Because of better design, ours saves money over the long haul.
With a Toro Central System, you control the entire course from one location. Make instant changes in your program as the weather shifts. Savings on labor costs can be dramatic. Water efficiency is maximized.

Soggy turf and puddling are virtually eliminated.
Let us help you build and maintain the kind of turf you've been dreaming about.

TORO
We Take Care

Toro Manufacturing Corporation, Moist O'Matic Division 5825 Jasmine Street - P.O. Box 489, Riverside, California 92502

A Toro Vari-Time* Central Control System keeps the turf here at Oak Ridge Country Club and over 300 courses installed in the last two years.
also occur due to (a) actual displacement of sods and soils when subjected to flowing water of high velocity; (b) covering portions of the turf with wood, soil, and other debris which results in death of the turf by light exclusion and (c) deposition of a soil layer, particularly silt, which creates a soil layering problem and associated long term disruption of soil air and water movement. The latter problem is particularly difficult to correct.


Tifgreen bermudagrass was grown under various levels of nitrogen, phosphorus and potassium for the purpose of correlating visual analyses of these elements. Six-inch diameter plugs were taken from a mature monostand of Tifgreen bermudagrass. The plugs were thoroughly washed to remove all soil and decayed plant material. Most of the root system was also eliminated. The plugs were placed in plexiglass frames over fiberglass screens. The frame containing a plug was then placed in a gallon, glazed, porcelain container.

Seven individual nutrient treatments of nitrogen, phosphorus and potassium were utilized in the study with four replications. The seven treatments were maintained by a modified hydroponic system where all other essential elements were provided. The culture solutions were aerated and maintained at a pH between 5.8 and 6.2. The nutrient levels maintained during the experiment include 0, 35 and 140 parts per million (ppm) of nitrogen; 0, 7.75 and 31 ppm of phosphorus; and 0, 58.5 and 234 ppm of potassium.

Visual ratings of turfgrass quality were made at weekly intervals for a month following development of the first visual nutrient deficiency symptoms. Leaf clippings were also collected weekly for analyses of the nitrogen, phosphorus and potassium content.

Specific relationships were established between the visual turfgrass quality of Tifgreen bermudagrass and the nutrient content in the leaf tissue. Nitrogen was the first nutrient to show a visual deficiency symptom. A reduction in shoot growth and loss of color occurred as the tissue nitrogen content declined below 22,500 ppm. Chlorosis of leaves and increased seedhead formation also occurred when the tissue nitrogen content dropped below 15,000 ppm.

Phosphorus deficiencies in Tifgreen bermudagrass first appeared as a dark purplish-green coloration of the shoots. Subsequently a pale green color and reduction in shoot growth occurred when the phosphorus content dropped below 2,000 ppm. In addition shoot growth suppression occurred at higher phosphorus levels in the range of 4,500 ppm.

Symptoms of potassium deficiency first appeared as a thinning of shoots and narrowing of the leaf blade. This occurred when the potassium level decreased below 18,000 ppm and was very distinctive at potassium tissue contents less than 10,000 ppm. The grass did appear somewhat pale green at this lower potassium level.

Comments: The primary analytical method of determining turfgrass quality (Continued on page 43).
fertilization practices has been through the use of a soil test. Sometimes this method can be inadequate because the nutrient level determined for the soil may not be available for uptake by the plant.

An alternate approach involves the use of tissue analysis which measures the actual nutrient status of the turfgrass plant. The laboratory analysis of tissue is very accurate. However, the primary problem involves proper tissue sampling procedures and proper interpretation of the results. Representative uniform, tissues of the same age and type must be selected. A particularly difficult problem frequently associated with turfs is that minute quantities of dust or soil present on the shoots can adversely affect the tissue analysis. Another serious problem in effective utilization of turfgrass tissue analysis has been the lack of sound scientific data on which to base interpretation of the results. Studies of the type reported in this paper will assist in eliminating this latter problem.

