

Control freaks

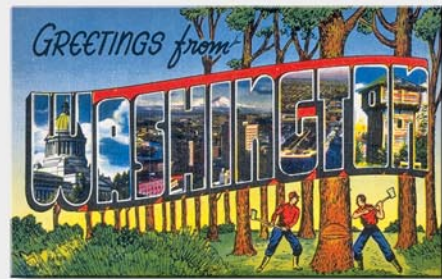
New Goodyear ultra high performance all-seasons

by Joe Sage

Tire development seems as though it would be largely the same from one tire to the next: maximize traction, handling and tread life, achieve tradeoffs between wet or dry, hot or cold, slick or adhesive surfaces, figure your target market, calculate your costs. How, then, can it keep so many people so busy, over and over? We flew to the Pacific Northwest to learn how one tire might break through all that has come before.

We began by reviewing any tire's fundamentals—a torus-shaped flexible membrane pressure vessel, constructed from high-performance composites comprising long-chain macromolecules. You suspect there is rubber involved, and you are 43 percent right. Add another 27 percent carbon black, 5 and 10 percent each fabric and steel wire, another 5 and 10 percent each oils and other chemicals, and you have a recipe with 18 components, 12 compounds, two fabrics, two steels and 60 raw materials.

Torturing itself where thousands of pounds and hundreds of horsepower of



vehicle meet the road, a set of tires has to ensure the ultimate stable engineering interface between the two—carrying the load and cushioning the ride, while aggressively and effectively accelerating, cornering and braking, while maintaining strong fuel mileage, not wasting horsepower and minimizing noise, vibration and harshness.

Computerized design processes help, but the starting point will never be quite the same for two tires. Even within the Goodyear Eagle performance lineup, there are six families: three high perform-

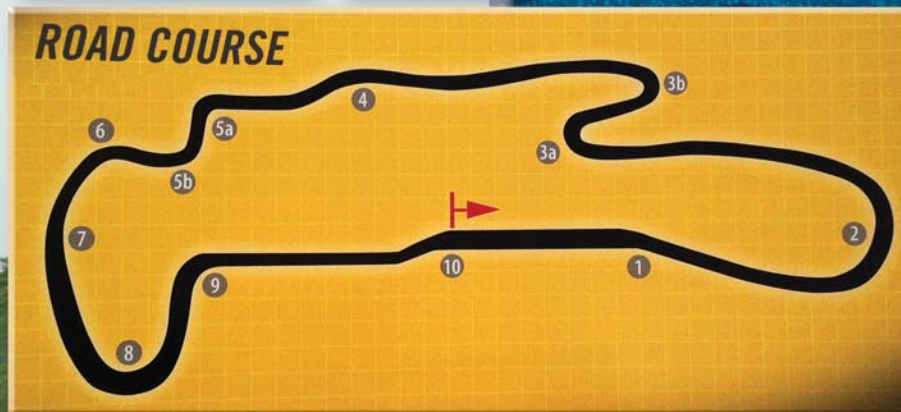
The 2.25-mile track at Pacific Raceways was perfect to push the limits of Goodyear's new all-season F1 Eagles on a pouring rainy day. At right, BMW 3 Series gather at the starting line. The S curves of Turn 3 (third row, first photo) could not shake our grip, nor could the significant standing water in the straightaway to Turn 1 (third row center). Rounding Turn 8 (bottom), we were all ready for another run.

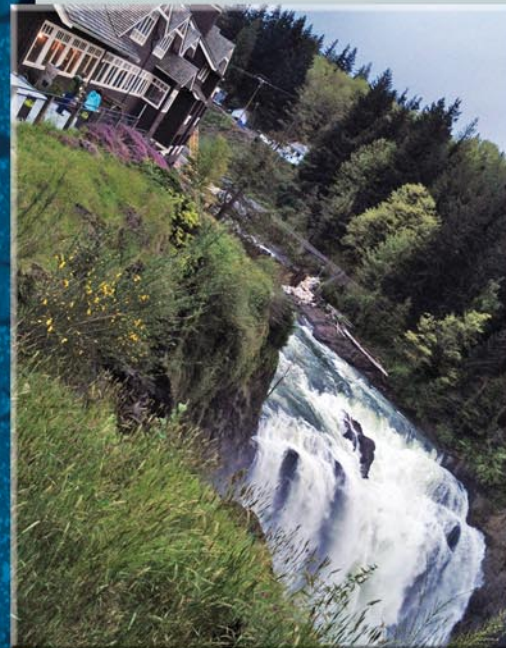
ance and three ultra high performance lines.

Goodyear knows performance. In Formula 1 racing, they have an enviable record of 368 victories and 25 drivers' world championships. Every NASCAR Sprint Cup champion since 1968 has won on Goodyear tires, and they have been the exclusive supplier since 1997.

The performance tire segment of the market is the fastest-growing, now approaching half the volume of conventional commuter/touring tires, surpassing all-terrain, and eclipsing winter tires almost four-fold. Manufacturers are increasingly using them as original equipment, for reasons of style, stopping power (their lower profile allows for larger brakes), and intrinsic

KEEP RIGHT >>





Outside shoulder:
Dry handling zone
(lower void volume)
Enhanced handling & grip

Inside shoulder:
All-season zone
(higher void volume)
more water evacuation

Three-finger block

Traction teeth

TredLock® technology

X
Specialized tread compound

The venue was well chosen for the task. A break in the clouds revealed the wet conditions below. The gushing waters of Snoqualmie Falls at Salish Lodge & Spa, known to Twin Peaks fans as the Great Northern Hotel, were another harbinger of a wet day ahead. Pacific Raceways is home to the famous novel *The Art of Racing in the Rain*. And clever Goodyear technologies got us through it all.

characteristics of handling and grip. OEM is important for volume and the endorsement factor, but folks bought 247 million replacement tires in 2011. These buyers are increasingly putting performance tires not just on Corvette or Porsche, but on Taurus and Malibu, and they want them to work well in any weather.

