He had trouble with his rhododendrons. They received enough water to keep them alive but not to grow. Other than rhododendrons and evergreens, which suffered considerably, there were no significant losses.

Can much be done now? "It is never too late," says Weir. "Make every effort to give mechanical protection to any broadleaved evergreens that have tendencies for scalding, winter burn, or are recently planted." Burlap or a snow fence are suggestions. Since desiccation occurs in late January, February, and March, it is time to put stakes in for burlap or caging. Weir also recommends antidesiccant materials for tender plants to prevent the loss of moisture with the warning that only one application may do more harm than good.

Weir also says it would be wise to apply nutrients very early in the spring. "Just because plants look well in April and May doesn't mean they've survived," he says.

Dr. Dunham, realizing the gravity of the situation last fall, suggested putting down a 3 to 4-inch layer of some kind of organic mulch around plants about mid-November after a thorough watering. Next spring before growth starts (early April in Delaware), prune any dead wood back to live shoots. If plants appear much weakened, give them a severe pruning.

Other advice Dr. Dunham gave to his Delaware residents was to fertilize (if still feasible in the winter) with a 10-6-4 fertilizer, with part of the nitrogen in a slow release form. Apply 2 pounds of fertilizer for each inch of trunk diameter. Half of the fertilizer can be put down in 12-inch deep holes in the area under the spread of branches. Broadcast the other half over the ground. In the spring repeat this treatment, using half of the amount broadcast over the surface. Delay pruning until next June. At that time remove all dead and dying branches.

"Some loss is inevitable after such a severe drought," says Dr. Dunham. "But with this kind of care, your plants will have a better chance at survival."

Although researchers and nurserymen seem to disagree on the severity of last summer and fall's drought, there is no argument that a dry, cold winter would be very damaging to many plants. Exactly how damaging won't be seen until spring and summer and even later for some species. The verdict is still uncertain for anyone closely watching ornamentals and Dr. Pellett is the first to admit it.

"This (the research) is not the final answer, but it gives us something to work on," he says. "Cold hardiness is a complicated area. The more information we get, the more we find out we don't know." **WTT**

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Tough, hard-to-get weeds such as crabgrass and *Poa annua* are no match for Dacthal W-75 preemergence herbicide.

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TIGHT MAINTENANCE PROGRAM KEEPS EQUIPMENT GOING IN WINTER

Courtesy of John Deere, Moline, Illinois

In extremely cold temperatures and heavy snows, it is very important to help make your equipment function properly. The following recommendations should be followed to operate equipment through the cold months. Remember to perform the regular engine preventive maintenance procedures as outlined in the operator's manual. A little extra time doing this can save valuable work time when you count on your machine to perform.

Since almost all industrial machines are powered by diesel engines, the following procedures apply:

Fuel system

— Use quality fuel that is not contaminated with water. Water in the fuel system is the greatest cause of injection system failure.

— No. 1-D fuel is recommended for use in temperatures below 40° F (5° C).

— Fill fuel tank at the end of each day to prevent condensation inside the tank.

— Do not use fuel additives or deicer containing methanol or methyl alcohol—it will not disperse in diesel fuel and can cause damage to fuel system.

— Fuel filters remove most contamination, but will not stop water. Water becomes emulsified at the transfer pump and will flow through the filter. If water is present at the fuel filter, it has likely also entered the injection system. To flush water from the injection system, drain water accumulation from fuel tank, replace the fuel filter, and operate the engine for several minutes.

— Install fuel storage tank filter to further protect engines by filtering out dirt, rust, and scale.

IMPORTANT: The filter should not be used in conjunction with fuel tank pumps of more than ⅓ horsepower (0.25 kW). Also, install a shut-off valve between the tank and filter. The filter element should be changed yearly, or more often if fuel flow is restricted.

Lubrication system

— Change oil and oil filter before cold weather arrives.

— Use proper viscosity oil recommended for use in winter operation.

Air intake system

— Inspect entire air intake system for openings that could draw in unfiltered air (loose clamps, cracked hoses, etc.).

