OIL MAINTENANCE PRACTICES

Engine oil is a major factor affecting the performance and service life of your engines. Monitoring the oil levels and frequent oil changes are essential for maintaining and prolonging the life of your commercial equipment.

Equipment operators often are responsible for monitoring and changing the oil. At the beginning of each season, train operators in proper oil maintenance procedures. Use this article to explain the importance of a clean, adequate engine oil supply.

Engine oil performs the following vital functions:
Lubrication-Oil maintains a film between moving parts to help prevent metal-to-metal contact, which causes friction and engine wear. The key to an oil's ability to lubricate is its viscosity, or resistance to flow. The higher an oil's number, the higher its viscosity will be. For example, a 40 weight oil is thicker than 20 weight.
Sealing-The same oil film that provides lubrication also assists sealing to maintain engine efficiency. Oil provides sealing both in the combustion chamber and with seals and shafts. It helps the piston rings seal pressure in the combustion chamber.
Cooling-Your engine's oil also carries heat away from the hot areas, especially the piston and cylinder head.
Cleaning-The term "detergent oil" refers to the cleaning capabilities of engine oil. Many engine oil additives assist in keeping the engine clean. About half the test criteria an engine oil must meet concern detergent properties. These detergents are necessary because of combustion by-products that find their way into the oil. Detergents keep varnish and deposits from forming in the engine, and to some degree remove existing deposits.

Checking the Oil

Running g your lawn mower's engine with insufficient oil can cause serious engine damage, resulting in costly repairs or down time. Therefore, it is important to check the engine oil every time you use equipment.

The following is a typical procedure for checking a lawn mower's engine oil. Refer to your operator's manual for the proper procedure for your mower:

*Stop the engine and position the mower on a level surface.
*Clean the area around the oil filler cap/ dipstick.
*Remove the oil filler cap and wipe the dipstick clean.
*Insert the dipstick into the oil filler neck, but do not screw in.
*Check the oil level shown on the dipstick.
If the level in low, add the recommended oil to the upper mark on the dipstick. Do not overfill.

Commercial equipment is operated under the toughest conditions, so it's helpful to have a mower equipped with a system such as Honda's Oil Alert. An alert system warns the operator when the engine oil level begins to fall below a safe limit, indication the operator should stop the engine immediately and add oil.

Why Change The Oil?

Adding oil regularly isn't enough. You need periodically to drain the old oil and replace it with clean oil. As crankcase oil lubricates, seals, cools and cleans, it becomes contaminated with acids, dirt and abrasives. These contaminants stay in the oil and can damage the engine. Also, prolonged use depletes many oil additives, rendering them ineffective.

Grounds care equipment works extremely hard for each hour of operation, requiring frequent oil changes. For example, you probably will run an air-cooled commercial lawn mower at or near full throttle for long periods of time. After 100 hours of operation, the small quantity of oil in the crankcase can work the equivalent of an automobile engine traveling 5,000 hard miles. Also, consider that your automobile's engine runs in a relatively clean environment. A lawn mower's engine can be exposed to extremely dusty conditions, which further dirty the oil.

With the quality of today's engine oil, change the oil every 100 hours to provide adequate protection against premature engine wear. Make it a practice to log the hours of operation for equipment to determine proper maintenance intervals.

New engines are the one important exception to this recommendation. Newly machined surfaces moving against one another in a new engine produce abrasive powdered metal particles that will enter the engine's oil within the first few hours of usage. To prolong engine life, change the engine oil after the first 20 hours of use on a new machine.

Which Oil to Use

In selecting an engine oil, two questions that typically arise relate to the viscosity and American Petroleum Institute (API) rating.

Selecting the proper oil viscosity for an air-cooled lawn mower engine becomes especially important because ambient (surrounding) temperature greatly affects oil temperature. Most manufacturers have a chart in the operator's manual showing the recommended viscosity to use for certain ambient temperatures.

You want to use the thinnest oil that maintains sufficient film strength to keep engine parts from touching. The thinner the oil, the lower its internal friction and the better its ability to flow quickly when you first start the engine.

