



ADVANCED TIRE DESIGN



*NTSB Tire Safety Symposium
December 10, 2014*





SPEAKER

Russell Shepherd

Director of Competitive Analysis
Michelin North America



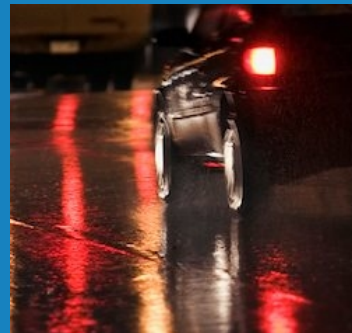


THEY WANT TO KEEP LOVED ONES
SAFE... ESPECIALLY IN WET WEATHER



"I am unsure about how fast and at what point tires begin to lose grip and I begin to sacrifice my family's safety."

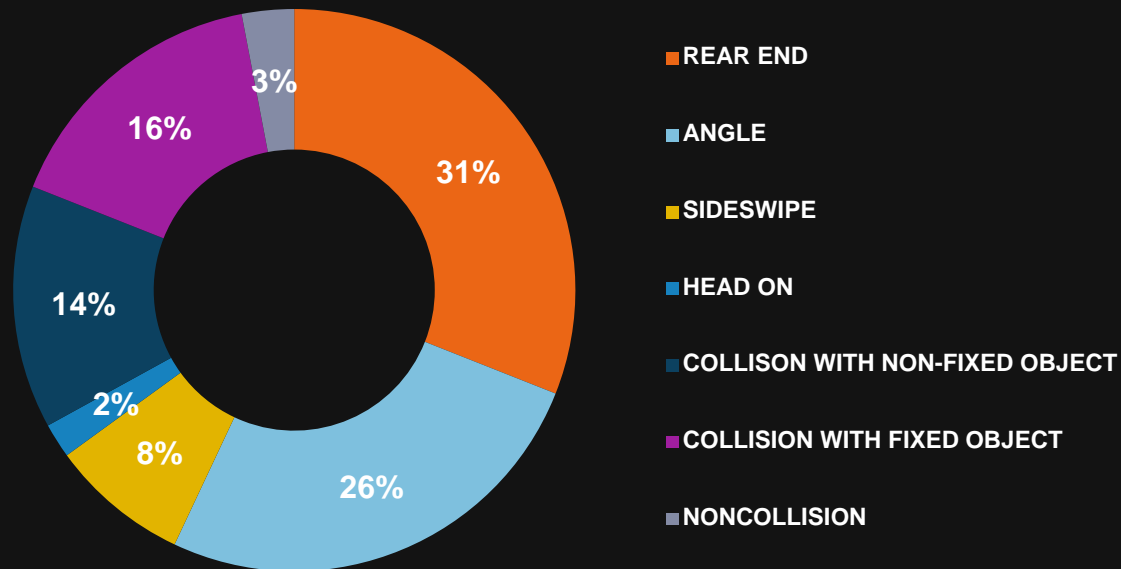
"I get more nervous driving in bad weather. That's when I'm glad for all those safety options. You know, just in case."





FACT: REAR-END COLLISIONS LEAD ALL ACCIDENT CATEGORIES

Accident Event Types



Traffic Safety Facts 2009, NHTSA, US DOT, 2009





FACT: WET ROADS ARE A LEADING FACTOR IN REAR-END ACCIDENTS



Rear-end Accident Conditions

- **20% OCCUR ON WET ROADS**
- **87% OCCUR WHEN THE POSTED SPEED LIMIT BELOW 55 MPH**
 - **On average approximately 40 MPH**
- **13-30% INCLUDE NO CORRECTIVE ACTION**
- **AVERAGE TIME SPENT BRAKING PRIOR TO IMPACT: 1.1 SECONDS**



FACT: WET ROADS INCREASE
ACCIDENTS

2X

*For the same distance covered,
on wet roads, you are more
than twice as likely to have an
accident as on a dry road.*



U.S. DOT NHTSA: Tire-Related Factors in the Pre-Crash Phase (2012)



