"Pledge of Quality" commits engine division employees to the highest standards of excellence in every engine they build.

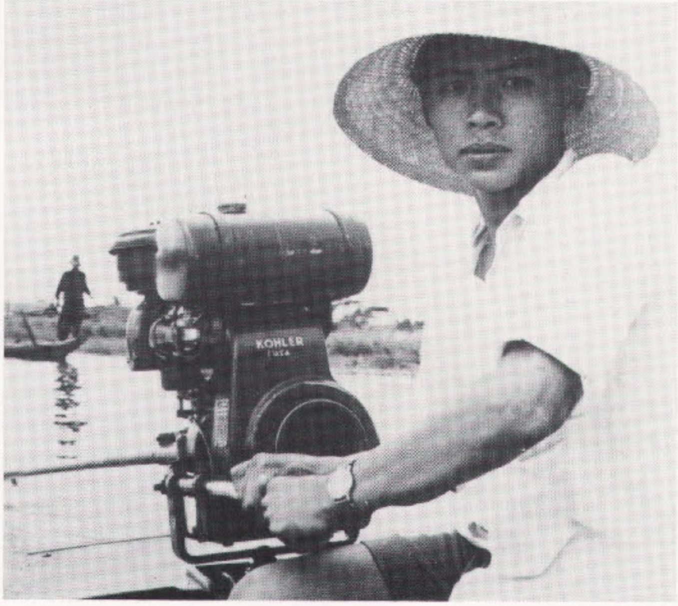
Twin-cylinder Kohler engines roll down the production line, assembled by workers who are committed to the engine division's "Pledge of Quality."

ing preserve, and the recently opened Woodlake Market and Shops, a unique concept in neighborhood shopping.

The Kohler Design Center, a multi-story showcase of the company's past and present products, includes 26 bathrooms, powder rooms and kitchens created by leading interior designers.

Diverse new product lines have recently been added to the company through a number of "bold venture" strategic acquisitions.

Kohler Co. took a major step into the total home furnishings market with the purchase of Baker, Knapp & Tubbs, the premier manufacturer and largest distributor



Kohler engines are a preferred source of marine power in the Philippines and throughout much of the Far East.

of furniture for traditional and contemporary homes and executive offices.

The company's purchase of Compagnie Internationale Des Produits Sanitaires "Jacob Delafon", the most recognized name in French plumbing products, was a significant move in established access to European and other international markets. Jacob Delafon has manufacturing facilities in France, Spain, Morocco and Egypt.

During the last 12 months, Kohler's Sterling Faucet subsidiary acquired Polar Stainless Products, a top producer of stainless steel sinks, and Owens-Corning FRP Components Division, the country's leading manufacturer of sheet molded compound bath products. Together these companies fill voids in Kohler's plumbing product portfolio and strengthen Sterling's position as a leading supplier to retail markets.

Kohler Ltd. is the company's new manufacturing and sales subsidiary in Canada. Fiberglass and acrylic plumbing products are produced in Cornwall, Ontario, and Armstrong, British Columbia, and sales offices are located throughout the nation.

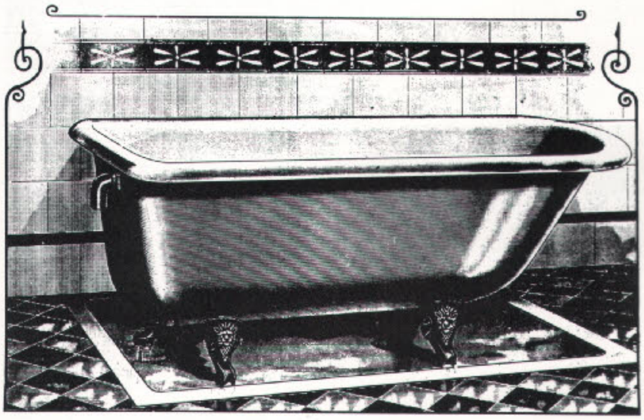
Kohler Japan KK, a subsidiary with sales offices, showroom and warehouse in Tokyo, focuses on the design, development and sales of plumbing and leisure products for the Japanese market.