How to Change the Oil

Below is a typical procedure for changing the oil in a lawn mower. Always consult the owner's manual of your particular model for any variation from the steps below.
*Start them mower and allow the engine to reach normal operating temperature. Shut off the mower and disconnect the spark plug before proceeding.
*Place a suitable container under the mower deck to catch the used oil. Check to make sure the drain hole in the mower deck is not clogged. Remove grass and debris, if necessary.
*Clean any dirt from around the oil filler cap/dipstick and remove the cap. The biggest enemy of a commercial lawn mower engine is dirt, and any dirt that falls through the filler opening will contribute to engine wear.
*Remove the oil drain bolt. The used oil will flow along the mower deck channel to the drain hole. allow it to drain completely. Get as much of the old oil out of the engine as possible.
*Install the oil drain bolt and tighten it securely. Do not overtighten.
*Fill with the recommended oil to the upper level on the dipstick. Do not overfill. An engine with too much oil will smoke, foul spark plugs and run poorly.
*Install the filler cap/dipstick.
*Wipe up any oil from the mower deck to reduce dirt and grass build up when you use the mower. Reconnect the spark plug wire.
*Dispose of the used engine oil in a way that is compatible with the environment. We suggest taking it in a sealed container to your local service station or recycling center for reclamation. If you have several pieces of equipment, start an oil-collection drum. Some recycling companies will drive to your site for pickup. Whichever method you choose, do not throw it in the trash or pour it on the ground.

A routine oil change is also a good time to inspect the crankcase breather hose to be sure it is securely fastened and undamaged. A torn or disconnected breather hose will allow dirt to enter the engine, which will result in rapid engine wear.

Oil is the lifeblood of your lawn mower's engine. You can help ensure long engine life and many hours of trouble free operation by performing proper oil maintenance.

This article was written by service engineers at Honda Poser Equipment, Duluth, GA. Article seen in SportsTurf, February, 1992.

PHYSICAL PROPERTIES INVOLVED IN IRRIGATION SYSTEM PROGRAMMING

Last month this article described some of the important environmental factors that determine how much water needs to be applied for effective irrigation of your turf. This month the focus will be on the properties of your irrigation system that affect how much water can physically be applied during a specific watering period.

The system components that have the greatest impact on the amount of water applied to the turf during an irrigation cycle are the controllers and the sprinkler heads. The controllers are programmed to signal the heads to open and allow irrigation for a certain length of time and in a specific sequence. When the sprinklers are allowed to open, they are designed to automatically distribute water over an area by using the available force of water that is supplied to them through the pipe network. The amount of water that is supplied to a given area by a group of sprinklers during a period of operation is termed the "precipitation rate" of those sprinklers. Precipitation rates are expressed in inches per hour units to maintain consistency with rainfall, evapotranspiration, and soil moisture data measurements. The two main variables involved (expressed as a flow rate in gallons per minute or "GPM"), and the area of coverage within a group of uniformly spaced sprinklers. Precipitation rate formulas are normally based on flow rates from full circle sprinkler patterns because part circle sprinklers with similar flow rates will make more passes over an irrigated area and therefore provide a proportionally greater amount of water to that area over the same watering period. For sprinklers that are installed in a uniformly square pattern with head-to-head spacing, precipitation rates within the square area formed by four sprinklers can be calculated as:

$$= \frac{\text{Flow from one full circle sprinkler (GPM)} \times 96.3}{(\text{Typical spacing between two sprinklers})^2}$$

For sprinklers that are installed in a uniformly triangular pattern with head-to-head spacing, precipitation rates within the equilateral triangle area formed by three sprinklers can be calculated as:

$$PrT = \frac{\text{Flow from one full circle sprinkler (GPM)} \times 96.3}{(\text{Typical spacing between two sprinklers})^2 \times .866}$$

For example: If your course has sprinklers installed uniformly at 65' spacing in a triangular pattern, and the sprinklers are each providing a flow of 20 GPM through the nozzles, you can calculate your precipitation rate as:

$$PrT = \frac{20\ (\text{GPM}) \times 96.3}{(65')\ (65') \times .866} = \frac{1926}{3659} = .53 \text{ inches/hour}$$

Each of these formulas depends on uniformity of sprinkler spacing and layout pattern, matched nozzle flow and operating pressure, and rotation speed uniformity at each sprinkler.

