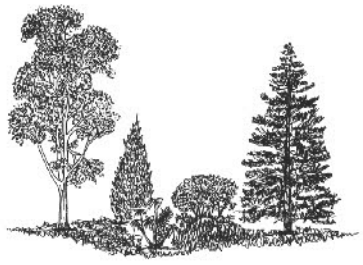
wanted to know about the soils of Wisconsin, it is in this book. It covers everything from the factors forming Wisconsin soils, to their properties, to covering the nine different soil regions. In addition to this, there are large numbers of maps, pictures and profiles to aid the reader. In my opinion, it is one of the more interesting soils books I have read in a long time.

During the course of the last three articles we have covered many different books on the topic of turfgrass management and golf courses. The intention of this was to make the readers aware of the amount of written material concerning our profession and hopefully guide you to some of the better books available to us. I hope in the very least that your interest has been stimulated and that they will serve as some type of guiding light to finding that perfect book.

The Other Plants

Chrysanthemum Culture on the Golf Course

By Dr. Lois Berg



The chrysanthemum is truly the 'Queen of Autumn.' If cultivars and planting locations are carefully selected, mums can be permanent additions to the landscape, requiring less work than most other herbaceous plants. This flower deserves consideration on the golf course, where it can provide an interesting and beautiful variety of color, size and shape from August to hard frost.

The genus Chrysanthemum includes several familiar plants: Costmary, an herb; Pyrethrum and Painted Daisy, both sources of pyrethrum insecticide; and Marguerite, Oxeye Daisy, Nippon Daisy, Feverfew and Shasta Daisy, all used as ornamentals. But by far, the most important member of the genus is Chrysanthemum x morifolium, the Chrysanthemum. This hybrid, probably originating in China, is used as a greenhouse potted plant, as a commercial cut flower and as a much-loved hardy perennial. A more recent use is as an annual bedding plant. . .but more on that later.

The chrysanthemums we plant outdoors are called "garden mums," a term that refers to those mum cultivars which will naturally flower in most of the country early enough in the fall to be showy before the first heavy frost. On the other hand, most greenhouse mum cultivars flower naturally in late October or November, and would be nipped by frost if grown outside. Many garden mums are winter hardy, and while this may vary greatly from one location to another and from one season to another, there are many excellent cultivars for the upper Midwest.

Variety of color, size, habit and bloom season

Chrysanthemum flowers vary tremendously in color, type and size. Most garden mums have small flowers, ¾ to 2" in diameter. A few cultivars bear flowers up to 5" across, but these generally are not as durable outdoors. Flower types range from tiny 'buttons' to huge, shaggy pompons. Singles have daisylike flowers; anemones are much like singles but have a rounded center of deeper colored petals; pompons are nearly globular flowers with short, closely packed petals; decoratives have close regular petals curving inward toward the center or outward toward the edge of the flower; spoons' petals have spoon-shaped tips; spiders have long, tubular petals with hooked ends; and quills have straight, long, tubular petals. In general, most singles and anemones are hardy, and some pompons, decoratives and spoons are hardy. Few spiders and quills are hardy in the upper Midwest.

Not all mums have the same growth habit. Some are classified as 'cushion mums,' meaning that they form a rounded mound when grown in an uncrowded, full-sun location. A second type of habit is 'upright,' meaning that the plans display a stiff vertical character.

Colors include white, yellows, pinks, lavenders, bronze, oranges and reds. There are also bicolors, with petals of one color on top and another color underneath. Newer introductions are more resistant to fading.

Chrysanthemums' flowering season is determined by daylength. In the long days of summer, mums produce stems and leaves. During the short days of autumn, they initiate and develop flower buds. Mums are classified according to the number of weeks required for flower development. Because late-season varieties which require many weeks for flower development will not bloom before hard frost, it is important to select only early- or mid-season mums.