— Inspect dry element type filters—clean or replace if clogged with dust or dirt. Inspect for damaged seams and pleats. Replace if damaged.

— If machine is to be operated in blowing snow, consider a precleaner attachment on the air intake system. This attachment prevents blown snow from entering the air cleaner element, which would result in loss of power, excessive fuel consumption, and possibly oil consumption.

Cooling system

Maintaining the proper mixture of antifreeze and water is mandatory for proper cooling system operation in subfreezing temperatures. But that alone will not provide all the protection necessary.

For example, continued use of the same coolant depletes the corrosion inhibitors and chemical additives. Without these inhibitors and additives, rust and scale form in the cooling system and reduce cooling efficiency. Also, cavitation erosion may occur, which can lead to early engine failure.

If antifreeze breaks down, a heavy sludge may form in the radiator. This can severely restrict water flow and result in less efficient cooling.

Before cold weather develops:

1. Drain cooling system.
2. If old coolant is dirty and rusty, clean entire system using a heavy-duty cooling system cleaner.
3. Replace radiator hoses that are cracked, soft, or swollen. Also inspect heater hoses (if so equipped) and replace if necessary.
4. Check for proper operation of thermostats.
5. Clean dirt and trash from outside of radiator to allow unrestricted flow of air. Check that radiator is clean by holding light behind the core. If light is not clearly visible through the entire area of the radiator, clean it again.

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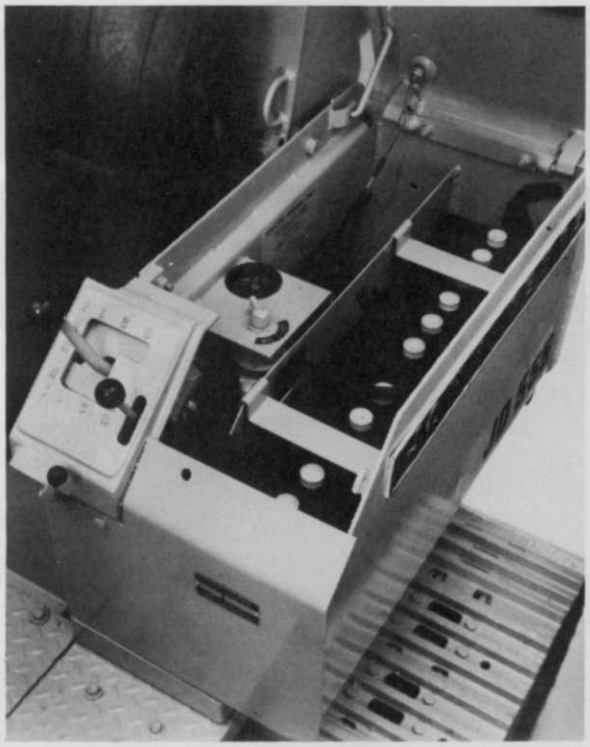

The heart of an electrical system in power equipment is the battery. It must be kept fully charged to provide maximum cranking power and prevent freezing of the battery solution.

"I wouldn't do anything to harm this tree. That's the reason I use Roundup®."

Donald Dusek
Park Superintendent, Victoria, Texas

As Donald Dusek will tell you, controlling tough weeds is just part of his grounds maintenance problem. As a park superintendent, Don is also responsible for protecting his valuable trees, shrubs and plants. So he insists on Roundup® herbicide by Monsanto.

With Roundup, Don can be confident that all of his valuable vegetation—including this beautiful 75-year-old pecan tree—can continue to flourish. He just follows label directions for Roundup. Since Roundup has no residual soil activity, and won't wash out of treated areas, Roundup helps Don control weeds in many different situations—even in his most delicate areas.

See your local Monsanto representative or chemical dealer soon for your supply of Roundup. Like Don, you'll find that Roundup is the solution to many of your toughest weed control problems.

