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From Marathon Helping America's Heavy-Duty Fleets Hit the Brakes

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SCOTT SIMMONDS President Marathon Brake Systems

"Although it may take many years for drum brake systems to disappear, if ever, the move to air disc seems inevitable."

## **PRESIDENT'S LETTER**

Message from Scott Simmonds

## Adapting to Changing Times is the Key to Future Success

One thing that is constant in life is *change*. In the heavy duty industry this encompasses manufacturers, distributors and fleets as well. Marathon is no different from other companies, in that it's how we adapt to changes within our marketplace that will determine our future success.

Let's start with a look into our company's business model. Marathon is part of a group of companies, Grupo a, that are owned and managed by one individual and have grown significantly over the last 90 years. Grupo a has manufacturing and sales/marketing offices in multiple countries. This creates cultural differences within that require working hard and adapting to ensure communication is understood from one market to another. Cultural Transformation must evolve to meet the different market requirements of each country, in order to exceed the expectations of users of our products, which ultimately results in strong sales success.

Next let's take a look at how the world has changed since the Covid pandemic, effecting everything one touches. Marathon adapted quickly to these world-wide challenges and maintained our traditionally high 95% plus service levels. Operational Excellence was the focus throughout our organization, from ensuring the flow of raw materials to manufacturing to maintaining the high quality level of finished products to the logistics required to keep products on the shelf. This time frame actually helped Marathon improve productivity levels in all facets of our business.

Finally, let's dive into the changes going on in our marketplace surrounding products and applications. Some examples are shock absorbers being designed into air bags and telematics being integrated into many established designs. Some of these changes bring on higher costs, as well as better awareness of maintenance requirements, including facing issues like corrosion. Marathon is navigating these evolving applications by introducing a number of new products. We have developed a shock absorber that provides a more simplified approach with a mechanical sealed option that would automatically adjust to the trailer weight load. This new shock will help lower costs by improving the life of the shock and other wheel end components indirectly effected.

Marathon has also adapted to the industry's move towards air disc brake systems. Although it may take many years for drum brake systems to disappear, if ever, the move to air disc seems inevitable. To meet this growing need, we have developed a full product line for air disc brake systems from pads to rotors to calipers and chambers. We were one of the first companies to remove copper from the disc pad and offer both a standard grade as well as severe service pad option. As the market continues to move in this direction with air disc brakes, Marathon will continue to adapt and meet market expectations going forward.

Thank you for your continued interest in and support of Marathon products as we continue to meet our customer's expectations through Innovation, Productivity Improvements, Sustainability and Operational Excellence.

### AIR DISC BRAKE PADS, ROTORS, CALIPERS & CHAMBERS

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Marathon Brake Systems, the heavy duty industry's leading friction supplier for more than 40 years continues to support the bus and coach, and heavy duty markets move to air disc brakes. Marathon offers a full line of DiscStar air disc brake rotors, calipers and chambers to complement our proven DiscStar pads. DiscStar pads and rotors are engineered to exceed OE specifications and are manufactured in world class ISO certified plants. Pad, rotor, caliper and chamber compatability has been engineered into our friction materials and verified with RP628C and SAE J2115 wear testing standard.

Together DiscStar pads, rotors and calipers & chambers are an unbeatable combination!

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# Drum Scoring

## in Mining or Gravel Hauling Applications

In certain mining, gravel hauling or off-road trucking applications around the world, there are environmental contaminants that can lead to a high degree of brake drum scoring and accelerated wear rates of friction materials. The issue arises in off-highway applications that have a high level of guartz exposure in the area. Quartz, the most common form of silica, is a mineral. Depending on the location and type of mining taking place, your trucks likely will be exposed to some levels of guartz. Veins of gravel may contain guartz as well when mined. As trucks drive in and out of these mines, or haul away mined minerals, the truck's braking systems may become exposed to quartz impurities that can find their way between the lining and the drum causing drum scoring and premature lining failure.

