

SPORTS TURF MANAGER

... for better, safer Sports Turf

DECEMBER 1998

Snow Mould

What to Do to Protect Your Fields

If you believe what the weather forecasters say, we can expect a long cold winter in the days ahead. A winter like this usually translates into lots of snow, and this creates perfect conditions for snow mould diseases to develop and thrive.

Snow mould can be devastating on turf, especially on golf courses where entire greens can be wiped out over the winter. This same result can happen on sports fields, so it is in the best interests of the sports field manager to be aware of the potential effects of snow mould diseases and work on preventing their development.

Snow mould can be devastating on turf, especially on golf courses where entire greens can be wiped out over the winter.

There are two types of snow mould, pink (*Fusarium*) and grey (*Typhula* sp.), which can affect all cool season turfgrasses. Annual bluegrass, perennial ryegrass, and creeping bentgrass are highly susceptible. The disease occurs under snow cover, and the results become evident after snow melt.

Conditions which favour the development of snow mould are: long periods of snow cover; temperatures around the freezing point (0-15°C) under high moisture conditions; and long grass under high nitrogen conditions.

You will know if you have snow mould if circular patches from 10-25 cm with a bleached appearance appear after snow melt. These areas can overlap to form large irregular patches. Longer turf may show general blighting. Under severe conditions (usually snow cover for more than 90 days), large areas of turf can be affected leading to crowns and roots being killed with little or no recovery in the spring. Snow mould tends to persist in the same areas from year to year.

To help prevent snow mould development, the following cultural methods can be employed to lessen the effects:

- minimize thatch;
- avoid succulent growth going into late fall;
- improve air circulation, remove excess water, and rake leaves;
- avoid compaction on the field from snowmobiles, etc.; and
- try to prevent the formation of large snow drifts by using windbreaks and snow fencing.

Preventative fungicides can also be applied in late fall to sports fields, bowling greens, and areas which seem to get snow mould every year. Consult product labels and provincial publications for products, uses, and recommended rates.

After winter, if damage has occurred, rake the matted areas to encourage drying. If the turfgrass has been killed, seeding, sodding, or other measures may be required.

Snow mould can be a potentially devastating disease. However, if turfgrass areas are prepared properly, the effects can be greatly minimized, resulting in turf which is healthy and playable earlier in the spring. ♦

— Harold Van Gool

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Firming up Your Winter Schedule?

Check out our extensive list of Coming Events on page 12 of this issue of Sports Turf Manager.

STA Questionnaire

The Sports Turf Association telephone questionnaire, which so many of you answered during 1997 and 1998, provided your Association with a wealth of reliable information and assisted in bringing names, addresses, and contact information up to date. Most members appeared satisfied with the overall workings of the Association and indicated that questions were answered promptly when phoned into the office.

Many of you were too far away to attend either the field day or the symposium. Those that did attend had some very useful suggestions for future topics of discussion (see below).

The majority of those surveyed described the quality of the *Sports Turf Manager* as excellent, retaining past copies for future use. Quite a few indicated they would write articles for the newsletter (we'll be in touch!). More, however, expressed interest in serving on the Board of Directors or as a committee member.

Most found the membership roster helpful and kept it close at hand for networking and supplier names.

With respect to funding research, most agreed to do so if the projects were relevant and not a duplication of past efforts.

In conclusion, we have listed your comments as they relate to articles or topics you would like to see addressed in the future either in the *Sports Turf Manager* or at symposia or field days.

Sports Turf Manager

- ◆ new trend developments
- ◆ monthly bulletin on equipment tips
- ◆ technical articles by Bob Sheard
- ◆ do not allow it to become just a look at shiny new equipment

Administration

- ◆ user fees (including formats for costs vs. user fees)
- ◆ liability updates
- ◆ how municipalities or public organizations handle the need for increasingly longer seasons
- ◆ survey of playing dates & policy

Professional Development

- ◆ career and training opportunities for students, job postings, professional development opportunities
- ◆ every other year do a "hands on" field education day
- ◆ profile turf managers who have come up through the ranks - managerial skills

Turf Basics

- ◆ improvements in root zone construction and root zone materials
- ◆ turf diseases and biological controls
- ◆ seed, fertilizer, chemicals
- ◆ alternatives to sand-based turf
- ◆ soils, drainage, irrigation