Kohler's newest bold venture is its championship golf course presently under construction on the southern edge of Kohler Village. Designed by Pete Dye, the public golf course is located on a 200-acre site that lies along the winding Sheboygan River and utilizes every existing feature of the land, with special emphasis on the river.

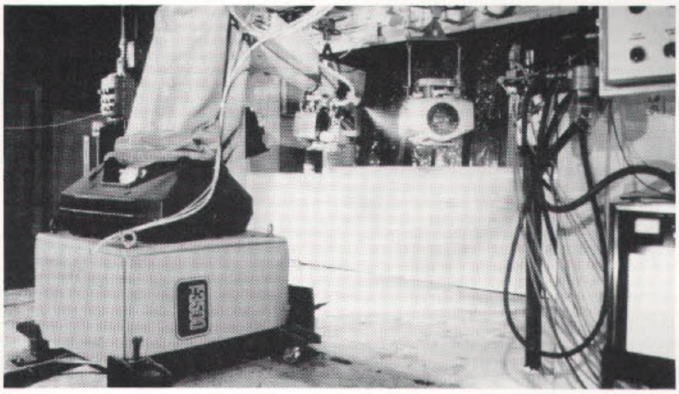
Dye has indicated that the tournament-calibre course will be a "test to the professional, but enjoyable for the average player."

The golf course was scheduled to open in June of this year, but heavy rains last fall delayed construction plans

KOHLER



The first Kohler bathtub was a hog scalder/feed trough from Kohler's farm equipment line. John Michael enameled the inside of the fixture, added feet and drains, and changed the company's course of history.

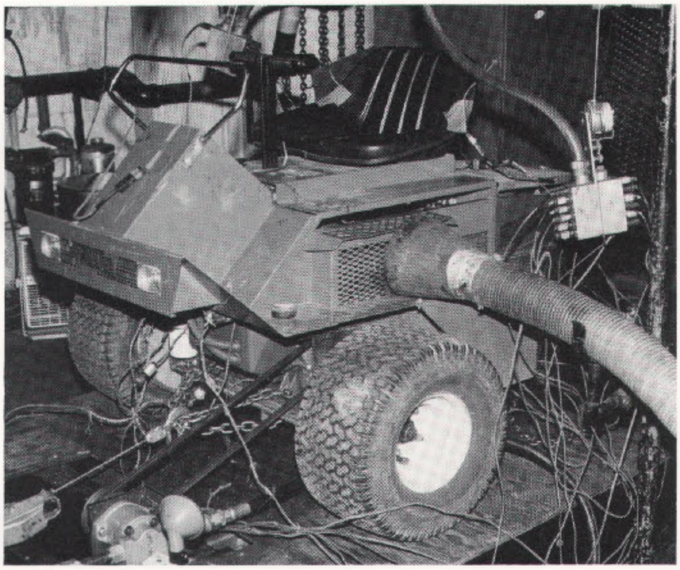


Computer-controlled robotic painting insures that each engine receives a finish that is both durable and attractive.

and the course is now expected to open in early 1988. A $1 million log and fieldstone clubhouse overlooking the river and golf course is presently under construction. The 15,980-square-foot building will include a dining room, outdoor eating area, meeting rooms and pro shop. It is expected to open to the public later this year.

The golf course is an integral part of a long-range plan to make the Kohler environs a viable travel and residential destination. The goal was first envisioned in a 50-Year Master Plan adopted by the company and Kohler Village in 1973, and has since been enhanced by residential and commercial developments throughout the community.

