

INTERNATIONAL HOCKEY FEDERATION

**HANDBOOK FOR THE CARE AND MAINTENANCE
OF SYNTHETIC TURF HOCKEY PITCHES - OUTDOORS**

First Edition: December 2001

FOREWORD

For a variety of reasons, the FIH encourages further dissemination of information on synthetic pitches. Full details of the requirements and classifications are contained in the Handbook of Performance Requirements for synthetic pitches. Regularly, a list of FIH approved products is published. Both documents are available from the FIH office in Lausanne or the FIH website: www.worldhockey.org

One of the main objectives of the FIH is to act as the Centre of Expertise for its members. Because proper maintenance of synthetic pitches is one of the main contributors to player enjoyment, the reduction of injuries and extended longevity, the Equipment Committee of the FIH has composed these guidelines. Reference is regularly made to manufacturers, who know best about maintenance and have a vested interest in extended life cycles of their products.

The views expressed in these guidelines are given in good faith and no responsibility or liability can be accepted by the FIH for any damage or loss as a result of any party relying on the views given.

The guidelines are sub-divided into a number of self-contained sub-sections for easy reference. As a result, there is an element of duplication when the document is read in full.

Recognition is extended to a number of manufacturers of FIH approved products who have put their documentation at the disposal of the FIH Equipment Committee for the compilation of these guidelines.

As with all technical issues, numerous changes are anticipated in the not too distant future. Hence, an easy up-to-date format has been chosen in the presentation of these guidelines.

FIH, November 2001

Disclaimer

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These Guidance Notes have been compiled by the FIH to assist in general terms. National Associations and facility managers are advised to refer to manufacturers, consultants, and other authorities.

TABLE OF CONTENTS

FOREWORD	2
1.00 PREFACE	4
1.01 Introduction	4
1.02 Objectives	4
1.03 Scope	4
1.04 Limitations	4
2.00 GENERAL PRINCIPLES	5
2.01 Optimum Playing Conditions	5
2.02 Economic Considerations	5
2.03 Design and Pre-Construction	5
2.04 Installation Supervision	5
2.05 Provision of Trained Personnel	5
2.06 Importance of Proper Watering of Unfilled Pitches	6
2.07 Access and Security Considerations	6
2.08 Posting and Prohibitions	6
2.09 Monitoring and Inspection	6
2.10 Rapid Action and Early Intervention	6
2.11 Consultation with Manufacturers	6
2.12 Technical Aspects Referred to Appendices	7
3.00 MAINTENANCE	7
3.01 Preventative Measures	7
3.02 Preventative Maintenance	7
3.03 Routine care of Carpet (Sweeping/Brushing)	8
3.04 Periodic Major Cleaning of Carpet (Unfilled)	8
3.05 Treatment of Algae	9
3.06 Treatment of Moss/Weed	9
3.07 Repairs to Seams/Tears	9
3.08 Line Marking and Painting	10
3.09 Treatment of Chemicals and Stains	10
3.10 Major Treatment of Filled Pitch (Rejuvenation)	10
3.11 Replacing and/or Upgrading	10
4.0 SUMMARY OF KEY POINTS	11
Appendix A Red Card for Algae	12
Appendix B References and Resources	15
Appendix C Acknowledgements	16

1.00 PREFACE

1.01 Introduction

Pitch maintenance is a very important factor in the short-term and long-term viability of a synthetic playing field. In the short-term, the enhanced playability of the pitch, the minimisation of injury potential and added enjoyment are the major considerations. Over the longer term, a good maintenance regimen greatly increases the longevity of the pitch - a major economic consideration.

This manual is intended as guidance for National Hockey Associations (as well as clubs, local authorities, schools & other bodies) undertaking the installation of a synthetic pitch. As well as expertise garnered from members of the FIH Equipment Committee and other knowledgeable members of the international hockey community, several manufacturers provided maintenance schedules, advisory notes and other very helpful technical information. However, this manual is not intended to be prescriptive, definitive or authoritative; it is merely intended as a reference guideline for proprietors and users of synthetic turf pitches, with the aim of achieving optimum playing and safety conditions for users of synthetic turf pitches.

It is generally recognised that a major advantage of synthetic turf over natural grass is the greatly reduced maintenance required. However, a reduction of maintenance does not mean no maintenance. It is extremely important to realise that sufficient maintenance must be performed to ensure the pitch is kept in top condition. This applies both to filled and unfilled pitches; hence this manual covers both.