- ◆ pesticide/herbicide management
- ◆ plant/soil science
- ◆ how plants grow, grass response, botany, photosynthesis
- ◆ pesticide update (reductions vs. banning)
- ◆ crumb rubber - who else is using it, class 2 seed mix, culture practices
- ◆ research on real life fields
- ◆ turf trials
- ◆ irrigation, layers of soil, alternate green method
- ◆ how to correct turf problems, e.g. how to bring back old soccer fields
- ◆ use of composts

Facilities

- ◆ work done at your facility
- ◆ renovation alternatives
- ◆ tender specs
- ◆ maintenance
- ◆ more info on golf courses

Please Note: Topics that members wanted to see researched were very similar to those issues listed under the administration, turf basics, and facilities categories described above.



**Thank-you to all
our participants!**

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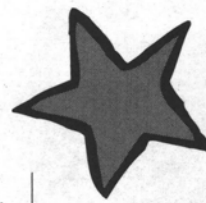
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Lee Huether is in the office from 9:00 a.m. to 2:00 p.m. Monday, Wednesday and Friday. The office phone number is (519) 763-9431.

At other times, a message may be left on the voice mail system. Please include the vital information of name, telephone number with area code, and time of calling. The office may be reached at any time by faxing (519) 766-1704 or via email.

Letters



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— F. Scarpellini

Editor's Note: The inclusion of this correspondence is for the information of our members and does not constitute an endorsement of the product. Please email your reply directly to F. Scarpellini at fscarpellini@tinet.ch.

If you are looking for a specific market for your products, advertise in *Sports Turf Manager*. Published four times a year, this newsletter has a national and international distribution with the majority of the membership residing in Ontario. 1998 advertising rates are as follows:

- business card size \$40.00
- 1/4 page ad \$80.00
- 1/2 page ad \$160.00
- 1/4 and 1/2 page ads are available in either a vertical or horizontal page placement.

For more information, contact Lee Huether at the STA office, (519) 763-9431, or Joy Black at New Paradigm Communications, (519) 371-6818.

**Content deadline for the March
issue of Sports Turf Manager
January 15, 1999**

News Brief: No Soccer at Pan-Am Games?



WINNIPEG - Soccer's international governing body, FIFA, is threatening to withdraw its support of the Pan-American Games soccer tournament because of concerns there are not enough venues for the sport.

"They sent a representative here to look at the two fields recently, and the letter indicated they thought two fields weren't good enough," said Bob McMahon, chief operating officer for the Games.

"We don't know what else they are concerned with, they didn't spell anything out, but we'll be speaking with them to try and work it out."

McMahon said one soccer field originally was planned to host the men's games and another field set aside for the women's matches.

McMahon said two additional fields have been established in response to the concerns from FIFA.

McMahon said he hopes to iron out any problems because if FIFA removes their support there will be no soccer at the Games.

— *Canadian Press, The Record, November 3, 1998*

PLEASE NOTE

The articles written within do not necessarily reflect the views of the Sports Turf Association.

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CHRISTOPHER MARK
The President's Desk



Hello to all members. I am sure by the time everyone reads this, all your athletic field maintenance responsibilities will be concluded for the year and a few months of reduced pace will be welcomed after a hectic summer and fall. It was a difficult season for most, and those without irrigation on their fields faced larger challenges than usual. I for one do hope we receive the "forecast" of significant snow accumulation this winter since our fields, both athletic and agricultural, are starved of moisture.

Now it is the holiday season and a time for sharing and enjoying time with family and friends. I would like to extend my sincere thanks to the Board of Directors and especially to our Executive Manager, Lee Huether, for their excellent efforts, support, and dedication during 1998. I would like to personally thank Lee, who has been with us for just over a year. She continues to provide the membership and the Board with outstanding service and ensures the day-to-day administrative affairs of the Association are promptly looked after on our behalf.

Another individual I would like to express appreciation to is Dr. Ken Carey, who at the GTI is always available to assist us with computer/technical assistance. The use of email for the Association during 1998 has been a huge success, and without Ken's help, this technological transition would have been much more difficult. Although we presented him with a book at the summer Field Day, I would like to again offer our

appreciation to Ken and all his efforts to support the STA.