Kohler Village was one of the first planned communities



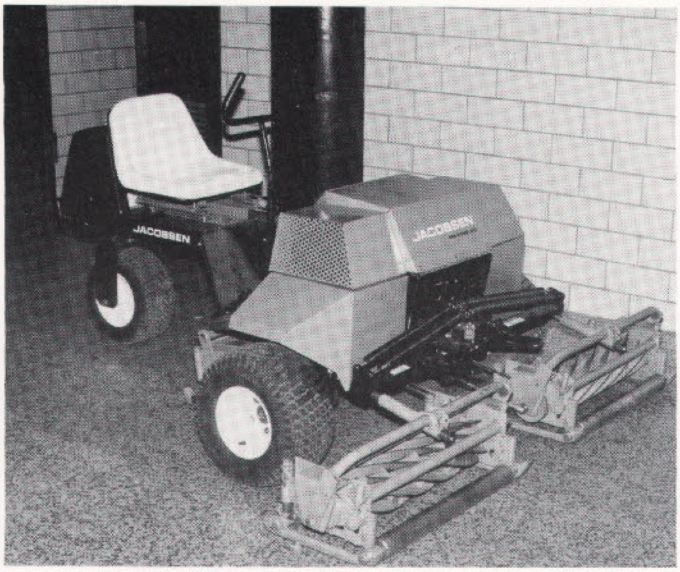
Exhaustive testing plays a major role in the success and proven track record of Kohler's new Magnum engine line.

A view of the clubhouse on the Kohler Company's new championship golf course.

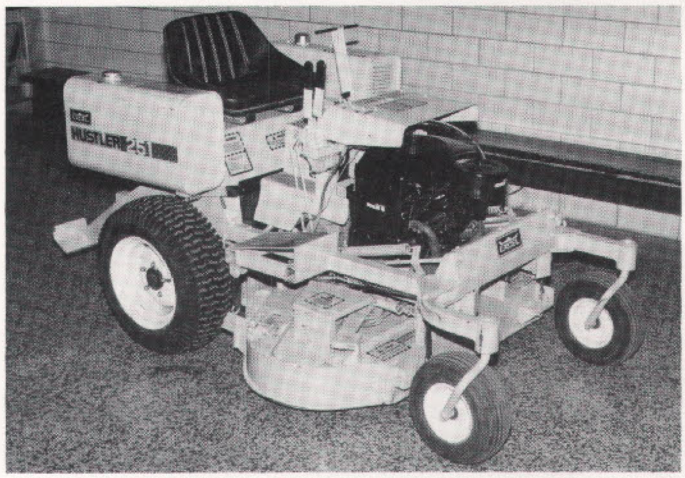
in the nation, initiating a village master plan in 1915. Its chief architect was Walter J. Kohler, then chief executive officer of Kohler Co.

The plan called for a broad avenue to separate the industrial sector from the residential community. Curving streets, numerous parks and a "greenbelt" around the community made Kohler Village a "garden community at industry's gate." The Kohler Stables, home of championship Morgan horses, lies within the greenbelt; Kohler Farms, where prize Chianina and Chiangus cattle are raised and the source for a new, flavorful, healthier brand of beef, is located just south of the village and golf course.

Back in the days of crewcuts, the K-161 Kohler engine was a popular power source on the farm.

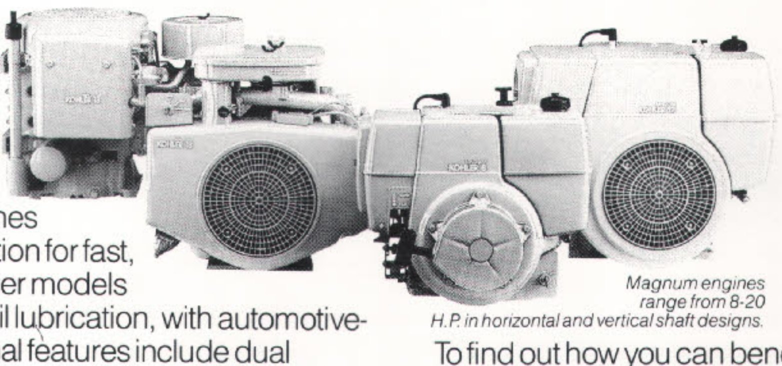


Kohler Magnum 14-HP engine drives Jacobsen's three-gang mower.

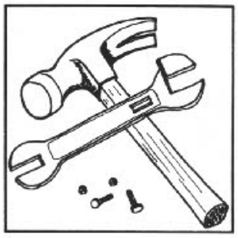


Excel Hustler 251 with a Kohler 18-HP Magnum engine.

A man-made lake near the clubhouse on the front 9 of Kohler's new golf course currently under construction.



Magnum engines range from 8-20 H.P. in horizontal and vertical shaft designs.