1.02 Objectives

It is generally recognised that a well-maintained pitch enjoys the following advantages:

- optimising playing conditions;
- minimising potential for injury;
- maximising longevity of the pitch.

Thus, the objective of this manual is to:

- identify preventive measures in design and implementation;
- stress the importance of following specified maintenance routines;
- outline maintenance protocols and procedures;
- emphasise the need for regular monitoring and inspection;
- highlight advantages of early detection and prompt intervention;
- recognise the need to refer to experts (manufacturers);
- realise that proper installation of the pitch, appropriate watering arrangements (automatic) and having knowledgeable local contacts are imperative.

1.03 Scope

This manual endeavours to address care and maintenance requirements of unfilled and filled synthetic turf pitches.

In the case of filled pitches, this refers to pitches filled with sand or materials simulating sand and not rubber.

1.04 Limitations

This manual contains little information on long-fibred surfaces infilled with rubber granules, as feedback on the hockey-playability of these surfaces is limited at this stage of their development.

2.00 GENERAL PRINCIPLES

2.01 Optimum Playing Conditions

The prime objective of a properly maintained synthetic turf pitch is to provide the best possible conditions of playability and safety for the participants.

2.02 Economic Considerations

The capital cost of installing a synthetic turf pitch, and the cost of replacing or up-grading it later, are so high that maximising the interval between these two events (thereby increasing the longevity of an installation) is of the utmost importance. There are examples in several countries around the world where strict supervision of pitch use and conscientious following of proper maintenance practices has resulted in a pitch life of at least 12 years, for both filled and unfilled surfaces. On the other hand, there are also numerous examples where failure to follow these recommended practices has led to failure in less than 5 years.

2.03 Design and Pre-Construction

Many facets of good maintenance practice can be incorporated into the design and pre-construction phase of the installation:

- installation of concrete/tarmac paths;
- installation of security fences/gates;
- availability of synthetic turf practice/warm-up areas;
- provision of markings and extra goals for cross-pitch practice;
- installation of boot cleaners;
- provision for and regular emptying of rubbish bins;
- routing of player traffic to minimise tracking of impurities;
- set up of food and beverage facilities well off-pitch.

2.04 Installation Supervision

It is vital that expertise is available during the installation to ensure that specifications are adhered to, that inspection is thorough, and that any corrections have been satisfactorily completed. (This is especially pertinent in developing countries with no experience of synthetic turf pitches and no local synthetic turf manufacturers.)

2.05 Provision of Trained Personnel

In order to be certain that maintenance regimens are clearly outlined, trained personnel is on hand and essential machinery is available, it is recommended **manufacturers are required** to ensure that:

- maintenance regimens and procedures are very clearly described;
- several local personnel receive full knowledge of requirements and sufficient training to ensure back-up;
- maintenance machinery is purchased/leased as necessary for carrying out the maintenance programme;
- monitoring takes place to ascertain that maintenance/inspection regimens are fulfilled.

2.06 Importance of Proper Watering of Unfilled Pitches

A very important aspect of maintenance is ensuring that the pitch is properly watered during all times of activity (matches and practices). As well as short-term considerations such as playability, injury avoidance and enjoyment, improper watering has negative long-term implications with respect to pitch maintenance and longevity.

If not properly watered a synthetic turf pitch loses its cleansing properties, resulting in depositing of impurities, thus creating abrasion of the carpet. Furthermore, played on when dry, much greater forces are in action which have a very detrimental effect on the turf (fibres, joints, interface with sub-base/e-layer) causing wear and more rapid deterioration (rippling, tearing, uneven stretching). This greatly decreases the longevity of the pitch - a major economic consideration.

The optimum solution for ensuring that a pitch is properly watered at all times is the provision of a computer program controlled watering system. This is the only reliable practical solution. With respect to watering, it is especially true that: **"a cent well spent is a dollar well saved"**.

Note that if a club has its own water well, the water **must** be free of ferric oxide.

2.07 Access and Security Considerations

If the pitch is on public or unsupervised private land, a security fence and a gate to control entry and exit should be provided. A single access with distribution of keys to a limited number of responsible persons is advisable. The optimum situation in relation to access and security of a synthetic turf pitch is the appointment of a Facility Manager.

