

# STOPPING POWER

MAGAZINE

ISSUE 1  
JANUARY, 2018

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

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A Closer Look at the  
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in Friction Manufacturing

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AMX Trucking, Inc.

## **New Facility**

Marathon's New World Class  
Friction Manufacturing Plant



## 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 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 zinc-chromate 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

**Marathon**  
BRAKE SYSTEMS

A graphic element at the bottom of the logo, consisting of a stylized black road with white dashed lines curving to the right.

Call 800-223-5201 or visit: [MarathonBrake.com](http://MarathonBrake.com)

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### Request a Copy:

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**BOB HICKS**  
President, Marathon Brake Systems

*“...when you spend more today for something that will lower costs or improve productivity in the long run – are you increasing expenses or making an investment?”*

## PRESIDENT'S LETTER

Message from Bob Hicks

### Business Spending – An Expense or Investment?

Welcome to the first issue of Marathon Brake Systems' Stopping Power Magazine. We've worked hard to include a range of articles that address topical issues that we hope you'll find helpful.

As a veteran of over 30 years in the heavy-duty aftermarket, I've watched a great many changes take place. But probably none so great as the downward cost pressures that exist throughout our industry. As an overall theme for this issue, I was drawn to a concept that seems to dominate so much of our professional and sometimes even personal lives: lowering costs. In today's competitive business environment, the need for lower costs seems to permeate nearly every decision. Unfortunately, this can result in too many short-sighted decisions. It brings to mind the old saying: "You can't see the forest for the trees."

A question that I've often asked of myself when faced with a business spending decision: is this an expense or an investment? Some things, such as office supplies, are clearly expenses, while other spending decisions fall into a grey area. In many cases you can choose to lower the costs of obvious expense items without much in the way of negative consequences. But the rub comes when you spend more today for something that will lower costs or improve productivity in the long run – are you increasing expenses or making an investment?

At Marathon, we've consistently tried to make investments that will improve our position in the long term. Our new 40,000 square foot friction manufacturing facility that opened in 2014 certainly comes to mind. While the millions of dollars spent on the new plant has increased our short term expenses, we believe it is a long term investment that positions Marathon to be a leader in the friction industry for many years to come. You can learn more about our new world class facility in our story on page 8.

The same holds true for our ongoing commitment to source only the finest raw materials for all of our various friction products. The evaluation process by our R&D engineering team and subsequent purchase of the highest quality resins, fiberglass and other raw materials increases our annual expenses. However, the quality and performance of the friction products that our customers count on makes it a worthy investment, one I hope you will agree with after reading our raw materials article (pg. 10).

On the other side of the aisle, I've watched for years as more fleets make aftermarket product choices based on almost entirely on a lower initial purchase price. The increase in low cost products manufactured in China and India has only accelerated this process. It includes a great many aftermarket truck and trailer products, friction materials very much included.

So in this issue of Stopping Power magazine, we've included a number of articles that speak to the idea of investing today for a long term return. In addition to our plant and raw materials articles, we show how the density of a friction material impacts its performance and you'll hear from one of our customers on how they've saved money with Marathon brake linings. We hope you enjoy the magazine and please be sure to share any feedback.

# HEATSTAR

A versatile friction material designed for heavy loads & tough terrain, yet excellent for over-the-road hauling



## HEATSTAR™ DELIVERS

- Works on a broad range of applications from severe duty to normal over-the-road hauling applications
- Hi-Density formulation for excellent heat dissipation
- The longest service life of any brake lining in its class
- Dependable stopping performance
- Excellent brake fade and recovery characteristics
- Extremely drum friendly

Call 800-223-5201 or visit: [MarathonBrake.com](http://MarathonBrake.com)

**Marathon**  
BRAKE SYSTEMS



Alabama Motor Express, a.k.a. AMX Trucking, Inc., runs a tight ship, which of course is pretty much a necessity if you're going to succeed in today's hyper-competitive trucking industry. As a general dry box carrier that hauls freight throughout the US lower 48, the AMX fleet carries widely varying loads across even more widely varying terrain. Finding the right brake lining to stand up to such a range of conditions while delivering consistent stopping power with a long lining life was a challenge and priority for AMX.

In order to maximize uptime for their trucks and trailers, AMX pays close attention to maintenance details and demands the products used within their fleet perform to an extremely high standard. Headquartered in Ashford, AL, AMX has a full service maintenance department that handles a fleet of more than 250 trucks and 600 trailers.