History of the mum

The chrysanthemum has a long history as an ornamental. It was cultivated in China over 2000 years ago. The Japanese subsequently adopted the flower, contributing much to its culture, hybridization and improvement. It was introduced to the U.S. around 1820, primarily as a garden plant. By 1880 its value as a greenhouse crop was fully realized, and many new varieties were developed every year. Today, the mum is grown by a greater number of florists than any other commercial crop, and is among the top three commercially grown flower crops.

Over the years, more than 3000 cultivars of garden mums have been available in the U.S. Plant breeders have responded to the public's demand for shorter, sturdier, more compact plans, and have developed excellent cultivars that are self-branching and free-flowering, with longer lasting flowers in a wider range of color and form. The season of bloom has been extended, and winter hardiness has been much improved.

Choosing the right mum

Study your landscape needs first, and learn which types and cultivars are best suited for your conditions. A good

way to make a selection is to visit a trial ground during flowering season to evaluate mums in flower.

Select mums first for hardiness and earliness, and second for plant habit and flower characteristics. As much as possible, buy locally from a reputable dealer. Buy only high-quality plants that are properly labeled. Be cautious of plants labeled only "white" or "early."

Culture

Garden mums are very reliable if a few simple rules are followed, and nearly impossible if they are not.

Mums are best planted in spring after danger of hard frost, usually mid-May. In any event, they should be planted early enough in the season that their roots have time to become well-established before the heat of midsummer. Further south, mums can be planted in fall, but in the north, fall-planted mums do not reliably survive the first winter unless they are field-grown clumps rather than pot-grown greenhouse plants. If you must plant mums in the fall, do so no later than early August, water the plants well for the duration of the season, and mulch thickly for the winter.

Space mums according to their type and size. Generally, the taller, more spreading varieties need 18-24" spacing, while the shorter, more compact plants need about 12" spacing. Plant the soil ball just slightly below the level of the garden soil.

The healthiest plants are grown in full sun. Shaded plants grow taller, have weaker stems, and bloom later in the fall. Most soils are acceptable if well-drained. Mums grown in wet soil are likely to winterkill. Avoid low, poorly drained spots.

Prepare the soil to a depth of 8-12" before planting, and mix in organic matter. Soil fertility will determine the amount of fertilizer needed. Mums need a fairly rich soil. If the soil is naturally rich, or if you've added a quantity of compost, commercial fertilizer need not be applied at planting time. However, if the soil is not rich, or if you added peat moss rather than compost, fertilize with 5-10-5 or 10-10-10 fertilizer at a rate of 3-4 pounds material per 100 ft^2 soil. Fertilize established plantings at this rate each spring, after danger of late frost, and again in early July.

During a hot, dry summer or in areas with light soil, mums must be watered thoroughly every 7-10 days. A 2-3" layer of mulch (shredded bark, cocoa bean hulls and peat moss are excellent) retains soil moisture and reduces the necessity to weed.

In spring, when young shoots are 6-8" tall, pinch back the tips. When the new shoots resulting from this first pinch are 6-8" tall, pinch them back. Continue this pinching until mid-June for early flowering cultivars, late June for late September cultivars, and early July for early October cultivars. Pinching too late will delay and possibly prevent blooming, since the buds will not develop until after hard frost.

Perhaps the most common insect pests of mums are aphids, which distort growth, cause leaf drop, and sometimes affect flowering. Leafhoppers cause leaves to become mottled, curled or withered due to removal of plant sap. Leaf miners eat tunnels through leaves, reducing photosynthesis and plant vigor. A serious attack can result in stunted, poor quality flowers. Plant bugs remove plant sap, causing deformed leaves and flowers. Spider mites cause foliage to lighten in color and turn brown along leaf margins. Always identify insect infestations before treating. Most of these insect problems can be controlled with either a spray like malathion or diazinon, or with a granular systemic.