2.08 Posting and Prohibitions

To facilitate maintenance of the pitch, it is necessary to identify positive actions which are required and activities which are prohibited and to post a notice of such actions and prohibitions clearly and prominently. It is important that adequate supervision is maintained to ensure these actions and prohibitions are adhered to by **all** players and users and that failure to observe them results in appropriate sanctions.

2.09 Monitoring and Inspection

During the life of the pitch (and especially in its initial stages) it is imperative that periodic monitoring and inspection is incorporated into the routine. Manufacturers should undertake to provide a periodic inspection service, particularly during the warranty period, to detect early any need for adjustment or repair. Details of inspections should be defined in the warranty contract. Appointment of a Facility Manager to carry out these duties helps to ensure that vital tasks are done.

2.10 Rapid Action and Early Intervention

The old adage **"a stitch in time saves nine"** is certainly relevant when it comes to pitch maintenance.

2.11 Consultation with Manufacturers

It is important to consult with manufacturers regarding maintenance and to conform with manufacturers' specified maintenance procedures. Warranty conditions will typically demand fulfilment of a maintenance regime. Some manufacturers will offer a separate service contract in which they undertake to perform for a fee a pro-active role in the regular maintenance of a pitch (eg 3 visits in the first year and then 2 per year). In addition to normal adjustments and repair functions, a service contractor would be expected to undertake all tasks where special equipment is needed (eg high-pressure hosing, vacuuming and line re-marking).

2.12 Technical Aspects Referred to Appendices

Technical aspects of a specialised or evolving nature are referred to in Appendices.

3.00 MAINTENANCE

3.01 Preventive Measures

Certain preventive measures, aimed at keeping the pitch and adjacent areas free of litter, gravel, grit, mud, dirt, oil and toxic materials can be incorporated into the design and construction of the facility:

- landscaping with non-leaf-shedding trees and bushes;
- installation of concrete/tarmac paths;
- routing of player traffic to minimise tracking of impurities;
- set up of food and beverage facilities well off-pitch;
- control of access to minimise possibility of vehicles entering the pitch area;
- availability of synthetic turf practice/warm-up areas;
- provision of markings and extra goals for cross-pitch practice;
- installation of brushes, sluices and mats for cleaning boots;
- strategic placement of rubbish bins with provision for regular emptying;
- erection of prominent signs designating required positive actions and prohibitions **for everyone**.

Positive actions:

- clean boots before entering pitch area.

Prohibitions:

- no smoking;
- no chewing gum (but note that this can sometimes be removed with the use of dry ice - CO₂);
- no food or drinks (except water);
- no glass containers or bottles;
- no sharp tags on boots or stiletto heeled shoes.

Vehicles:

- observe all recommended static and rolling load limits.

3.02 Preventive Maintenance

Periodic Monitoring and Inspection:

- close watch for algae invasion on unfilled pitches, especially in warmer climates;
- constant vigilance for moss on filled pitches;
- attention for seam separation, rips & tears in turf and observation of worn areas.

Routine Action:

- frequent collection of foreign material from the pitch area (litter, canteen waste, tape, gum, etc);
- sweep up grass, leaves, twigs and cones regularly;
- clean up organic materials such as food, faeces, compost, mud, etc;
- empty bins frequently to ensure they do not overflow;
- cross-brush filled pitch regularly;
- repair minor damage promptly;
- report more serious damage or repair problems immediately to manufacturers;
- take early action on algae, moss, weeds, etc. Note for a prophylaxis: it is useful to install a dosage

system, continually adding the appropriate amount of "DIMANIN" (Special or A) to the sprinkler system with a recommended dosage in the range of 10 ppm minimum, to 30 ppm maximum;

- attend to any watering system problems promptly;
- if lines or seams come loose, they must be repaired as soon as possible; a loose seam running a few centimetres can quickly become several metres unless quick action is taken.

Maintain complete and accurate details of maintenance regimen, including a record of monitoring inspection.

3.03 Routine Care of Carpet (Sweeping/Brushing)

This may be done by the customer. It concerns minor maintenance requiring no specialised equipment.

As well as ensuring that litter is removed from the pitch immediately, it is also essential that grass, leaves, twigs, cones, other organic materials and coarse dirt are swept up periodically. These will be deposited on the pitch under various seasonal and climatic conditions and, if they are not removed, over time they will work themselves into the fibres. This will affect the permeability because of soiling of the carpet pile. Thus, it is important that they are removed as soon as possible. This can be accomplished with a synthetic lawn rake, a sweeper (when using a sweeper on a filled pitch, make sure not to sweep up too much of the sand) or a blower. A leaf-blower with adjustable settings usually gives the best result. Blow the debris to one side of the pitch with the wind, where it can be collected with a lawn rake and removed. Do not point the nozzle too deep. With filled pitches, care must be taken to avoid the sand shifting or to ensure that the filling of the pile flooring is subsequently evened out again.