For years AMX had struggled to find a brake lining that would satisfy their safety concerns for reliable stopping under often difficult conditions while providing wear characteristics that would fit their desired brake reline schedule. About 10 years ago, AMX's brake shoe reline partner, Tri States Brake Center, suggested to Jackie Dansby, AMX Maintenance Director, that he give Marathon Brake Systems' HeatStar friction material a full trial.

Mr. Dansby summarized the transition to HeatStar "Our fleet is a tough customer, we haul a lot of different loads all over the US and Canada. We were having a hard time finding a brake lining that could give us the lining life we wanted while stopping our trucks every time. From the moment we gave Marathon's HeatStar a try, it's truly been a star."

HeatStar is a premium brake lining rated for 23,000 lb. axle loads and specifically formulated to handle varied loads over varied terrain, including tough mountains. Dansby concluded by saying, "We've been running HeatStar for more than 10 years now, with consistent performance and no problems. Our brake reline cycle has been extended and HeatStar has definitely helped our maintenance ROI. And our drivers are happy with the way our trucks stop."

***"From the moment we gave Marathon's HeatStar a try, it's truly been a star."***



# Fleet Focus

## AMX Trucking, Inc.

Alabama Motor Express  
Improved Maintenance  
ROI with Marathon









# Marathon's New Facility

40,000 sq. ft.  
World Class  
Friction Manufacturing

In 2014 Marathon Brake Systems opened a new 40,000 square foot friction manufacturing facility. This state-of-the-art ISO9000 and ISO14000 certified plant produces the complete family of Marathon friction materials and complements Marathon's other two friction manufacturing plants. The friction materials produced in our new facility all meet or exceed FMVSS #121 and RP628 test standards. Some Marathon products have ECE certification for sale or use in Europe. We supply brake linings from this facility to our aftermarket customers around the world and to our OE customers in North America.

The new Marathon facility features a world class process that incorporates several new manufacturing technologies. Among the processes utilized in the new plant are a geothermal cooling system to maintain optimum and consistent humidity and temperature, an automated raw material weighing system to ensure batch-to-batch consistency and a proprietary process for transfer of raw material mix into the hot curing presses.



**Computer controlled hot presses ensure optimal product curing**

One of the more significant quality control improvements are the use of a continuous curing process for better swell and growth control of the friction material. This continuous curing delivers a consistent temperature throughout the process eliminating the hot zones common in traditional friction curing and improving overall product quality.

The plant also features an automated ultra-sound scanning system to examine 100% of our friction for possible delamination.

Marathon's research and development team plays an integral role in the overall quality control system. Incoming raw materials undergo rigorous testing including ash (%), loss of ignition, oil content, acetone extraction, screen analysis, moisture (%), specific gravity, bulk density, phenolic resin curing and flow tests.



