Driving Distance, Facts, Fiction & Myths

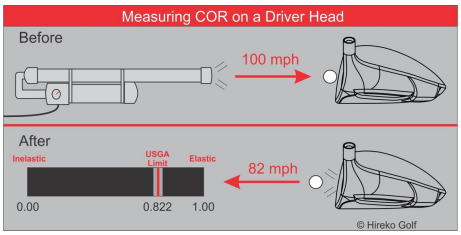
This paper is to help understand the facts, science and logic that determines how far your drive will travel off the tee.

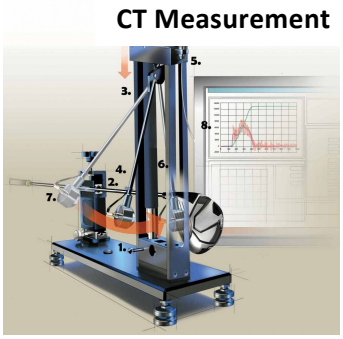
#1. Swing Speed / Clubhead Speed / Ball Speed

Speed is the prime factor in how far the ball will travel. If your age is 50+ it's not likely you can do anything to significantly change your swing speed. Usually, any attempt to swing harder just results in erratic off center strikes, or personal injury! Also, to accept the fact that if you're going to spend some money on a club you can hit for a few years, your swing speed is most likely to drop off a bit. It is what it is. The result of the swing speed and face contact is ball speed.

#2. Driver Clubhead design.

Since the advent of metal head drivers, the concept of the "trampoline or spring affect" plays a role in ball speed. That rebound affect is called COR (Coefficient of Restitution), the ratio of the final ball speed to club head speed after the contact collision. This is the measure of how much energy is lost. A perfect COR would be 1.0 or 100%, no energy lost. But that's impossible. There is always an energy loss. This is where the USGA and R&A stepped in in 1998 to establish the limit of this COR. It is determined to be .822 + a tolerance of .008 for a total COR of .830. That is determined by firing a ball from an air cannon at 100 MPH and measuring the rebound speed to calculate the ratio. The maximum allowable rebound speed is 83 MPH or a COR of .830.





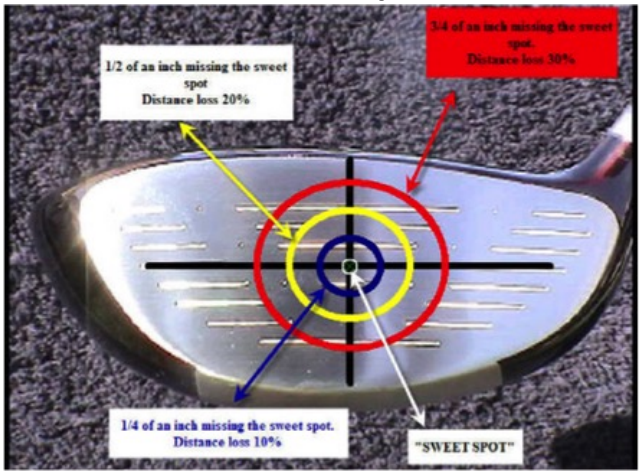
This COR method was really hard to measure outside a lab, so in 2016 the USGA / R&A came up with an alternate method, called CT (Characteristic Time). This method uses a pendulum where a weighted ball is dropped against the clubhead face, and the time it remains in contact with the face before it "springs" off is 257µs. That 257µs is equal to .830 COR, but of course an easier way to measure that can be done in the field with a portable measuring device.

Every major club manufacturer for the past 10 years has a head design that maxes out the .830 / 257µs limit. So, what's the difference in all these heads? None really, IF you can hit the center of gravity every time. Most of us can't.