Small Engine Care

By Tom Harrison

We all have different problems maintaining our courses. Turfgrass diseases, irrigation, irate members, and employees are but a few of the areas that make our jobs very difficult. Our turf equipment, if properly maintained, can be an asset in making the season less hectic. But when a piece of equipment fails prematurely during the growing season, it just makes our jobs that much more aggravating.

The majority of the machinery used on golf courses today is powered by small engines from one to four cylinders in size. These small power plants are the backbone of the equipment we use. It is imperative that this equipment operate trouble free and continuously throughout our growing season. Midseason breakdowns and the problems they cause are both unwanted and in most cases unnecessary.

Good equipment care starts with purchasing good, durable equipment; training your employees to operate and care for it properly; and servicing it regularly. Good preventative maintenance means thoroughly understanding each piece of equipment; following manufacturers recommendations on servicing; using good quality lubes and fuels; and having a trained person, who is given adequate time to care for the equipment.

Every golf course maintenance operation needs someone to service the equipment. Most of the larger golf courses with many pieces of equipment need a full time person in the shop while small operations can make do with a man in the shop half time or less. Large operations that need a man in the shop full time but who are constantly pulling him out of the shop to rake traps and mow roughs are asking for trouble. Eventually the equipment will start to fail prematurely and the superintendent will blame it on his inept mechanic. But no matter the size of the operation the fact remains that someone with training and the necessary time must care for each piece of equipment.

Many clubs in the state have successful maintenance programs and consequently there are many ways to approach good equipment care. It would be difficult to write an article that details specifically "the" method to care for equipment. There are many superintendents who do a good job along these lines so what I have to say will not be of much value to them. But there are many superintendents who are great golfers and great agronomists, but are lacking in the area of equipment care. I would like to relate our experiences at Maple Bluff Country Club because we feel that we do a pretty fair job of caring for and repairing equipment.

The heart of any good maintenance program is the commitment by the superintendent to put some emphasis on his equipment repair. Secondly the level of service and the delegation of responsibility to an employee or mechanic must be made. The most basic part in taking care of equipment is following the manufacturers recommendations on servicing. More specifically, this means changing the oil, filter and chassis lubrication. The engine is the single most expensive part of any piece of equipment, which makes its care critical. Too many people extend oil and filter service intervals too far. An engine that has its oil and filter changed regularly will last a tremendous length of time.

At Maple Bluff Country Club all single cylinder engines are serviced every 25 hours. This includes oil, air filter, oil filter (every other lube interval on some engines, every interval on others) and a general inspection of the outside of the engine for any other problems. We use Cenex 518 #30 in all engines used during the warm months of the year unless the manufacturer requests use of a multi-weight oil. If a manufacturer specifically recommends a multi-weight oil then we use a 15W-40. We do not switch brands of oil, from year to year. We will check our suppliers prices periodically to keep everybody honest and we let them know we are doing so, but we have no intention of switching brands. Many years ago different brands of oil had major differences in quality and additives. That is less so today which makes changing brands of oil in a repair facility less hard on the engines. But there are still differences among oils so it pays to settle on a good reliable supplier who sells a good quality product and stay with that company.

Single cylinder engines are serviced every 25 hours, 2 cylinder engines anywhere from 50 to 100 hours depending on the type of use and 4 cylinder engines every 100 hours or 2 months. At these service intervals it is common to get 1800 hours on a single cylinder Kohler cast iron block before we have to rebuild the engine. Briggs aluminum blocks (on Ransomes Motor 180's) are currently at 1130 hours with no failures. Cushman 2 cylinder engines have lasted 5000 hours before overhaul. Regular, frequent oil service intervals can give tremendous life to an engine. When the engines are finally ready for repair we do not discard them but rather rebuild them for more service life. It is amazing how you can cut the operating cost of a piece of equipment down drastically by merely extending service life by regular oil change intervals.

Air filters and the screens on flywheels on air cooled engines are checked very carefully. Air filters can be blown out with low pressure compressed air but care must be taken. Any chance of a filter not sealing properly or of a hole developing from too high air pressure used in cleaning and the filter is discarded. A filter that gets too plugged for cleaning, or oil or gas soaked, must likewise be discarded. The volume of air that an air cleaner handles and the importance of clean air to the life of an engine makes it critical that air cleaners be cared for properly.