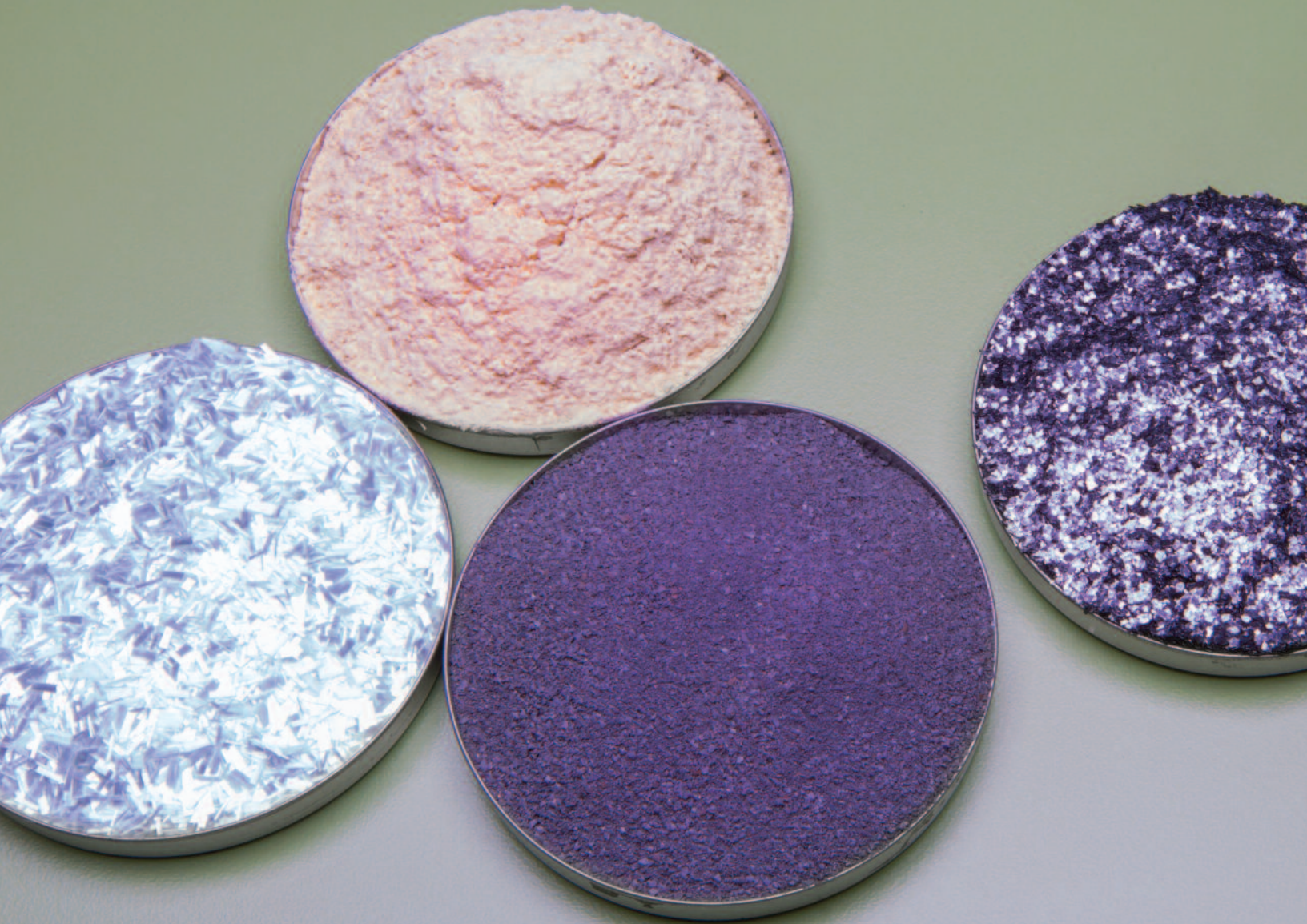
**R&D inspects both incoming raw materials and finished products**

Finished product testing includes specific gravity, hardness, fast, dimensional stability, chase, transverse rupture strength, internal rupture strength, compression strain and dynamometer cycling. Marathon friction materials are tested to and comply with an extensive list of global standards.

In 2018 another significant investment will result in the addition of a new production line within our plant. Goals for these ongoing investments in manufacturing facilities and processes are not only the highest quality standards for our products, but efficiency that allows us to compete globally... in fact, we're very proud that our world class Marathon manufacturing process goes from raw material to finished brake lining in a matter of hours, as opposed to other manufacturers whose process takes days!

# Raw Materials

A Closer Look at the Biggest Cost Component in the Manufacture of Brake Linings



One of a fleet maintenance manager's most critical evaluations is which brake lining is the right fit for their fleet. In an economy where bringing costs down is more important than ever, it can be difficult to justify spending more for a premium grade brake lining, such as Marathon's HeatStar. But does the money saved at time of purchase really extend through the life of the lining? That's where the rubber meets the road.

To truly understand how to assess and compare the quality/value of a brake lining, we have to look to its formulation. In other words, examine the raw materials used in the friction formula. What is a lining made of, exactly? As it turns out, not all linings are created equal.

The science behind what raw materials and in what percentages each go into a friction product is so critical to the performance of the lining that, for most companies, these formulas are closely guarded secrets. Finding the perfect balance between a lining's strength, durability, heat resistance, brake fade and, of course, cost requires extensive testing, in the lab, on the test track and on the highway.

A common misconception in the heavy-duty industry is that the price of a friction material is largely a function of the labor rate in the country of manufacture. In reality, labor is typically less than 35% of the cost of the product, whereas the raw materials used in the friction formula represent more than 65% of the cost. Further, labor savings that might occur in far East countries

are usually offset by freight costs and lead-times to deliver to North America.

## A Closer Look at Raw Materials

One of the stars of any friction material is phenolic resin. Used as a binding agent, this raw material is cured through a high-heat, thermoset reaction. As a result, linings that have higher amounts of phenolic resin maintain strength and integrity over time. Phenolic resin also helps improve lining wear/life at low temperatures, making it key for over-the-highway applications.



