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Laboratorio di Fisica Tecnica Ambientale

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TEST REPORT

Abstract

Applicant: Limonta Sport S.p.A.
Via Crema 60, Cologno al Serio (BG) - Italy

Test performed: Air temperature gradient measure

Scientific Coordinator: Prof. Fabio Peron

Technician: Arch. Massimiliano De Bei

Venezia; October 19, 2010

Place and Date of test: Limonta SpA factory, Cologno al Serio (Bg) Italy, sports fields; Brusaporto (BG) Italy. September 10, 2010

Applicant: Limonta Sport S.p.A.
Via Crema 60, Cologno al Serio (Bg) Italy

Materials tested: Natural Grass;
Synthetic Turf and Infill's:
SOCCER PRO MAX-S 45mm w/InfillPro P SBR (ground car tires)
SOCCER PRO MAX-S 60mm PU w/InfillPro GEO TP (cork/coir & TP+/-10%)
TANGO TURF F 40mm w/InfillPro NB (PU encapsulated SBR)

Test performed: Field Surface Temperature and Air temperature measured in gradients

DESCRIPTION OF SAMPLES TESTED:
The synthetic fields tested were similar in the manner that they consisted primarily of 100% polyethylene extruded yarn in 100% tufted into a fabric backing with a secondary coating of either polyurethane or latex. Various types of infill materials were used to fill the voids between the tufted rows of plastic fibers: PU coated and uncoated SBR (ground car tires); thermoplastic; sand and organic infill (cork & coir)

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TEST EQUIPMENT

PT100 Temperature Sensor:

The RTD is a temperature sensor that exploits the variation of resistivity of certain materials as a function of temperature. In particular, the PT100 resistance thermometers are platinum (Pt), in which the resistance at a temperature of 0 ° C is 100 Ω.

According to IEC 751 (1995), the PT100 is classified per the tolerance parameters specified. For these tests they are Pt100 Class A ± 0.15 ° C [0 ° C] Ω ± 0.06 [0 ° C].

Pyranometer:

The pyranometer is a device for measuring solar radiation. There are different types, distinguished according to the principle of operation. Utilized for this test was a thermopile pyranometer manufactured by Kipp & Zonen model CM6B Spectral sensitivity: 305-2800nm; Sensitivity: 9-15 uV/Wm2; Environmental limits: -40 +80 ° C Max irradiance: 2000 W/m2; sensitivity to temperature: ± 2% (-10 to +40 ° C) ; response time: 1 s 5s 99% 55s.

DT605 Datataker:

The DT605 Datataker, battery powered data loggers act as the "universal input" run by micro processor to accept various types input via analog and digital signals. The data is stored in battery-backed RAM and / or magnetic cards. The data processing includes calculations, statistical functions, and calibration of sensors. Accuracy is better than 0.15% of full scale.

TEST METHOD

The methodology used for the test was to measure the thermal reflectivity/temperature readings at various levels above the various types of synthetic and natural turf fields as affected by solar radiation.

Four PT100 sensors positioned at different heights: ground level, 20 cm, 100 cm and 170 cm, to adequately represent an athlete's exposure to the temperature gradients above the turf.

The initial test began with dry conditions during a sunny day with an atmospheric temperature of 25°C (77°F) and average humidity of 28%. A second round of testing began after wetting the fields at a time corresponding to that of a daily schedule when the fields were typically used so as to understand the athlete's exposure from a thermal point of view.

