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Techno, Economic, Feasibility Review of "Artificial Turf" in India

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Abstract : *Artificial turf is a surface of synthetic fibers made to look like natural grass. It is most often used in arenas for sports that were originally or are normally played on grass. However, it is now being used on residential lawns and commercial applications as well. The main reason is maintenance artificial turf stands up to heavy use, such as in sports, and requires no irrigation or trimming. Domed, covered, and partially covered stadiums may require artificial turf because of the difficulty of getting grass enough sunlight to stay healthy. But artificial turf does have its downside: limited life, periodic cleaning requirements, petroleum use, toxic chemicals from infill, and some heightened health and safety concerns. Artificial turf was first introduced in the 1960s by David Chaney for professional sports teams, and is now widely used in all levels of sports for indoor and outdoor fields. Although it is still more costly than natural turf in the short term, the cost has come down as technologies have improved, making artificial turf a realistic option for homeowners today. Till the periods there are 4 generations of artificial turf comes into the account which is described in paper. For the "traditional" green manicured lawn look all year round without using a lot of water, fertilizer or maintenance, artificial turf is a water saving choice. While artificial or synthetic turf is not for very garden, it is another alternative to the water hungry lawn. Some types are just for looks and can be placed in hard to grow accent areas in the garden while other varieties are designed for recreational activities and putting greens.*

Keywords: Artificial Turf or Synthetic Turf, Natural Grass, Trimming

1. INTRODUCTION

Artificial turf is a surfacing material used to imitate grass. It is generally used in areas where grass cannot grow, or in areas where grass maintenance is impossible or undesired. Artificial turf is used mainly in sports stadiums and arenas, but can also be found on playgrounds and in other spaces. Artificial turf has been manufactured since the early 1960s, and was originally produced by Chemstrand Company (later renamed Monsanto Textiles Company). It is produced using manufacturing processes similar to those used in the carpet industry. Since the 1960s, the product has been improved through new designs and better materials. The newest synthetic turf products have been chemically treated to be resistant to ultraviolet rays, and the materials have been improved to be more wear-resistant, less abrasive, and, for some applications, more similar to natural grass.

2. LITERATURE REVIEW

2.1 History of Artificial Grass

2.1.1 1st Generation Artificial Grass
2.1.2 2nd Generation Artificial Grass
2.1.3 3rd Generation Artificial Grass
2.1.4 4th Generation Artificial Grass

2.1.1 1st Generation Artificial Grass

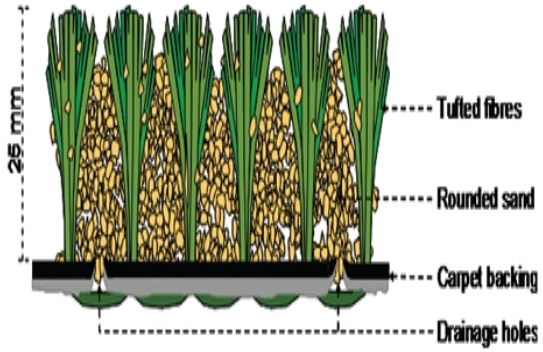
The development of synthetic fibres and their integration into a carpet to try to simulate the conditions of natural grass was first successfully achieved by the Monsanto company in the United States of America at the Moses Brown School, Providence, Rhode Island in 1964. Two years later, Monsanto's high-density knitted nylon product was installed in the indoor Houston Astrodome following the failure of natural grass to grow under the stadium's translucent roof. Originally called Chemgrass, but nicknamed 'Astroturf' by the media, By the mid-1970s these First Generation artificial grass pitches (low-pile height, high-density of fibres) had improved to the point where an artificial grass pitch was successfully used for the hockey tournament at the 1976 Olympic Games in Montreal. Made of nylon (polyamide) yarns, first generation pitches were coarse and capable of causing friction burns and wounds unless played on wet - as per the hockey model.

