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## The Maturing Of Graphite from page 23

manufacturers are helping to solve a lot of the questions of fitting. The importance of fitting is mirrored dramatically in a 1974 survey of graphite users. Hardly a rousing endorsement for the shaft, 60 percent of the users found little difference in performance over steel. Marked improvement was the case in 20 percent of the golfers, while the remainder lost distance. However, variables in surveys can make for misleading conclusions.

The variables-quality of shaft from brand to brand; discrepancies in carbon graphite fiber content, for example. Shaft strength, torque, weight and deflection are other factors. Not to mention the structure of the club that was used. Lofts and headweights will vary, as will the lie and the angle of the face. Was the clubhead especially built to accommodate a graphite shaft, or was it a re-shaft job? So it goes.

A Stanford University Research group projects sales of 24 million golf clubs yearly by 1984, with 25 percent of it in graphite. This indicates acceptance of graphite in pro-line irons as well as woods. It also projects population growth and increased popularity of golf. But rumors are that part of the rosy estimate for graphite is based upon anticipated lower prices for carbon graphite fibers.

Yet, lower prices for fibers are not expected soon, even though within the last three years they've come down from astronomical heights to the present \$50 per pound level. (It takes about a half-pound of fibers to make four shafts.) Shafts are much lower too since graphite was first marketed. At first, they sold around the \$60 mark. Today they're just \$30 each in large quantities, and some sell for a shade less. (Aldila's graphite/boron shaft is priced slightly higher.) Today's shaft prices make a pro-line caliber driver a comfortably priced item at \$85 retail. In the offing, perhaps, by 1980, we may see low priced carbon graphite fibers made of coal tar pitch, or petroleum.

Today, top quality carbon graphite yarn is manufactured from acrylic fibers. These fibers are made from polymerized acrylonitrile (or PAN),

a liquid organic compound. Union Carbide is developing a method of making graphite fibers from coal tar pitch. The company predicts tar pitch fiber production by mid-1975, with a price of \$40 per pound and \$25 per pound by 1977. If enormous quantities are produced and sold, Union Carbide foresees substantially lower prices than this by 1980. While the new product will have use in aerospace and other industries, it has not yet been tested in golf club shafts.

At present most shaft makers use the "pre-preg" method. They buy the graphite fibers already impregnated with resin/epoxy in the form of wide tapes, often called "broad goods." These tapes are about as thick as heavy wrapping paper, and are cut into narrow strips to be wrapped onto a steel mandrel. Each narrow strip, or tape, is wrapped by hand in layers on the mandrel. The wrapping must be tight, with the tape laid down precisely, either parallel or on prescribed angles. (The correct wrap angles are critical, affecting the torque and deflection.) After steps that follow, the mandrel is removed after a heating and drying process, and the hollow graphite shaft remains.

While utilizing the pre-preg technique, Graftek has made some changes in its manufacturing process. Dick Van Auken, Exxon's technical director, has used some acquired knowledge of the aerospace industry to make some significant changes in the development of the Graftek lines. Knowing about internal stresses of composite parts inherent in laminated constructions, Van Auken has incorporated an "inter-laminar" layer to absorb and uniformly disperse these stresses.

A new development, however, is Fansteel's fully automated system. This method promises a quality shaft for less than 30 percent of present graphite shaft costs. The threads are wound automatically onto the shaft, and, allegedly, variables are eliminated, according to Fansteel's Barman.

Barman said, "Our new automated machinery will do most everything that can be done by hand, and do it better. We look for an introductory price of under \$20 per shaft in quantities. But, of course, any new method like ours must be proven and stand up under every test, even

though it's been in development for a long time.

"The advantage of our new automation is its consistency. We can produce shaft after shaft, exactly the same. We can program directional winding to control precisely the flex, weight and torque of each run of shafts. We can program the exact deflection point a golf clubmaker may specify to give his shaft its distinct brand characteristics. In fact, our sophisticated space age machinery does everything but talk back to the operator."

Barman added that Fansteel's automation method is an exclusive, and that only the highest grade fibers and epoxy/resin will be used in the new shaft. The machinery stands about 20 feet high. A stairway gives access for loading the graphite fiber bundles onto the automated spools. An operator on a platform above feeds steel mandrels down into the machine. The graphite threads are then wound directly onto each descending mandrel, according to programmed specifications. Within one minute, this job is completed automatically, and the shaft is conveyed to the cure oven. After curing, the mandrel is stripped and a urethane finishing coating is applied. Then the shaft is given its final inspection and checked against the specifications.

Fansteel made only one hedge about the projected \$20 price. Said Barman, "Our new GRW shaft will be priced lower, that's for certain. But our estimate is based on the present price of graphite fibers. We're assuming there'll be no increase. In fact, we're hoping, along with others in the industry, that the coal tar pitch process will mean the beginning of lower fiber costs."