Stands w/ Sensors

Typical Watering Method

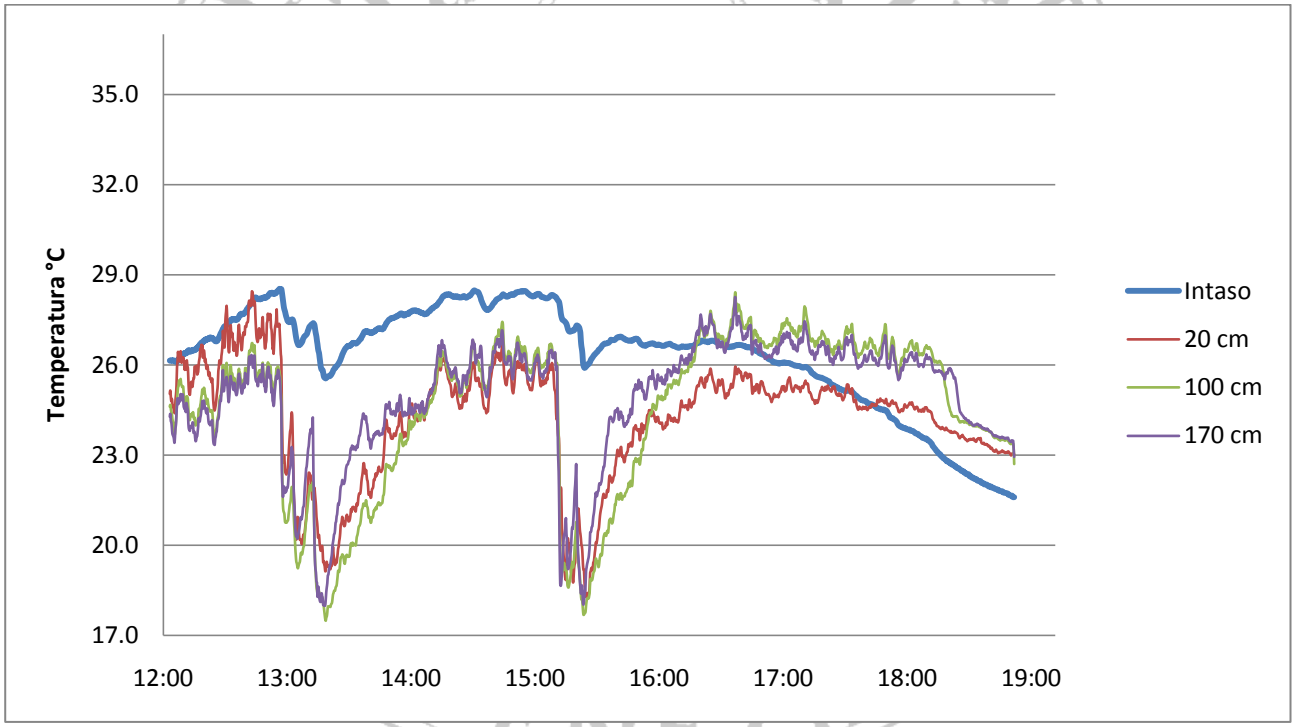
The same test apparatus and methodology was used for readings taken at the natural grass field at Brusaporto for use as a benchmark against different temperatures collected to measure the effects of solar radiation on the fields, both dry and watered, as compared with two types of synthetic turf and infill fields located at the headquarters of Limonta SpA in Cologno al Serio, and consisting of:

1. Soccerpro Max S 45 –InfillPro P SBR
2. Soccerpro Max S PU 60 –InfillPro GEO TP (coconut, cork w/ thermoplastic)
3. Tango Turf F 40mm w/InfillPro NB (PU encapsulated SBR)

The fields were evaluated in the dry condition and then wet to evaluate the corresponding temperature changes. These measurements were compared with those found in natural grass field in Brusaporto, IT.

The readings commenced at 12.00 and lasted through 18.40. The wetting of the fields occurred at two intervals, the first at 13:10 and the second at 15.20.

Please refer to the following graphs:



Synthetic Turf- Limonta Sport Soccerpro Max S PU 60 w/ InfillPro geo TP (cork, coir and TP)
Temperature trends Surface and Air @ 3 levels