1st Generation Artificial Grass
© Loughborough University; www.sportsurf.lboro.ac.uk
• 10 – 12 mm fibre length, integral shock pad developed 1960s, nylon, unfilled, hard, abrasive
• Used for hockey at the 1976 Montreal Olympics

2.1.2 2nd Generation Artificial Grass

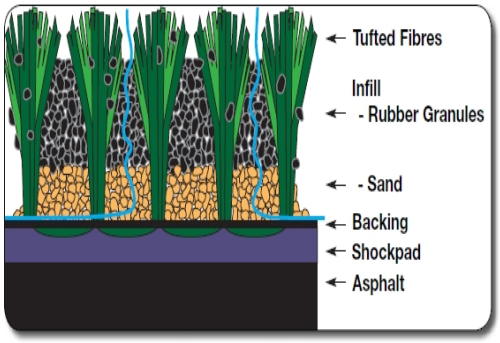
London-based soccer club Queens Park Rangers were the first to install a 'Second Generation' artificial pitch (medium pile height – lower density 20 to 35mm of fibres, filled with sand to provide stability and some control of ball bounce) and by the mid-1980s there were four second generation artificial grass pitches in operation in the English soccer leagues. Now made of

polypropylene these versatile and durable pitches were immediately successful for community level soccer and other activities but at the top level of soccer they soon lost with the low-pile height, highdensity carpets (first generation) being ideal for hockey, but a suitable artificial grass.



2.1.3 3rd Generation Artificial Grass

Third Generation carpets (longer pile – 35-65mm, dressed with sand/ rubber granules/both) were introduced in Europe in the late 1990s, and have developed, particularly because of the adoption of the softer polyethylene based fibre and the ability of the surface to take a normal stud, into a very acceptable surface for sports such as soccer and rugby union. The rubber infill, sometimes with a shock pad as well for added safety (rugby's initial preference), have made third generation artificial grass carpets. More acceptable for most sport.



2.1.4 4th Generation Artificial Grass

Developments so far this century could be gathered under the heading of Fourth Generation artificial grass carpet systems, and these would include:

For soccer and rugby type use: Variations on the third generation model, utilizing a mix of monofilament, textured fibers of variable lengths without infill.

For hockey type use: Sand-dressed pitches which is a variation on the second generation sand-filled pitches. Sand-dressed pitches have a much-reduced sand content (50-80 per cent of the 12-13mm crimped pile height). The lack of surface-level sand aids faster ball movement and reduces the severity of any abrasions for falling or sliding players.

3. RAW MATERIALS

The quality of the raw materials is crucial to the performance of turf systems. Almost anything used as a carpet backing has been used for the backing material, from jute to plastic to polyester. High quality artificial turf uses polyester tire cord for the backing.

The fibbers that make up the blades of "grass" are made of nylon or polypropylene and can be manufactured in different ways. The nylon blades can be produced in thin sheets that are cut into strips or extruded through molds to produce fibers with a round or oval cross-section. The extruded product results in blades that feel and act more like biological grass.

Cushioning systems are made from rubber compounds or from polyester foam. Rubber tires are sometimes used in the composition of the rubber base, and some of the materials used in backing can come from plastic or rubber recycling programs. The thread used to sew the pads together and also the top fabric panels has to meet the same criteria of strength, color retention, and durability as the rest of the system. Care and experience must also be applied to the selection of the adhesives used to bond all the components together.

4. THE MANUFACTURING PROCESS

The "grass" part of a turf system is made with the same tufting techniques used in the manufacture of carpets.

1. The first step is to blend the proprietary ingredients together in a hopper. Dyes and chemicals are added to give the turf its traditional green color and to protect it from the ultraviolet rays from the sun.

2. After the batch has been thoroughly blended, it is fed into a large steel mixer. The batch is automatically mixed until it has a thick, taffy-like consistency.

3. The thickened liquid is then fed into an extruder, and exits in a long, thin strand of material.

4. The strands are placed on a carding machine and spun into a loose rope. The loose ropes are pulled, straightened, and woven into yarn. The nylon yarn is then wound onto large spools.