With Christmas holidays upon us, members will have an opportunity to relax and prepare for the OTS '99, Turf Technologies: Positioning for the New Millennium. It is hard to believe but another great symposium is almost here. The improved brochure is terrific and the layout is superb. The list of speakers, suppliers, and scheduled activities indicates that Pam Charbonneau and Peggy Nagle have put forth another great effort.

When you register, please ensure you check the Sports Turf box in the Industry Sector portion on the registration form. Ticking this box indicates your membership or affiliation to the STA and credit will be given to the Association. Funding from the OTS is one of the primary revenue streams for the STA, so please take the time to check off the box.

While at the OTS, please join us at the Annual General Meeting and Dinner on Tuesday, January 5, 1999 at 7:00 p.m. Contact Lee at our office for more information and to reserve a seat for the dinner. It promises to be a wonderful evening.

To all STA members and their families, I wish everyone a happy, joyful holiday season. May the spirit of the season and the fellowship and goodwill always displayed at Christmas remain with all of us throughout the coming year. Best wishes.

Yours for better, safer sports turf. ♦

— Christopher Mark



Ontario Turfgrass Symposium

January 5, 6, & 7, 1999
Toronto, Ontario, Canada

Support Your Association and Save Money Too!

When registering for the OTS make sure you indicate you are a member of the Sports Turf Association, a sponsoring association of the symposium. On your registration form please Sports Turf Association to ensure your membership credit is directed back to us!

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Save more money on the registration fees of others from your facility/organization who are not members of the Sports Turf Association. Non-members registered **at the same time** as a member qualify for the same lower association rates.

Send the registration in the same envelope, fax it at the same time, or make just one phone call to register.

See You There!

Essence of Life: Water is the Key Ingredient

A healthy turf requires constant vigilance, and water is a vital ingredient. Every athlete wants to play on perfect, green grass that is soft and resilient, yet firm enough for good footing. These same athletes also want a field that is tough, wear-resistant, and weed-free.

"Water management is a key component of good field design and maintenance," says Dr. James Watson, Vice President & Agronomist for the Toro Company. Dr. Watson consults with sports fields around the world. He also works with Disney's Wide World of Sports® and is involved in preparing stadia for elite competitions, such as the World Cup.



**Even the heartiest
turfgrass cannot
maintain its growth
and resiliency without
supplemental watering ...**

Even the heartiest turfgrass cannot maintain its growth and resiliency without supplemental watering, and some fields require more precise watering than others. Fields that sustain intensive play or that support football, rugby, or American football, need sand-based soils to ensure good playing surfaces while avoiding soil compaction. However, sand-based fields do not hold water or nutrients well and must therefore be watered more frequently, with smaller amounts of water. These fields also require smaller amounts of fertilizers applied more often. Fertilizers or nutrients may also be applied through an appropriately designed irrigation system, through a process known as "fertigation."

Water may also be applied to turfgrass in several ways to keep it green and resilient throughout the growing season. Hand watering is an effective way to treat stress areas but is most useful when used in conjunction with an installed irrigation system.

Another external watering option is the use of sprinklers that

pull themselves on a hose or wire-travelling sprinklers. They are largely limited to very small areas of established turf, as this method washes away grass seedlings during the grow-in phase. In addition, they require labour to move the equipment to various field areas and must be watched to ensure that they move freely, avoid obstacles, and are not subject to vandals.

In cases where soil is heavy or compacted, an automated system is capable of running multiple cycles to ensure water infiltration into the soils and percolation through the seedbed. Quick cycling capability is also effective for newly seeded or sodded fields, and when turf needs to be syringed to affect evaporative cooling during times of extreme heat and stress. Every field should be equipped with quick coupling valves around the field to allow hand watering or syringing of turf and to provide emergency water. They can be easily installed with automatic irrigation systems.

Water management also includes conservation strategies. Only an automatic irrigation system provides fingertip controls that alter irrigation cycling, which will conserve water and apply it efficiently and uniformly. The system may also include a rain switch to shut off automatic sprinkling during rainfall.