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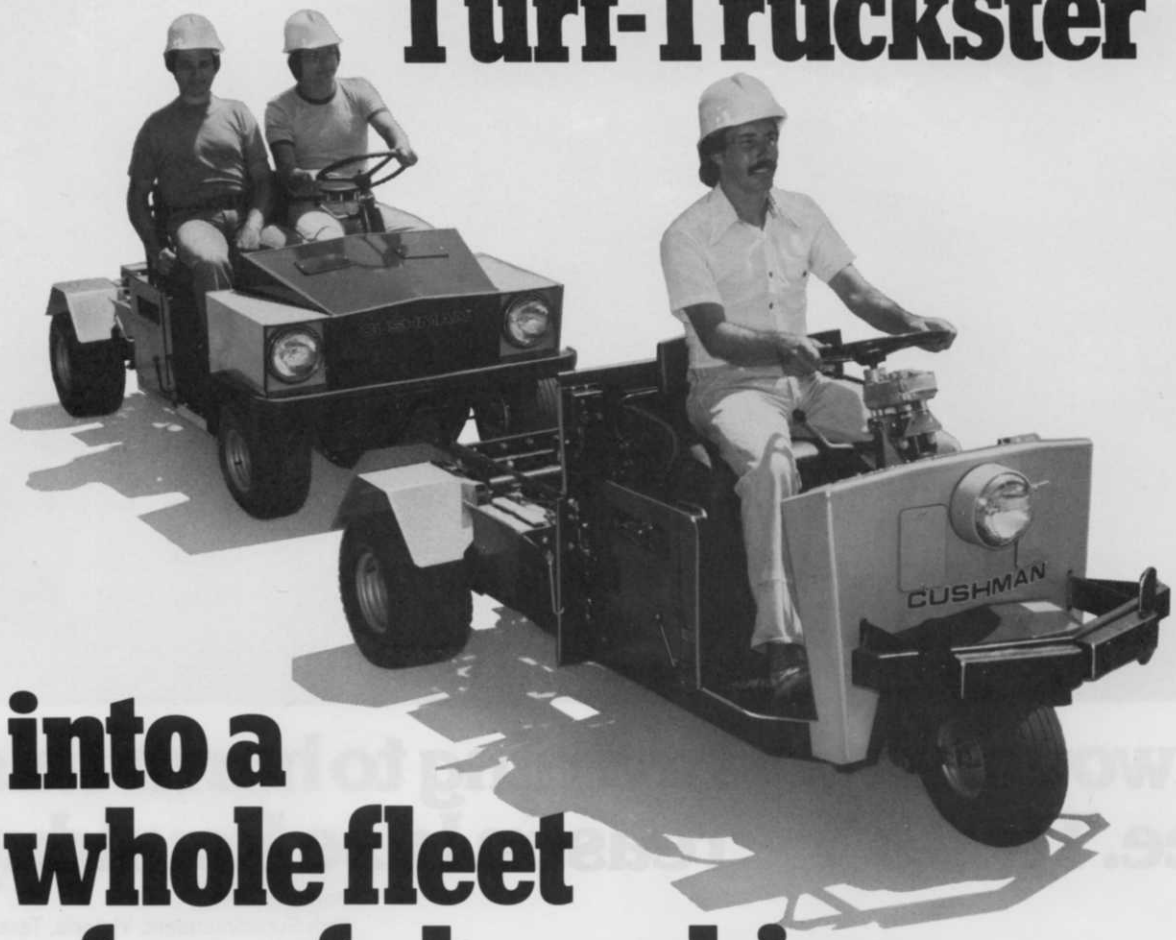
It's a snap to turn a Cushman Turf-Truckster



into a whole fleet of useful machines.

On its own, the Turf-Truckster® is an impressive way to move people, tools and equipment quickly and economically. And, as the workhorse of the Cushman® Turf-Care System, it's without equal.

Both the 3- and 4-wheel Turf-Truckster vehicles are powered by a rugged, air-cooled 18-hp OMC engine. And recent improvements help this year's Turf-Truckster deliver a 1,500 pound payload capacity.

What's more, in a matter of minutes, the Cushman pin-disconnect system and wide range of optional attachments can turn the Turf-Truckster into any of the specialty machines on the next page. All interchangeable. All engineered specifically for the turf-care professional.

