GRASS CLIPPINGS 22

Grass Clippings 21 was different from all the others because it did not deal with the grass or the soil
It was an attempt to make the bowler more conversant with the origin, the properties, and development of the bowl itself.
Apart from outlining the manner in which the bowl was manufactured originally and the various attempts to impart a bias to the bowl GC 21 included a mathematical analysis of the forces which determine the dynamics of the “draw” and how changes in the configuration will also influence the “draw”
The second part of this article (GC 22) will deal with how changes on the green can influence the draw and speed.
The mathematical analysis came from an article by Prof. G.P.R. von Willich in which the introductory paragraph was -

If the bowl is delivered on to an absolutely smooth and undeformable surface, it will continue moving in a straight line indefinitely. Such a surface does not exist in practice, and the bowl is observed to start to spin until it rolls without slipping, its path becomes curved, and it slows down until its forward motion ceases and it falls over to one side.
This behaviour is due to the interaction between the bowl and the surface of the green. Three aspects must be considered:

- *the vertical deformation of the green surface,*
- *the bending of the grass covering of the green,*
- *friction.*

All three have to do with the characteristics of the surface of the green
The transition from sliding to rotating can best be compared with an aircraft landing on a runway. As the landing wheels of the aircraft touch the surface of the runway the the wheels will initially slide (or skid) on the runway.
Within seconds the adhesive properties of the rubber tyres will “grip” the suraface of the runway the aircraft will stop sliding and the wheels will start rotating.
Eventually the plane will start slowing down until it comes to a stop.
The same might be said for the bowl which, at the moment of touching the surface of the green, will slide initially. The friction betweem the two surfaces will slow it down to the stage where the bowl grips the surface of the green and starts rotating on the running surface The distance it travels will depend on many factors built into “the playing surface”.

1.2.0 The Playing Surface
When a player delivers a bowl he imparts a certain amount of force (energy) to the bowl. As the bowl encounters resistance to it’s forward movement it will use up some of this energy to overcome the resistance. The bowl will come to rest when all the energy has been expended

It can ,therefore, be said that assuming the amount of energy imparted in the delivery is constant the distance a bowl will travrl on a green is in inverse proportion to the **sum of the resistance** it encounters in it’s passage across the green i.e. the greater the resistance the sooner the bowl will come to rest.

1,2.1 Resistance
If it is acceprted that the bowl will come to rest when all the “energy”, originally imparted to the bowl, on delivery has been expended then it follows that as the resistance to it’s forward movement increases so will the distance run by the bowl decrease.

Resistance can be divide into a few sub-divisions

1. The initial friction loss while the bowl slides.
2. The area of contact between the bowl and the green while the bowl is rotating.
3. The characteristics of the green itself.

1,2.1.1 Friction
When an object slides on another surface the friction between the two will depend, firstly, on the properties of the two surfaces and secondly on the area of contact. When a bowl is delivered it will be travelling too fast to start rotating immediately. It will start sliding – friction will occur and within a short space of time

the friction will slow the bowl down to the extent that it will start rotating (See Prof von Willich's article)
Part of the "energy" imparted to the bowl at the delivery will be expended to overcome this resistance stemming from friction.
As the area of contact between the two surfaces will influence both the friction losses amd the rotating bowl it is necessary to examine the "area of contact".

1.2.1.2 Area of Contact
The "area of contact" can change according to the "sofness" of the running surface eg

1 A bowl is delivered on a smooth hard concrete surface. It will initially slide until the friction between the two surfaces causes it to start rotating. Depending on the amount of force used to propel the bowl it will run a considerable distance.
2 A bowl is again delivered with the same amount of force on a dry clayey surface where the width of the area of contact is larger than with the cement sutface. The initial slide will be of shorter duration and the bowl will start rotating but will slow down sooner than on the concrete surface
3 The bowl is again delivered in the same way on a sandy surface – the bowl will sink slightly into the sandy surface – the slide will be still shorter and the distance run will be shorter.
4 The sandy surface is covered by a thin mat of grass – again the distance run will be shorter.
5 The layerr of grass is thick – the distance run is very short.

From the above experiment one can draw the following conclusions -

1 From 1 to 5 the "deformability" of the surface changed – it became softer and the bowl sank more into the surface of the green because the area of contact between the bowl and the green increased.
2 As the bowl sank more into the surface of the green so did the area of contact between the bowl and the surface of the green increase
3 The area of contact will, partly, determine how far the delivered bowl will run on any green.