Mum diseases can be quite serious. Fungal problems include verticilium wilt, septoria leaf spot and powdery mildew. It is much easier to prevent these problems than to treat them. Overcrowded and shaded sites increase the problems, and good culture goes a long way in minimizing diseases. Buy only clean stock, select a growing location carefully, and maintain good culture. Several viruses such as mosaic, stunt and yellows can attack mums, but are only an occasional problem.

Once you have determined which insects and diseases are perennial problems in your plantings, you can control them with an insecticide-fungicide mixture as needed.

(Continued on page 15)

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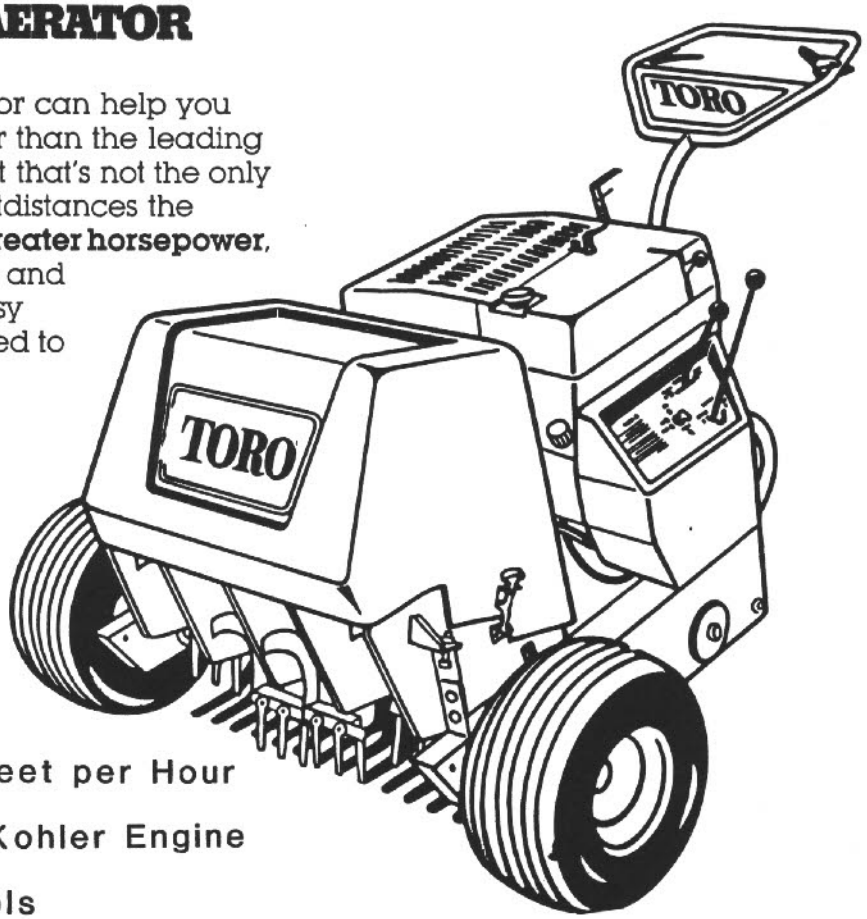