Flywheel screens can become plugged during seeding time and if ignored the effects are not known until the engine overheats and the valves and rings are damaged. A simple cleaning with an air gun will suffice to keep a flywheel screen breathing properly.

These simple items—regular oil and filter intervals, proper air cleaner care and keeping the air cooled engine cooling properly—will keep the operating cost of a piece of equipment down. It is a poor business practice to discard equipment because the engine needs repair due to poor servicing. If your equipment is cared for properly and gives you trouble free service it is one step in making your operation run a little smoother.

(Continued from page 15.)
covered with soft, woolly white hairs, forming a mat 8-12" tall. Plant Lamb's Ears along the front of an annual flower garden, 15-18" apart. It will fill in as a broad edging plant. Most Lamb's Ears produce 12-15" upright stalks in July, with small magenta flowers, but gardeners often cut them back before the flowers develop. Lower-growing, non-flowering types such as 'Silver Carpet' are available.

SUPPORT OUR ADVERTISERS

And be sure to read Bill Roberts' "President's Message"

ROBERTS SEEKS RE-ELECTION TO GCSAA BOARD

WGCSA President Bill Roberts plans to run for re-election to the Golf Course Superintendents Association of America Board of Directors at the association annual meeting in Houston in early 1988.

Bill addresses his plans and a request for WGCSA support in the following letter to the membership:

SentryWorld

601 North Michigan Avenue
Stevens Point, WI 54481
715 345-1600

May 29, 1987

Dear WGCSA Members,

Once again, with a degree of confidence, humility and pride, I seek the support of the Wisconsin Golf Course Superintendents Association for nomination for the office of Director of the Golf Course Superintendents Association of America.

I believe my interest in the "National" was evidenced by my participation in GCSAA affairs before election to my current term. I know my experience as a Director and officer of the Wisconsin GCSA has been invaluable in helping me to serve, on balance, the ultimate interests of all members. I am secure in the knowledge that my two years as a member of GCSAA's Board of Directors have been productive and have shown that I can be an effective partner in the group, working with other Directors and staff and, more importantly, working for GCSAA's members.

My sense of humility is mixed with the intense pride I have always felt as one of a profession whose members are the most dedicated, vital and hardworking group of individuals it has ever been my privilege to know. Our collective future is limited only by ourselves and having long been a believer in the old adage, "You only get back what you put in", I trust that my time, energy and talents may be of use to our Association in realizing the resolution of the challenges presented to the Golf Course Superintendent, now and in the future.