Another consideration when choosing an irrigation method is response time by support personnel. Missed watering cycles due to equipment failure can be a death-blow to athletic turf. When selecting irrigation equipment, it is important to choose a reputable supplier that offers local field support to customers.

With many stadium debates surrounding professional athletics and continual growth in community fields, groundskeepers are challenged to provide optimum turf under ever changing financial and social conditions. Good water management decisions by today's groundskeepers will ensure every athlete plays on the toughest, safest, and greenest turf possible. ♦

— Reprinted from the Panstadia International Quarterly Report, Volume 5, No. 2, August 1998

Note: Toro irrigation systems are found on the world's top sports venues including the Stade de France and Disney's Wide World of Sports complex.

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Cold Weather Management

MICHAEL BLADON

What are you doing with regard to winter kill on your sports fields this year? Field safety also includes trying to prevent winter injury to your turf by using good management practices. Winter kill is defined as any injury to turf during winter. These injuries include low temperature kill, desiccation, low temperature diseases (see the cover article on snow mould), ice cover damage, and heaving. I have seen a Merion Kentucky bluegrass field dead from low temperature kill. The grass leaves were a whitish brown and then turned a dark brown. Leaves were limp, just like a mat on the ground. Temperatures had exceeded -30°C . There was very little snow that year, and the field was quite exposed to drying winds.

Cold Hardening

Cold hardening is the first process that occurs as the grass plant goes into winter dormancy. It is an adjustment in the plant's growth. Shoot growth slows gradually over a three to four week period to maximize hardiness while temperatures are still above freezing ($2-7^{\circ}\text{C}$). There is an increase in carbohydrate levels and a decrease in the tissue hydration level. During the cold hardening process, the water content in the grass plant may be lowered from 85% to 60% depending on the species and cultural practices employed. What should you do at this stage?

- ◆ Check your field for surface and subsurface drainage.
- ◆ Raise mowing heights during the hardening process.
- ◆ Boost potassium levels.
- ◆ Avoid high nitrogen (N) levels. Fall fertilization is an acceptable practice using a high N analysis fertilizer after the grass has gone into dormancy (usually late Oct., early Nov.).
- ◆ Maintain adequate phosphorous levels.

Low Temperature Stress

At -15 to -24°C , roots tend to be cooler than shoots. With low temperature stress, ice crystals form and damage the protoplasm through fracturing. (Protoplasm is the jelly-like substance of plant and animal cells basic to all life processes.) Crown hydration is not a cause of low temperature stress. If the area is poorly drained, the leaves can take on a water-soaked whitish brown colour as the plant loses chlorophyll (its characteristic green colour). Examine the individual plants crown/node meristematic tissue. It should be firm and white. If it is brown and mushy, you have a problem. Bring in the same plugs, add moisture, and examine. The root tissue will have larger cells. All leaves and roots can be killed. Turf will survive as long as long as meristematic tissue in the crown of plants and in the nodes of shoots survives. Select cold hardy cultivars as well as species.

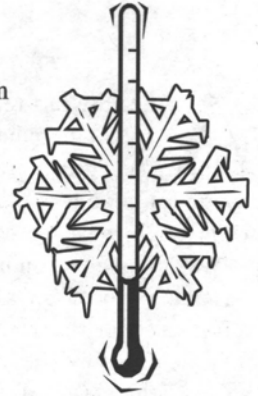
Low Temperature Kill (-5 to -20°C)

The northern adaptation of ryegrasses and tall fescues is restricted by low temperature kill. Soil temperature is more important than air temperature in causing low temperature kill. There are four situations when it can occur: (1) during freezing,

(2) after freezing when an equilibrium is reached, (3) during thawing, and (4) after thawing. Factors which influence the absolute killing temperature are:

- ◆ plant hardiness level
- ◆ degree of tissue hydration
- ◆ number of freeze-thaw cycles
- ◆ shaded risk - low carbohydrates
- ◆ repeated freezing and thawing
- ◆ saturated turf

In a simulation chamber, there was no kill in rough bluegrass or in creeping bentgrass at -10°C . Weakest were the ryegrasses. Stress tolerance was maximized by balancing nitrogen to potash by a ratio of 3:2.