The twain meet in one tire and tread

What distinguishes the new Eagle F1 Asymmetric All-Season (A/S) is that it is both an ultra high performance tire and an all-season tire—goals that have typically been at odds with each other. (Goodyear did develop the first all-season performance tire—the GT+4—in 1986.) Tire engineers typically make tradeoffs among three elements comprising a “performance triangle”: rolling resistance, wet/dry performance and tread wear. This new F1 expands the triangle.

A team of more than 50 engineers at Goodyear developed this new tire, using virtual tools to create many iterations of tread pattern, profile and other characteristics, to test for wear, noise and handling. Over 1000 alternate models were tried, with even a racing slick in the mix as a benchmark, generating profiles that enabled the team to identify a sweet spot for steering, handling and feel overall. The tread compound had been determined and fixed by last summer—a functionalized polymer chain protected by several Goodyear patents. Next it was time for a tread pattern and mold shape.

The job of any tire varies considerably from edge to edge: the outer half bears the brunt of handling and grip, but dimensional and load-carrying rigidity, along with traction, must be maintained. To the degree that task can be carried across the inner half of the tire, there is increasing latitude for the outer half to give and grab more. Stiffness was balanced across the entire footprint, which may sound simple as a concept, but involved considerable modification of the molds.

An aggressive tread pattern is key for traction. But what's *there* is only half the story. What's *not* there—the “void volume”—is what evacuates water. The outer edge of this new Asymmetric A/S tire features a three-finger block design (32 of these) that shoots rain and snow out quickly, while having three times the number of biting edges. Since a big blocky pattern can be noisy, the inner edge has a smaller element, and 64 of these.

When you come down to it, rubber on pavement is what gives grip, not grooves—visualize a racing slick. Goodyear tackles this with its TredLock® technology on the second course of the outer half of the tire, with biting-edge microgrooves that provide wet traction but lock together for more grip in turns. Bigger traction teeth on the inner half continue to provide bite in wet conditions (including mud, snow or rain—lots and lots of rain).

By the time we were done learning about the development of the new Goodyear Eagle F1 Asymmetric All-Season tire, and ready to drive it in the best possible

While we weren't doing road course laps, we were hammering a very wet autocross course also at Pacific Raceways. Our runs were also done in the BMW 328i equipped with Goodyear's new A/S tires, then with tires from competitors. We also did about an hour's open touring drive in the BMW, Audi A3 and Lexus IS, tackling the equally very wet hills, curves, highways and school zones of the region.

conditions—which would in this case mean the worst—at Pacific Raceways outside Kent, Washington, we were hard pressed to figure what the team would tackle next, that hadn't just been solved for all time.

Taking it to the track and the open road

Lots and lots of rain is what we found at Pacific Raceways in the Evergreen State—enough to scrub any normal event. But you couldn't have asked for better, for our track test of the Goodyear F1 Eagle Asymmetric A/S tire. We also had a fleet of 3 Series BMWs, as this was the primary development platform for the tire, demanding an ideal comfort and ultra high performance mix. The road course at Pacific Raceways (which also has a drag strip and motocross course) is 2.25 miles long, with nine turns and significant elevation changes. Great for race events, it is also used for such skills as law enforcement winter pursuit training. The facility also created a flat, very wet coned handling course for us.

These conditions are not that different from the worst that Arizona can dish out—from winding two-lane mountain highways in winter, to sudden stretches of standing or rushing water on desert road surfaces during our less frequent but often even more intense rains. Goodyear's own testing indicated that their new Asymmetric A/S outperforms its main competitors—the Michelin Pilot Sport A/S Plus and Bridgestone Pole Position RE970 A/S—in six out of eight tests on the handling course and four out of eight on the road course. We would be testing all conditions except “dry.”

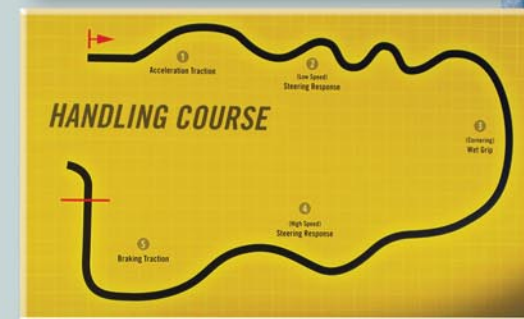
We pushed the tires to extremes on the track, and we were impressed. We ran many laps, and on some we brought along a seasoned race instructor, who made sure we pushed our boundaries. Yet we never exceeded our comfort zone. We've driven many a mile in the worst of weather, and we think we can feel the edge of grip, but these tires did not want to reveal any limits.

We also drove on a flat autocross course, running the new A/S on the 328i, back-to-back with the same car on competitive tires. One colleague had grim results in this comparo. We kept our sheetmetal intact, but could very much feel the difference. Impressive.

Made in America for the long haul

Goodyear has engineered the Eagle F1 Asymmetric All-Season for a 45,000-mile warranty life. The tires are manufactured at plants in Lawton OK and Fayetteville NC. It is being produced in 36 sizes; the first thirteen W- and Y-rated variants began arriving in stores in July.

Between a great car and a great road—all the more so a great road in miserable conditions—is a piece of engineering that must pull it all together. The development team at Goodyear has worked very hard to ensure the new F1 Eagle Asymmetric All-Season is the perfect key to that puzzle. For an entertaining video about this tire, visit www.goodyear.com/controlfreak. ■



EAGLE F1 ASYMMETRIC ALL-SEASON