In the case of filled pitches (**including "dressed" pitches**), to keep the amount and distribution of the sand in optimum condition, regular sweeping with a triangle brush is highly recommended (once per week is considered appropriate for good maintenance). Do not use metal brushes.

Note that the fill in the long-pile "starter level" pitches may be composed of rubber granules instead of (or as well as) natural or simulated sand.

Wear of the synthetic turf pitch causes micro-grindings. These grindings are concentrated during heavy rainfall and tend to cause a "cake". This material should be removed as soon as possible with a plastic or wooden snow-shovel before it is walked about the pitch and must certainly be separated from the sand before carrying out major maintenance of a filled pitch.

When using machines with engines, take care not to leak oil as it is very difficult to remove oil from synthetic turf. Moreover, oil may damage the elastic layer and as a result affect the pile anchorage. If a tractor is used, check wheel pressures to see that they conform with the limit sets.

3.04 Periodic Major Cleaning of Carpet (Unfilled)

This requires specialised equipment and should be carried out in consultation with manufacturer.

One of the hazards of an unfilled pitch is the very fine soiling from worn fibres, airborne dust, smoke and chemical emissions, fine sand particles and other organic impurities which initially appear on the surface and rapidly seep into the filling of the pile flooring. Not only does this continual invasion of polluting material accelerate the mechanical wear of the pitch but it also clogs the pores, affecting permeability and reducing drainage capacity. Over time, surface pooling will occur in certain areas during heavy rain and will linger longer than is desired after watering.

To prevent this, the impurities must be removed regularly. Special machinery, specifically designed for the purpose (a sweeper-vacuum fitted with two contra-rotating brushes and broad wheels, deployed by experienced operators) is available to carry out the required in-depth suction cleaning of the pitch. The machinery is fitted with an appliance which raises down-trodden fibres. Care must be taken to avoid forming waves in the carpet. Conventional unmodified road-sweepers and sweepers designed for large areas are seldom suitable because of their high surface load and because they usually lack the technical requirements for cleaning synthetic turf.

Before using a machine on the pitch, the surface should always be carefully inspected. Attention must be paid to weakened adhesive seams and line intersections. If any faults are detected, these must be repaired before cleaning begins.

If, over the course of time, impurities appear which can no longer be removed with the sweeper-vacuum, periodic flushing with a high pressure water jet can be used to keep a pitch in good clean condition.

3.05 Treatment of Algae

Algae growth is a natural occurrence caused by humidity. Algae invasions in unfilled pitches occur more frequently in warmer climates especially in pitches that are not cleaned regularly and thoroughly. Usually the first sign is that, in patches, the green carpet turns brown and becomes very slippery.

As a preventive measure, spraying of the surface at given intervals with an approved algae killer is recommended. (Note that too much algae killer will affect the coating of the turf.) There may also be the option of feeding this product through the existing irrigation system by means of a metered addition unit.

The most effective treatment, so far, is to apply a product called "Dimanin Special" (produced by Bayer AG) to the affected area, followed by high pressure water-jet cleaning and suction removal with a vacuum cleaner capable of vacuuming water. If the pitch is under warranty or is subject to a service contract, this treatment is best left to the contractor. The most important action by the pitch proprietor is early detection and reporting.

More information about the treatment of algae is provided in Appendix A to this document.

3.06 Treatment of Moss/Weed

Filled pitches are not so affected to algae attacks but are subject to the growth of moss (particularly in shaded areas) and growth of weeds arising from seeds blown onto the surface. Early detection is important. In the case of moss, high pressure water cleaning wherever and whenever it appears is the best measure. With weeds, removal by hand is usually adequate, taking care not to damage the turf or its sub-base. However, if the problem is not solved, weedicide may be required - refer to the manufacturer or contractor.

3.07 Repairs to Seams/Tears

If lines, seams, etc. come loose, they must be repaired as soon as possible. A loose seam of just a few centimetres can quickly become a tear of several metres unless quick action is taken.

