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Photo: Courtesy StopTech

## FROM TRACK TO STREET

Implementing brake upgrades to production-based racing cars

**P**roduction based racing is one of the fastest growing motor-sport sectors. With everything from turnkey factory race cars to nearly stock touring cars running in dozens of different series, there is something for everyone. The direct tie to production car sales is not lost on manufacturers who are getting more involved with this type of racing every day.

Some sanctioning bodies allow extensive modifications and others tightly control what changes can be made. Brakes are usually one of the first allowable upgrades. Experienced racers know that most passes happen under braking, so the brake system can be your best friend or your worst enemy out on the track.

"While almost every current passenger car is capable of a single stop from maximum speed at or near the limit of tire adhesion, the braking systems of most passenger vehicles and light trucks are not adequate for racing. Most stock brake systems lack sufficient thermal capacity - the system's ability to absorb and dissipate heat," says StopTech Director of Engineering, Steve Ruiz.

StopTech has been involved in

production based racing for years. The company currently supplies brakes to racers in the Continental Tires Sports Car Challenge, to the Cayman Interseries, and is the official brake sponsor for the SCCA Pirelli World Challenge Championship. You'll also find StopTech Brakes on a lot of grassroots racers as well, especially in NASA and SCCA racing.

### CHOOSING THE RIGHT SYSTEM FOR YOUR APPLICATION

Factors considered in the selection of a high performance aftermarket brake system for your road car include intended use, performance, safety, ease of installation and cost. In racing, the considerations are the same, but the rulebook may impose mandatory constraints. The basic goal for a race brake system is to brake later than your opponents, allowing more time on the throttle and overall quicker lap times, and to have brakes perform as well at the end of the race as at the beginning.

K-PAX Racing's Robb Holland recently chronicled the build of his off-the-showroom-floor Volvo C30 for World Challenge Touring Car series. In a series of articles, Robb covered every aspect of the build, from

bodywork to safety equipment, engine, suspension and brakes.

"Braking is one of the most overlooked performance enhancements in racing," explains Holland. "If I can brake 20 feet later than my competition and still get down to the same corner entry speed as they do, then that is a huge advantage. Think about it. While they are hard on the brakes, I will still be full throttle for that additional 20 feet. Yup, big deal."

So how do you choose the right brakes for your production based race car? We asked Turner Motorsport how they settled on the StopTech Trophy Big Brakes. "Well, it was a pretty easy choice once we saw how effective the brakes were. Guys who were running them were able to brake so much later so we went to the guys at StopTech and said, 'What can you do for us?' They worked with us to choose the exact components to keep our car balanced and performing at the limits of the tires. It is amazing what a difference it made once we had them on the cars."

"The experience gained in racing transfers over to the road car applications and vice versa," said Ryan

Kim, Motorsports Sales Engineer at StopTech. "Our involvement in World Challenge, Grand-Am and ALMS allows us to constantly review our current technology and find ways to improve.

Racers find ways to exceed the limits of almost any engineered component. Working with them to develop their braking systems for success helps us not only build better products, but also provide better service to the track-day enthusiast and club-level racer.

Technology and product development transfer in both directions. Our Trophy Brake System calipers were conceived for racing, but have proven popular with street customers. Conversely, the natural anodizing process applied to the rotor hats for Trophy Brake Systems and the World Challenge Touring Car systems was first developed for a customer building high-horsepower street cars."

### STOPTECH'S APPROACH IN CREATING AN UPGRADED BRAKING SYSTEM FOR A PRODUCTION BASED RACE CAR

Kim again: "The first step of development in any racing system, whether brakes, suspension or engine, is to read the rule book for the class in which the car will compete. Some entry-level race classes allow only upgraded brake fluid and pads, or may allow stainless steel brake



lines as well. The use of directional-vane, one-piece rotors such as those available for selected applications through our parent company Centric Parts, that are otherwise identical to stock parts, may be a gray area that should be clarified with one's sanctioning body or race officials. Stepping up, many classes allow the use of two-piece, floating rotors with the OE calipers."

After the rules constraints are outlined, StopTech's development process begins with an assessment of the vehicle characteristics. Technical considerations include power, weight, weight distribution, tire size and type, and wheel size, as well as race length and the types of tracks. All of these contribute to a proper analysis of the system and its ability to control temperature. Heavier cars and longer races typically point toward the use of a six-piston front caliper, if it is allowed, because of its greater pad volume, and a larger-diameter or thicker and heavier rotor for greater heat capacity.