5. The yarn is then heated to set the twisted shaped.

6. Next, the yarn is taken to a tufting machine. The yarn is put on a bar with skewers (a reel) behind the tufting machine. It is then fed through a tube leading to the tufting needle. The needle pierces the primary backing of the turf and pushes the yarn into the loop. A looper, or flat hook, seizes and release

the loop of nylon while the needle pulls back up; the backing is shifted forward and the needle once more pierces the Backing further on. This process is carried out by several hundred needles, and several hundred rows of stitches are carried out per minute. The nylon yarn is now a carpet of artificial turf. The artificial turf carpet is now rolled under a dispenser that spreads a coating of latex onto the underside of the turf. At the same time, a strong secondary backing is also coated with latex. Both of these are then rolled onto a marriage roller, which forms them into a sandwich and seals them together. The artificial turf is then placed under heat lamps to cure the latex. The turf is fed through a machine that clips off any tufts that rise above its uniform surface.

7. Then the turf is rolled into large v/lengths and packaged. The rolls are then shipped to the wholesaler.

4.1. Installation

Artificial turf installation and maintenance is as important as its construction.

1. The base of the installation, which is either concrete or compacted soil, must be leveled by a bulldozer and then smoothed by A profile of artificial turf. a steam roller. Uneven surfaces will still be evident once the turf is supplied.

2. For outdoor applications, intricate drainage systems must be installed, since the underlying surface can absorb little, if any, rainwater.

3. Turf systems can be either filled or unfilled. A filled system is designed so that once it is installed, a material such as crumbled cork, rubber pellets, or sand (or a mixture) is spread over the turf and raked down in between the fibers. The material helps support the blades of fiber, and also provides a surface with some give, that feels more like the soil under a natural grass surface. Filled systems have some limitations, however. Filling material like cork may break down or the filling material can become contaminated with dirt and become compacted. In either case the blades are no longer supported. Maintenance may require removing and replacing the entire fill.

5. QUALITY CONTROL

1. Because of the high use of artificial turf and the constant scrutiny by professional athletes, new products must undergo a number of tests as they are being developed. In 1994, the American Society for Testing and Materials (ASTM) published a list of standard methods for the testing of synthetic turf systems. It contains over two dozen tests for the properties of turf systems.

2. As part of ASTM's testing, the backing fabric is tested for strength. The force it takes to separate the individual tufts or blades is also measured. In tufted turf, this test usually measures the strength of the adhesive involved. To test how resistant the turf is to abrasion, the ASTM recommends testing the fabric by running it under an abrasive head made of spring steel, while another ASTM test measures how abrasive the turf will be to the players. The ASTM also has tests that measure the shock absorbency of the turf system, and there are also tests to see how well the turf stands up during the course of a game or even prolonged tournament play.

3. Several quality checks are performed during the manufacturing process, as well. For example, according to Astro Turf Incorporated, the following quality checks are performed:19 checks for the raw materials, eight checks for extrusion, six checks for unfinished fabric, and 14 checks for finished fabric.

5.1 By products/Waste

1. Defected artificial turf batches are discarded as are nylon yarn that is damaged. Completed turf is generally recycled, but not reused as artificial turf. The earth that is cleared from the installation site is transported to a landfill and discarded. Older turf that has been worn down is typically recycled.

2. The arguments about the environmental impact of artificial versus biological turf continue. Both create large amount of water run-off, adding to sewage problems. Chemical processes are used in the manufacture of raw materials for artificial turf, but most biological grass in stadium applications requires chemicals in the form of fertilizer and pesticides for maintenance.

6. Applications:

1. Soccer
2. American Football
3. Lacrosse
4. Baseball
5. Airports
6. Circket
7. Air port

Artificial grass use in fields in pitches have become the preferred playing surface for middle and lower grade cricket and others games competitions over the past two decades. Replacing old matting and method pitches, these pitches are generally single strips of high-density carpet (9 – 11mm pileheight) glued to a concrete base. They have no infill. Pitches that are infilled with rubber granules over the winter period must be thoroughly cleaned out (repeated through cricket season) before summer use. In comparison with those older types of

pitches, the artificial grass version is low maintenance. During the winter season, the pitch is covered with loam or a second sheet of artificial grass (often a longer pile with much less density of fibres) is laid over the actual pitch, and the upper layer is filled with rubber granules to provide a cushioning level to counteract the pitch's concrete base.