Optimistic price forecasts on graphite fibers have been around awhile. So the shaft makers, in general, are taking a "we've heard it all before" attitude as they watch new developments. Some question the efficiency of graphite fibers from the pitch process. They say to gain acceptance, any new pitch fibers will have to be as good as today's \$50 per pound PAN based fibers. If they're not, the graphite industry has had another false alarm, and will have to try to cut costs in other ways. If the pitch process is successful? . . . Well, why wait until 1980 to add 20 years to your ailing tee shots? □

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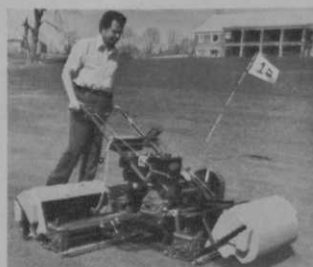
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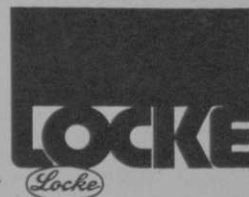
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# AQUATICS THE CHEMICAL ANSWER

Water hazards on golf courses may be challenging for golfers and aesthetically pleasing — but water needs and algae that infest them have become an increasing problem for golf course superintendents.

Unightly and smelly water weeds can cost golf courses money — and not only from golfers that are discouraged from playing the course. Water weeds that infest ponds and lakes used for irrigation can clog drainage and irrigation equipment.

There is also the danger of infesting turf with weed varieties transported in irrigation waters, according to Andy Price of Asgrow Florida Co., Plant City, Fla. There are a number of weed varieties that are adaptable to both aquatic and terrestrial environments, Price says.

Weeds in some golf course lakes have become so dense that divers in some parts of the country have refused to retrieve golf balls after isolated cases of diver fatalities when they became entangled in weeds.

Why is the problem of aquatic weeds and algae growing so rapidly

in the United States? No one claims to know — there are just some “educated guesses.” One theory offered by Chuck Carroll of Arizona Agri-Chemicals in Phoenix is that, once established, water weeds become increasingly prolific. Others believe aquatic weed growth is spurred by large amounts of fertilizer that is being used and washed into water bodies.

And, finally one authority claims, with all the construction being done that includes man-made bodies of water, more water is being exposed to sunlight. Sunlight hitting water begins the process of photosynthesis where energy from the sun is transferred into aquatic vegetation.

Whatever the source of aquatic weeds and algae, the problem simply stated, is how to control them. Experts who have studied the elimination of noxious aquatic vegetation have concluded chemical control is the most effective and economical method of control. The alternatives are mechanical and biological con-

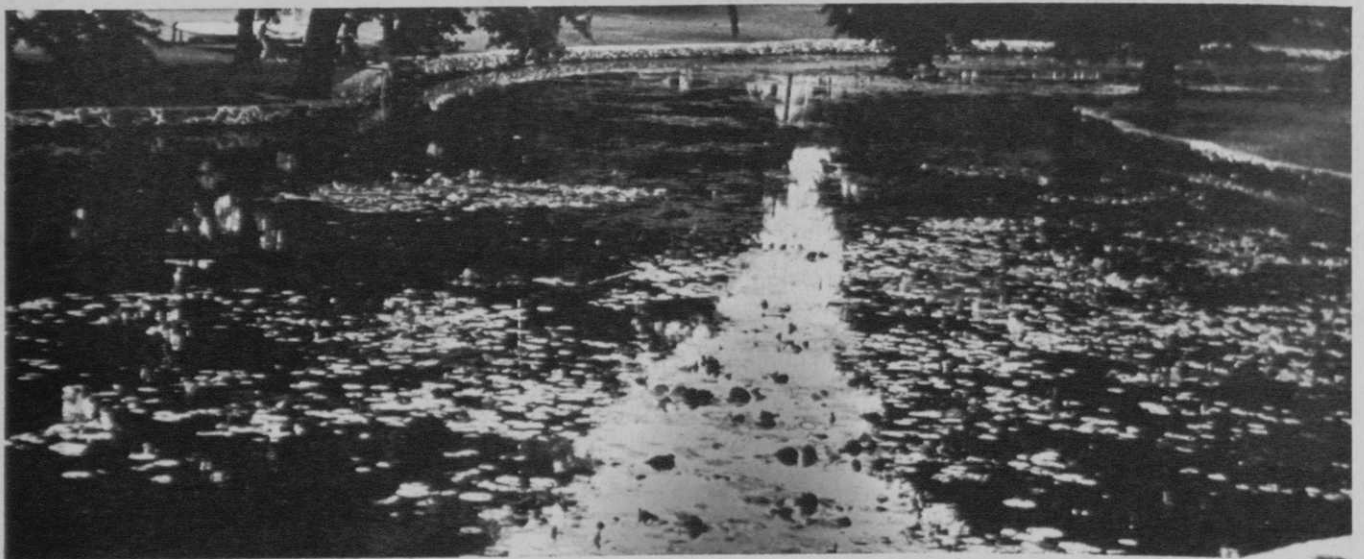
trol. Mechanical “harvesting” of aquatic weeds is not economical in today’s labor market — and disposal of these weeds is usually a problem. Biological controls have not been a realistic solution. Most states ban the importation of “weed-eating” fish and aquatic mammals for fear these will upset nature’s delicate balance.