Specific observations relating to this data include defining the nitrogen and potassium content of the tissue at which deficiency symptoms develop. In the case of these two nutrients, the severity of deficiency symptoms increases as the nutrient content of the tissue decreases. In the contrast, phosphorus appears to have a critical level in Tifgreen bermudagrass tissue rather than a range. In summary, continuing investigations of this type may eventually provide sufficient information so that tissue analysis of turfgrasses could be effectively used in diagnosing the turfgrass nutrient status and requirements.

Other papers of interest:
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A rugged chassis on Terra-Tires, with removable, interchangeable 1 cu. yd. hopper and big flat bed

Carrying loads up to 5,000 pounds, these unique trailers cradle the weight on Terra-Tires across a 48-inch width to protect your fine turf from ruts. Keep your crews working more days. Handle a hundred-and-one hauling jobs with an easy change from roll-dump hopper to flat bed as needed. For big hauls, like rebuilding tees or greens, we make a 2 cu. yd. hopper model that treats your turf the same gentle way.

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Business at the 42d Annual Golf Course Superintendents Assn. of America Conference in Denver, February 7th to 12th, will get underway with the first educational session chaired by Warren Bidwell. Its theme is Golf and Man's Environment. Superintendents will then be welcomed to the conference by state and local officials and Norman Kramer, GCSAA president. The Profile of a Professional and a look at The Bright 70s complete the opening program.

The second session on Monday afternoon will be chaired by L. Palmer Maples Jr.; the theme is Thoughts—Past, Present and Future. Superintendents' thoughts will be explored in the first part of the presentation when nine turfmen air their pet ideas or innovations with slides. The remainder of the program will give superintendents much to think about because it is concerned with Regulatory and Research Viewpoints on Pesticides.

On Tuesday morning the equipment show will open. As of press time the advance bookings promised the biggest show to date. Irrigation and riding greenmowers are expected to draw the biggest interest as they did in Houston in 1970.

Tuesday afternoon, the third session, will be chaired by Dr. Paul Alexander, director of education for the GCSAA. This is Dr. Alexander's first national conference in this position. Practical Irrigation Operation is the theme, which many superintendents believe is the key to a successful summer operation.

The fourth group on Wednesday morning meets with A. Caranci as chairman. This session is devoted to The Total Effort, and five men will tell how the superintendent can effectively conduct a public relations campaign.

The final fifth and sixth sessions will be chaired by staff members of the United States Golf Assn. Green Section, and the topic will be The Budget and Its Impact on the Golfer.

Because more and more superintendents have been bringing their wives to conferences, a full ladies' program has been planned.

Bookings have been very good for the Ski In, to begin on the 12th. Several package deals are available from $80 to $100 per person and all necessary equipment and clothes may be rented in Denver or at Vail.

—Bill Smart

On the following pages are highlights of the merchandise that manufacturers, distributors and representatives will be exhibiting at the GCSAA show. The companies appearing are those that have indicated to GOLFDOM that they will be at the show; it does not represent an official exhibitors listing. An asterisk following a company's entry indicates that specific details on its product line were unavailable at press time.
Golf and utility cars

American Golf Car Manufacturers Assn.

Club Car, Inc., features the four-wheel electric Caroche golf car. It has a gross operating weight of 840 pounds with a suggested list price of $1,319.50. Club Car has discontinued its line of gas-powered cars and its three-wheel cars.

Cushman Motors., Div. of Outboard Marine Corp., makes the Trophy four-wheel electric golf car, constructed of terneplate steel to resist corrosion. It features individual bucket seats, automotive steering and a 36-volt electric motor. A windshield and canopy are available.

E-Z-Go Car Div., Textron Corp., features the Four Wheel Model X-444 and the Three Wheel Model X-444 electric golf cars. The X-444 offers a low center of gravity and high ground clearance for stability and short turning radius. Cars are constructed of steel and feature spike-proof dash padding, open mesh bag wells and wrap around bumpers.

Harley-Davidson makes the Utility line of utility cars in gas or electric models. The body is made of heavy gauge steel and impact-resistant fiberglass, and it has a minimum gross carrying capacity of 750 pounds. Available with a line of accessories which includes a trailer, cab enclosure, personnel carrier seat, cargo box of heavy gauge steel and a wooden stake box.