An alternative method to determine actual precipitation rates at your golf course is presented by the California Department of Water Resources "Landscape Water Management Program". This method involves the placement of catch basins in a uniform pattern throughout an irrigation zone that has similar sprinkler characteristics. Each catch basin must have a uniform "catch area opening" and should be transparent with the sides marked in milliliters for easy "catch volume" measurement. These catch basins are laid out in a uniform grid within the irrigation zone and the zone is turned on for a designated length of time (long enough to determine a measurable volume from the irrigation water stream). The precipitation rate for the zone can then be calculated using the following formula:

$$Pr = (CVavg \times 3.66) / (Tr \times CDA) = \text{inches per hour}$$

with the variables in this formula being:

CVavg = Average of Volume in Catch Basins (milliliters)
Tr = Testing runtime (minutes)
CDA = Catch Device opening area (square inches)

Instruction for proper methods of data collection using this procedure (and a computer software package for automatic calculation of precipitation rates from the field data) is provided by the California Department of Water Resources during their two day seminar course in "Landscape Irrigation Auditor Training".

At this point in the irrigation system programming process you will have accumulated the necessary information for your golf course that indicates how much water the turf needs and how much water your sprinklers will provide. The next step is to combine this data and effectively use the capabilities of your control system to provide the water in an efficient manner.

Next Month: Combining the required data into a baseline Irrigation Program

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NAUMANNS NORCAL NEWS

Gary Williams is the new superintendent at Meadowood CC in Saint Helena. Gary is replacing Dana Waldor who moved to Hidden Valley lake CC...**Ed Manry** has replaced Steve Good at Napa Muni Golf Course. Ed most recently was working in Fresno...**Bob Painter** has accepted the Superintendent position at La Rinconada CC. Bob was working in the Scottsdale area prior to his move...**Charles Pratt** is the new Superintendent at Sequoyah CC in Oakland replacing Blake Swint, now at Castlewood CC. Chuck was the Superintendent California Golf Club before moving across the bay...**Bob Costa** has been promoted to Assistant Vice President, Director of Golf Course Maintenance for the Lombardo Group. The Lombardo Group manages Laguna Seca Golf Ranch, Pajaro Golf Course, Old Brockway Golf Course, Rancho Canada Golf Course and Fig Garden Golf Course.

A LOOK AHEAD

April 27	Palo Alto Hills CC
May 4,5	CGCSA Annual Meeting Ojai Valley Inn
June 19	U.S. Open-Pebble Beach
July 13	Lake Merced-Supt/Pro
August 14	Marin CC
September 14	Pasitiempo CC
October 9	Sierra Nevada Chapter joint meeting
November 11,12	GCSANC /UC CooperativeExtension Golf Course Institute
December 4	Christmas Party

THE MICROBIOLOGY OF NONPATHOGENS AND MINOR ROOT PATHOGENS IN HIGH-SAND CONTENT GREENS

Golf greens constructed with high-sand content mixes have become the standard for the golf course industry. the high-sand content green is physically superior to older sandy-loam greens because plants with larger, deeper root systems can be produced. The majority of these greens function well, but they are often susceptible to biological problems in the root zone that are difficult to identify and result in loss of turf. The problems are unpredictable; difficult to control and involve both nonpathogenic microbes and minor root pathogens. Because of the stressful conditions under which today's greens are maintained, both nonpathogenic microbes and minor root pathogens are increasingly involved in disease problems. The physical characteristics of sand, and the cultural practices used, may inadvertently contribute to the microbiological problems.

CHARACTERISTICS OF SAND

Characteristics of sand that may contribute to micro-biological problems include the inherent microbiology of sand, sand-induced root abrasion and the chemistry of sand. Microbial populations of sand are believed to be less diverse or lush than that found in soul. thus, the sand placed in a green may be more susceptible to colonization by organisms in the surrounding soil, especially greens reconstructed with sand on old golf courses where the soil is well-infested with turf pathogens and other organisms associated with grasses.

Roots growing in sand have sharp twists and turns accompanied by unilaterally swollen cortical regions. The inner side of most twists and turns show cuts due to the root growing around and between sharp edges of sand particles. This abrasive action may be worsened by the shifting and grinding of sand particles under foot and machinery traffic, and by the addition of sand topdressing. this abrasion provides sites for nutrient leakage that may attract the motile spores of pathogens, or for infection by other soil-borne pathogens.

The chemistry of the sand used in the construction of greens may affect the microbiology of the sand. Many sand sources are calcareous with pH values of 7.5 to 8.5 or higher. These alkaline sands are especially supportive of cyanobacteria (blue-green algae) and may also promote growth of some fungi and sulfate-reducing bacteria in anaerobic microsites within the green.