SO LITTLE KEEPS YOU **IN CONTROL**

BRAKES STOP YOUR WHEELS



TIRES STOP YOUR CAR

30 sq. inches

Amount of rubber that touches
the ground at any given time





WITH EACH MILE AND STOP,
WET TRACTION DETORIORATES



19,850 miles/year
X 2.08 stops/mile

41,288 STOPS/YR



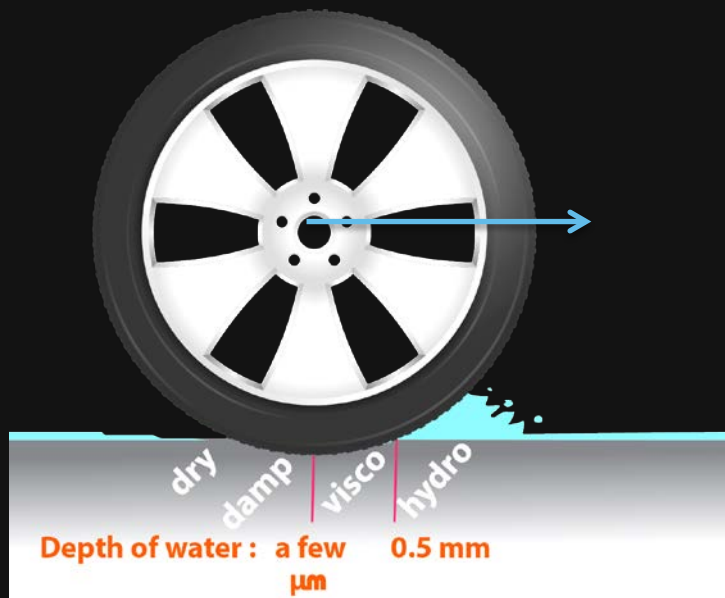
Estimate based on National Household Travel Survey (2009) and EPA test procedures for average stopping



WATER: ITS IMPACT ON GRIP

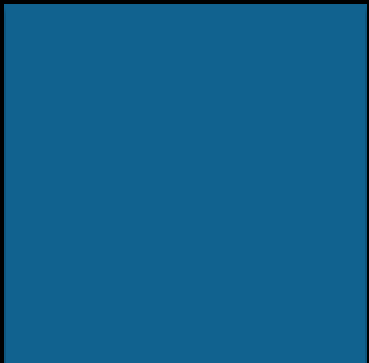
Max Grip (μ_{\max}) : Depending on
Depth of Water and Speed

Depth of Water	Speed	
	60 km/h	100 km/h
0 (dry surface)	1	1
< 10 μm (damp surface)	0.8	0.7
1.5 mm	0.6	0.4
5 mm	0.5	0.1





WE HAVE RE-THOUGHT
SAFETY BY RE-THINKING TIRES



UNDERSTANDING AND
IMPROVING WET TRACTION IS
A PRIMORDIAL TO TIRE DESIGN
AT MICHELIN BECAUSE WE
CARE ABOUT SAFETY

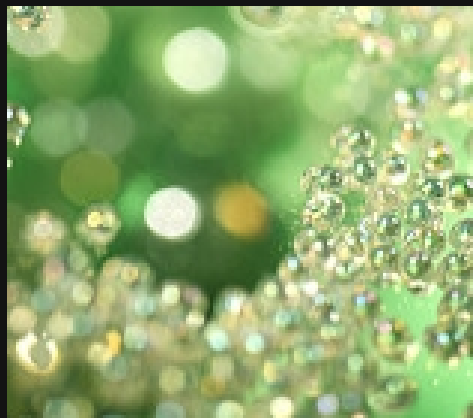




ANOTHER GAME-CHANGING ADVANCE



1946 Radial



1992 Silica



2014 MICHELIN®
Premier® A/S Tire

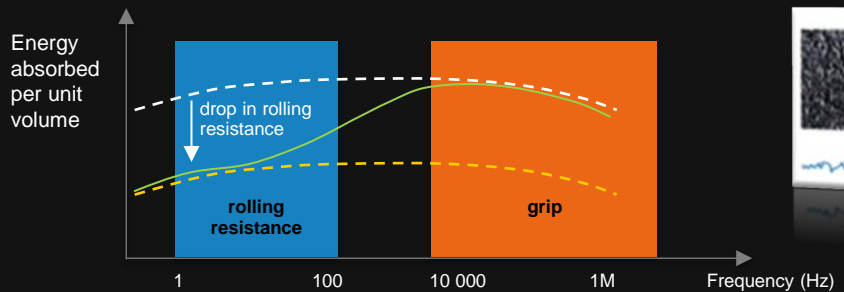


SILICA: BEST OF BOTH WORLDS

Traditionally, compounds required a trade-off between rolling resistance and grip, but silica delivers both.