Some mines may have no quartz exposure and will not have issues, whereas other locations may have a major issue with the quartz contaminants. Even if quartz is common in a select area, it may be present in variety of particle sizes. Typically, the larger the particle size of the quartz, the bigger the drum scoring problems will be.

To help understand why quartz can be such a big issue as a brake system contaminant, let's look at the Moh's system to define hardness.

Hardness	Standard Mineral
1	Talc
2	Rock salt or gypsum
3	Calcite
4	Fluorspar
5	Apatite (glass)
6	Orthoclase feldspar
7	Quartz
8	Topaz
9	Corundum
10	Diamond

In trying to determine a material's level of hardness, they can be rubbed against each other, to see which is able to scratch the other. Over time the Moh's Hardness Scale was developed, listing materials from 1 to 10 in ascending levels of hardness. Each of the intervals on this scale are about equal except for that between corundum and diamond, which is about 30 times as great. For example, if a mineral scratches feldspar but not quartz, it would have a Moh's between 6 and 7. This is in fact where gray cast iron falls (brake drums typically are made of gray cast iron).

The challenge for trucking operations in locales where quartz impurities are common, is that road debris (often with quartz) can get lodged between the brake lining and the drum. Then because quartz is harder than the cast iron of the drum, it scores or scratches grooves in the drum. This scoring leads to further braking issues that ultimately lead to fast lining wear, unstable braking, etc.

Although it is difficult to prevent debris from entering a brake system, one tactic that often improves performance is the use of dust shields. Some impurities may still find their way into the braking system even with a dust shield, but they can help abate the issue. Fleets that can't keep the impurities away from the brake system will continue to get heavy drum scoring and fast lining wear. This phenomena effects most all brake drums and friction materials as they are both much softer than quartz. In North America, there seems to be a high guartz presence in the Dakotas, North Central US states and Canada.

There is a good and simple way to test for the presence of quartz in a specific application area. Purchase some glass microscope slides and when the drum is removed during a brake job, find debris inside the drum or scrape wear debris from the rivet holes on the lining. Place the debris between 2 glass slides and squeeze them together and slide them back and forth. Glass is a 5 or so on the Moh's scale, and most rocks, dirt, dust and even worn friction material is not that hard. If you see scratches on the glass slides, then its very likely that guartz is the culprit. If you don't see scratches after checking out numerous wear debris samples, then impurities may not be your issue. While there are far more scientific techniques for analysis of impurities, this is a simple technique easily done in the field.





# New vs Reman Brake Shoes

In the brake maintenance world, one of the age-old questions is... Why should I buy new brake shoes when reman (remanufactured) shoes are cheaper? This question obviously makes an assumption that reman shoes are the more economical option as they typically have a lower "upfront" or sticker price when compared with new shoes with the same friction material attached. Currently there is a trend within the industry of purchasing more new brake shoes as the hidden costs of reman shoes are increasing. In this article we'll look at this important maintenance decision from both the fleet and parts distributor point of view.

The calculation of total costs for a remanufactured brake shoe should include (but often do not) the cost of handling, processing and tracking of cores, which applies to both the distributor and the fleet customer. In addition, who pays for a rejected shoe core. For the distributor, the cost of shipping the cores back to the reline plant has greatly increased in the past few years. Most distributors and fleets do not account for core processing into the cost of the product. This not only includes the technicians and distributor staff that must handle. stack or pile cores for return, but also administrative staff that have to process returns and reconcile the core credits to core charges. And when there is a short fall of accepted cores... who pays the bill? If fully accounted for, core charges will typically add up to more than the cost of a new shoe.

#### **Reman Shoe Quality**

Now, let's review performance and the quality variables in remanufactured brake shoes. One of the key selling features of many reman products is that it is "coined" back to OE specifications. In practice this can often become more of a process to re-use rejected cores, than an effort to rebuild a shoe back to OE specifications. When brake shoes are coined, the full shoe table is not re-formed, only the parts of the table outside of the webs. This leaves the center part of the shoe table untouched. This can allow for the table not being perfectly flat and create stress points on the friction material when riveted.