The need for carpet repairs can occur in both types of pitches but tends to occur most frequently at the seams of an unfilled pitch, particularly on a loose-laid surface. If the carpet is fixed to the sub-base, the seams will usually be held by a seam tape or butt-jointed with a glue bead or, alternatively, lap-jointed using glue. After exposure to weather and regular wetting, these seams may be subject to separation or peeling failures. These can be repaired, usually by re-gluing, if problems are detected early and reported to the manufacturer or contractor.

The stitching in the seams of loose-laid unfilled pitches will become exposed to sunlight and abrasion at a relatively early stage. Unless the stitching cord is treated for ultra-violet resistance (check with manufacturer before deciding on the carpet!), it will soon break up particularly in conditions of prolonged sunlight. Re-sewing can be undertaken but is never very easy to do on top of the carpet and often leads to smoothness imperfections which cause erratic ball behaviour. This is one of the major weaknesses of loose-laid design which has led to the wider use in recent years of fixed carpets with either sewn or glued seams.

3.08 Line Marking and Painting

As this is often specific to the type of turf, details of line marking and painting procedures are best left to manufacturers' instructions.

3.09 Treatment of Chemicals and Stains

There are numerous toxic chemicals which may come in contact with the turf. The best advice is to take all

possible precautions to avoid their incidence in the first place. However, if chemicals are spilt, or stains appear, it is important that they be detected early and action taken immediately. Remedial treatment will depend on the chemical and type of turf. Again, reference to manufacturers' instructions is advised.

3.10 Major Treatment of Filled Pitch (Rejuvenation)

Over time impurities will intermingle with the sand in a filled pitch, detracting from its playability, creating potential for skin abrasions to become septic and causing hard spots in the playing surface. Periodically, a basic maintenance procedure should be carried out to cleanse the pitch.

First, the amount of sand is checked. Then systematic inspection across the width of the pitch is carried out. All seams and woven-in lines are checked for tears and loose parts. If present, weeds along the sides and ends of the pitch are removed (ensuring that the roots are removed as well) making sure not to damage the sub-stratum in which they have grown. The perimeter of the pitch is treated with herbicide (e.g. "Roundup" from Monsanto).

Next, all loose refuse and coarse impurities are cleaned from the surface. The pitch is now subject to a treatment which consists of "tossing" it intensively. The process is carried out by progressing lengthwise and, if necessary, cross-wise. The sand filling is extracted with a special rotating brush. This sand is separated during the brushing process by vacuuming up the very fine impurities and, if necessary, is fed back into the upper covering through a riddle sifter to separate sand and small stones. Hard spots should also be brushed up with a stiff brush (not metal). Brushing out when the sand is damp is inadvisable because it is not possible to remove the dust which may subsequently be brushed back in.

The pitch is now brushed again to remove all remaining loose refuse. Then all "spots" are supplied with extra sand (ie new sand is strewn in and brushed with a synthetic broom).

This treatment has the following advantages:

- the structure of the sand becomes and remains loose, which makes the pitch more pleasant to play on and reduces the chance of injury;
- the sand is "aired" so that moss and weeds get less chance to grow;
- existing moss is partially or completely removed;
- permeability is improved, which inhibits soiling of the top layer and reduces puddling.

During major maintenance, it is opportune to check all accessories such as goals, dug-outs, flag poles, etc as well as fences and gates. They should be repaired or replaced as necessary.

3.11 Replacing and/or Up-grading

Average life of a pitch (depending on playing intensity) is about 10 years, several years more if it is well maintained, considerably less if not. Provided the sub-base has not been damaged, and irrigation/drainage systems are in good condition, at the end of this period a further 10-12 years of life should be obtainable essentially by only having to replace the carpet.

4.00 SUMMARY OF KEY POINTS

- 1 Take care in the design stages to facilitate simple and effective maintenance features.**
- 2 Post clearly positive actions and prohibitions and closely monitor adherence to them.**
- 3 Ensure that the pitch is properly watered before every match or practice activity.**
- 4 Carry out simple maintenance regimens and routine inspections regularly.**
- 5 Attend to any problems urgently and take remedial action immediately.**
- 6 Refer to manufacturers for expertise required to ensure proper maintenance.**

7 Adhere to the long-term maintenance programme recommended by manufacturers.

APPENDIX A

Red Card for Algae (April 2001)

How can their formation and spread on unsanded synthetic turf sports fields be combated by preventative and remedial action?

According to the past emphatic motto of the manufacturers, the construction of a synthetic turf pitch provides trusting gullible users with a practical and low maintenance sports field with hardly any running costs.