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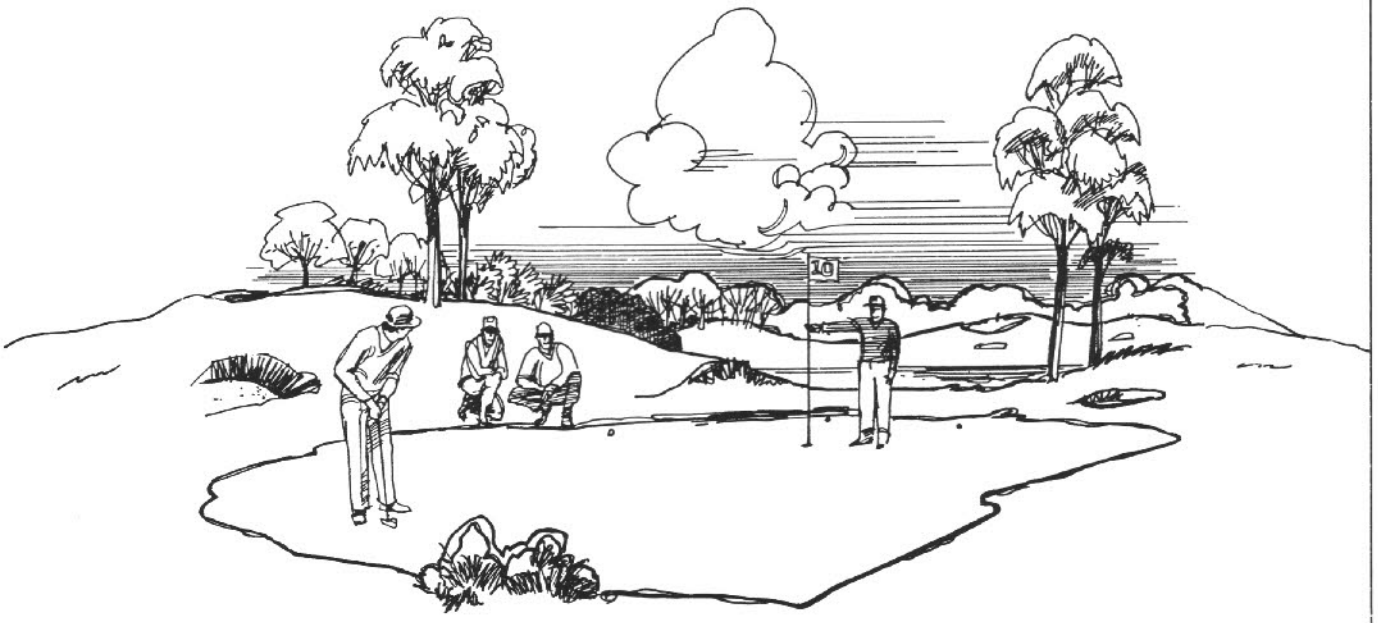

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OLDS

(Continued from page 12)

Late flowering may be caused by several factors, including late pinching, selection of a late cultivar which does not flower before frost, too much shade, insufficient fertilizer or water, root competition from nearby trees and shrubs, unusually hot weather in July and August, unusually cold weather in late August and September, and insect or disease injury. Evaluate the situation before taking any action.

Garden mums can winterkill easily. Select only hardy varieties. Avoid poorly drained locations, since alternate freezing and thawing of wet grounds in winter can destory mums' shallow root systems.

After most of the leaves have turned brown from hard frost, mound the soil 8" high around the base of the plants. Cut the branches back to 10" above the mound. Apply a 2-4" mulch around the plants after the soil surface has frozen. Do not mulch earlier, as this provides nests for rodents which will destory the plants. Appropriate mulches include evergreen branches, marsh hay and clean straw. Do not use materials which will compact and pack solid when wet, like leaves or grass clippings. In spring, remove the protective mulch and soil mound gradually. By the time new green shoots develop, the plants should be entirely exposed.

An alternative method of overwintering in the far North is to dig plants in late fall, plant them in large pots and hold them in a cold cellar (33-38°F) for the winter. Plants can also be placed in a cold frame with a thick layer of mulch. If you have a greenhouse, you can remove rooted suckers from around the base of the plants in late fall, place them in small pots and keep them actively growing through the winter, pinching as needed.

Established clumps of mums can be divided in spring. Dig the clumps when new growth is 4" tall, and after danger of late frost. Stronger shoots are generally on the outside of the clump. Remove them with a good root system and replant where desired, with the growing tip of each division just above the ground level. Vigorous plants may require annual division.

