

RESEARCH REGARDING THE COST OF ARTIFICIAL PLAYING SURFACES IN MODERN SPORT AND EVALUATING THE DESSO GRASSMASTER SYSTEM

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Abstract

Grassmaster, a semi synthetic sports turf surface which uses the principle of reinforced natural grass, is one of a few systems that have enabled increased hours of play and stadium use compared to more conventional surfaces. Modern sport demands that the playing surface is in pristine condition all year round, however with increased hours of play and a longer playing season, the pitch, the focal point of the stadium can become subject to criticism. Previous research has not explored the business and technical aspect of the surface. It is the aim of this project to:

- *Critically analyse the Desso Grassmaster system in terms of construction cost, maintenance and renovation costs compared to others sports surfaces such as natural turf and 3G.*
- *Investigate how the increased participation in sport at all levels has led to the need for more cost effective sports surfaces.*
- *Determine how the use of these new surfaces can able a return on investment*
- *Evaluate the impact that the increased use of these surfaces could have a negative impact on the groundsman and machinery industry.*

“The health and safety and social benefits from sports participation are more easily achieved if the playing surface provisions are safe, affordable and of a high quality. Investment, construction and research into artificial playing surfaces have increased to meet this provision” Stiles, V.H and Dixon, S.J (2006)⁽¹⁾. However, Full provision cannot be met without natural turf surfaces.

Keywords: *Artificial grass, sports surfaces, turf technology, stadium innovation's, pitch construction.*

INTRODUCTION

Playing surfaces have evolved significantly over recent years, particularly at professional level. Less than two decades ago it was acceptable to see a televised game of premier league football being played on no more than dust with a few line markings, however now with a televised game there is an expectation that not a blade of grass should have been disturbed or out of place, even if the stadium has hosted a concert with 50,000 fans music fans jumping up and down on the pitch the night before.

A modern pitch at any level is now required to serve multiple purposes in the aim of achieving a return on investment, whether that

is hosting music concerts in large stadiums or enabling multiple sports in community sports areas (James, 2011)⁽²⁾.

Artificial surfaces have also increased in popularity in recent years at both a recreational level and in professional sport; however this increase has also highlighted the concerns and scepticism of the health and safety implications of these surfaces. It is also unclear on the additional financial gains that can be made by using these pitches paired with the rumours that an artificial surface is maintenance free (Leigh spinners)⁽³⁾.

Whilst modern pitches are required to meet certain standards such as the surfaces interaction with the player and the ball according to Bell et al (1985)⁽⁴⁾ it is also required to cope with increased hours of play, something of which natural grass pitches have been unable to adapt to. Desso Grassmaster however, which is a reinforced grass system that combines the playing characteristics of a natural turf pitch with the durability and increased hours of play of a fully artificial pitch, Desso (2009)⁽⁵⁾. This has allowed many famous sports venues to achieve a return on investment from their playing surface.

A stadium that has really put the Grassmaster system to the test and gained full return on investment is the Danish Parken Stadium, the home base for FC Copenhagen and the Danish national team. At this Stadium "more goes on there than just football, business seminars, pop concerts and other sports events, such as speedway, take place regularly.

MATERIAL AND METHOD

Two discreet strategies were adopted, a questionnaire to gather specific data related to sports turf usage and a critical examination of two separate sports turf complexes.

Groundsmen from a range of professional sports clubs from the premier league and championship were selected to take part in a questionnaire to find the different techniques carried out on each of the surfaces.

In order to collect the specific data required, it required an effective strategy to provide the most effective results. A list of all the suitable clubs were selected using their stadium capacity as a benchmark from World Stadiums (2012)⁽⁵⁾. From this, clubs with a capacity of 5,000 people and upwards were targeted. As well as choosing different sizes of sports organisations by using the stadium capacity as a guide, venues that host different types of sports were also compiled. Possible 165 sports venues in the United Kingdom were assessed of which 52 were chosen as the target audience.

Once the questionnaires were returned the results were collected and entered into a Microsoft Excel

spread sheet for ease of analysis. From the results there was a good response with 23 per cent of the questionnaires being sent back which was considered to be a useable amount.

RESULTS AND DISCUSSIONS

For this part of the project two separate complexes were visited, one at an amateur level and another at professional level with usage and financial data being collected. In the industry there are major differences in the required standards of the sports surface both from players and spectators according to Baker et al⁽⁶⁾. At a professional level the pitch is required to be in perfect condition throughout the year and in all weather conditions, however with increasing standards from governing bodies such as the FA (Football Association) there is increasing standards for surfaces at an amateur or community level. The Federation International football association (FIFA) has outlined that by improving sports facilities at grass roots level and community level whilst increasing pitch usage offers local people to have access to games and coaching which will provide a significant role in player development (FIFA, 2008)⁽⁷⁾. This highlights the importance of the increased required standards for modern surfaces.