Texas Refinery Corp., offers Tire Seal, a liquid sealant, Dzl-Lene, a fuel stabilizer, and Big Red, a concentrated liquid chemical detergent.

Viking Corp., offers the Viking '71 and the Viking Baron golf cars. The former has a fiberglass front cowl with built-in drink holders and a large storage area, customized suspension system, two pedal braking and speed control systems and a 36-volt electric power system. It is available in a color to match a club's color.

The Baron features a combination fiberglass and steel body, a console for the ignition and shift and an arm rest. It is available in lime green.

Irrigation equipment

Aqua-Dial makes a line of turf irrigation equipment which includes valves, heads and automatic controls. The line features a geared rotor sprinkler in two models. Model 14 is a part circle sprinkler, and Model 13 is a full circle sprinkler.

Buckner Sprinkler introduces a line of geared sprinklers and piston valves new this year. In addition the Buckner Central Programmer System for irrigation control is offered. The system features an infinitely variable syringe cycle from 1.5 to 5 minutes which overrides any existing programs.

Ethyl Corp., Visqueen Div., will feature PVC pipe made of polyvinyl chloride resin that maintains the strength of the original polymer. The piping is constructed using a Bell-Ring method which offers joint components for easy assembly. The pipes and fittings exceed all commercial requirements and ASTM tests.

Griswold Controls makes Modular and Zone Control Systems which automatically control irrigation. The Modular System programs a desired watering cycle throughout the course, while the Zone Control System controls the irrigation cycle in individual zones. In addition, Griswold offers diaphragm valves which feature slow closing action to prevent water hammers and which operate with sandy water.

Hays Mfg. Company features Safe-T-Rain pop-up sprinkler in its line of broad-range sprinklers and solenoid valves. Safe-T-Rain is a ball rotor drive sprinkler which is a combination impact and pop-up. Its adjustable nozzle trajectory covers a radius of 16 to 43 feet. A single unit can be used for a circle of 30 to 360 degrees. Also offered are Marfaid automatic solenoid valves, Rise-N-Rain pop-up sprinklers, a spray head wrench and sprinkler housings.
This new TORO cuts up to 90 acres a day. It has 35% more mowing capacity than our Parkmaster 7† or any comparable machine. But capacity isn’t the whole story on this versatile, labor-saving rig.

Cutting units are individually controlled by a hydraulic system that picks them up or sets them down in under 60 seconds.

You can drop one or nine, whatever you need.

Between jobs, you roll along at 30 mph, with the 18½ foot spread tucked into a safe 8 feet.

Hills are no problem. The 6 cylinder engine develops 79 horsepower, and the cutting units are free floating to follow the curve of the turf. And while they’re following it, they won’t be crushing it because of oversized pneumatic tires.

We think this adds up to a lot of mowing. So if you have a lot of turf to take care of, get in touch with us.

†Exclusive trade names of Toro Manufacturing Corp.
used with Moody Slave Controllers. It can stop, start or override watering programs set on remote slave controllers. Moody also makes a line of sprinklers, valves, heads, nozzles, attachments and accessories.

Rain Bird Sprinkler Mfg. Company offers a line of irrigation equipment which includes the Rain Bird 41 rotor pop-up sprinkler with positive impact arm drive. Also offered is the E.F. Electric Remote Control Valve, a fluid resistor which does not use small orifices. A grit filter stops debris from entering the solenoid tubes and prevents the plunger from sticking in an open position. In addition, Rain Bird makes the Master Control Satellite System which features a syringe cycle timing adjustment.

Rain-O-Mat Sprinklers, Inc., features the Model 21 rotary pop-up sprinkler in its line of sprinklers, automatic controllers and valves. The Model 21 features a 180-foot diameter range and a 38-gallon-per-minute capacity.

Skinner Irrigation Company introduces a Central Control System which features individual valve operation and timing from the Center. Skinner also offers the AC-10 Area Controller and a system for converting a manual irrigation system to automatic.