CULTURAL PRACTICES

The physical characteristics of sand alone would cause only minor problems if it were not for cultural practices that compliment and enhance the physical problems. Cultural practices suspected of contributing to microbiological problems in sand include mowing, irrigation and the application of some nutrient substances. Close mowing (1/8 inch) subjects plants to severe stress during high temperatures and opens the surface for greater light penetration and colonization by cyanobacteria. The minimal formation of thatch under close mowing contributes to sand abrasion of leaves, stems and roots under foot and machinery traffic. Close mowing and sand abrasion predispose the plant to attack by microorganisms normally of little consequence to healthy turf.

The microbiological problems associated with the excessive irrigation are cyanobacteria and black layer. Cyanobacteria reduce drainage and induce anaerobic conditions that support growth of sulfate-reducing bacteria and black layer. Water from ponds and rivers may contain numerous species of algae, bacteria and fungi that become dominant species on sand greens. These problems may be further complicated by alkaline water.

High-sand content greens often need frequent fertilization and application of specialty nutrient products to maintain vigor and color. Excessive use of iron and sulfur may promote cyanobacteria and can be utilized by sulfate-reducing bacteria in black-layer development. It is probable that interactions between other nutrient substances, pesticides and microbial populations also will be found.

Nonpathogens

Nonpathogenic microbial problems of high-sand content greens include cyanobacteria (blue-green algae), sulfate-reducing bacteria and fungal mycelium responsible for localized dry spots. Cyanobacteria deposit hydrophilic mucilaginous substances in the sand and create a perched-water table at the surface of the green. This condition slows water movement and produces anaerobic microsites that are colonized by sulfate-reducing bacteria that form black layer. These conditions are promoted by close mowing, heavy irrigation, calcareous sands and excessive use of iron and sulfur containing products.

Localized dry spots result from hydrophobic by-products of nonpathogenic fungi that bind sand particles together to the exclusion of water. Development probably results from the inability of the microbial population of sand to prevent colonization by the fungi responsible for dry spot.

Minor Root Pathogens

Four genera of fungi are consistently associated with loss of turf on high-sand content greens. These include Pythium, Curvularia, Microdochium and Acremonium. Preliminary studies suggest that each of these organisms is capable of reducing the growth of creeping bentgrass grown in sand. P. arrhenomanes and P. aristosporum are minor pathogens of young roots in sand mixes during establishment. They persist and damage turf the first two years after construction and then usually cease to be a problem. They show a preference for very young roots or aging roots.

Curvulari lunata and C. geniculata are associated with brown to golden-orange colored spots, about one-quarter inch in diameter, that occur with a density that produces a measles-like appearance on the green. The spots do not increase in size, occur only during periods of high temperature, rarely kill any substantial quantity of turf and do not respond to fungicides. The Curvularia species are found only in the roots. Dry weight of root-inoculated plants ranges from 42 percent to 79 percent noninoculated plants.

Microdochium bolleyi is associated with irregular chlorotic to necrotic areas of the green and collar that occur primarily in cool, wet periods of the spring and fall. Development slows with high temperature and recovery is slow with lower temperatures. The disease may reappear in the same area in subsequent years. Inoculation of roots decreases the dry weight of plants 56 percent to 93 percent of healthy controls.

Acremonium is associated with symptoms that range from general thinning to thinning in relatively confined areas of the green and collar that persist from year-to-year and gradually increase in diameter. The affected areas are most active with heat stress and do not respond to fungicides. Dry weight of root-inoculated plants is 41 percent to 95 percent of healthy controls.

The organisms discussed in this paper are part of the normal microflora of grass root systems and should not present major problems for survival of creeping bentgrass. The fact remains, however, that the incidence of these organisms (and others) in the roots of low vigor or dying plants has increased with the increasing use of high-sand content mixes.

Knowledge of imbalances in populations of nonpathogenic microorganisms and of the activity of minor root pathogens in sand mixes is inadequate to conclude that these microorganisms are inherently more active in sand than soil. However, potential interactions of physical and biological characteristics of sand; cultural practices; and growth and development of the root system with nonpathogenic microbes and/or minor readily predisposed to these microbes than those in soil. Sand abrasion, pH and 1/8 inch mowing, in combination with periods of high temperature, may be the primary stress factors predisposing roots to infection by minor pathogens, or in aiding the colonization of sand by nonpathogens.

The problems and questions relative to root disorders in sand mixes are numerous and the solutions and answers are few. The turf pathology of the next decade relative to high-sand content greens will be more complex than simply indentifying clear-cut pathogens; the sand environment will necessitate an approach to the study of disease that encompasses nonpathogenic microbes, minor pathogens, physiochemical stress and all aspect of culture.

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