Two other vital raw materials are chopped fiberglass strand and abrasives (aluminum oxide). Fiberglass increases the flexural strength of a friction material, effectively minimizing cracking because of its ability to reinforce and strengthen. Abrasives like aluminum oxide are the raw materials responsible for creating the torque when brake linings are used during a stop – quite literally, the friction.



Graphite is also an important raw material, as it is temperature resistant and acts as a lubricant for the lining, thus greatly aiding in reducing wear and stabilizing friction level. Because different types of graphite exhibit varied frictional characteristics, many combinations or forms of graphite may be used in a friction formula based on the application of the lining.



Rubber and friction particle, along with graphite, are part of a second tier of raw materials from an importance/cost perspective. Rubber, typically recycled tire treads, and friction particle derived from cashew shells are both organic materials that help to make the friction softer and more compressible.

Other inorganic minerals such as calcium carbonate, barytes, and wollastonite, commonly referred to as fillers, are mined directly from the

earth and as a result are generally inexpensive. But because these ingredients are naturally sourced, they require purification processes before being considered acceptable for a friction material. However, it can be costly to set up and maintain high quality separation and purity processes. Outsourced manufacturing companies in the far East often forgo first-rate purification standards as a method to reduce costs. These impurities can lead to issues with lining and drum wear or noise.

So, how does the use of raw materials and the ultimate price of a brake lining come in to play? As previously noted, the cost of labor in friction manufacturing is actually dwarfed by the much larger cost of raw materials. An excellent way to illustrate the impact of raw materials is to look at the varying costs of friction materials from a single manufacturer, like Marathon Brake Systems.

Marathon's premium grade linings such as HeatStar cost approximately twice as much as their economy grade linings. With both brake linings manufactured in the same plant with the same labor cost, the difference in price is almost entirely driven by the raw materials used in the friction formulations. A higher percentage of the key and very expensive tier one raw materials of phenolic resin, fiberglass and aluminum oxide will be found in HeatStar and a lower percentage

of the less expensive filler materials. The opposite is true for economy grade materials.

The same principle holds for the low cost linings manufactured in the far East. Lower percentages of key raw materials combined with a lower quality of these raw materials results in a less expensive product... and one that performs poorly in most key metrics. This leads to more frequent brake jobs and issues like friction cracking, which can cause out-of-service fines and safety concerns such as wheel lockup and fires.

More fleets are learning what friction manufacturers have known for years – you get what you pay for. To achieve the greatest return on investment, a premium lining manufactured with the best raw materials will save fleet owners significant money by delivering a longer service life with superior performance characteristics, thereby extending brake reline cycles. Giving you confidence in your fleet's safety and improving your bottom line.



# New Products from Marathon

## DiscStar Air Disc Pads for On-Highway Trucks and Motor Coaches

Marathon Brake Systems introduces DiscStar Highway Premium (DSHP) brake pads designed for air disc brake systems used in on-highway truck, tractor steer and drive axles and motor coach applications. DSHP is premium low-metallic friction material rated for 23,000 lbs. and formulated to provide a longer pad and rotor life than OE pads, while delivering a significant noise reduction.

DiscStar Highway Premium is a high performance commercial vehicle disc pad that features exceptional rotor compatibility and shows up to 33% less brake rotor wear than leading OE linings. DSHP uses a proven, reliable attachment method to ensure a high mechanical bond between the friction material and the steel backing plate for a high resistance to shearing. The rapid heat dissipation characteristic of DiscStar pads is a key feature resulting in its longer pad life and dependable stopping power.



## HeatStar HS20 Premium Brake Linings Now OE Approved



Marathon Brake Systems announces its premium grade HeatStar HS20 brake lining is now an OE approved aftermarket lining. Part of Marathon's flagship premium HeatStar line, HS20 is a versatile, high performance premium brake lining rated for 20,000 lb axle loads. HS20 is designed to provide the longest service life of any brake lining in its class and is ideal for a wide range of over-the-road hauling applications.

Marathon's proven HeatStar20 formulation provides an OE approved, long-life friction material that lowers your cost per mile and reduces overall brake maintenance costs. HS20 meets Federal regulations for brake effectiveness, fade and recovery in accordance with FMVSS 121 test procedure. Marathon's HS20 features its Hi-Density friction formulation designed to improve your bottom line through better performance and fewer maintenance headaches.



For over 30 years, Marathon Brake Systems has differentiated themselves from competitors in the heavy-duty market via one primary product characteristic: higher density friction formulations. Marathon's time-tested, proven family of high density brake linings have become synonymous with performance and reliability.