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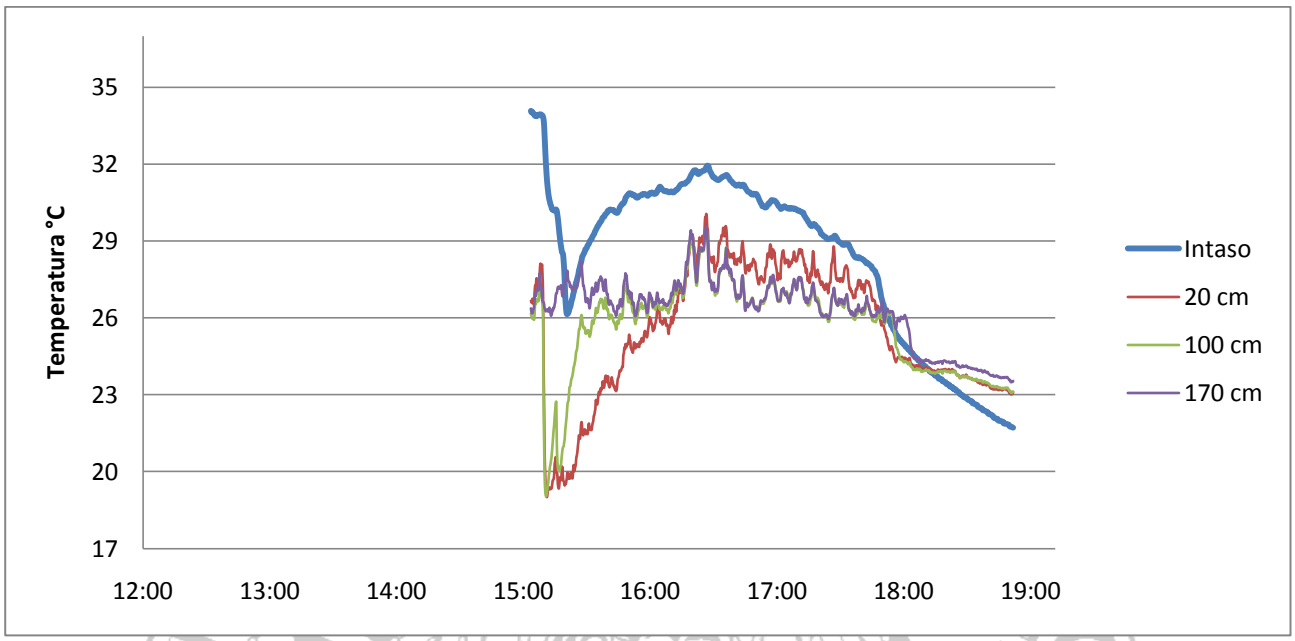

Synthetic Turf- Limonta Sport Soccerpro Max S 45 w/ InfillPro P (SBR)

Temperature trends @ 4 levels

READINGS:

The temperature data from the tests are compared in the following chart. It is evident that the temperature varies considerably between the two similar synthetic turf surfaces, but utilizing different types of infill. In both cases it was observed that the air temperature remained lower than the field surface temperatures, yet in some cases it was close.

	Soccerpro Max S 45 Infillpro P (sbr)	Soccerpro Max S PU 60 Infillpro GEO TP (cork, coir & term.)	Natural grass
Dry	36,0	27,5	
Before wetting		25,6	
End evaporation (15:00)	34,1	28,2	27,0
Second Wetting (15:20)	27,4	26,0	22,0
End evaporation	31,1	26,8	25,5

The data reveals that the field surface temperatures vary depending on the type of turf/infill materials used. Of the types analyzed, SoccerPro Max S PU 60 with InfillPro GEO TP (cork, coir and thermoplastic) exhibited consistently lower surface temperatures, similar to that of natural grass.