One of North America's major reman shoe suppliers, does not coin. They state "Time, torque and temperature will quickly undo the effects of coining - unfortunately, while the brake shoe is still on your vehicle." Although coining does lessen the reject rate of shoe cores, it is only one aspect of the brake shoe that can affect performance.

Shoe cores being returned to a processing facility are sorted by core type. Within that stock of shoe cores are brake shoes produced from many different manufacturers. Some of the shoes are from OE shoe suppliers and some come from a range of aftermarket companies with varying quality levels. These cores are not sorted to ensure you get a matching pair or even get shoes with hardened cam and anchor pockets.

Another quality problem occurs with the pockets that the rollers and the anchor pins sit in. These are critical dimensions that determine how the shoe contacts the drum. These are also wear points as huge forces are applied with metal-to-metal contact with each brake application. These areas are not highly inspected other than "out of roundness. flare and looseness." The lack of uniformity in these key points for shoe geometry can affect the shoe to drum contact. The variances in the shoe to drum contact affect brake balance and will result in the friction material wearing quickly and unevenly.

#### **Bottom Line**

The decision between opting for a new brake shoe versus a reman shoe is often driven by upfront price and without a great deal of consideration. Although it can take some time and energy to identify the true cost of a reman shoe, it can be well worth the effort. Conversely new shoes have no added costs and no other after sales expenses. Couple this with the superior quality of an OE level new brake shoe and the resulting maximizing of the mileage between brake jobs and you arrive at a very different answer. For the longest brake reline intervals, and lowest true cost-per-mile, new high quality shoes are the only way to go!

# Don't Let Your Brakes Get "Rust-Jacked!"



Heavy duty fleets across the northern United States and Canada certainly are familiar with the term rust-jacking and the many problems that may follow... from shorter brake reline schedules to more significant failed inspections and out-of-service vehicles. In this article we are going to dig a little deeper into the causes of rust-jacking and the actions a fleet can take to help prevent it from happening.

#### What is Rust-Jacking?

When rust grows on the mounting surface of a brake shoe between the shoe and the brake lining, it places upwards pressure on the lining that

is riveted to the brake shoe. This pressure increases as the amount of rust grows in volume. Eventually the increasing pressure of the rust causes the lining and shoe to begin separating and results in cracking of the brake lining. This whole process is called rust-jacking.

The friction material cracking is typically seen as a horizontal crack across the material at the height of the rivet heads. Rust-jacking results in an outof-service condition, and can occur very early in the life of the brake shoe, leaving a lot of wearable thickness remaining on the brake lining. This out-of-service condition is a big issue for fleets, as the brake will require emergency maintenance outside of the normal maintenance schedule. This cracking is a safety issue and also is very costly to the fleet.

Out-of-service due to cracking is defined by the Commercial Vehicle Safety Alliance (CVSA) as cracks or voids more than 1/16 inches wide, cracks that exceed 1-1/2 inches in length, cracks that extend through the lining edges down the side of the block and cracks that result in missing pieces of lining. In 2022, 25.2% of all out-of-service violations found during roadside inspections were due to brakes and brake systems. In addition to the cracking, typically one will observe a gap begin to grow between the lining and the brake shoe. It may not always be visually apparent that the gap formation is due to rust accumulation, but if the lining is removed from the shoe, a significant thickness of rust will be seen on the shoe table. Rust-jacking can occur with as little as 1/16 inch of rust and can easily reach 3/16 inch or more on a shoe table.

The first defense versus rust on most brake shoes is a paint coating. Some brake shoe suppliers sell a higher quality of paint or have a special rust resistant coating applied in addition to the paint that can help slow the rusting process. When applied correctly to a good shoe table, the paint and coatings can resist rust for several hundred or thousands of hours.