In order to investigate this, two separate sports complexes were compared that used a range of sports surfaces. Both of the complexes used Natural grass in the forms of soil based pitches and Fibresand pitches, a Desso Grassmaster pitch and an artificial pitch.

The first complex, used by a university, has a Grassmaster pitch which is intensively used for mainly football and is one of the main match pitches used on the campus.

The second complex being a professional football stadium, which has a Grassmaster pitch used intensively for football throughout the season, plus a wide range of other activities both in and out of the football season.

For each complex, pitch use, annual expenditure of routine maintenance, annual expenditure of end of season renovations were researched enabling total costs and usage to be calculated; from this data the cost of maintenance per playing hour would be produced.

Table 1. Site 1 pitch comparisons

Surface	Annual expenditure (£)	Usage	Cost Per playing Hour
Soil Based Pitch	4125	190	£21.71
Fibresand Pitch	3250	225	£14.44
Grassmaster Pitch	4500	600 plus	£7.50
Artificial Pitch	N/A	Not monitored as the facility is also used by the public	N/A

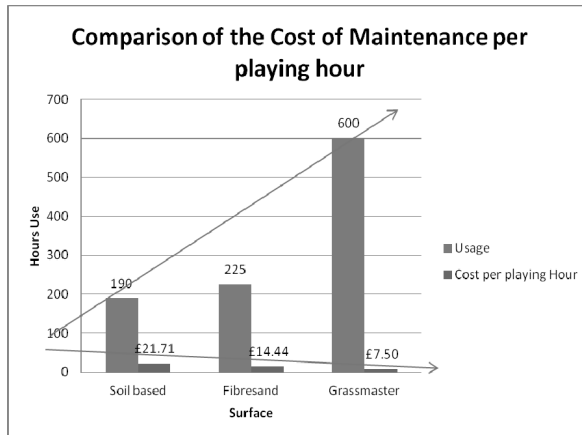


Fig. 1. Site 1 pitch comparisons chart

Table 2. Site 2 Pitch Comparisons

Surface	Annual expenditure (£)	Usage	Cost Per playing Hour
Soil Based Pitch	15,000	160	£93.75
Fibresand Pitch	20,500	190	£107.89
Grassmaster Pitch	32,250	125	£258
Artificial Pitch	8,500	766	£11.09

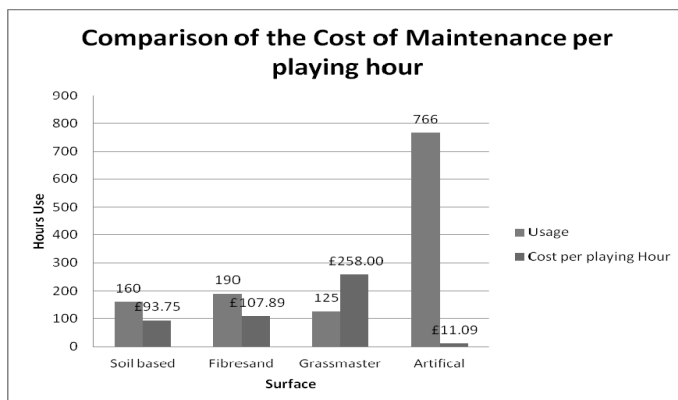


Fig. 2. Site 2 Pitch Comparison chart

Comparison of Sports Surfaces Using Players

In order to investigate the Grassmaster system other sports surfaces were critically analysed in a number of different aspects. The areas that were investigated where construction differences and costs this would highlight the characteristics. In terms of speed and performance high specification artificial surfaces do have many advantages for players especially at a professional level. For this study a professional football team who train on a

high specification FIFA 2 star artificial pitch were asked about their opinions of the surface and how it compares to their own natural grass stadium pitch.

Construction Comparisons

Construction comparisons were gathered using a well-known sports ground contractor, working on a standard pitch size of 8250m². Construction and renovation techniques vary significantly between each of the surfaces.

Table 3. Construction costs

Layer	Soil - low Spec	Soil - High Spec	Fibresand - low Spec	Fibresand – High Spec	Desso Grassmaster
Sand	80mm	Gravel Trenches	Gravel Trenches	-	-
Lower Rootzone	-	150mm	125mm	200mm	200mm
Upper Rootzone	-	100mm	175mm	175mm	100mm
Gravel Base	-	-	-	150mm	150mm
Cost	£110,050.00	£263,000.00	£352,000.00	£434,000.00	£707,000.00

Layer	3G – low spec.	3G high - spec
MOT Type 1 Sub Base	250mm	250mm
Macadam Base Layer	45mm	45mm
3G Synthetic Carpet	50mm	50mm
Polymeric Shockpad	-	15mm
Cost	£485,000.00	£560,000.00

Questionnaire

The questionnaire comprised of twenty questions:

1. Sports that the pitch is used for
2. What influenced the choice of surface used?
3. Specifications of the pitch
4. The choice of pitch and what it can enable
5. Area of the pitch
6. Weekly pitch use
7. Is the pitch used as a multi-use venue?
8. Does the pitch earn return on investment?
9. Staff for day to day maintenance on the pitch
10. Hours maintaining the pitch
11. Extra groundstaff on match days
12. Maintenance practices 1
13. Maintenance practices 2
14. End of season renovation
15. Extra adjustments to the pitch after construction
16. How long do you expect the pitch to last?