Design considerations

Mums are generally available at Mother's Day as potted flowering plants. Buying plants in flower is usually a bit more expensive, but there is a bonus. You can plant the mums in full flower in spring (or keep them on dining tables in the club house). When the flowers fade, cut the plants back to 6-8" and continue caring for them as described above. The plants will bloom again in the fall. (In subsequent years, the plants will bloom only in the fall.) If you are too far north to reliably overwinter mums, this is a good way to get a double season from the plants and still treat them as annuals.

Use mums as accent plants in shrub borders, along with Siberian iris for spring bloom, daylily for summer flowers and showy sedum for late summer bloom. These plants are all high quality when green, and provide a splash of color when in flower. If given good drainage and full sun, they will need minimum maintenance.

Plant mums as a backdrop for annual flower beds. Mums will provide a green background during the season when the annuals are at their best, and will continue to flower later in the fall after many annuals have died.

If you have an annual flower bed with a shrub backdrop, plant a staggered line of mums about 2½' in front of the shrubs. Fill in the front of the border with annuals, and seed a line of flowering kale between the mums and the shrubs. The kale will develop its color at the same time the mums are flowering in the fall. It's a great way to extend the life of your annual flower beds.

Use mums with groundcovers. Vinca and euonymus do very well in full sun, but large beds of these plants can be monotonous. Add mums, daylilies and spring-flowering bulbs for some seasonal color.

Editor's Note: Dr. Lois Berg is a floriculture consultant with Stack Landscaping in Verona, Wisconsin. She received her M.S. and Ph.D. from the University of Wisconsin's Department of Horticulture, where she taught floriculture classes and worked with the greenhouse industry for several years.

WATER: STRATEGY, FUNCTION AND BEAUTY

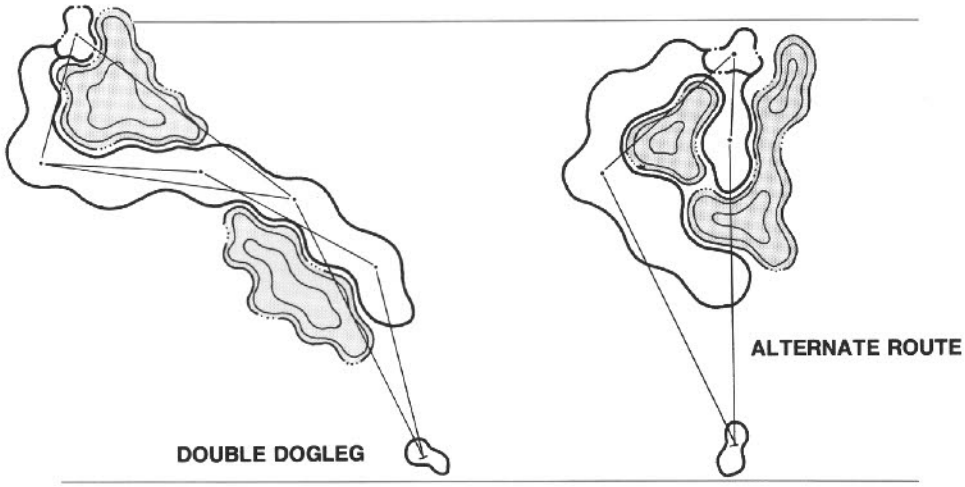
By Bob Lohmann and Jim Rodgers

A golf course consists of many elements that create settings of great beauty. Features such as rolling terrain, sand, trees, and mounds can provide breathtaking scenes and challenging golf holes. However, there is no view as scenic or intimidating to a golfer as a pond tucked up close to a green, or a lake that must be cleared on the drive.

Water has always been the most powerful feature in the design of golf courses. One of the best known examples of a water hazard is the infamous No. 17 at the Tournament Players Club in Sawgrass. Despite measuring only 132 yards from the back tees, the isolated green in the middle of a large lake intimidates even the pros. No doubt, this hole would look spectacular on any calendar, but it is just too demanding for a large number of golfers. The only conservative way to play this hole is to putt the ball across the earthen bridge leading to the green.