Artificial turf has several advantages over natural grass for use at airports:

1. Rescue and firefighting vehicles can reliably drive on the artificial surface, as can planes that veer off the runway.
2. Foreign Object Damage (FOD) can be reduced.
3. Artificial turf provides no food, shelter, or water for wildlife, reducing the risk of wildlife colliding with planes.
4. Artificial turf is always bright green, even in winter, and provides good visual contrast with runways and taxiways.
5. Artificial turf will not wash away or become muddy, and helps to stabilize runway and taxiway shoulders.
6. Less maintenance means fewer workers need security clearances, there is less chance of runway incursions by maintenance machines, and may reduce costs.
7. Erosion from aircraft maneuvering is much reduced.

7. LIFE EXPECTANCY AND DURABILITY

Generally, artificial turf lasts beyond 20 years with proper upkeep, and potentially up to 30 years. Many dealers offer warranties of 8 years or more. Most varieties of turf have a coating to protect against UV rays and prevent fading. Turf that has been installed in the mountains, where rain and snow fall heavily has no flooding issues if the site is prepared with good draining base rock. Wind is not a worry since the turf is secured to the ground. Central Coast sun can get very hot, so during Mid day direct sun, the grass may feel hot to the touch. Certain infills may reduce heat absorption. The grass does not retain heat in the shade or darkness like rock does. The turf can easily take even the hottest direct sunlight without damage providing that there isn't any strong reflection or sun magnification.

7.1 The Future

1. The engineering and design of both artificial and biological turf systems are constantly improving. As new stadiums are built, the owners and architects strive to give a more old-fashioned feel to the structures, which usually means no dome or a dome that allows the use of biological turf.
2. Recent installations of artificial turf have included new advancements that serve both economic and environmental needs. Large holding tanks are built beneath outdoor installations. The water that runs off the surface is held in the tanks, and used later for watering practice fields or nearby lawns.
3. Another recent development has been a hybrid of filled turf and biological grass. Once artificial turf is installed, it is filled not with rubber or sand, but with soil. Grass seed is then planted in the soil, nurtured and grown to a height above that of the artificial turf. The resulting combination combines the feel, look, and comfort of biological turf with the resilience and resistance to tearing and divots of artificial turf. Of course, it also requires all the maintenance of both systems, and it is not suitable for most indoor applications.

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Fig :(4) Application for play ground fields

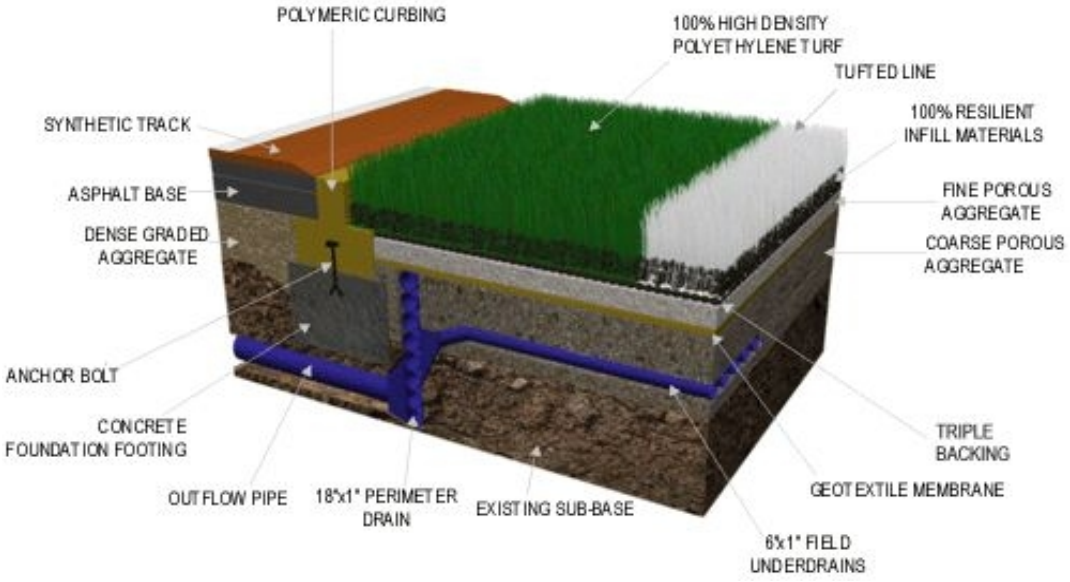

Fig :(5) Technology of "Artificial Turf "