However, one of the challenges a painted shoe faces is that in-service as a brake is applied off and on, the brake lining slides just a little bit back and forth on the brake shoe. This movement is referred to as a micro-abrasion. Over time, dependent on the quality of the paint application and shoe table, the inside diameter of the brake lining will "scrape" the paint from the brake shoe, exposing the bare steel of the shoe table. Once steel is exposed, rust will begin to form and the rust-jacking process will begin.

Chemicals used on roads to prevent ice or dusting on back roads can greatly speed up the corrosion process. Salt water can also speed up the oxidation. Magnesium chloride, calcium chloride and sodium chloride are commonly used as de-icing agents (along with salt) in the northern United



States and Canada. Salt water in coastal areas can exasperate this issue as well. Container fleets often struggle with rust-jacking due to their truck's and trialer's exposure to water and salt. While rust-jacking is a common phenomenon for fleets in northern climates, it is uncommon for local fleets running in warmer and drier areas such as the south or southwest.

#### What Can be Done to Delay or Stop the Rust-Jacking Issue?

Typically, it requires a little more of an upfront investment to delay or stop completely the rust-jacking process. Rust-jacking occurs most frequently on a brake using a low cost brake lining mounted on a low cost remanufactured brake shoe. Any fleet that is experiencing rust-jacking should consider one or all of the options below:

#### 1. Specify a stronger, tougher friction material

• The strength of a friction material is typically measured using a transverse rupture strength test procedure. In essence it is a strength test of the material in flexural mode.



TRS (transverse rupture strength) is a test used to quantify the strength of a friction material. In essence, it is a 3 point flexural strength test that is performed on a one inch sample of a brake lining. Calculations are performed based on the sample size to convert strength to a psi value. Marathon has the strongest friction materials in the industry, with every Marathon lining rated at 6,500 psi or higher, and premium products rated in excess of 10,000 psi.

• Stronger friction materials require more expensive raw materials that provide a better part strength, and thus the friction costs more. This is why you see a higher percentage of fleets in the northern US and Canada running premium grade friction materials.

• Marathon Hi-Density premium grade friction materials have the highest strength in the industry. For example, Heat Star's flexural strength measures over 10,000 psi. Even Marathon's standard grade MV and GL products have a minimum strength of 6500 psi.

• Many of the other brake linings found in the industry, especially imported products with very low pricing, have strengths measuring from 4500 psi down to as low as 3000 psi.

• Expensive raw materials such as phenolic resin and chopped fiberglass are critical to a lining's strength. Economy grade linings underuse these raw materials to save cost and in turn that decreases the strength. There are several other raw materials proprietary to the industry that help increase the strength and toughness of a friction product.

## 2. Purchase brake shoes using a better paint process or coating

• There are various paint and coating qualities available in the market. A better quality/adhesion paint or coating will help to resist the micro-abrasion.

• Typically paint or coatings will adhere better to a new brake shoe than a remanufactured brake shoe that will have pitting and thickness variation on the shoe table.

## 3. Specify a high quality new or remanufactured brake shoe

• Remanufactured brake shoes can have a variety of conditions depending on the quality of the original shoe and how many times it has been remanufactured • A shoe that has been remanufactured many times may have more pitting and shoe table thickness variation, which can make an even, well applied paint coating very hard to do.

• An uneven shoe table that has been remanufactured many times is hard to get all the rust off when shot blasting the shoe. If the shoe remanufacturer does a poor job maintaining the shot in the blaster, or has an inexpensive shot blaster it may not be capable of cleaning the rust off the shoe completely. Any remaining rust can continue to propagate and eventually contribute to the rust jacking situation.

## 4. Wash the vehicle brakes on a routine basis to remove road chemicals

• Use water from a hose often to remove the road chemicals from the brakes, do not pressure wash and do not wash with cleaning chemicals.