Another famous water hole is the 16th at Cypress Point. It offers a spectacular view of the ocean and demands a great tee shot to reach the green. However, the difference between these two holes is that No. 16 offers a safer route of play to the left of the green. The golfer may not make par, but he can play the hole with some dignity.

During the initial stages of laying out a golf course, it is important to determine where water would be best located on the site. When a coastline is available, it is desirable to route as many golf holes along it as possible. Because the most dramatic holes will be located here, it is preferable to use the coast on both the front and back nines. An excellent example of this is the Pebble Beach Golf Links on the Monterey Peninsula. Here, the golfer is led to the ocean on two separate occasions. Holes No. 7 — 10 run along the rocky coast; then the golfer heads inland before returning to the ocean on No. 17 and 18. This kind of routing creates balance throughout his round. Where no coastline is available, water should be located in lowlands and flat areas where drainage might become a problem.



When using water as a design feature, it is important to consider the average golfer's perception of water. To him, a pond will appear three times the size it really is. He can try to put it out of his mind and play his normal shot, but more often than not, he will send his ball to a watery grave. The fact that it will cost him strokes is bad enough, but it also represents money out of his pocket in terms of lost balls.

Often water serves only to terrify the average golfer and to offer no deterrent to the low handicapper. It is best not to position water right in front of a tee. This leads the duffer to top his drive into the water and cause him even more frustration than he already has. Whenever possible, ponds should be placed laterally to the golf hole, near the ideal position to approach the green. The pro then has the option to flirt with disaster in order to set up an easier second shot. More importantly, it gives the average golfer the option to play safely away from the hazard. He may require an extra shot to get to the green, but he can keep his ball dry.

A good example of lateral placement is the cut-off hole. With good distance and great accuracy, the golfer can shave distance off the hole and require a shorter iron to the green. However, he may elect the more conservative route leading to an easy bogie. This strategic positioning of water makes not only a challenging golf hole, but also a fair one.

Another situation where strategic water placement makes a good golf hole is on a double dogleg Par 5. Here, the golfer has the option to approach the hole in three different ways.

1. He can go for broke and maybe reach the green in two.
2. He can play conservatively, trying to position his ball for a Par 5.
3. He can play well away from the water and take bogie.

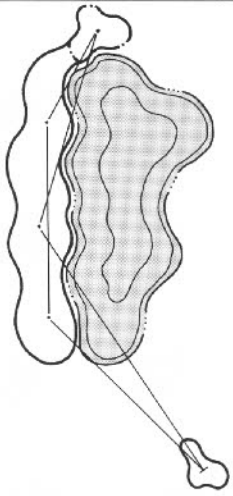
Once again, playing the hole requires thought and proves challenging to all levels of golfers.

The most intriguing use of strategic water placement is an alternate route golf hole. Here, the golfer must make a definite decision as to how he wants to play the hole. If he successfully drives his ball into the landing area surrounded by water, he has a much easier second shot and a good chance to make birdie. Yet, the option to play safe always remains.

A Par 3 makes an excellent hole to use water. The contoured green can follow the water's edge on one side

and allow for a variety of pin placements, ranging from relatively easy to very difficult. If an extra degree of beauty is desired, the water's edge can be defined by a retaining wall or rocks.

Sharp doglegs that offer no deterrent to going for the green often slow down play as golfers must wait for the group ahead to reach the green, and then perhaps spend more time looking for their balls somewhere in the rough. To prevent this, one might be tempted to plant a large number of trees. But, it will take 20 years for them to develop into a suitable deterrent, and golfers will still spend time looking for their balls. One solution is the construction of a pond at the corner of the dogleg which can provide an immediate hazard. If balls are hit into the water, golfers know it right away and can continue to play, which will alleviate slow play.