In the course of years, and favoured by intensive watering during training and playing, a phenomenon occurs that the affected owner is virtually powerless to prevent. This phenomenon is called algae.

Algae are unicellular and autotrophic (ie single-celled and self-feeding) plants that extract water, mineral salts, sunlight and carbon dioxide from the environment (air or water), and incorporate it into their plant structure (photosynthesis).

Normally algae grow in seas and lakes and are regarded as unpleasant and a nuisance by humans only when they occur in large masses (a phenomenon called "surface water eutrophy") on in unwanted places.

One example of this annoying plague is the explosive growth of this biological family in outside swimming pools and garden ponds unless these are protected by suitable preventative measures

One object of the mass spread gratefully chosen by algae are the synthetic turf pitches of sports fields, as here they can sometimes find excellent living conditions.

The possessors of a synthetic turf pitch must ask themselves a series of important questions, which I shall attempt to examine on the following pages of this guide:

- 1 How can the formation of these algae be prevented at all?**
- 2 How can a layman establish whether algae have even formed?**
- 3 What can be done to combat and remove existing algae growth?**

Regardless of their type of polymer (polypropylene / polyethylene or nylon) and type of construction (tufted or knotted / rustled), most unfilled synthetic turf pitches are sooner or later colonised by algae to some extent or another, depending on their location and surroundings, and therefore the prevention of growth should take first place in the solution of the problem.

The first important measure is "*cleanliness*".

Avoid planting deciduous trees, shrubs and hedges and where possible gradually replace these with evergreen varieties.

Poplar (and also weeping willow) in particular has no place at the edge of a synthetic turf pitch. These trees attack the turf not just by shedding leaves and a sticky white blossom but also by the destructive effect of their extensive root system, that can sometimes even break up and raise the foundations.

One of the most important maintenance tasks is regular cleaning of the synthetic turf. A series of cleaning machines are offered on the market for this purpose. Experience has shown that the best machines are the specialist ones that have a suction unit and also two counter rotating brush drums and are fitted with wide tyres. Single drum cleaning machines are effective only where the pitch area is only slightly dirty.

Drivable blowers that use air pressure to blow the dirt from the floor to the edge of the pitch are suitable in some cases. However, the dirt must then be disposed of in a second working step.

If the soiling of the synthetic turf can no longer be dealt with by the in-house equipment, then a specialist company must be entrusted with the task. These specialists have access to machines that use rotating fine jet nozzles and variable water pressure to drive the dirt particles from the floor and at the same time pick up the dirty water using a vacuum cleaner (vortex process).

Experience in swimming pools and own experiments with synthetic turf surfaces have shown that, for

economic and ecological reasons, **prevention** of an unwanted algae infestation is clearly preferable to combating an already established species. For this method, the required amount of an effective algicide is continuously added to the sprinkler water. The applied product concentration is usually around 10 ppm (10 parts per million) and should be raised to 20 ppm only in recalcitrant cases.

The agent of choice is a quaternary ammonium chloride with the chemical name "didecyl-dimethyl-ammonium chloride", which is marketed by the firm Bayer under the name "DIMANIN spezial" and by the firm Menno-Chemie under the name "M+ENNO-TER forte". In addition to its purely algicidal action, the quaternary salt is also adsorbed onto the pile fibres by the "van der Waals" forces arising from its chemical structure, and this significantly extends its long term action and also reduces electrostatic charge build-up.

For continuous use with synthetic pitches, it is necessary to incorporate a dosing plant. The core item of this apparatus is a corrosion-resistant dosing pump that feeds the algicide from a reservoir container into the sprinkler water.

A detailed description of the dosage plant to be incorporated is appended to this article.

Once algae have formed (for example, if preventative measures have not been performed), this can be seen as a change in the colour of the surface of the synthetic turf. If spread is severe, the playing properties of the affected areas can also change. When rained on or watered, the mat becomes increasingly slippery and the players can lose their grip even with the special synthetic turf shoes. Accidents and resulting injuries are then inevitable.

If safe playing on the pitch area can no longer be ensured, the next step is to combat the formed algae. The treatment of a hockey pitch (including the field margins outside the marked pitch) with an area of 5'500 to 6'000 m² requires 10 litres of the standard commercial 32.5 % "DIMANIN spezial" solution. For use, these 10 litres of concentrate must be stirred into 2'000 litres of water (not vice versa owing to possible foaming). The resulting 0.5 % end-use solution should be applied uniformly over the area to be treated using a mobile spraying unit during dry weather (it should not rain for several hours after spraying).