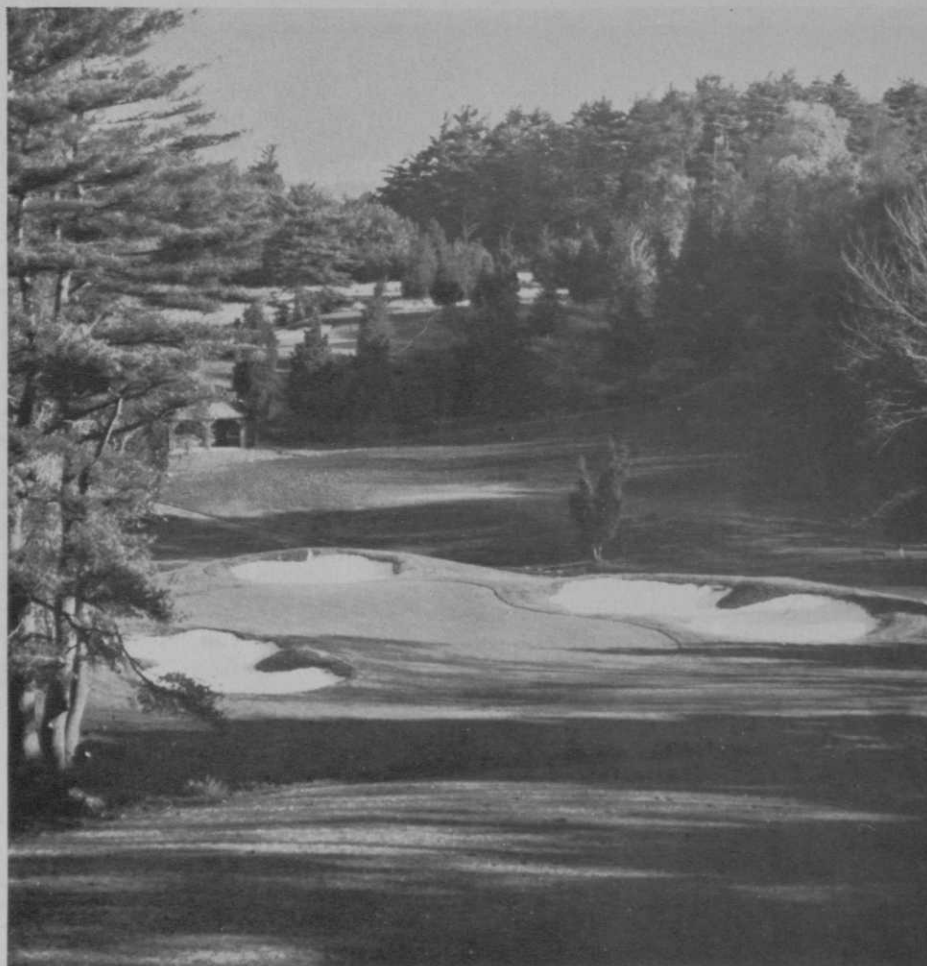
What must you do to control aquatic weeds with chemicals? The first step is to check into your state’s requirements regarding aquatic treatments with herbicides. Many states now require all applicators be licensed by the state. If this is the case in your state, consult a professional applicator.

In either case, you will then need to identify the types of weeds and algae that infest your lake or pond. A number of chemicals are used for controlling the myriad varieties of aquatic vegetation. Proper weed identification related to chemical selection is the key to effective kill.

Carroll in Arizona gives one

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5. Great for top dressing greens, tees and fairway bunkers, and as seedbed mixture.
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## AQUATICS THE CHEMICAL ANSWER from page 34

example of chemical compounds he recommends for the control of chara. Hydrothol-47 (a form of salt of endothall), mixed with a form of copper sulfate or chelated copper has given him the best results. This is due to the synergistic effect the chemicals have on one another, he said copper is effective against floating algae. Endothall formulations are most effective on general rooted aquatic weeds — particularly the hard-to-kill maturely rooted weeds. Coppers alone have not proven effective on the mature rooted weeds, he said.

Endothall, the primary active ingredient in Pennwalt's line of aquatic herbicides, is absorbed into the plant leaves and stems. The chemical disrupts the plant's vascular system which causes the plant to disintegrate and settle to the bottom of the lake.