CUT OFF HOLE

In addition to the aesthetic benefit, ponds must sometimes be excavated to solve drainage problems. Because land values are steadily increasing, golf courses are often constructed in low flat areas not suitable for any other purpose. As a result, greens become flooded and fairways never dry out properly. This problem can be solved by digging a pond and using some of the excavated soil to build up the fairways. This method, coupled with the installation of draintile in key locations, can alleviate the problem.

One primary use for a water hazard on a golf course is to have it serve as the source of an irrigation system. When constructing an irrigation pond, it is important that it be of adequate size and depth so it does not become an eyesore. Irrigation ponds that do not have sufficient square footage can have a significant drop in water level during peak irrigation times. As a result, an unsightly edge that takes away from its beauty is produced. Also, a pond should be constructed at least eight feet deep to prevent sunlight from reaching the bottom, and causing weed growth.

A water hazard placed near an access road also becomes an excellent calling card to the passer-by. The picturesque setting can first capture his eye, then make him realize that a golf course with water can pose a formidable challenge.

In summary, when introducing water to a golf course, it is necessary to locate it where the site dictates. Always make sure the water becomes a strategic element in the design of the course and not a monster ready to devour the intimidated golfer. In addition, a pond should be properly constructed so there are no detractions from its potential beauty. These principles will lead to water that provides a challenge to the golfer as well as a splendid view that he will remember long after playing the course.

Editor's Note: A native of Illinois, Jim Rodgers received a Bachelor of Environmental Design from Miami University in Ohio in 1985. For the past year, he has worked on the staff of Lohmann Golf Designs, Inc., actively involved in designing, building, and remodeling golf courses.

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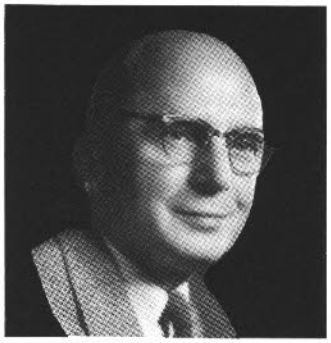

OSCAR T. JACOBSEN
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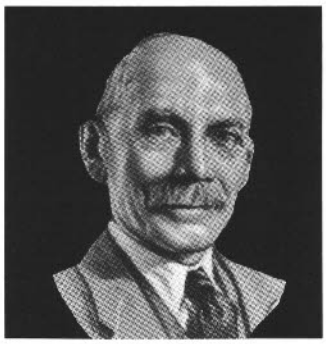

KNUD F. JACOBSEN
Co-founder
President, 1921-1937

EINAR A. JACOBSEN
Engineer
President, 1958-1969

Off to a Fast Start

The famous 4-Acre Mower started Jacobsen Manufacturing Company off strong in 1921. This engine-driven reel mower was specifically designed for use in parks, cemeteries, large estates and golf courses because it mowed 4 acres of grass in one day. It was the first mower equipped with a gasoline engine specifically tailored to power mower requirements.

Jacobsen, which began in Racine, Wisconsin and is still there today, has come a long way in the mowing industry since the 4-Acre Mower. Many of the company's philosophies which made it a leader are making it a leader today.

Industry Firsts

The company has compiled a long list of other industry "firsts," and continues to be a leader in a growing and competitive marketplace. Some of these "firsts" include: the first powered greensmower; the first riding attachment for power mowers; the first mechanical recoil starter for small mower engines; the first successful polyethylene grass catcher; the first rotary mower with 4 reversible, replaceable blades; the first pneumatic-tired equipment; and the first all-hydraulic triplex greensmower.

Even in 1986, Jacobsen is still showing its leadership by introducing the revolutionary Turf Groomer™ greens conditioner, and the industry's first diesel-powered triplex greensmower.

