the pushrod, some of which may be lost due to friction. An improperly guided pushrod could significantly diminish the force output delivered by the spring brake (due to high friction losses) and could also wear the seal or diaphragm prematurely, typically resulting in a leak.

The key to limiting center seal damage and to reduce the effects of friction is to ensure a straight motion of the pushrod. This may be accomplished by properly aligning the moving components and by providing the right bearing surface for the pushrod to travel through. Unfortunately, low-quality spring brake designs typically do not account for this design feature and fail to properly maintain centering of the spring and pushrod, increasing the likelihood of center seal issues.

In contrast, OEM spring brakes properly address the impact of side loads to minimize the potential for center seal damage and reduce friction losses. For example, the Bendix® EverSure® spring brake features a patent-pending slotted center seal design that clips into the adapter base and is held firmly in place to serve as a bearing for the pushrod. This design – along with other built-in measures such as a high-profile, flat, aluminum pressure plate – helps to center the power spring and ensures more consistent and reliable force output.

Addressing the Chamber Housing

An additional consideration for spring brake operation is the non-pressure housing, which is located near a brake's chamber mounting bracket. All spring brakes are mounted at this location. Because most of the weight of the overall spring brake is between 6 to 9 inches away from the mounting surface, there is significant force on the non-pressure housing as a vehicle vibrates during operation.

In lower-cost/low-quality spring brake designs, the non-pressure housing may not be optimized to handle the load put on it by vibration and the weight of the part itself. In this case, the spring brake itself can actually rip free from the vehicle, causing a very concerning failure on the road that places other motorists at risk. In contrast, an OEM quality spring brake, such as the Bendix EverSure maintains the integrity of the mounting surface and reduces the stress put on this area through a weight savings of 2 – 3 lbs. when compared to most other T30/30 spring brakes.

Calculating Real Savings

In general, a low-quality spring brake may cost $10 to $15 less than an OEM spring brake. These savings look attractive on the front end, but they can quickly fade away in the long run as low-quality brakes will need to be replaced more frequently than OEM brakes. That means added costs for replacement parts, as well as expense associated with the fleet's hourly labor and downtime rates.

OEM replacement spring brakes are designed to protect springs from premature failure, ensure sufficient parking force output over time, shield interior components from wear and leakage, and minimize the impact of side load stresses. And despite their initial cost premium, OEM replacement brakes can save fleets money over time.

OEM spring brakes present a substantial savings of time and money that really add up when you evaluate spring brake purchases for the total fleet over the span of several years. So while you may pay less for a low-quality spring brake up front, you'll pay more – and more frequently – down the road.

Ensuring Vehicles Stay Parked

To avoid the pitfalls associated with low-cost/low-quality aftermarket spring brakes, when selecting replacement spring brakes, fleets should look to qualified OEM brake suppliers for product durability, extended service life, and after-sales support. OEM replacement spring brakes are designed to protect springs from premature failure, ensure sufficient parking force output over time, shield interior components from wear and leakage, and minimize the impact of side load stresses. And despite their initial cost premium, OEM replacement brakes can save fleets money over time, while delivering the peace of mind that comes from using a high quality product specified by OEMs.

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