No bolts. No hitching. No more jerryrigged trial-and-error attachments. Imagine how much time that convenience, and these accessories, could save you in the year ahead.

Cushman's pin-disconnect system makes equipment attachment a snap.

GREENSAVER® AERATOR

The Greensaver aerates greens, tees and other turf areas up to 10 times faster than walk-type units. Select 1/2" or 3/8" coring tines (both coring drums will collect cores as you aerate) or slicing tines to match your turf.

TOP DRESSER

Compared to self-powered or walk-type top dressers, this unit quickly pays for itself in saved manhours. A rubber fabric moving bed and rotating brush are matched to the vehicle's ground speed governor for an evenly spread 31 1/2" swath. The clutch control, to engage spreader, can be operated from the driver's seat. And the hopper holds up to 1,000 pounds of material.

SPRAYER

With optional 15' boom and handgun, this attachment is ideal for spraying greens, trees, bushes or roughs quickly and accurately. Powered by the Turf-Truckster vehicle's optional PTO, and equipped with ground speed governor, calibration is easy and thorough. The 100-gallon tank means fewer refilling stops.

POWER CONVERTER

The Cushman Power Converter is an inexpensive way to turn your Turf-Truckster into a mobile power plant for electric tools, floodlights . . . anything with a universal motor that draws up to 12 amperes at 120 volts DC. So instead of bringing small repair jobs back to the shop, your crew can handle them in the field.

SHORT BOX & FLATBED BOX

Your Turf-Truckster becomes a flatbed hauler with just two pull pins in place. Bolt on the optional side panels and tailgate to the flatbed, and you have a 1,500 pound capacity* box that can be dumped manually or hydraulically.

SPREADER/SEEDER

Mounted on the optional Short Box or Flatbed/Box, its cyclone action broadcasts as much as 300 pounds of seed, fertilizer or other material over a 40' wide area. The Spreader/Seeder is powered by the Turf-Truckster vehicle's optional PTO with extension shaft. And the controls are operated from the driver's seat.

QUICK AERATOR

With its 46" swath, this attachment earns its name by finishing big aerating jobs fast. By hydraulically lifting it into transport position from the driver's seat,** you can move quickly from job to job, too. Choose from three tine styles, slicing, coring (2 sizes) and open spoon.

To find out more about how the Cushman Turf-Care System can make your work force more productive, ask your Cushman Turf Dealer for an on-turf demonstration soon. For the name of your nearest dealer, call Cushman Information at 402-435-7208.

*Rating for vehicle equipped with 9.50-8 rear tires.

**Optional hydraulic system and dump set required.

CUSHMAN®

The Labor-Saving Turf System

1024 Cushman, P.O. Box 82409, Lincoln, NE 68501, 402-435-7208

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6. Check baffles around radiator and fan shroud to see that they are in place and functional.

7. Fill cooling system with proper mixture of clean water and permanent antifreeze with ethylene glycol base. Mixture should be adequate to protect to the lowest temperatures expected. Do not use antifreeze with stop-leak or sealer additives.

8. If engine is equipped with coolant conditioner filter, perform service as recommended in operator's manual.

9. Inspect belts and replace those showing damage and excessive wear. Check for proper belt tension to assure proper coolant and air flow.

Electrical system

The battery is the heart of the electrical system. Typical batteries contain a number of individual cells enclosed in a hard rubber or plastic case. These cells are made up of a series of positive and negative plates with plate separators. Plate straps, welded to a number of similar plates, form positive and negative plate groups.

Dry-charged batteries come from the factory with no electrolyte added to the cells. Wet-charged batteries contain an electrolyte solution. The electrolyte is a solution of sulfuric acid and water, and a dry-charged battery becomes wet-charged when electrolyte is added.

A chemical reaction between the battery's plates and the electrolyte converts chemical energy into electrical energy. The reaction causes positive and negative charges of electricity to build up on their respective positive and negative plates. Battery cells reach a fully charged condition because of the electrolyte interaction with plate material: the longer the interaction, the greater electrical charge on each plate.