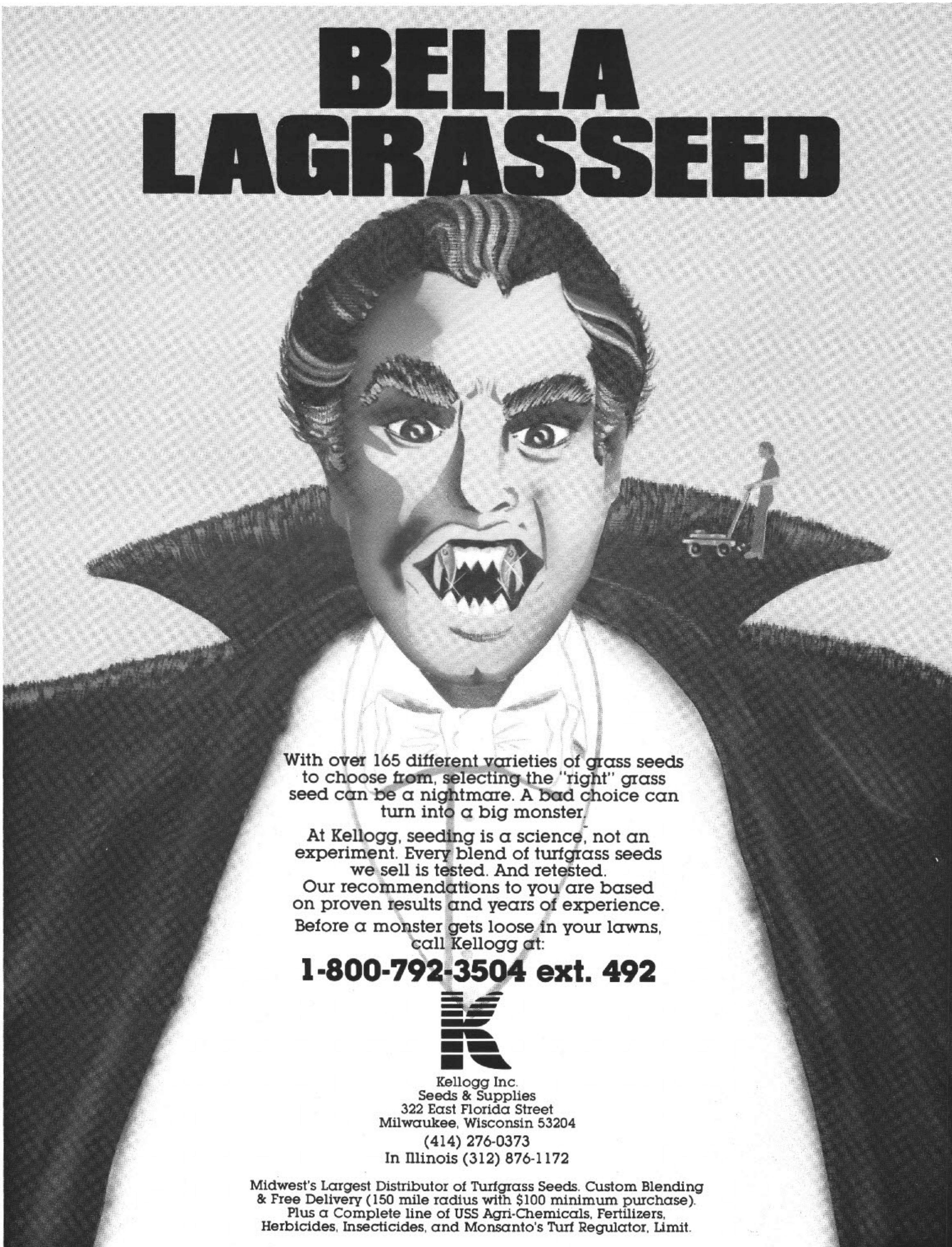
With the complete support of my family, my employer and my staff, I ask the same commitment from the Wisconsin Golf Course Superintendents Association in continuing what I believe has been and will be a very rewarding experience for all of us.

Respectfully,

William R. Roberts

William R. Roberts, CGCS

dma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On Making Recommendations— When Do You Make Changes?

(Or. . . "Snow mold applications— early or late?)

By Dr. Gayle Worf

There's an old axiom that many of us follow rather religiously: "If it works, don't change it". Another way of putting it is "If it ain't broken, don't fix it!" We've thought about that a lot regarding the traditional practice of waiting until the last minute to lay down the fungicides intended to last through the winter for snow mold control. That's what both labels and "wisdom" have suggested for many decades. So why change? Doesn't it work? Is there something wrong with it?

For the last several years we've been growing in our belief that there really is something wrong with that practice, especially when so many superintendents get caught by a surprisingly early snowstorm, one that stays until spring —and without any protectant fungicides laid down! That didn't happen this last winter, but it did the year before, as well as several more in recent years, which prompted our seeking the cooperation from twenty golf course managers around the state to see whether their results would match our research observations over the previous several years.

The date of application does sometimes make a difference, according to our experience—the problem is, sometimes an early application is better, while on other occasions a later treatment provides better protection. On most occasions, we don't think it makes that much difference, though.

Let's look at the results of the last few years as an example. In 1983-84, we applied chemicals on October 21 and November 10 at Wausau C.C. with Walt Stepanik, and on October 28 and November 18 at Westmoor C.C. with Jerry Kershasky. At Westmoor, where only pink snow mold developed, nearly all applications of Caloclor, Daconil, Bayleton, Terremec, Terraclor and experimentals were better with the earlier (October 28) date than the later date. Both pink and gray mold developed at Wausau, and Caloclor and higher (8 oz) rates of Terraclor were equally effective on both dates. Terremec and Daconil results were also about equal, while Bayleton and the 4 ounce rate of Terraclor were somewhat better at the later date.