#### **CONCLUSION:**

More and more heavy duty fleets in today's marketplace are understanding that upfront investments in higher quality brake shoes and friction materials will result in longer brake reline cycles and fewer unexpected problems... saving substantial money.

There are a number of excellent Return on Investment (ROI) tools available to help fleets calculate their potential savings with higher quality brake components. Marathon Brake Systems has developed such a tool, ask your local representative to evaluate your fleet's potential savings. M

# New Products from Marathon

## GL20 and GL23 Brake Linings Marathon's New Green Leaf Technology

Marathon Brake Systems developed Green Leaf GL20 and GL23 brake linings to provide fleets an environmentally friendly option for a standard quality friction material. Marathon's new Green Leaf Technology uses a manufacturing process designed to produce less in process waste and also to reuse the limited waste created during manufacturing in the formulation of the friction material.

GL linings are ideal for general freight hauling with GL20 handling most 20,000 lb axle applications, while GL23 handles most 23,000 lb. applications. These linings feature excellent brake fade and recovery characteristics, dependable stopping performance and are extremely drum friendly. In addition, Green Leaf is a 100% copper-free formulation and certifies as N rated per SAE J2975 test criteria.



## Air Disc Brake Calipers and Chambers for a Wide Range of Air Disc Brake Applications



Marathon Brake Systems introduces DISCSTAR New Air Disc Brake Calipers and Chambers. These two new product lines complement Marathon's air disc pads and rotors to comprise a complete family of air disc brake replacement parts. DISCSTAR calipers and chambers will provide consistent quality and performance, in keeping with proven DISCSTAR pads and rotors.

Marathon calipers and chambers are designed to address a wide range of aftermarket air disc brake applications, including on-highway trucks and trailers, motor coaches, school buses, fire trucks, and waste haulers. Fleets that use DiscStar pads, rotors, calipers and chambers together will have confidence in their stopping power while maximizing product life, reducing noise and lowering maintenance costs.



Marathon Introduces Line of Heavy Duty Shock Absorbers Following numerous requests in recent years from its fleet and distribution customers, Marathon Brake Systems has developed a complete line of heavy duty shock absorbers for class 6, 7 and 8 trucks and trailers. The decision for Marathon to enter this mature market made further sense given the impact shock absorbers have on braking, specifically to lessen stopping distance.

#### The Role of Shock Absorbers

- Keep wheels attached to the road
- Provide better control when driving
- Increase comfort for truck drivers
- Prevent premature tire wear
- Reduces loosening of parts and chassis
- Dissipation of heat energy

The primary criteria established for Marathon's design team was to develop a Best-In-Class shock absorber that delivered a smooth ride with reliable performance and a long service life... performance in keeping with Marathon's market leading friction materials.

Marathon's Shock Absorber line includes models covering a wide range of over-the-road and severe duty applications for all major truck, trailer and suspension manufacturers. These hydraulic shocks feature a heavy duty design and rugged construction with reinforced welds, tough high tensile strength end mounts and durable piston seals. Complementing this durable design is a focus on a comfortable ride that reduces vibration from the vehicle's suspension system.

#### World Class Manufacturing

Marathon's confidence in entering the shock absorber marketplace stems in large part from its ability to control the design and manufacturing of the shocks. These shock absorbers are manufactured by a sister company within Marathon's parent company Grupo a, which operates three plants producing both automotive and heavy duty shock absorbers for OE and aftermarket customers. These shock absorbers are designed to exceed OE specifications and are manufactured in world class ISO certified facilities.

#### Top-Performing Hydraulic Shock Design

Marathon's shocks incorporate a hydraulic stop design that outperforms the market leaders. The seals and valves within the shock enable piston dampening in both up and down movements and creates a layer of oil that protects the shock from topping out and damaging internal components. In addition, Marathon uses a high viscosity hydraulic oil to ensure consistent performance over the life of the shock and through all types of weather, including extreme heat generated in severe service applications. All of these design considerations lead



to a shock that does an excellent job of vibration absorption to assure driver comfort, improve tire wear and lessen the wear of sensitive components.