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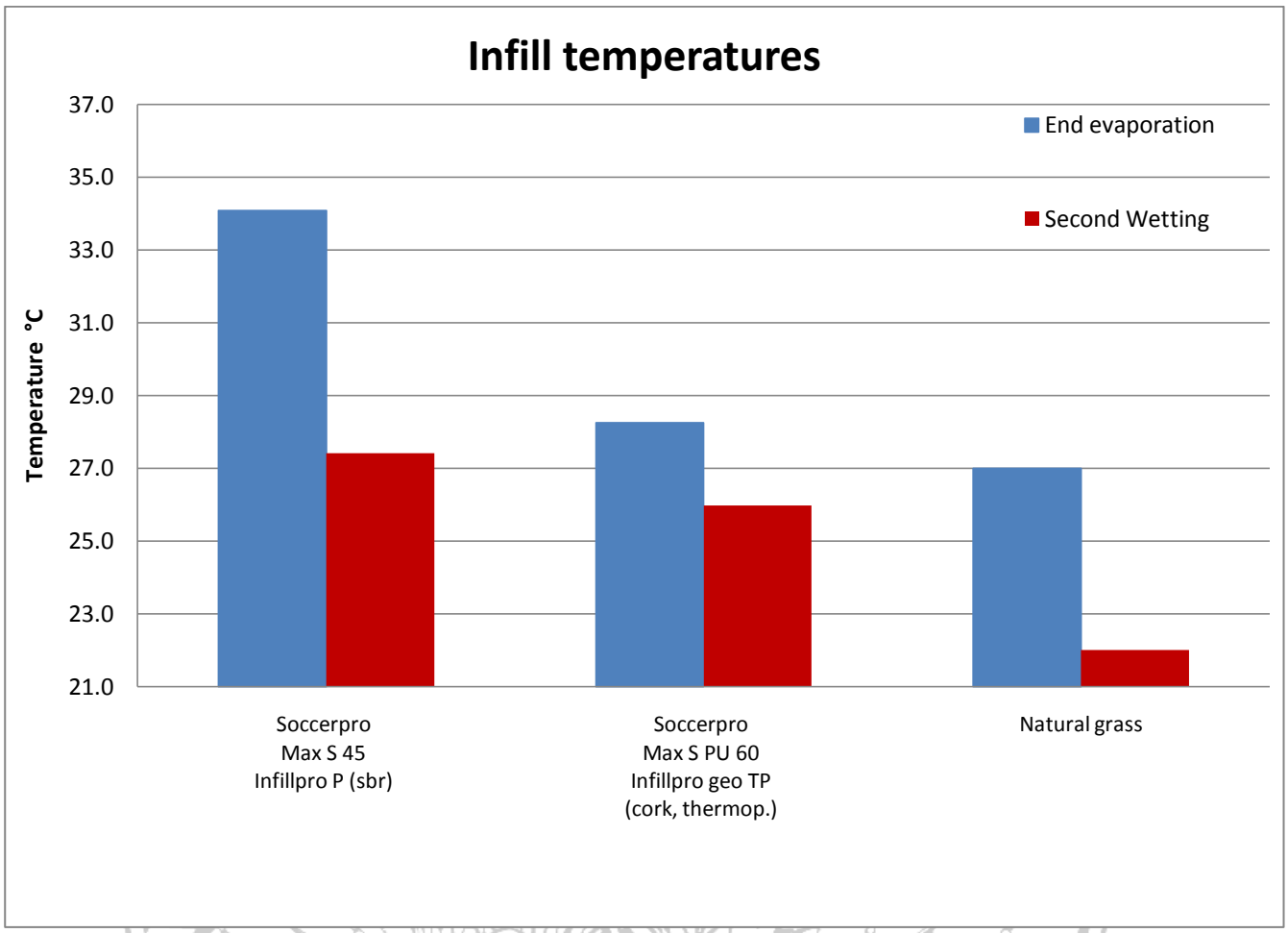

Infill temperatures 15:00 hours (dry) - 15:25 (wet)