Ice Cover

This is where oxygen is excluded from the meristem, and toxic levels of carbon dioxide accumulate in the meristem under the ice. Dr. James Beard was the first scientist to investigate the effect of winter injury on cool season turf in the 1960s. He took plugs of turf, creeping bentgrass, Kentucky bluegrass, and annual bluegrass and allowed them to harden fully in the Michigan area. They were then placed in glass jars that were filled with water and slowly frozen to form dense clear ice. He found that the bent and Kentucky bluegrass were not killed after 100 days and survived without significant injury. Annual bluegrass (*Poa annua*) was killed at 90 days.

Turf kill associated with ice cover typically occurs during the freezing or thawing period when standing water hydrates the crown/node meristematic tissue. Cell protoplasts are crushed, and crowns are not affected. With sleds, toboggans, and foot traffic, damage is minimized as long as an inch of frozen snow cover is present on traffic paths and wet slushy conditions do not exist (-7°C).

Desiccation

This is a major cause of winter kill. Desiccation is usually more severe on elevated areas, sites exposed to excessive drying winds, or areas where surface water run-off is high. Typically, leaves are a distinct white and remain erect in high dry areas.

Some recommendations are the use of organic mulches, brush or synthetic covers, or windbreaks such as shrub plantings or snow fences. Covers may be solid plastic or ventilated, and the integrity of the seams is very important. Covers keep water off the crowns. They should be installed before the soil freezes or first snowfall, and the area must be covered properly. First, remove all clippings and leaves. Second, ensure fungicides for snow mould control have been applied, and lastly, put the cover in place and stake it.

Covers should be removed when there is a low probability of winter injury and before excessive shoot growth occurs. Record temperatures and keep a daily log. Preventative maintenance is

the key. Moderate nitrogen and control thatch on turf. As for soil, perform no late corings and do not leave holes open. Adjust your fall irrigation to maintain adequate soil moisture to avoid winter drought, saturated soil, or standing water, and reduce thatch accumulation.

Conclusion

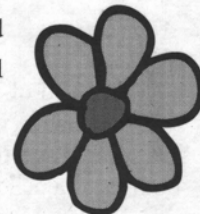
It is the wise sports turf manager who will increase vigilance on his/her fields following this article. In areas where there is a lack of snow cover, increasing freeze-thaw cycles, or little rainfall, desiccation may become a problem. Conversely, areas of high winter traffic, i.e. outdoor ice rinks, may have to be located away from sports fields. A little preventative maintenance can result in a field or fields that are ready for play after surviving a harsh winter relatively unscathed. Have you filled in those low areas where water may accumulate? Have you raised your cutting heights? These and other issues may be particularly important when groups are asking or demanding to be allowed on the fields earlier in spring. Begin planning now! ♦

References

- ♦ Pam Charbonneau, OMAFRA Turf Specialist, GTI Advisor, February 17, 1998.
- ♦ J.B. Beard, Ontario Turfgrass Symposium - notes, Winter Turf Problems, January 1997.
- ♦ J.M. Roberts, University of New Hampshire, Golf Course Management, October 1993.

Communities in Bloom

YOUR ASSOCIATION was well represented at the Communities in Bloom First Annual Symposium on Parks, Grounds, and Open Spaces on September 24th and 25th in Winnipeg, Manitoba. STA member/director Dr. Bob Sheard represented the Association, addressing the topic *Design and Construction of Sports Turf Fields*. STA member Vic Hergott was also on the speaker roster with a presentation entitled *It's Time to Stop Playing Around*. ♦



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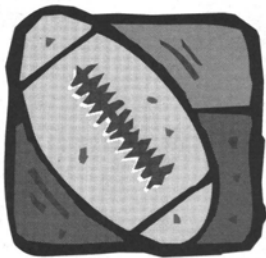
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'Every Child Deserves a Place to Play'

THE NATIONAL PLAYING FIELDS ASSOCIATION OF THE UNITED KINGDOM

In a land of 57 million people (more than a quarter of the population of the USA), that would fit nearly 40 times into the USA, competition for space is keen. The United Kingdom faces a major dilemma: the need for constant new building and development and the need to protect its playing fields—and in the United Kingdom, that generally means turfgrass. With constant demands for new housing, roads, supermarkets, and car parks, the easy option has too often been a sacrifice of the nation's recreational land. But, as the humorist Mark Twain once observed: "The trouble with land is, they've stopped making it!"