The process which generates rolling resistance is similar to that of grip but it does not belong to the same frequency range.

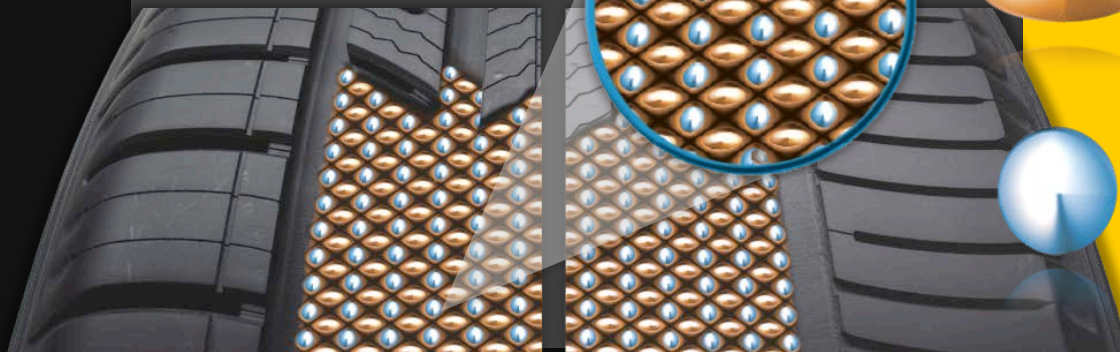


- High hysteresis rubber compound (good grip)
- New generation of compound combining low rolling resistance and good grip
- Low hysteresis rubber compound (low rolling resistance)



SAFE WHEN NEW EXCEPTIONAL TRACTION

HIGH-TRACTION TREAD COMPOUND



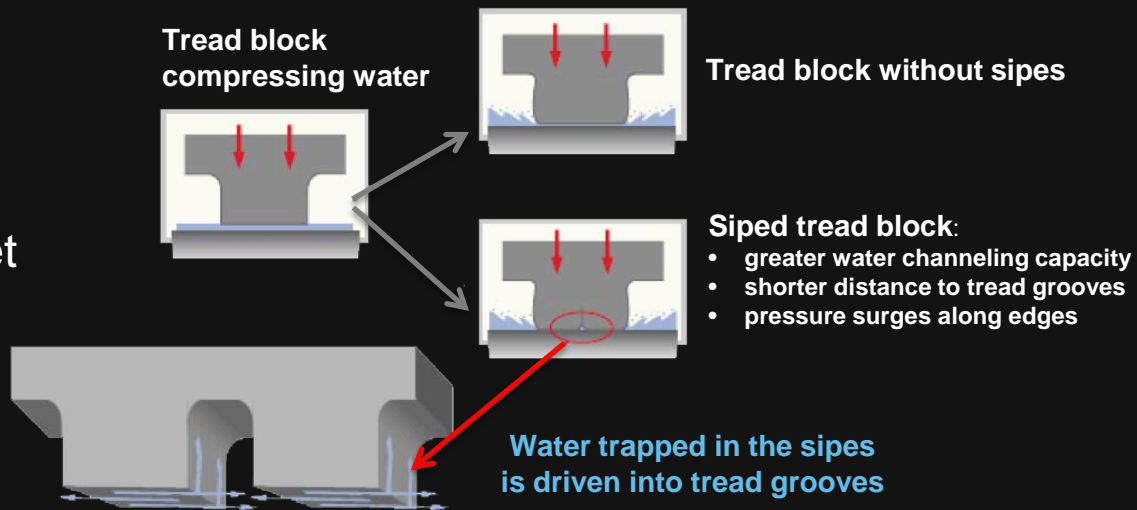
EXTREME SILICA is key for wet weather performance. The MICHELIN® Premier® A/S tire has the maximum amount of silica, distributed finely and evenly throughout the tread for incredible wet road grip.

SUNFLOWER OIL gives the tire greater flexibility at low temperatures, improving cold-weather grip.



WET TRACTION TREAD DESIGN

The tire's tread grooves and sipe system help evacuate water and improve grip on wet surfaces.





