

Advanced Circuit Driving Techniques

Article 9: Finding time in the wet

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Using a predictive lap timer to go faster in the wet

Driving quickly on a wet track sometimes requires a very different technique compared with driving in the dry. Depending on the track, the quickest line through the corners may differ substantially from the accepted dry 'racing line'.

The wet line myth

It is often quoted that the racing line becomes coated with rubber and oil which makes it more slippery in the wet. However plausible this sounds, it is in fact a myth and here is why:

When asphalt is first laid down, there is a uniform roughness to the surface. Over the years, as many cars pass over the same piece of road, the sharp ridges and peaks in the road surface become worn down to a smooth surface.



Close up of tarmac worn smooth after 8 years of heavy use

If you look next time you are on track, (assuming it is sunny!) you will see that the track surface on the racing line is 'shinier' compared with the rest of the track.

Off the racing line, it is the sharp ridges and peaks which yield greater grip in the wet than the smoother, more frequently used parts of the track.

Why is this?

The two dominant forces affecting the performance of a tyre are adhesion and deformation. Adhesion is the chemical 'stickiness' between the tyre and the track, and deformation is the force which results from the rubber changing shape to fill in the gaps in the surface.

With adhesion, the more direct contact there is between the tyre and the track, the greater the force.



With deformation, the more distortion of the tyre there is, the greater the force.



Adhesion generally has a stronger effect than deformation, so in the dry, once the tyre is up to temperature, a smooth surface will generate better grip than a rough surface.

However, a wet surface prevents direct contact between the rubber and the surface, completely blocking the formation of the adhesive forces that work best on flat surfaces. Therefore, in the wet, a rough surface can generate far more grip by increasing the deformation of the tyre.

Another important factor is the tyre temperature, as cold tyres have inherently less grip than warm tyres. In the wet, it is often difficult to get tyre temperatures high enough to give good grip.

How to find the wet line (or wettest line)

Unfortunately, there is no magic formula to working out the 'wet line' through a corner, the only way is through trial and error, and this is where a predictive lap timer becomes an essential part of the process.

Here are some tips from Nigel Greensall, (highly experienced driver coach) on finding the grip on a wet and slippery track:

- **Get some temperature into the tyres**
I find it is important to work the tyres hard straight from the pits. I try and slide the car around to move the tread blocks about to generate some heat. However, there is no point trying to do this on the greasy parts of the track, as you won't be able to generate enough g forces to have an effect, so I drive around the edges of the track trying to find some grip.

It is only once the tyres are up to temperature that you can properly begin to find what the quickest line will be.

- **Brake offline**

The track is often very smooth in the braking zone, so I sometimes try braking slightly towards the inside of the track to maximize the grip.

- **Turn in later**

I avoid the normal turning in point, and attempt to drive just round the outside of the normal racing line, leaving a later turn in than as normal. I then turn more sharply than I normally would in the dry in order to get the car pointed up the next straight as early as possible, and get on the throttle as soon as possible. Slow in, fast out.

- **Straight line the slippery bits**

Of course, at some point you have to cross the slippery racing line, so that is also why you should try and be as straight as possible to avoid any wheelspin. Spend as little time as you can accelerating on the slippery part of the track - try to 'float' across it - and avoid the exit curbs, if at all possible.

- **Use a predictive lap-timer**

A predictive lap timer displays the difference between your current lap-time and your previous best. A positive number means you are going slower, and a negative number means you are going quicker.

I reset the display just before I leave the pits, and then I try a number of different lines around each corner, watching how much time I gain or lose. As I enter the corner the display may be reading +0.50 which means I am 0.5s slower at that point, but this doesn't matter as I am only looking for a change in value.



A predictive lap timer in position and giving immediate feedback

As I exit the corner it may then display +0.25, which means I have gained 0.25s in that section. This works on a corner-to-corner basis, all I have to do is glance at the readout just before I turn in, and then once again as I exit. The key point is that I don't need to wait until the end of the lap to find out if my new approach to that corner has worked.



A VIDEO VBOX LITE with predictive OLED

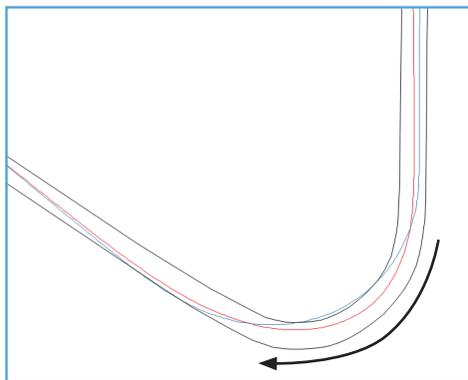
In this way, over three or four laps I can quickly build up a picture of where the grip can be found, and then string these pieces together to produce a quick lap. When you then sail past other people on the track, they are often left wondering how you managed to drive clean round the outside or even up the inside of them whilst they are slipping and sliding around!

Continued on next page.

Take the following example from Tower corner at Croft:

On my wet lap, I approached the corner in the middle of the track, and then turn in

much later, deliberately missing the apex to drive on the grippier part of the track. At the same time I am trying to get on the throttle as early as possible and straighten my exit trying to avoid the slippery exit of the corner by the curb.



Wet line red, dry line blue

S-bends

On S-bends or chicanes, I tend to use more or less the same line as in the dry. This is because to drive on the grippier parts of the track in these situations requires a lot of deviating backwards and forwards across the slippery racing line, which ends up being slower.

Another fascinating example comes from the FunCup round at Croft where Nigel was coaching Julian Thomas the day before the race.

Julian: "It was the end of a wet test session, and I was slowing down on my in-lap when I turned into Hawthorn a little bit slower than normal. Immediately I felt more grip, allowing me to take a much tighter line than normal, and I saw the OLED display start to rapidly count down. By the time I reached the

chicane I had gained 0.54s! You could certainly feel the extra grip on this line, but for it to be worth this much time was quite surprising. In fact, when it rained in qualifying the next day, I used this new line and managed to set the fastest lap in my class by 0.6s, setting my first pole position!

Watch how Julian saved 0.54 here:

<http://www.youtube.com/watch?v=73DjI2guKbI>



An example of this is the chicane at Croft, where the wet line and dry line are virtually identical.

We hope you've enjoyed reading this article, and that it has provided an interesting insight into how you can gain time in the wet using a predictive lap timers. You can add your thoughts to the discussion on the Racelogic forum here:

<http://www.racelogic.co.uk/Forum/>

This effective device gives you immediate access to information to help you go faster. Predictive lap-timing is nothing new, and have been around for some time on many high end data-logging systems.

However, many existing systems are expensive. And because most use rolling distance around the lap (gathered from a wheel speed sensor) as a reference to compare two different laps, they're not very accurate either.

A better solution is to use the GPS position from a fast updating data-logger to align the two laps. Whilst GPS position may only be accurate to a few metres, a typical average race speed would be well in excess of 30m/s, minimising any errors to around 1/10th of a second. By using GPS, **VIDEO VBOX LITE** incorporates the technology you need to go faster. All data and video in this article was recorded with **VIDEO VBOX LITE**.



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