The biocidal action sets in relatively rapidly, and can be observed as a marked lightening of the initial brown colour.

As the breakdown product of the "dead" algae remains slippery, every combating action must always be followed by the intensive cleaning described above using the rotary vortex method. A period of 48 hours should be allowed to elapse between spraying on the algicide and mechanical pressure cleaning, in order to ensure that all algae are reliably killed.

A further agent suitable for combating algae is "DIMANIN A" (benzalkonium chloride) that is also manufactured and marketed by Bayer. However, as three times the amount must be used to achieve the same effect as "DIMANIN spezial", it is used only in rare cases where the waste water of a treated synthetic turf pitch runs directly into waters inhabited by fish.

Dr. Schneider
Bad Dürkenheim, 28.02.01

<i>Instructions for Use</i>		
<i>DIMANIN spezial</i>		<i>DIMANIN A</i>
	<i>Stir</i>	
<i>10 litres of 32.5 % concentrate</i>		<i>30 litres of 33 % concentrate</i>
	<i>into</i>	
<i>2'000 litres of water (0.5 % solution)</i>		<i>3'000 litres of water (1 % solution)</i>

After mixing well, apply evenly using a spray applicator. After waiting for 45 hours, perform thorough deep-cleaning.

Strictly observe the safety guidelines specified by the manufacturer when working with the undiluted liquids. Always wear protective spectacles and protective gloves during the dispensing and dilution steps.

The diluted end-use solutions are neither irritating to the skin nor harmful to health.

Continuous dosage of "DIMANIN spezial" or "M+ENNO-TER forte" to prevent algae formation on unfilled synthetic turf

Apparatus:

- dosing pump with corrosion-resistant pump head of polypropylene (e.g., type BT 4a 1005 PPE of the firm Prominent in Heidelberg);
- 140 litre reservoir container in polypropylene;
- suction lance with level switch;
- dosing valve;
- pressure hose.

The capital costs for this apparatus are about 800 EURO including tax. To this must be added the on-site assembly costs.

Dosing and dosing amounts

In normal cases an algicide concentration of 10 ppm (10 parts per million) relative to the 32.5 % original solution is used. 10 litres of this "DIMANIN spezial" original solution is diluted with water to give 100 litres of a 10 % working solution.

The output of the pump is adjusted so that 100 ml of the 10 % working solution is added per 1 cubic meter of sprinkler water.

For example, if the sprinkler system delivers 30 m³/hour, then 30 x 100 ml = 3 litres of the working solution must be dosed in.

Annual requirement for "DIMANIN spezial" original solution

An annual water consumption of 2000 m³ for sprinkling of the synthetic turf requires 20 litres of "DIMANIN spezial" solution.

APPENDIX B

REFERENCES and RESOURCES

FIH Publications:

Handbook of Performance Requirements for Synthetic Hockey Pitches - Outdoor, 4th Edition (June 2000)

Guide to the Artificial Lighting of Hockey Pitches, 2nd Edition (April 2000)

Listings of FIH Approved Hockey Products

For further information see FIH web-site www.worldhockey.org and the "approved equipment" link on the home page

APPENDIX C

Acknowledgements

Recognition is extended to a number of manufacturers of FIH approved products who have put their documentation at the disposal of the FIH Equipment Committee for the compilation of these guidelines. In particular, the documents kindly provided by Desso and AstroTurf were most helpful.

The contributions of Frank Yeend, Chairman of the FIH Equipment Committee from its inception in 1986 to 1996, is greatly appreciated. Reference to Frank's numerous articles, in particular his 1999 publication *Synthetic Hockey Pitch Solutions*, has proved invaluable in the compilation of this document.

Preparation of this Manual was instigated by Bob Davidzon, Chairman of the FIH Equipment Committee from 1996 to 2001. Bob's creative ideas, organisational skills, guidance and attention to detail were crucial in the evolutionary process of developing these Guidelines.

Acknowledgement is also extended to fellow sub-committee members Allan Woods, Kurt Schneider and John Giles for their contributions during the compilation and editing phases of these Guidelines.

Valuable feedback was provided by Brenda Read, former Equipment Committee member, and Colin Horsley of the English Hockey Association, who are also gratefully acknowledged.

**John McBryde,
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