SAFE WHEN WORN
IMPROVES WET GRIP
REDUCES HYDROPLANING

EXPANDING RAIN GROOVES

As the tire wears, rain grooves widen, maintaining their ability to remove water and deliver wet traction.



Rain grooves on traditional tires get narrower instead of wider.

MICHELIN®
PREMIER® A/S TIRE

TRADITIONAL
TIRE





SAFE WHEN WORN
IMPROVES WET GRIP
REDUCES HYDROPLANING

EMERGING GROOVES

New grooves – hidden in the rubber – emerge, adding to the ability to grip the road.

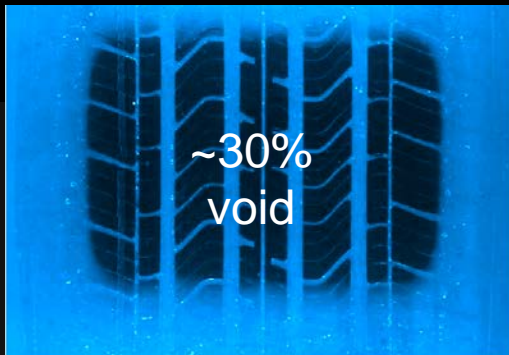




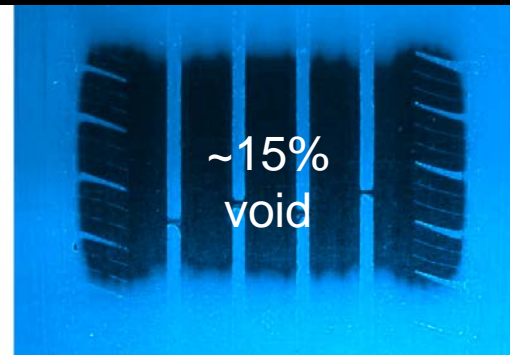
SAFE WHEN NEW. **SAFE WHEN WORN.**

Evolving tread design permits
the tire to maintain the ability
to evacuate water

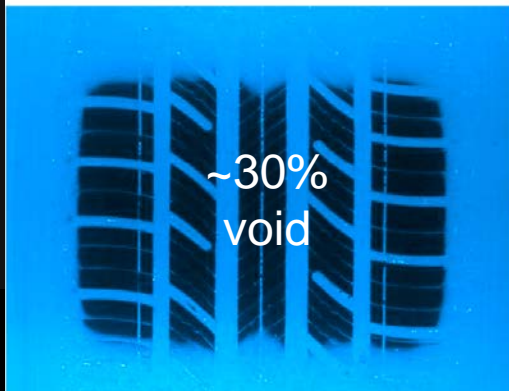
Traditional (NEW)



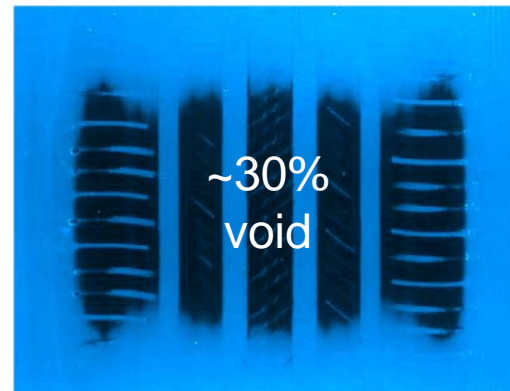
Traditional (WORN)



Premier® A/S tire (NEW)



Premier® A/S tire (WORN)





SAFE WHEN NEW. SAFE WHEN WORN.

WET BRAKING TEST RESULTS USING TIRE SIZE 235/55R17(H) (2012 Cadillac CTS)

NEW MICHELIN® Premier® A/S



106 ft

NEW Leading Competitor



133 ft*

WORN MICHELIN® Premier® A/S



119 ft

Based on internal wet braking tests from 40 and 50 MPH conducted in September & October 2013; all stopping results are averaged from multiple test runs on specific days ; the worn MICHELIN® Premier® A/S tire was buffed to 5/32" of tread. Actual on-road results may vary based upon vehicle type. * Actual competitor stopping distances recorded were 139 ft. and 127 ft. respectively.





ADVANCED TIRE DESIGN
COMBINING RESEARCH IN MATERIALS
WITH ADVANCES IN TREAD DESIGN

***SAFE WHEN
NEW***

***SAFE WHEN
WORN***



SAFE WHEN NEW
SAFE WHEN WORN