The United Kingdom faces a major dilemma: the need for constant new building and development and the need to protect its playing fields ...

However, as is so often the way of the British, the people are fighting back. Leading the crusade against the continuing loss of playing fields is an independent charity, the National Playing Fields Association (NPFA), which was established in 1922 to protect and improve recreational land. Involved in the organization are such world-renown notables as Prince Philip, the Duke of Edinburgh, who serves as President, and NPFA Vice-President Michael Caine. Roger Moore of James Bond fame, also lends his active support to the organization.

To the NPFA, the value of physical activity among children is paramount. It believes it is essential that the habit of keeping active and fit should be formed at school age. Once children leave school, many of their games, sports, recreations, and other pastimes are forgotten, and there is little likelihood that the fitness habit will be developed in adulthood.

Surveys have led to a growing concern about the fitness of British children. One study revealed that 90 percent of children in a major provincial city were not as fit as they should be. Part of the problem comes from the fact that many of them are being denied the facilities they need to play freely and safely at school and outside of school hours.

The NPFA believes that generally, children are still keen to play games and sports, and particularly on a natural surface provided by turfgrass. However, if society makes it increasingly difficult for them to do so, they will inevitably drift more and more to passive pastimes, thus becoming less physically fit.

To counter the loss of playing fields, the NPFA carries out its protective role in a number of ways, including constant lobbying of central and local government bodies. It has had some success in persuading them of the value of one of its major planks of policy—the NPFA Six Acre Standard. Broadly, this recom-

mends that a minimum of six acres (2.43 hectares) of recreational land should be provided for every 1,000 people in the population. The NPFA also acquires land for sport, recreation, and play and at present owns 111 playing fields or open space sites. These holdings make it the largest owner of formal recreational land in the country.

The charity also promotes improvement of play fields by providing an independent advisory service on all technical aspects of outdoor recreational facilities. This includes design, layout, installation, construction, management, and maintenance and can range from advice on soil, drainage, and irrigation to floodlighting, fencing, and line marking.

The NPFA also recognizes the value of turfgrass playing and sports fields because of their increased margins of safety, cleanliness, and diversity. While not all play and sports areas can appropriately be turf-covered, the vast majority in the United Kingdom are. The reduction of injuries, both major and minor, to active participants on well maintained turf has been well documented by numerous scientific studies. The NPFA accordingly encourages not only the use of high quality turf playing areas, but also their proper management and maintenance to ensure that the quality is ongoing.

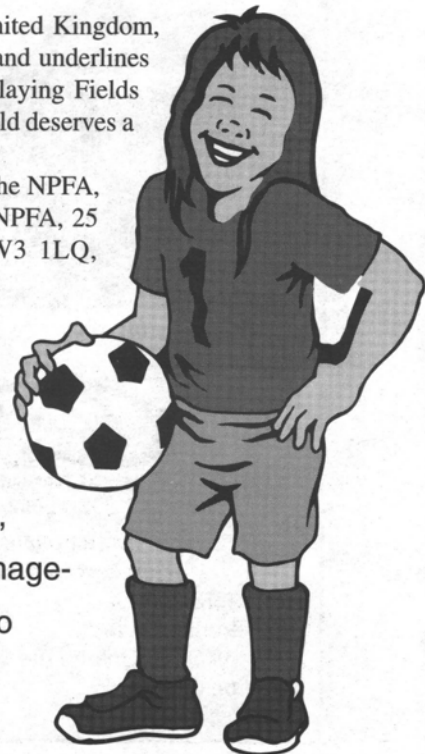
The NPFA has proven what common sense tells us and that is, if children are given a reasonable opportunity to play out of doors on a well maintained area, they will gladly do so. Also, a community which provides a mix of activities including safe and adventurous play, sport, and recreation, will benefit from healthier, more intellectually developed, imaginative children. They will grow into adults who will contribute much more to that community.

The need, not only in the United Kingdom, but around the world is urgent and underlines the relevance of the National Playing Fields Association's slogan, "Every child deserves a place to play."