But what, exactly, is density? How does it impact stopping power

and lining life? By definition, density is a measurement of mass per unit of volume. The higher the density, the more mass in a given space. Understanding that friction products are made up of a mix of raw materials, it goes to reason that a higher density of those raw materials would have some benefit.

In friction manufacturing, when higher quality and heavier raw materials are used in a lining's formulation, it creates a higher mass, thereby its higher density. High density increases a brake lining's ability to efficiently handle heat, which is the most critical factor influencing the life and durability of a brake lining.

Heavy-duty truck brakes are designed to convert the energy of a moving vehicle into heat energy. The higher the density of a friction material, the greater its ability to hold more heat energy and subsequently dissipate the heat through the drum. This ability to deal with heat is the primary driver in a brake lining's fade, recovery and wear characteristics. In other words, higher density friction delivers stopping power that recovers quickly and yields a longer lining life. This is especially true at higher temperatures that are so common in many varied and severe duty applications.

Another benefit of higher density in friction products is greater structural integrity. It is actually somewhat common sense that a higher mass would yield a stronger product. In the real world, higher density brake linings are far less likely to crack while in service, while riveting, or due to rust jacking.

Conversely, let's consider the impact that a lack of density can have on brake linings. Typically, economy grade and far East manufactured brake linings have a much lower density than premium friction materials. This is a direct reflection of what they are made of: large amounts of low quality raw materials.

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**See the Difference...  
Marathon Hi Density  
formulations use  
higher quality  
raw materials than  
the competition.**

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Since their introduction to the heavy-duty industry, Marathon brake linings have featured a family of friction formulations that have led the market in performance. The density of a Marathon brake lining exceeds all other friction competitors.

**Below are the average density advantages of Marathon versus the competition:**

- +15% vs Federal Mogul/Abex**
- +20% vs Arvin Meritor/Frasle**
- +25% vs Haldex**

For the greatest return on investment, fleets that choose a premium, high density lining will save significant money by achieving a longer service life, extending brake reline cycles, and providing consistent, reliable stopping power that their drivers will value. And when it comes to Hi Density... it's the Marathon Advantage!



# High Density Friction

## Why It Matters

# Brake Maintenance

## Check List ✓

### Best Practices to Keep Your Brakes in Good Condition

#### ✓ Air Systems

Ensure your brake system is well-balanced.

#### ✓ Spring Brake Chambers

Make sure your push rod is even on all chambers. To help, cut the push rod to the appropriate length.

#### ✓ Slack Adjuster

Ensure your slack is setup properly per the manufacturer's recommendation.

#### ✓ S-Cams

Make sure no grease is on your S-cam head. Aim for free play movement in and out, and up and down. Also, seal your installation.

#### ✓ Hardware Kits

When performing a brake job, replace the hardware kit completely, not only the springs.

#### ✓ Shoes

Do a complete replacement, not only one wheel. The minimum should be a complete axle if it's not possible to do an entire unit.

#### ✓ Drums

Make sure to use heavy drums for severe applications. Use of lightweight brake drums on any heavy duty application is not recommended – they frequently lead to damaged and cracked drums.

#### ✓ Lining Wear Patterns

To begin, after removing drums look at the brake shoes and lining before you remove them off the wheel - it will tell you a story.



#### ✓ Brake Adjustment

Jack up axles and snub up brakes, then back off  $\frac{1}{4}$  to  $\frac{1}{2}$  turn on manual slacks and use templates on automatic slack adjusters.

#### ✓ Brake Lining Burnishing

Heat up the brakes until you are able to smell them. Then, allow them to cool. Do this procedure within  $\frac{1}{4}$  to 1 mile. Check wheel temperature with a heat gun.



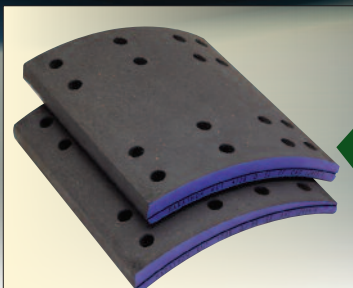
# Transit Premium Air Disc Pads

**Get the Longest Pad & Rotor Life  
with No Noise... Only from Marathon**



For more than 25 years, Marathon has been the transit industry's leading friction manufacturer. Now as more transit and coach fleets turn to disc brakes, count on proven **DiscStar Transit Premium Air Disc Pads** to safely and quietly stop your buses while delivering the longest service life.

**Get the most from your  
bus brakes with Marathon!**



*For your buses with  
drum brakes, trust  
proven OE transit  
approved KVT transit  
brake linings.*

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