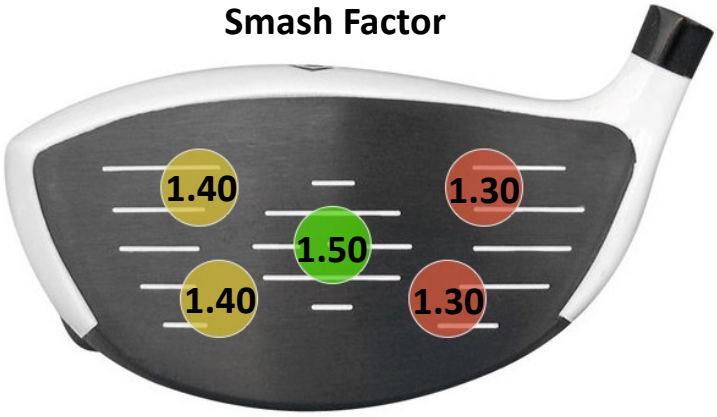
So let's talk about the famous "sweet spot", and the Smash Factor. The sweet spot is actually the heads center of gravity. It's the size of a pinhead. If you could hit the face of your club in the sweet spot every time you would max out the spring effect*. But just ¼" off the center will cost you about 10% of your distance. ½" is 20%, and ¾" is 30%. (see the pic below). Your 220 yard drive is now about a 150 yard drive.

What about Smash Factor? What is Smash Factor? It relates to the amount of energy transferred from the club face to the golf ball. It is a ratio of the ball speed / head speed. Given an .830 COR, the highest achievable smash factor is 1.50. ie: 100 MPH clubhead speed with a 1.5 SF, equals 150 MPH ball speed. These dots represent the loss of "off center" hits. A 1.40 smash factor would lose about 10% or 15 MPH ball speed. A 1.30 SF would cost you 20% or 30 MPH. In the example below, a golfer with an 88 MPH swing speed and a 1.5 smash factor would send the ball off at 132 MPH and fly 204 yards. And a golfer with a 92 MPH swing speed, but a smash factor of only 1.40 would send the ball at 128 MPH and fly only 196 yards. So the golfer with the 4 MPH slower swing speed would actually carry the ball further because of the improved smash factor / energy transfer. Ie: Hit it in the screws!

Sweet Spot

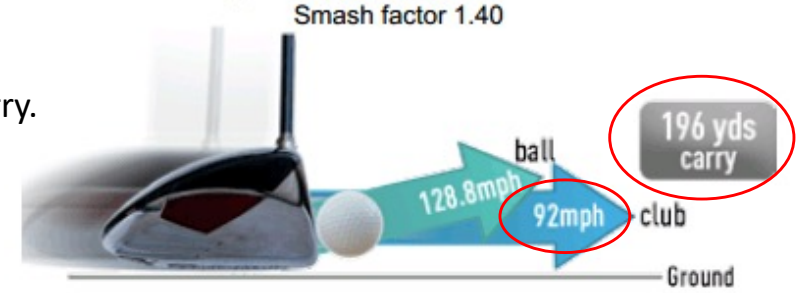


Smash Factor

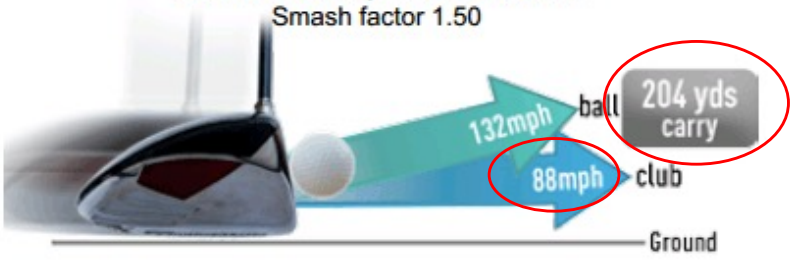


👍 Rule of thumb.
1 MPH head speed equals 2 yards of carry.

High club speed + Off-center-hit
Smash factor 1.40



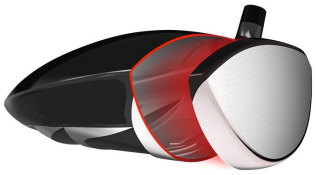
Reduced club speed + Center-hit
Smash factor 1.50



So, can I buy a driver with a bigger sweet spot? No, not really. As I mentioned the sweet spot is actually the CG and it's the size of a pinhead. However, there are face designs that can minimize the off center hit losses. And this goes back to the head design, using an insert face driver vs a cupped face driver. The cup face design offers a larger surface area with the milled face the full width of the head which does result in a higher MOI (moment of inertia) and therefore a wider hitting area with less energy losses plus the added benefit of a straighter shot with less side spin. So, Bigger Sweet Spot? Yeah, kind of.