For more information about the NPFA, write to Elsa Davies, Director, NPFA, 25 Ovington Square, London SW3 1LQ, United Kingdom.

— Tony Brett Young,
NPFA, United Kingdom

The NPFA encourages not only the use of high quality turf playing areas, but also their proper management and maintenance to ensure that the quality is ongoing.



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The Mechanic's Corner

REDUCE COSTS THROUGH LUBRICATION ENGINEERING

Managers are daily trying to improve the profit picture. Rarely do large-scale improvements come about without large capital investment, yet the lubrication engineers can help affect these improvements with little cost. This same effect can affect energy savings, many times reducing plant operating costs.

Correct lubrication, coupled with improved maintenance practices, are now providing savings in five figures in a typical mid-sized industrial plant in the American Midwest. Many of these savings are of a recurring nature resulting in savings year after year.

The following items all take advantage of new lubricant technology or new technology developed in lubrication application. These and other similar examples are shown with possible cost reductions or savings.

(1) Longer Anti-friction Bearing Life

Anti-friction bearing fatigue life was extended by a factor of seven as a result of oil additive technology developed for the Concorde SST. This technology is now available in certain oils commonly used in this plant for anti-friction bearings and gears in about 50 lathes, turret lathes, six spindle automatics, and 12 N/C machines. Longer anti-friction bearing life results. Lower maintenance cost and downtime are also a bonus.

◆ *savings per year: 1984 - \$3,000*

(2) New Synthetic Engine Oils

New synthetic engine oils have increased internal combustion engine life and extended oil drain periods. Engines start easily at -30°F.

◆ *savings per year: 1984 - \$3,000*

(3) Longer Life on Variable Speed Drive Bushings

Many milling machines which have variable speed drives utilize nylon bushings 1" diameter x 1/64" and check and crumble after a few year's service. New non-metallic bushings of compounded PTFE have now been in service for some time and no replacements have been necessary. This is important considering the number of machines in service and downtime for replacement,

◆ *approximate savings per year: 1984 - \$900*

(4) Big Savings by Correct Internal Cleaning of Machines

Many machines which use oil in crank cases, gear boxes, hydraulic systems with valves, or have slide mechanisms that periodically need cleaning to prevent sticking or wear. A fairly new type of gum solvent which will dissolve lacquers and gums can be added to old oil before draining and will remove deposits.

◆ *savings per year: 1984 - \$6,000*

(5) Savings in Air Compressor Operation

The use of proper synthetic air compressor oil coupled with clean

intake air (air filters) is producing large savings. The new synthetic compressor oil keeps valves clean, extending cleaning periods, and preventing air line fires. Well placed air filters give more compressor efficiency.

◆ *savings per year: 1984 - \$1,200*

(6) Reduction in Oil Inventory

Oil inventory covering all petroleum products used for lubrication and metal cutting was reduced from 45 to only seven main lubricants used. This not only releases space in the oil room but also allows less chance for application error. At the same time, better lubrication products are being employed. Cost of writing and following purchase orders is approximately \$20 each. This move will eliminate 15 purchase orders per year and reduces oil handling and allows purchase discounts.

◆ *savings per year - (Discounts only): 1984 - \$800*

(7) Changing Grease

The use of a special molybdenum grease to replace a special costly grease in chucks on machines is working well and is already in the plant.

◆ *substantial savings are realized*

(8) Solvent Change

Hi-flash point petroleum replaced chlorinated solvent for much cleaning of parts and machines.

◆ *savings per year: 1984 - \$300*

(9) Electrical Discharge Fluid

Substantial savings are possible by purchasing fluid from oil suppliers instead of from machine builders (Savings \$97/bbl.).

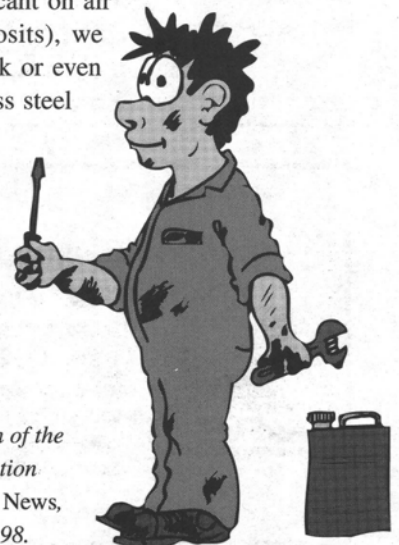
◆ *savings per year: 1984 - \$300*

(10) Eliminating Air Line Filter Bowl Problems

With the use of di-ester lubricant on air tools (eliminates gummy deposits), we found that air filter bowls crack or even explode so we now use stainless steel or glass bowls.