When the battery is connected to a complete circuit, current begins to flow from the battery and the discharge cycle begins. After batteries experience a number of charge-discharge cycles, or become discharged, they should be tested.

Typical tests include:

- Visual inspection — for general condition
- Specific gravity test — for battery charge
- Light load voltage test — for comparing cell voltages
- High rate discharge test — for internal conditions

Batteries that are questionable after any of these tests should be either recharged or replaced. Generally if all cells test the same, the battery is good. If all cells test low, recharging is usually all that is required.

If there is a real difference between cells, the battery generally must be replaced. The electrolyte specific gravity should be 1.270 at 80° F (27° C). This means it weighs 1.270 times more than water. For every 10° F (6° C) above 80° F add four gravity points (0.004), for every 10° F below 80° F subtract four gravity points (0.004). Specific gravity should not vary more than 0.050 between all cells. Voltages should not vary more than 0.050 volts between all cells under a light load test.

Battery efficiency is greatly affected by temperature. The point is—keep the battery fully charged. A half-charged battery at 0° F (-18°C) provides very little useful cranking power; its performance will be only approximately 20 percent of a fully charged battery. Battery charge must also be maintained to prevent freezing of the battery solution during cold weather.

The electrical charge of a battery can be restored by sending a direct current through the battery (from an outside power source) in a direction opposite to the direction of discharge. The reverse flow rebuilds the electrical charges on the plates.

Batteries are usually recharged automatically by the battery charging alternator or generator operated by the engine.

Stored, wet-charged batteries should be recharged at least every 30 days. If not, the effects of self-discharging and sulfate-crystal buildup on discharged plates can cause enough damage that the battery can never be restored to a normally charged condition.

Preventive maintenance can be the determining factor in whether a battery starts an engine. The following maintenance suggestions also may lead to longer battery life.

1. Proper mounting eliminates most battery vibrations. Continuous vibration loosens battery plates, wears holes in separators, and cracks the case and cover.

Secure mounting in hold-down trays with plates at right angles to the direction of movement eliminates most vibration damage. Overtightening of hold-down brackets, however, can put undue strain on the case and cause it to crack.

2. Clean battery connections permit better charging and easier starting. Use cleaning tools to remove corrosion and brighten connectors.

Clean the battery case with a baking soda-water solution. Apply this solution until foaming stops and then rinse with water. Make sure no solution enters the battery cells.

3. Electrolyte should always be visible above the plates. Constant overcharging results in low electrolyte level, and plates tend to deteriorate rapidly. Also, added stress is placed on the generator or alternator.

Overfilling results in electrolyte seepage from vent holes in filler caps, possibly causing equipment parts to corrode and rust.

4. Overcharging can warp plates and cause bubbling and loss of water in the cells. Active material bubbles from the plates and reduces battery capacity. A symptom of overcharging is a battery that uses an excess amount of water with no apparent leaks in the case. The specific gravity of the electrolyte will indicate battery charge.

Undercharging causes formation of a sulfate coating on battery plates. This sulfate inhibits the conversion of chemical energy to electrical energy and, therefore, permanently weakens the battery.

The heart of the electrical system stimulates the other parts of the system. Proper care and maintenance of batteries results in longer battery life and better performance.

Hydrogen gas present in all lead-acid batteries is

Continues on page 42

IN 4 YEARS OF TESTING, NOTHING EVEN CAME CLOSE TO CHIPCO® RONSTAR® G FOR GOOSEGRASS CONTROL.*

INTERVAL	CHIPCO® RONSTAR® G	BALAN	DACTHAL	BETASAN
101-150 days	94%	61%	45%	37%

The only turf care professionals who still think goosegrass is hard to control are the ones who haven't tried Chipco Ronstar G herbicide yet. The ones who have tried it will tell you it does a great job, even 200 days after application. And that it's effective against crabgrass and poa annua, too.

Got a goosegrass problem? Get the most effective, longest lasting pre-emergent goosegrass herbicide there is: Chipco Ronstar G. Rhône Poulenc Chemical Company Agrochemical Division, Rhône Poulenc Inc. Monmouth Junction, New Jersey 08852.

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