Insert face design.

Cup face design.



Insert face design.

Surface Hitting Area

Cup face design.

Expanded Surface Area

King Cobra

Taylormade

Callaway

Ping G Series

Krank Fire Cup Face Driver

Krank Golf is the only club head on the market that offers super hardened beta titanium material in a deep cupped face technology with an adjustable design.
Because of the manufacturing complexity and intricate welding process, it is much more costly to build a cup face design. That's why all of the major manufacturers offer a simple cast design with a welded in insert. They design to sell clubs by the thousands. Krank's heads are 100% handmade, one at a time.

#3. What about the shaft? The motor in this hot rod.

It's been stated over and over that the shaft is the engine of your golf club. That's true. You wouldn't want want to stick a 4 cylinder engine in your new Corvette. And as we've already discussed, if all the heads can launch the ball with the same .830 performance, and your swing speed is not likely to increase then one way you can make a difference in performance is with the right shaft. With all of the advancements in graphite and fiber technology over the past 10 years they can wind some magic into the shafts. They can use special materials and special winding designs to create some very lightweight shafts with multiple flex profiles.

Cont….

#3. What about the shaft? The motor in this hot rod. **Cont…..**

Why are some shafts $50 and some are $500? What's the difference. The big factor is in the type of materials used and the winding process. To get to these lighter and lighter shafts and still maintain low toque and stiffer tip profiles, it requires some exotic materials like high modulus graphite sheets, and Kevlar fibers. The rule of thumb is you should play the lightest weight shaft you can control. Not always easy to determine. 10 years ago, 75-80 grams was a lightweight shaft. Today, 40-50 grams is the norm, but with better stiffness, strength and torque than the older heavier shafts.

Shaft weight and torque make a bigger difference than shaft flex. The general golfing public has been conditioned and educated that shaft flex is the end-all-be-all when it comes to shafts and that simply is not true. Shaft flex has no industry standard. There is no 'governing body' for shaft flex that says a regular shaft or a stiff shaft has to be within a certain frequency range. That is why choosing a club solely based on shaft flex is highly flawed. After finding the right weight and torque, shaft flex is used to fine tune the shaft for the player.

Just the switch alone from a 70-gram shaft to a 50-gram shaft can increase your swing speed by 3-5 MPH. That doesn't work for everyone, but statistics show about 90% of us will pick up some swing speed with a lighter shaft

Getting the right weight, and then a flex to match your swing speed and transition style, and a tip stiffness or torque to help with ball control are all part of the equation. The other thing that most of the premium priced shafts have is some special technology proprietary to that brand. Kinetixx calls it "pre-loading", Fujikura Ventus calls it VeloCore and the Motore X means "speed multiplier". In other words, these shafts can store the kinetic energy generated during the transition and downswing and boost that speed right at impact. I have personally measured as much as 5 MPH difference in swing speed from those shafts. That's 10 yards on the carry! And while the $300 shaft may not always outperform the $100 shaft for you, those materials and technology sure help to ensure you've got the best chance of success. There's no guarantee with shaft performance as it's a pretty subjective thing, but getting fit using a launch monitor with some accurate swing information will certainly help to get you the right shaft.

#4. Let's get a grip.

Let's not forget about the grip. Maybe the least expensive part of this project, but the grip is the only component that connects you to the club. It's not just a matter of feel. Soft rubber, cords, multi-compound materials, etc. The size has a lot to do with the performance. As we get older, stiffer joints, maybe even a little arthritis those bigger grips seem easier to get your hands around. But you have to understand that the bigger diameter grips will slow your wrist action down when it comes to closing the club face in your swing. Too big a grip can cause you to block out the shot at the bottom of the swing and leave the ball out to the right. And too small of a grip can let you get too handsy and roll the lower wrist over too soon creating a snap hook condition. Either way, it can cost you some yards not having the right grip on the club.

TSH Golf

CERTIFIED MASTER CLUBFITTER & CLUBMAKER

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