The above are results of a study on actual cost savings that was conducted by Crane Packing Company, Morton Grove, Illinois. They represent a typical American factory in 1984. ◆

—Courtesy of *STLE*, publication of the Society of Tribologists and Lubrication Engineers, printed in the Turf Line News, Volume 148, October/November 1998.



Weather Facts: Focus on Lightning

LIGHTNING is a force of nature that fascinates as much as frightens. Here are some interesting facts about this power-disrupting phenomenon.

- Although thought to be an uncommon occurrence, lightning actually hits the earth about 100 times per second. That makes about 8 million strikes per day! The United States alone experiences over 20 million lightning strikes per year. Scientists have estimated that at any given moment there are nearly 2,000 thunderstorms occurring over the earth's surface. That means about 100,000 thunderstorms annually for the U.S.

- Cloud to ground lightning occurs when negative charges at a cloud's base are attracted to positive ones on the earth. A surge is created which carries current to the ground. This bolt typically contains about 1 billion volts and between 10 to 20 thousand amperes of current. What happens next is called a "return stroke" which is revealed as the bright flash.

- The average lightning stroke is about 6 miles long. The flash appears wider than it actually is due to the glowing air surrounding it. Lightning's return stroke can reach 50,000 degrees Fahrenheit. To put this blast in perspective, the surface of the sun is only about 11,000 degrees.

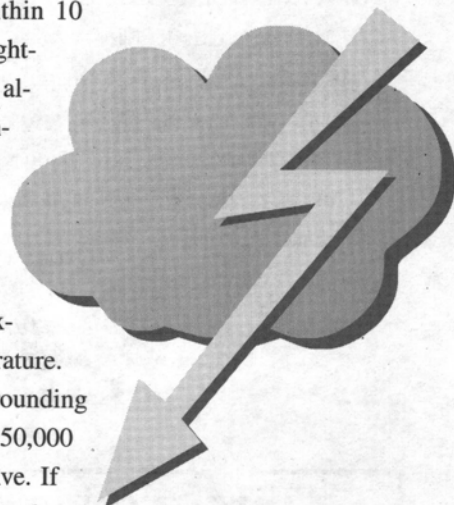
- Lightning may occur even with a clear sky overhead. A thun-

derstorm need only be within 10 miles for cloud to ground lightning to originate from high altitude anvil clouds. The thunder that follows the lightning bolt can be heard up to 10 miles away.

- Thunder is essentially the air around the lightning exploding due to high temperature. Lightning "cooks" the surrounding air to between 15,000 and 50,000 degrees. The sound is relative. If the strike is close by, the louder the thunder's "bang." Rumbling thunder is the "clap" arriving at a different time due to distance of the lightning.

Annual property loss in the United States due to lightning has been estimated into the hundreds of millions of dollars. Much of this damage is to sensitive electronics that suffered surge damage as a result of a nearby lightning strike. ♦

— American Power Conversion, APC Currents, July 1997



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Seasons Greetings from the staff and board of the STA.

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SAFETY OF SOCCER QUESTIONED

SOCCER may cause brain damage—even more brain damage than contact U.S. football, Finnish researchers say.

Eleven out of 15 amateur soccer players showed potential signs of brain damage, compared to seven out of 17 U.S. football players, a team from the University of Helsinki found. They said the helmets worn by U.S. football players could be protecting them.

The researchers used magnetic resonance imaging to look inside the brains

of 15 soccer players, 17 football players, and 20 non-athletes of similar age and background.

Lesions were found in most of the soccer players, although they were small. Only five out of the 20 non-athletes had them.

Soccer players always run the risk of clashing heads, and are required to head the ball, often when it is travelling very fast.

— Reuter, *The Record*, May 2, 1997