Once the calipers and rotors of the brake system are defined, applying a total vehicle system approach to the race car is key to completing the integration, and it's something that, for the most part, has to be done by the race team. Just as an upgraded turbo may not allow an engine to make more power without also improving the car's intake and exhaust systems, brake hardware works in conjunction with the rest of the vehicle.

Besides the calipers and rotors, other components that are just as

critical to optimal brake performance include brake pads and ducting. Selection of brake pads that perform well in the application is critically important.

Just as with tires, there are many good options, but each compound performs a little differently. Brake ducts can be extremely beneficial too, however, it is also possible for brake ducts to do more harm than good if they are not properly designed.

Other areas that hold surprises for some racers are suspension setup and ABS. Adjustable damper settings can affect the ability of one axle or the other to do brake work. In particular, excessive rear rebound damping is a common reason that a brake system that is actually well-balanced may seem to perform as if it is rear-biased.

In general, if ABS is available on the production car and allowed to be used, it is a tremendous advantage to keep it on the race car. However, the ABS tuning on some vehicles may not adapt well to the changed response of racing tires, versus the all-season HP tires the car was delivered with.

Some experimentation may be required to find the setup that works best for you, but remember that experimentation means measurement, not just reading opinions online. A temperature paint kit may seem expensive until you compare it to the cost of a set of race pads, or replacement rotors. It is a simple tool that can tell you what's really happening on the track.

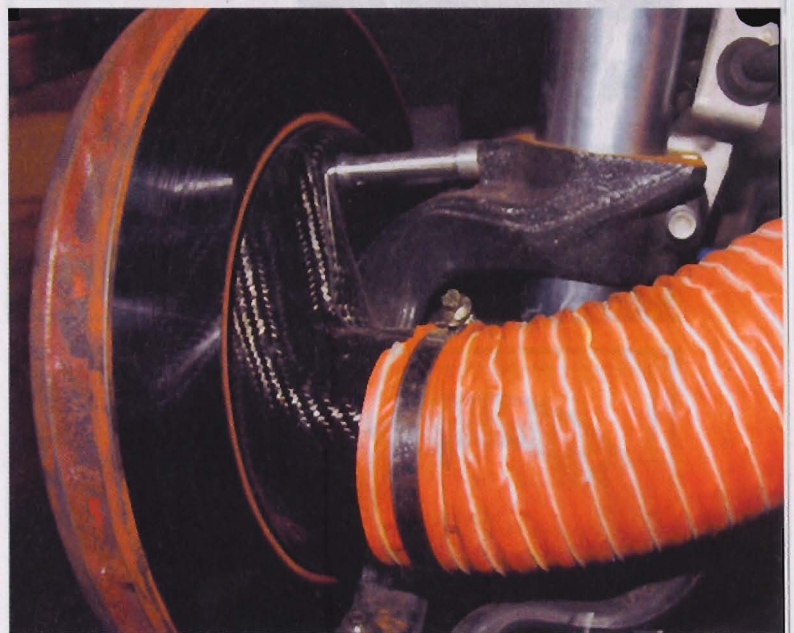
#### SIDEBAR:

The differences between StopTech's off-the-shelf caliper and the World Challenge versions

"Well known in the street performance world for its Balanced Brake Upgrades®, StopTech is also the official brake supplier to the World Challenge Touring Car field and has created a unique braking package for every model of car in the field," says K-Pax Racing's Robb Holland.

"The StopTech brake systems used in World Challenge Touring Car racing differ only in small detail from the street version available to the public. The minor differences include fully floating rotor mounting hardware and a natural-anodized AeroHat on the racing version," according to Ryan Kim, Motorsports Sales Engineer for StopTech, who continues:

"The StopTech brake systems used in World Challenge Touring Car racing differ only in detail from the street version available to the public. The minor differences include rotor mounting hardware with full axial and a natural-anodized AeroHat. The full-float rotor mounting helps eliminate pad knockback under the higher cornering forces possible with race tires, but would exhibit unwanted noise for a street car. Natural hard-anodized AeroHats are completely resistant to color change at the high temperatures experienced in racing, and are available for street use in StopTech's Trophy Sport Brake Systems. Standard street systems with painted calipers (used to keep costs down for racers in World Challenge) are supplied with black anodized hats and anti-rattle rotor hardware, but will otherwise perform identically to the systems raced in Touring Car. Customers will need to install brake pads appropriate for the power, weight and tires of their vehicle if they drive at the track." •



Brake ducts (top) are vital for routing cool air to the blisteringly hot brake discs of modern performance and race cars. Without them cooling your brake discs (middle), like these examples from StopTech (above), brake performance and life is greatly reduced.