Founding Father

Knud F. Jacobsen founded the Jacobsen Manufacturing Company in 1920. He was born in Hjorring, Denmark in 1869 and emigrated to America where he settled in Racine, Wisconsin in 1891. After serving as President of the company for 17 years, he retired in 1937. His son, Oscar T. Jacobsen, took over as President and General Manager for the next 21 years. In 1958, Oscar assumed a new position as Chairman of the Board, while his brother, Einar, was advanced to President and General Manager.

Jacobsen Merges

The company remained family-operated for 49 years un-

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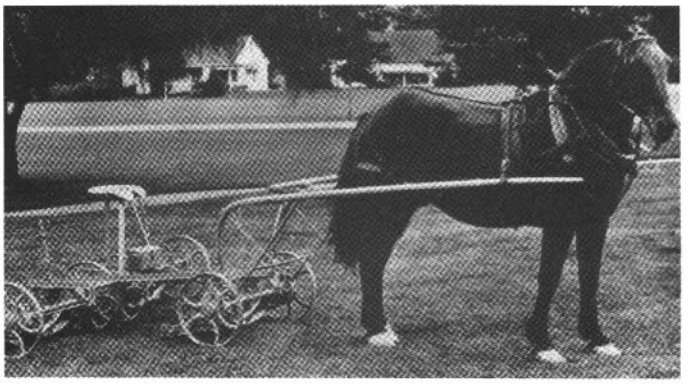
Jacobsen's 4-Acre Mower, introduced in 1921, was the first mower equipped with a gasoline engine specifically tailored to power mower specifications.



Jacobsen purchased the Worthington Mower Corporation in 1945 to broaden its line of large area mowers. These large area mowers included horse-drawn gang mowers such as the one pictured here.

til it merged with Allegheny Ludlum in 1969. During those 49 years, the company had grown from 35 employees in 1921 to over 1,400 employees. It had acquired several companies to expand its mower line including the Johnston Lawn Mower Company in 1940, the Worthington Mower Company in 1945, an the Standard Manufacturing Company in 1948.

Jacobsen was purchased from Allegheny Ludlum in 1978 by Textron Inc., Providence, Rhode Island. One change under the new ownership was to turn over Jacobsen's consumer line of lawn mowers and snowblowers to Textron's Homelite Division in North Carolina. As a result, the "Turf Division" of Jacobsen became an independent company specializing in commercial turf maintenance equipment.

Today, Jacobsen Division of Textron Inc., in Racine, Wisconsin, makes turf maintenance products for golf courses, parks, schools, municipal grounds, and other large turf areas, as well as for professional landscaping applications.

Jacobsen has two plant locations. A 115,000 square foot plant in Arrowood, North Carolina employs 77 people. The main plant and headquarters in Racine has 490,000 square feet and 526 employees.

Quality is Essential

John R. Dwyer, Jr. was named President of Jacobsen in 1981, and has kept the company competitive by stressing the need for quality projects.

"With growing competition in the industry, it's not enough to be first. . . . .you have to be the best," comments Dwyer. "At Jacobsen, we do extensive testing on all of our products to make sure they are top quality and able to withstand the punishment of turf and commercial applications before we introduce them for sale."

Jacobsen products are subjected to the most severe conditions to test durability under a variety of circumstances. Test cells control the environment to see how the equipment will perform in sub-zero temperatures as well as in extremely hot temperatures. Prototype machines are run under varied load and speed conditions in the lab to test for wear and tear. Then they are extensively field tested to be sure they will function the way the customer wants under actual mowing conditions.

Dwyer feels that the more testing that is done on a product, the higher the quality will be.

"Engineering is a vital step in producing quality products," he added.

How a Product Develops

Anthony J. Saiia is Vice President of Engineering. In the creation of new products, Saiia believes that the customer plays a vital role.

"We listen to their needs and problems and try to create products that will meet those needs and solve those problems," comments Saiia.

Saiia points to a recent example to show how an idea for a new product evolves:

"Golf course superintendents have been telling us that they love the way our Greens King IV cuts, but many wish it was available with a diesel engine for better fuel