## Four Shock Components that Make a Difference

• **Paint** – although this sounds like a simple element, shock absorbers need to resist corrosion as long as possible. Marathon shock absorbers feature a thicker coat of paint that lasts 60% longer in salt spray tests when compared to the leading brand.

• Inner and Outer Tubes – Marathon shock tubes are made out of thicker steel than the leading shock in the market. Our outer tube is 40% thicker to resist impact damage when in service. • **Piston Rod** – this is one of a shock's most important components. The rod must resist corrosion and pitting to ensure the seal does not get damaged and leak. Marathon uses the traditional hardened chromed shaft. The leading shock has changed to a nitrated (black chrome) shaft. The traditional rod has better corrosion resistance, but is a three-step process that comes with a higher cost.



• **Piston Valve** – is the control component of the shock that ensures ride quality. Marathon uses a traditional heavy and very robust valve. We do this to ensure the longest service life. The leading shock brand has changed to a lighter duty valve.

#### **Reinforced Welding to Prevent Premature Failure**

Inherent to designing a shock absorber for a long service life is to take extra steps to prevent weld failure. Marathon's shock absorbers have a reinforced welded perimeter for the closing system, reinforced projection weld zones for the end mounts that are tested to 8,000 lbs. maximum tensile strength and the end cap/outer tube welding has been tested to 12,000 lbs. maximum tensile strength. As part of the long life design, these shocks also use super chrome, tempered steel piston rods to protect against corrosion and act as a complement to the reinforced welding.



N/I

Welded Perimeter for Closing System



**Reinforced Projection Welded Zones** 

## Why Shocks are So Important to Vehicle Performance

Briefly mentioned earlier was the correlation between shock absorbers and braking distance. Yes, it is true that proper functioning shock absorbers reduce braking distance...this is done by keeping the tire in constant contact with the road. A weak or worn shock can't do this and will allow the tire to lose contact with the road ...extending the braking distance, but also causing premature tire wear. In the case of front tires, cupping or flat spotting are other common issues.

Shock absorbers also provide protection for the air ride suspension system by preventing the over extension of the air spring.

It is recommended by both tire manufacturers and air spring manufacturers that you replace shocks when replacing tires or air springs. These manufacturers know the importance of shock absorbers on their products and how it impacts their performance and longevity.

How do you know if your shocks are functioning properly? Shock absorbers take kinetic energy and convert that energy into heat...just like brakes do. A proper functioning shock absorber will be warm to the touch after a drive. If you have an infrared thermometer, measure each shock's temperature, they should all be close to the same temperature and more than the ambient temperature (measure the ambient temperature on the axle or the frame that the shock attaches to).

And finally last but not least.... Change your shocks in pairs! Keep in mind that heavy duty vehicles do not have independent suspensions and both sides of the axle must react the same. Failure to do this may cause tire wear and vehicle performance issues.





## Proven Marathon brake linings on an OEM quality shoe... it's a combination you can't beat

Marathon's family of Hi-Density friction materials can be delivered to your door already riveted on an OEM quality new brake shoe. And to further simplify your brake job, our new shoe kits include an OEM quality hardware kit with the new lined shoes... a package ready for installation. Marathon delivers:

- State of the Art Assembly Cells all of our New lined shoes and wheel end kits are riveted and assembled in Marathon's Cartersville, GA warehouse
- Quality Components our hardware kits contain stainless steel bushings, heat treated and zincchromate coated rollers and powder-coated springs, designed to be rust resistant and improve the dependability of your brakes
- Hardware Kits are built to OEM industry standards
- Heavy Duty Springs tested to 1,000,000 cycles versus competitors' average of 150,000 cycles, our true heavy-duty springs are certified to 125 ft/lbs resistance



Call 800-223-5201 or visit: MarathonBrake.com