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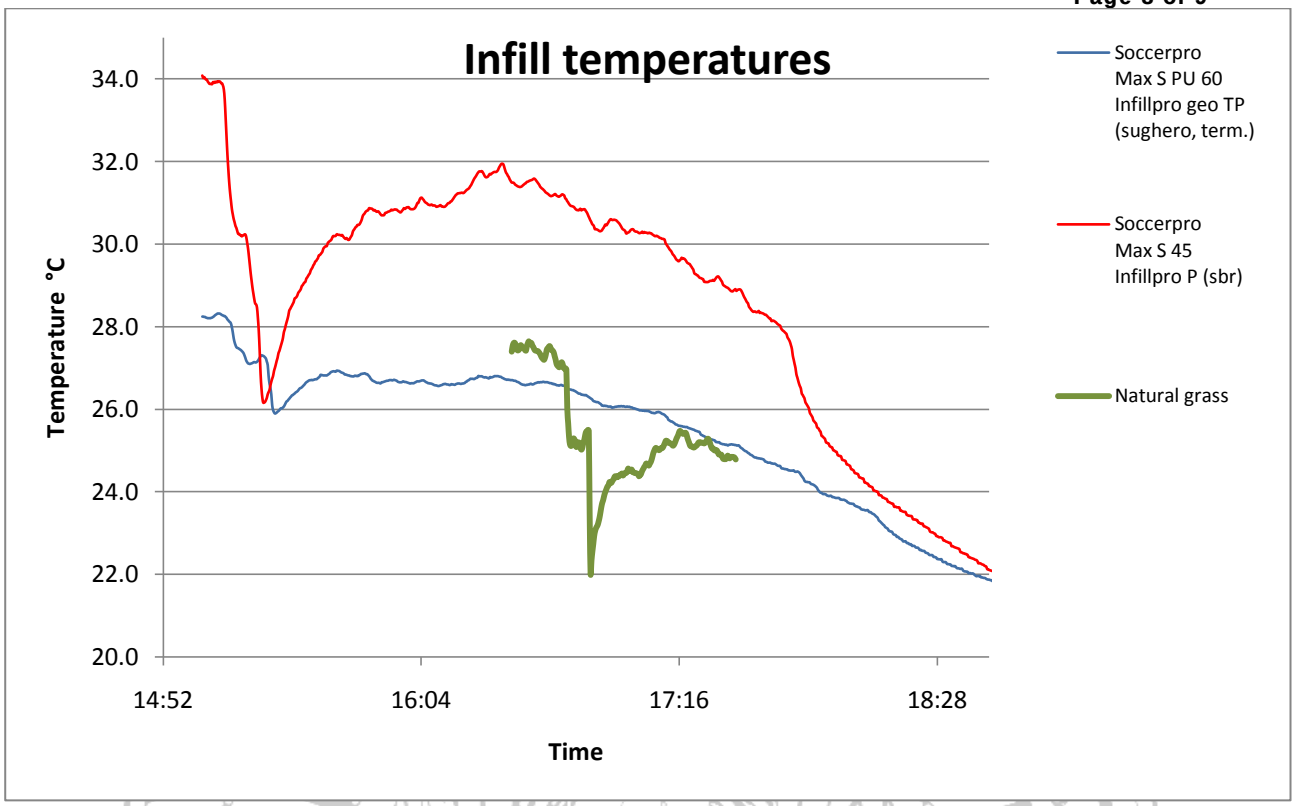
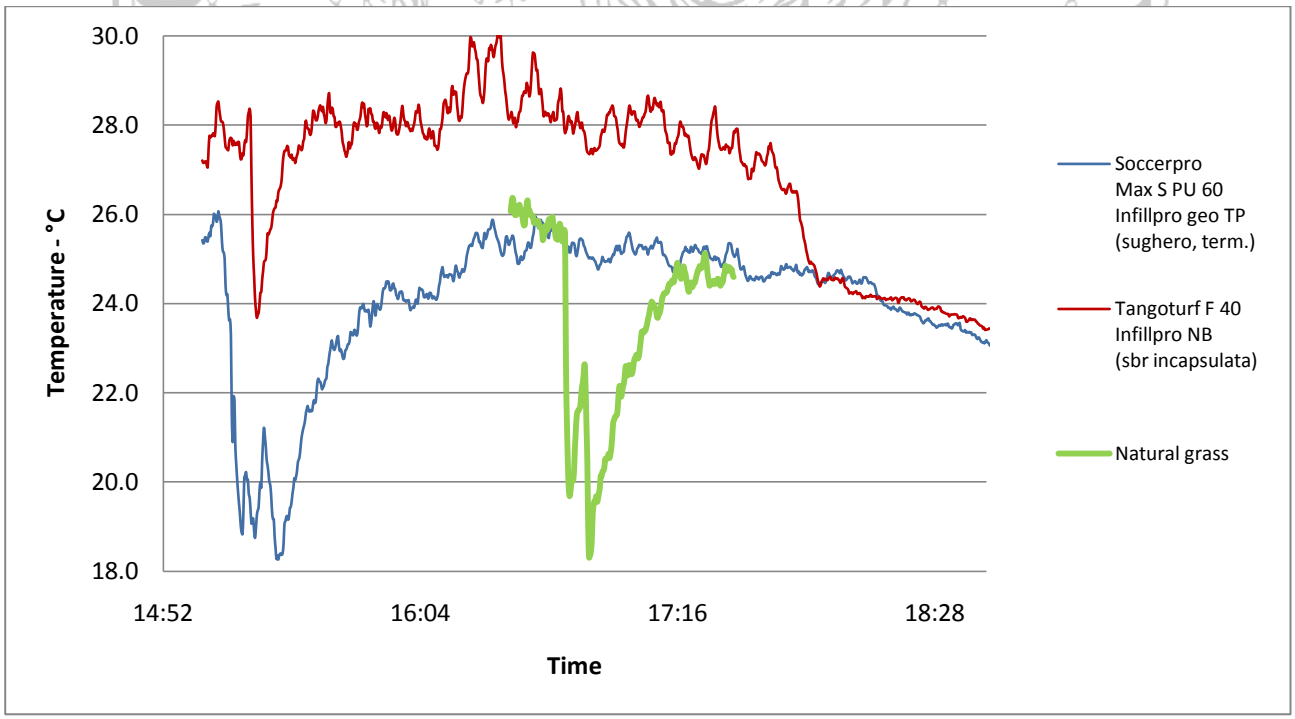


