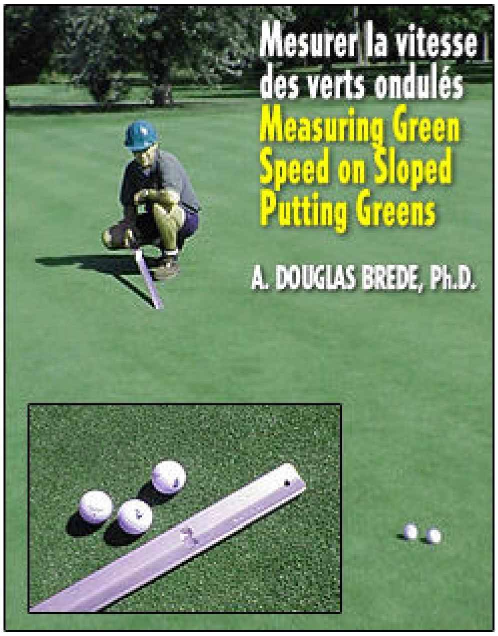
Stimpmeter



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I first became impressed with some of the problems of measuring green speed 10 years ago when participating in a Master's thesis project with Clark Throssell, who is presently Associate Professor, Department of Agronomy, Purdue University. (Well, I suppose participating is not the best word for my involvement in his project ~ try drafted.) We found that one of the main problems in measuring green speed, as I'll explain, was slope. But first, let me describe how Clark's study got me involved in green speed research.

Clark Throssell was a first-year grad student at Penn State University, and I was an experienced fourth-year student. Stimping is easier with two people, and Clark needed someone to read measurements while he held the end of the stimpmeter. The story goes that Dr. Joe Duich, our mutual advisor, sent Clark and me on a week-long trip to Pittsburgh to assess differences in green speed among Pittsburgh's many fine golf courses as part of Clark's thesis project. With virtually no advanced planning and no roadmap, we trotted off in a rental car in search of some of Pennsylvania's most exclusive courses.

Getting permission to set foot on these courses was not always easy. Some superintendents were surprised to see two tired, tee-shirted students who wanted to check the speed of their greens. Others were afraid we'd publicize how slow their greens were. "You should have been here last week before the rains hit," they'd say.

But those problems paled in comparison to the one we encountered when we took our measurements. The U.S. Golf Association Green Section booklet on the stimpmeter explains that readings must be taken on a reasonably level area. To our dismay, we had one heck of a time trying to locate representative level areas on which to take our green speed readings. Whole greens had to be bypassed because they just weren't flat. This problem seemed to be worse at the finer courses, the ones with challenging green architecture and lightning fast speeds. Staying within the six-inch deviation between forward and reverse readings recommended in the USGA booklet was nearly impossible. Furthermore, we were skipping large portions of the golf course because of sloped greens.

Mathematics to the Rescue

Necessity is the mother of invention. The problem of sloped greens bugged me for several years after our Pittsburgh study. One day, though, I sat down and figured out a mathematical solution to the problem. The solution came too late for Clark, though. He'd since graduated with his degree in Stimpmeter Science and was off to Kansas for his Ph.D. I also graduated shortly thereafter and was off to a faculty position at Oklahoma State. It was there at Oklahoma State that I was able to do the field validation work on the devised formula. Ron Hostick, one of my undergraduate students, was drafted to hold the stimpmeter while I took readings.

Deriving a formula for correcting green speed readings on a slope was not as complicated as it sounds. I had some help from Sir Isaac Newton. After Newton recovered from his apple-induced head injuries, he penned some of the basic theories of motion physics. These basic theories were the foundation of my formula for correcting green speed readings for slope. Who knows? If a stray hook shot instead of an apple had beaned him, Newton might have claimed the fame for this new formula instead of me!

Newton described the motion of apples (or any other object) moving down a slope in mathematical terms. By merging his equations for up- and down-slope movement into one equation, the following formula was born:

green speed corrected for slope = 2 X
S X S¯
S + S¯

where "S " is the stimpmeter reading taken in the uphill direction, and "S ¯ " is the reading taken downhill.

As simple as the formula looks, it actually works to remove the effect of slope from green speed readings. In fact, when using a calculator for the math, computing green speed is no more complicated than with the traditional two-direction averaging method the USGA presently recommends. Here's how to use the formula:

1. Locate a spot on the green with a uniform surface. The surface can be on a slope or on a flat area; the formula works in either case. Try to avoid areas with concave or convex surfaces, just as you would when reading traditional stimpmeter speed. Also, avoid shooting crossways on a slope, as the ball will curl downhill (Figure 3).
2. Roll three balls in the downhill direction. Average the three rolls. Then, roll three in the uphill direction, averaging these. Plug the downhill average into Sz in the formula and the uphill average into Sz. The formula will provide a green speed reading as if the sloped green were tilted into an upright, level position.

Validating the Formula

Mathematical theories are of no use unless they're validated with actual data. Checking the formula on golf course putting greens was only part of the validation. One problem arises when testing green speed on putting greens: Stimpmeter speeds can change from location to location on a golf course, confounding the ability to validate the formula. For example, comparing a rough-surfaced slope with a smooth-surfaced level area would be like comparing apples and oranges.

It was necessary, therefore, to construct a test runway in the laboratory that could be tilted at various angles and still have the same uniform surface. This was accomplished by building a solid wooden runway, 24 feet long, covered with patio grass carpet. Those of you who've putted on this stuff know that it stimps about 8 or 9 feet, similar to many putting greens. We tilted the runway at six different angles from 0 to 5.6% slope and tested the stimpmeter speed as we changed slope. Up-slope readings slowly declined with increasing slope, while down-slope readings began to really take off at slopes above 1 or 2%.

As a result, the traditional averaging method of computing stimpmeter speed began to incur error as slope increased. Using the formula, however, corrected speeds were equal, regardless of slope.

In our tests on actual golf courses, the formula provided the same correction factor as in the laboratory. We tested it on slopes up to 6% and still it yielded accurate results.

"Eyeballing" the amount of slope - or lack of it - on a golf course is a tricky task, even for professional golfers. After all, golf course architects design greens with an optical illusion that makes slope difficult to judge. I took several students out to a green where I'd placed pairs of flags on various slopes. Most were unable to distinguish a 2.2% slope from level. Thus, don't rely on your sight to tell you if you're on a level area. You'll know you're on a level surface when the forward and reverse stimpmeter readings differ by no more than six inches. If not, use the formula instead.

When to Use It and When Not to

If you're fortunate to have level greens, stick with the traditional averaging method of calculating green speed - the formula will give you no better results than the method you're presently using. But if you have sloping greens, or sloping spots you'd love to check for green speed, try the formula. You'll probably agree that the traditional forward-reverse averaging method is still handier. But for those sloped areas, the formula will give you accurate green speed readings that were previously impossible to obtain.