Our application dates were somewhat later in 1984-85 (November 8 and 29 at Wausau, November 9 and 30 at Westmoor), and we had fewer comparisons by dates (only experimentals and Terraclor). Those treatment dates did not influence efficacy, though they were later than we ordinarily would suggest.

In 1985-86 our tests were confined to the Stevens Point C.C., with Jeff Bottensek, where we could try the chemicals on a bentgrass nursery. We planned for two dates—October 26 and November 12. You guessed it—we were "snowed out" for the winter by the second date, and didn't get it applied. And so were a lot of superintendents! However, the October 26 Caloclor treatments, either alone or in lower rate combinations with Terraclor or Terremec provided nearly complete control of gray snow mold. No pink snow mold was noted. "Fairway rate" combinations of Terraclor (4oz) + Terremec (3 oz) also looked good. Early treatments were the only answer that year. In this past season's results there, just completed, late (November 14) applications of Caloclor (3 oz), Terraclor (4 oz) + chloroneb (3 oz.), of Terraclor (8 oz), trended better than October 27 applications, but the results were not statistically different.

The biggest disadvantage I've noted to date with earlier treatments has been the greater tendency for phytotoxicity from mercurials, especially, and PCNB to a lesser extent. I don't perceive this as a problem on fairways, where mercurials are not allowed, and the PCNB damage we've seen—with the lower rates used on fairways, especially—is not significant. No differential injuries have been noted with most other products, including chloroneb, which sometimes acts as a "safener" for mercury and PCNB. Some superintendents favor split treatments, applying some product in late October, and following with the completed dosage in November for their greens and tees. While we've not tried that, because of various time constraints, it may be the ideal way to go. But the big advantage of early applications shows up when inclement November weather occurs! Not only do we run risks of not getting chemicals laid down, we sometimes are restricted to use of granules only because of cold weather.

So what did our cooperators find out? For all of our concerns about summer diseases, snow mold remains potentially the most damaging disease complex affecting Wisconsin golf courses. Some may wonder about that, following the mild winter we just had. We didn't pick a good year to enlist the aid of cooperators in testing treatment dates. We received reports back from 11 cooperators, and most indicated that the winter was too mild to provide a realistic comparison. They used product(s) of their choice, applied at two different dates, made comparisons, and shared the results on a survey form with me. Virtually all date comparisons yielded equal results. Mark Kienert at Bull's Eye Country Club had a more severe snow mold year than other reporters, and he invited me to visit his course to look at the results on his fairways. This was their first year of treating fairways, which were treated with three ounces of Terraclor on October 27 and November 5. Results weren't perfect—but they were spectacular! There was only about 10% as much pink snow mold in the treated versus non-treated areas, regardless of treatment date.

I think we'll try this cooperative test another year. If you want to be a participant this fall, please contact me. We'd welcome your observations!

FALL FERTILIZATION OF TURFGRASS Part I. The Rationale

By Dr. Wayne R. Kussow

This is the first of a two-part series of articles on fall fertilization of turfgrass. In this Part I, the rationale for focusing on fall as the starting time for a turf fertilization program is developed by examining how turfgrass responds physiologically to weather and to temperature in particular. Part II, planned for the next issue of *Grass Roots*, will translate these physiological responses into recommendations for fall fertilization of turfgrass in Wisconsin. Research reports on the consequences of fall fertilization on turf quality and various cultural problems will be reviewed as well.

Biochemical Responses to Temperature

Turfgrass, like any other biological system, responds to changes in temperature. At very low temperatures, biochemical reactions leading to growth occur at such a slow rate that, for all practical purposes, growth ceases and the plant enters a dormant stage. At the other extreme of very high temperature, growth also virtually stops because certain biochemical reaction rates are so high that plants exhaust food and energy supplies required for growth. In essence, the plants "run out of gas." Somewhere between these extremes lies a temperature range where reaction rates are optimum.