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The difference between all these examples was the "deformability" of the surface – from the ,almost, undeformability of the concrete surface to the soft vielding surface of the green covered by a thick mat. With each example the bowl sank into the surface to a greater extent i.e. the area of contact between the bowl and the running surface increased.

The "area of contact " between the two surfaces would vary according to –

- The composition of the Soil Base
- The Grassy Mat.
- Tghe configuration of the running surface of the bowl

1 The <u>Soil Base</u>
From the evidence above it is possible to deduce that on a bowling green the percentage of clay in the top-soil will determine the "deformability"of the greens surface i.e. the greater the percentage of clay the less the deformability and the further the bowl will run.
A new green constructed in accordance with U.S.G.A.Specifications would limit the clay content to 5 % and silt to 3 %.
In the RSA the majority of the greens were not constructed in this way but local soil was used with the result that in some parts of the RSA (eg Durban) the clay content could be as high as 30% whilst in others (eg Western Cape) the clay contencould be ;less than 3 %.
The greens with 30% clay would have a relatively small area of contact and run "fast".
A green with little or no clay would have a larger area of contact and be "slow" by comaprison but , because it drains well, would be much healthier.
In the RSA the texture of the soil base could, therefore, vary from 30 %to 3 %
<u>Note</u> In all these discussions a wet green after rain or irrigation has not been ibncluded because such a condition is only temporary

2 The Grassy Mat.

The area of contact could vary according to the thickness of the grass mat covering the green with the thicker mat allowing the bowl to sink deeper into the surface of the green and, thereby, increasing the area of contact

Variations in the thickness of the mat could be attributed to –

1 The variety of grass
2 The expertise of the GKP

1 The variety of the grass will influence the thickness of the mat. The coarser Cynodon Dactylons (kweek) with thicker stems and larger leaves will take up more space in terms of inter-twining stems and runners (stolons) to cover the green effectively than the Cynodon Transvalensis with it's fimer stems and greater leaf count
2 One of the problems facing any GKP is controlling the proliferation of the mat. As simple mowing with the horizontal mower will not solve the problem the GKP is obliged to use the vertical mowers to thin out the mat. This must be done judiciously to avoid removing too much leaf area and leaving the grass plant unable to produce enough Carbo-hydrates to maintain growth.
   The GKP must rely heavily on experience to deal with this problem. Only an experienced GKP will know just how much grass he can afford to remove and how long it will take befoire the green is playable and when he should repeat the process.

1.2.1.3. The Characteristics of the Grass

This deals with those characteristics of the grass which do not fall under "area of contact"

These "characteristics" include –

1 <u>Mowing Height</u> The grass protruding from the mat will add to the resistance offered to the bowl . The higher the mowing height the greater the resistance.

2 <u>Rigidity</u> The rigidity of the leaves of certaint grsses ar more ?rigid"and less "bendable" than others.

A grass with rigid leaves will offer more resistance and require more emergy to ovrcome the rigidity than others – in this respect Bayview and "Kweek" are much more rigid than Tifdwarf and Paspalum eg. all other consideration being equal a bowl will run further on a Paspalum green than on a Bayview green

1.2.1.4 Bumps or Hollows

Little mounds or indentations on the green may not only divert the bowl but will ,also**,** use up some of the energy originally imparted to the bowl.

2.0
THE SPEED OF THE GREEN

Speed on the green has become the commonest cause of friction between the GKP and the Club members.

Most players and many Committees have no grasp of the "Dynamics of Speed" and their demand for speed has **far outstripped, not only the capabilities of some of our GKP's but also, in many cases, the capabilities of the green itself.** It is important that both the GKP and his committee should understand fully the interaction between the bowl and the playing surface as described above.

2.1 The Dynamics of Speed

Speed on a bowling green is inversely related to the resistance the bowl encounters in it's passage across the green. It is not uncommon for a new GKP to have to face "demands" from his members to speed up the green. In most cases he is ill-equipped to argue with any assurance and often finds himself acceding to their demands with inevitable results.

In measuring speed it can be said that "the speed of a green is in inverse proportion to the sum of the resistance the bowl encounters in it's passage across the green". The greater the resistance the slower the speed and vice versa.

2.2 <u>Measurement of Speed</u>

A player might walk off the green and say that the green was "fast" or "a bit slow". Both statements would be apt at the time but would be unacceptable in a scientific sense. When the speed on one green has to be compared with that of another green then a more accurate assessment would be required.

Speed can be measured in two ways –

- By measuring the time the bowl takes to cover a certain distance
- By measuring the distance a bowl will travel with a constant impetus to start it off i.e. by using a modified stimpmeter or chute.

Either method is acceptable as long as a reasonably accurate measurement can be obtained and it can be compared with other greens.