Temperature trend in natural grass versus various infill's
(Green down spike represents cloud cover)



Temperatures trends at 20 cm above the synthetic turf and natural grass surfaces
(Green down spike represents cloud cover)

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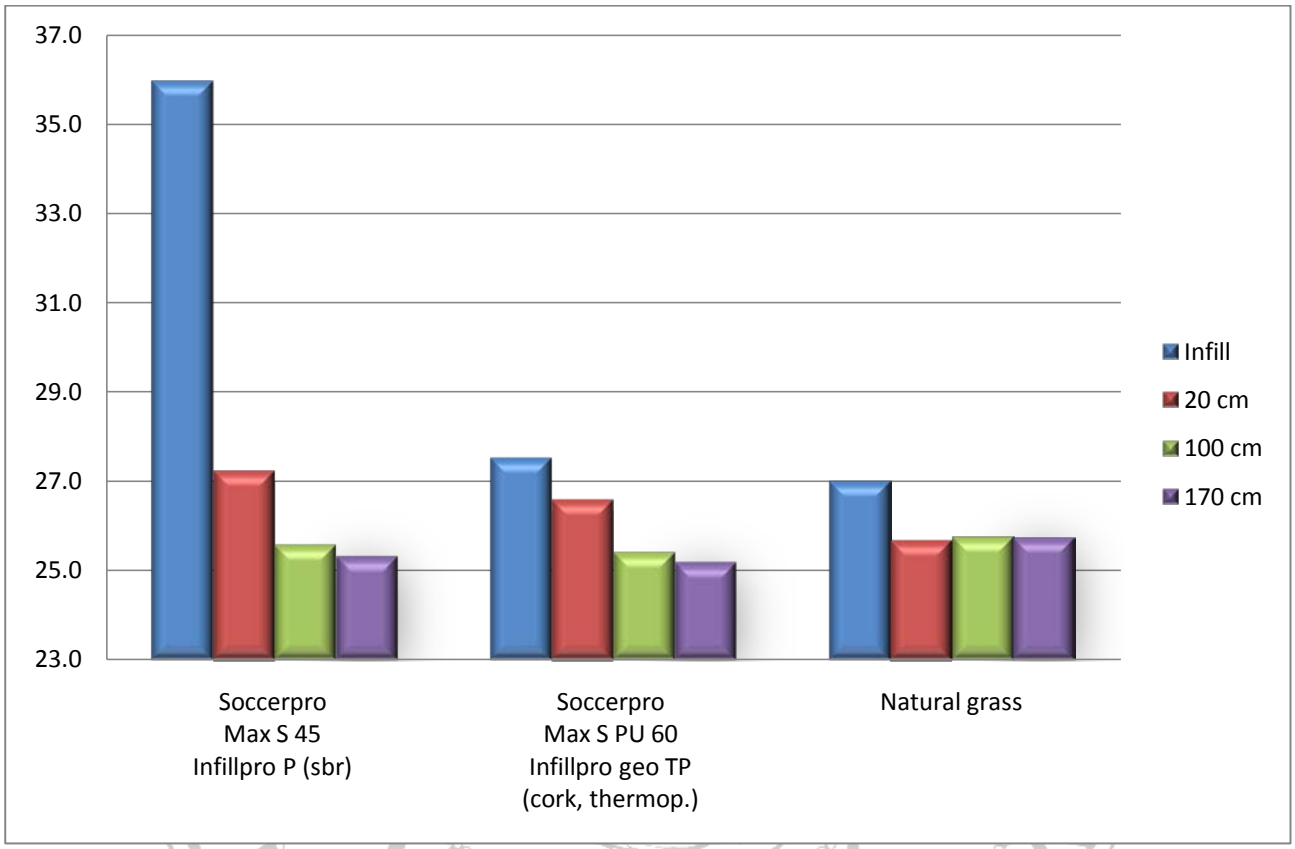

Air and Field temperatures - dry condition - 12.30

The studies reveal that although the infill temperatures in synthetic turf are higher than those observed in natural grass, there is a minimal affect on the air temperature in the regions between 20-170 cm above the surface. However, it is readily apparent that the choice of infill, in this case InfillPro GEO, considerably lowers the temperature of the field to the point of being almost on par with natural grass.

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