Smith-Blair, Inc., features the 342 saddle for plastic piping connections which eliminates the need for solvent welding and delays in pressurizing the water system. In addition, a full line of repair clamps and fittings for water system maintenance will be offered.

Thompson Turf Irrigation Products offers the Challenger, an intermediate range pop-up sprinkler with a tri-nozzle combination, free-spinning cap, easily removable nozzle cartridge, positive high torque transmission and a three-year guarantee. In addition, Thompson offers the Commander Rotor, a medium range, gear driven pop-up sprinkler.

Toro Mfg. Company offers four new sprinkler heads in their line of Moist O'Matic irrigation equipment. The 620 Series features a pop-up stroke of 2 ⅛ inches, a high impact plastic body and a counter-sunk cover.

Weather-matic Div., Telco Industries, introduces the Command Satellite System to its line of turf irrigation equipment. The Command System has a solid state control which enables syringing greens automatically. Weather-Matic also makes solenoid electric valves and pop-up rotary heads.

John Bean Div., FMC Corp., announces its Model 1010-T Turfkeeper sprayer. The Turfkeeper is equipped with high flotation tires, the Royalette 10 pump which delivers 10 g.p.m. at up to 500 psi and a 13-nozzle boom and hose connections. Available with 150, 200 or 300 gallon tanks and powered by a 6½ hp engine.

Bunton Company introduces the heavy-duty 22-inch self propelled mower with front wheel drive to its line of rotary power mowers, rotary push mowers and edger-trimmers. The Model 22SPF-4T8 features 10 by 2.75 wheels, an aluminum alloy frame, a four hp engine with a five quart fuel tank and a snorkel type air cleaner mounted on the handle. Also new is the Four-Way Edger-Trimmer which has both a horizontal and vertical cutting blade.

The Champion Company features its line of Doo-All Trailers with Terra-Tires, a removable interchangeable one-cubic-yard hopper and a capacity of up to 5,000 pounds.

Cushman Motors offers the four-wheel and three-wheel model Turf Trucksters. The four-wheel model has a hydraulic jack and an air-cooled 18hp engine. The three-wheel model has a wide-box body and a 12 or 18hp engine. In addition, Cushman offers the Turf Minute-Miser, a one-passenger gas engine vehicle available with a covered cargo box.

Cyclone Seeder Company, Inc., offers its line of broadcast spreading equipment. The line includes the Cy-(Continued on page 53)
America's foremost sports turf fertilizer . . .

MILORGANITE

Builds stronger healthier turf

For more than 40 years, Milorganite has been used by golf courses, athletic fields, parks, cemeteries, and home lawns to produce and maintain outstanding turf.

- Milorganite scores better than chemical fertilizers in experiment station tests.
- Milorganite is the best long-lasting fertilizer.
- Milorganite cannot burn, and is easy to apply because, unlike chemical fertilizers, Milorganite's bulk assures proper coverage.
- Milorganite is granular and dust free.
- Milorganite-fed turf needs less water and holds its color longer.

For Further information write:
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Unlike ANY synthetic fertilizer, the Milorganite concept is a major anti-pollution factor. Recycling is the key.

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the one versatile, high-quality vehicle for efficient grounds maintenance

The Cushman Turf-Truckster is a hefty vehicle designed especially for turf applications. Available with three or four wheels and in your choice of standard Pickup Body or Big Box.

An air-cooled, 18-hp, 4-cycle engine enables the Turf-Truckster to take the steepest hills in stride. And tow three-gang mowers with ease. It has a top speed of 22 mph, and a payload capacity of 1,000 pounds. Equipped with big traction tread 8.50 x 8, 4-ply rating Terra Tires, the Turf-Truckster can go anywhere on a golf course or park without damaging the turf. Even in damp weather.

Two different box sizes are available; the Pickup Body is 46" x 34¾", and the Big Box measures 57" x 53".

Slide-away-ramp for loading mowers is an accessory. Stows beneath bed. Optional fold-away rear seat allows the Big Box to carry three passengers in addition to mowers or other equipment.