17. Annual expenditure on maintenance
18. Would you consider the use of another type of pitch?
19. Overall how do you rate the surface you currently use?

The questionnaire gathered a consistent range of results with clear correlations between each surface. In terms of the reasons for the choice of the playing surface increased required standards from both spectators and management showed that the capabilities and overall appearance is an important consideration when choosing the right type of playing surface as found by Adams and Gibbs (1994)⁽⁸⁾. The requirements for a more durable surface also formed an important consideration with the groundsmen that use both Grassmaster and 3G agreeing that the durability of the surface is a prime consideration.

The comparison of the two sports complexes showed that the prestige and the expectations of the surfaces are greater at a professional level even though the usage of each of the surfaces is less. The tests at the amateur level complex concluded that the most expensive pitch to maintain is the soil based, which also recorded the fewest hours of usage compared to the Grassmaster pitch which enable greater hours at a lower cost.

At a professional level the usage is less, however the maintenance costs are higher. As seen in the graph below the Grassmaster is recorded to have the highest operating cost per hour, however this is because it is used as a stadium pitch therefore appearance is the most important consideration.

The 3G pitch, recorded high levels of use and again the maintenance cost were low. From the comparisons both groundsmen agreed that the Grassmaster surfaces allowed better water infiltration and level surfaces retention, as also found in other areas of this investigation. They also agreed that the Grassmaster system and artificial system are expensive to install.

From the results and data that have been collected in this project it is possible to compare the results by applying these to a scenario. This scenario is based on an average size capacity stadium of 30,000 people, Ellen (2010)⁽⁹⁾. The scenario incorporates a comparison of each of the three surfaces investigated in this report and applies then to a real life situation.

The scenario is based on a premier league stadium of which achieves an average match attendance of 91% capacity Ellen (2010)⁽⁹⁾.

Table 4. Return of investments

Soil High Spec.	Costs	Return on investment
Construction Cost	£263,000.00	
Maintenance (Per Year)	£38,755.00	
Maintenance (Per Week)	£745.00	
(Income per week) £1500	£755.00	6 years 5 months
(Income per week) £2000	£1255.00	4 years 1 month
(Income per week) £3000	£2255.00	2 years 3 months

Fibre Sand High Spec.		
Construction Cost	£434,000.00	
Maintenance (Per Year)	£38,755.00	
Maintenance (Per Week)	£745.00	
(Income per week) £1500	£755.00	11 years 1 month
(Income per week) £2000	£1255.00	6 years 7 months
(Income per week) £3000	£2255.00	3 years 9 months

The project highlighted that whilst Desso (2012)⁽¹¹⁾ claim that a Grassmaster surface can achieve 3 times as much usage compared to a natural surface, from the results in this project it showed that whilst the level surface retention can be maintained the cosmetics of the pitch may be affected this would be an issue a professional level. Adams & Gibbs (1994)⁽⁸⁾ found that natural turf surfaces could only accommodate a maximum annual usage of 200 hours, with a zero per cent grass covering however, as found in this research project natural turf surfaces can achieve much more than that today.

The cost comparisons show that there are significant differences in the cost of construction of each surface, from a low specification soil surface costing £110,050 to a Grassmaster surface costing £707,000.

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CONCLUSIONS

From the research it has shown that there are many influences that have led to the technological advancements in the industry both internally with improved plant and soil science, as well as external factors such as an increased participation in sport.

It has been shown that there is a link between the external factors, with the increased requirement from a modern surface in order to achieve an end goal of increased return on investment as also explored by Gale (2006)⁽¹⁰⁾. The research project has proved that there is a link between usage and maintenance cost and that this can differ significantly between each of the surfaces.

At a professional level, it has been concluded that the choice of the surface is not determined by the low cost option in terms of maintenance. Clubs will choose to pay more for a surface that is able to guarantee a constant level of quality throughout the season. For many premier league clubs that only use their pitch for around 125 hours per season having a pitch that costs in excess of £700,000 seems foolish, however for them having a pristine pitch from the start to the end of the season is priceless.

This project has proved that professional level players are affected by the surface and that if the surface is level, with not divots their game will be improved, so the requirement for a perfect pitch must be paramount. From the tests it found that in particular would improve the players speed and reactions on the surface, thus aiding them it a match the use of artificial surfaces for training purposes scenario.

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Desso Grassmaster		
Construction Cost	£707,000.00	
Maintenance (Per Year)	£48,916.00	
Maintenance (Per Week)	£940.00.00	
(Income per week) £1500	£560.00	24 years, 3 months
(Income per week) £2000	£1060.00	12 years, 10 Months
(Income per week) £3000	£2060.00	6 Years, 7 months