The two biochemical processes largely responsible for temperature effects on turfgrass growth are photosynthesis and respiration. Photosynthesis is the process whereby carbon from carbon dioxidee is combined with hydrogen from water to form carbohydrates. The reaction can be summarized as follows:

$$\text{Carbon dioxide} + \text{water} \xrightarrow[\text{Green Plant}]{\text{Sunlight}} \text{Carbohydrate} + \text{oxygen}$$

The carbohydrate then becomes the basic building material and energy source for plant growth and development.

Respiration is the process by which the energy in carbohydrates is released to fuel plant synthesis of substances such as starch, amino acids, proteins and all other organic compounds that make up plant tissues. Respiration can be depicted as follows:

$$\text{Carbohydrate} + \text{oxygen} \longrightarrow \text{carbon dioxide} + \text{water} + \text{energy}$$

In a sense then, respiration is the reverse of photosynthesis.

Figure 1 shows how photosynthesis and respiration in cool-season turfgrasses relate to changes in air temperature. The key features of these relationships are:

1. Photosynthesis reaches a maximum rate at a lower air temperature than does respiration; and
2. Respiration continues (albeit at very low rates) at temperatures below which photosynthesis ceases.

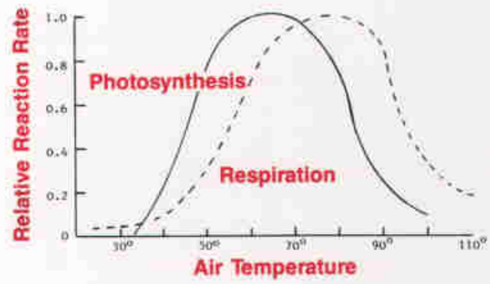

Fig. 1 Effects of air temperature on the rates of photosynthesis and respiration in cool-season turfgrasses.

The significance of Figure 1 lies in the balance between photosynthesis and respiration. As long as more photosynthate (carbohydrate) is being produced than is being broken down in respiration, there is a net production of carbohydrate for turfgrass growth and development. However, this is not always the case.

Fig. 2 Effects of air temperature on the net photosynthesis of cool-season turfgrass.

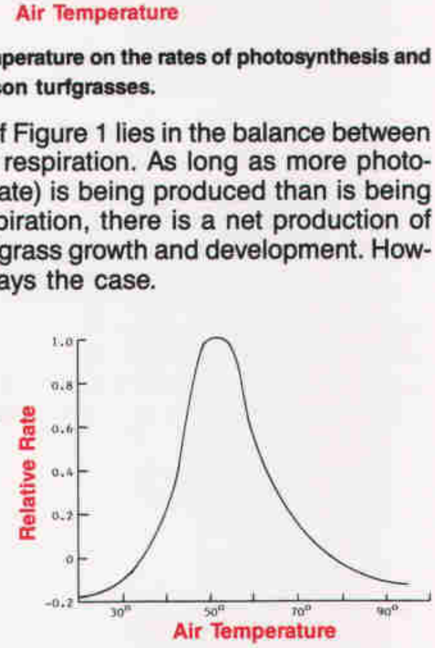

Figure 2 shows how net photosynthesis (the difference between photosynthesis and respiration) relates to air temperature. Peak net production of photosynthate occurs in the temperature range of 60 to 75°F.

At low air temperature (below about 35°) and high air temperatures (above about 80°F), net photosynthesis can be less than zero. Under these circumstances, the only way the turfgrass plant can initiate new growth is to draw upon carbohydrate reserves previously stored in stem, sheath and root tissues.

Growth Responses to Temperature

Turfgrass managers are well aware that the shoot growth rate of cool-season grasses peaks in late spring and early fall and declines markedly in mid-to-late summer. This growth pattern reflects the fact that optimum temperature range for cool-season grass shoot growth is 60 to 75°F (Fig. 3). To a large extent, this shoot growth pattern is a direct consequence of the effects of temperature on net photosynthesis (Fig. 2).

What turfgrass managers cannot readily observe and are often unaware of is the fact that turfgrass root and rhizome or stolen growth rates peak at temperatures approximately 10 degrees less than do shoot growth rates