When timing the speed by means of a stopwatch the readings must be taken over 27 metres.

When assessing the speed by using a stimphmeter a standard Stimphmeter should be used which allows the bowl to run between 23 and 28 metres.

When using a stimphmeter it is not only the distance run which is measured but the "draw" or amount of deviation from the straight line which is measured

The problem with both methods is that one is only measuring that part of the rink over which the bowl travelled. If the green had different areas where the grass mat was thicker than other areas where the growth was sparse a measurement over the thicker area only would not accurately reflect the speed of the whole green

It is for these reasons that whatever method is used the speed (and draw) should be measured on at least 8 different rinks.

2.3 The Sum of the Resistance

The resistance a bowl encounters in it's passage across the green can be summarized as follows –

2.3.1 **Friction** The initial friction at the moment of delivery when the bowl initially "slides" on the green. The length of the "slide" will depend on the "smoothness" of the two surfaces involved and the area of contact – the bowl and the green

2.3.2 Resistance

- Area of contact Once the friction has slowed the bowl down to the level where the bowl starts rotating the area of contact between the bowl and the green become a factor
- Note The possible variation\s in the area of contact is fully described in 1.2.1.2. above
- Thickness of the mat A bowl will "sink deeper into" a thicker mat than into a thinner mat, The thick mat will have a larger area of contact .
- Mowing Height The length of grass protruding out of the mat will affect the resistance (1.2.1.3. above)
- Characteristics of the Grass The rigidity of the leaves can affect the resistance. An unbending grass like Bayview) will offer much more resistance than Paspalum.

Having established which conditions cumulatively make up the resistance the bowl encounters in it's passage across the green it is now necessary to determine the relative values of each component

Studies at an American University concluded that the "sum of the resistance" was made up as follows-

a) 65 -70 % of the resistance is directly related to the "area of contact" i.e

- the friction losses as the bowl slides
- the "hardness" of the base
- the thickness of the mat

b) 20 -25 % can be attributed to the thickness of the mat

c) 10 % can be attributed to the rigidity of the leaves

In each category mentioned above there will be many variables which, when grouped together will show an infinite number of permutations

2.4 Greenkeeper's vs Club's Responsibility

A different classification would be aimed at indicating the responsible authority –

a The hardness of the base - Changing the soil forming the base would be a major operation which could only be sanctioned by the Committee or a Special A.G.M.

b Leaf Area – The thickness of the mat and the amount of leaf emerging from the mat would make up the total leaf area – this would be the responsibility of the GKP.

c The rigidity of the leaf. Any change would involve re-planting the green with another more-pliant variety. A major decision for the Committee

The GKP's influence on the speed of the green is limited to 55 – 60 % of the "sum of the resistance. It is not only a question of reducing the "Leaf area" to improve the speed of the green but he must ensure that the photosynthetic capability of the leaves left on the grass plant is enough to meet the energy requirements of the plant - These requirements can vary from Club to Club.
Most Club Committees (and some GKP's) tend to forget that a large percentage of the energy supplied to the grass plant on a bowling green is used up to repair the "damage" caused by the players – especially in the mat area.
It follows, that the "Player Count" is directly linked with the amount of food (Carbo-hydrate) the plant would require which, in turn, is linked with the leaf area which, again, is linked with the speed of the green.
On any green where the player count exceeds 350 players /month/green the GKP would be forced to increase the leaf area to such a level that he will he will be obliged to forfeit some speed to keep the grass alive and healthy.
A GKP serving a green with a sandy base, kweek grass cover, and a player count in excess of 350 would find it very difficult to maintain speeds in excess of 12.0 secs over 27 m throughout the growing season.

Controlling the number of players playing at a club is definitely a Club responsibility.

2.5 The Last Variable

The last, and probably the most important variable, is the expertise of the GKP
The commonest " advice" given to a new Green Keeper at a club is "reduce the mowing height so that we can have a nice fast green". Many Green keepers fall for this "advice" with dire results.
A well-known Australian Green keeper once stated that "to reduce the leaf area by 25 % requires three times the expertise"
Bearing in mind all the possible permutations one can say that even a relatively inexperienced GKP could produce a fast healthy surface on a green with minimum resistance (i.e. 88 % sand covered by C. Transvalensis).
Conversely, even an experienced GKP serving a green with maximum resistance (97 % sand covered by a coarse kweek) would have trouble producing a green running consistently at 13 secs over 27m..
He would be obliged to reduce the "leaf area" to a level where the health of the green is threatened.
In between these extremes there are many possible permutations where the expertise of the GKP would make the difference