After the proper chemical has been selected, the size of the body of water to be treated must be measured (depth and surface for total area). From the label, calculate the amount of chemical to use for the most effective kill. Keep in mind, when determining the amount of chemical to use, that the water pH (degree of acidity or alkalinity) may influence how complete the water weed kill will be. The higher the water's pH, the more chemical needed.

Read the label. Make sure the chemical you select is approved by the Environmental Protection Agency for use in your state — and for the body of water you plant to treat. Read carefully any warnings the label may contain. There is a danger of burning or other injuries.

Selection of the appropriate method of application is the next step in treating aquatic weeds. In smaller ponds, the usual method of application is with a power spray from the shoreline. However, this is not the most desirable method. Power spray equipment generally cannot reach the center of the pond where depth is usually the greatest and penetration most difficult.

In larger ponds and lakes, the most desirable method of appli-

cation is by boat. The agitation provided by power motors helps provide thorough mixing. Many courses have small aluminum boats kept just for that purpose. Small hoses trailing behind the boat beneath the water surface are a good method for applying liquid aquatic herbicides.

In areas where canals and other moving waters are a part of the landscape, aerial application is often used. Price, of Asgrow Florida, says that aerial application in canals and larger bodies of water is becoming an increasingly popular method of application in his area.

Many golf course maintenance men are specialists in turf care. But, as Price notes, the difference between treating turf and aquatic bodies of water is like day and night. One critical difference he singles out is turf herbicides usually percolate through sand and soil. Percolation usually nullifies any potential effect the chemical may have on the rest of the environment. However, when treating water, especially moving water, chemicals applied in a local stream or canal may very likely wind up in someone's tomato field.

Because of the wide-ranging effect aquatic herbicides can have on the environment, many golf course superintendents are turning to the professional applicator. Contracting the services of a professional frequently has economic advantages. Superintendents have found it is not profitable to invest in the equipment necessary to apply aquatic herbicides when the equipment often sits idle for months at a time. Most professional applicators will guarantee weed kill on a single price quote. This saves the golf course financial risk, if for whatever reason, the first application is not effective. Notwithstanding who applies the chemical, superintendents often have concerns about introducing chemicals into their water supply.

For example:

— How soon after the chemical is applied can the water be used for irrigation of turf? This answer lies in the selection of chemical. "With Pennwalt's endothall products," Carroll said, "the water can be used immediately after application for watering turf with no damage, when the chemical is applied according to label directions. However, it is advisable to let the water stand for 24

hours after application for the most effective weed kill."

— Will aquatic herbicides kill fish? Again, this depends upon the chemicals selected to do the job. Some chemicals, when used according to label directions, will not harm fish. Tolerances can be found on the label. But, in larger bodies of water, if it is necessary to use a chemical that might kill fish, this problem can be minimized by treating the lake in sections. The fish can then move to the untreated parts of the lake. Damage to fish may also depend on the species of fish; some are more susceptible than others. When in doubt, consult your local state fish and game agency.

Even after you have eliminated aquatic weeds from your pond or lake, your attention to this problem does not stop there. Most aquatic herbicides registered have no sterilizing effect on the soil. Weeds frequently begin to regrow soon after the chemical dissipates.

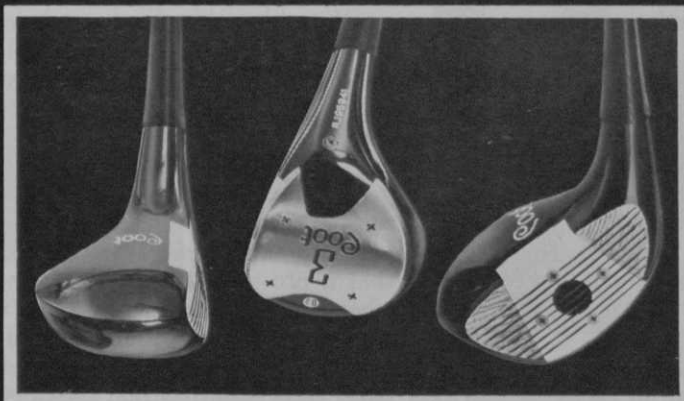
"Golf courses with 'enlightened' management often subscribe to a continuing maintenance program for controlling aquatic weeds and algae," Price said. "These courses have recognized that it is more economical to control aquatic weeds on a regularly scheduled program." This is because when the weeds are young it takes far less chemical to clear the pond than when they have been allowed to grow for a long period of time, he said. If they wait until the weed situation is intolerable, it takes large amounts of chemicals — or even two applications — to eliminate them.

How frequently should chemicals be applied in a comprehensive maintenance program? "Up until about two years ago, some ponds could be controlled with chemical applications spaced up to a year apart," Carroll said. "However, recently, the aquatic weed problem in the Arizona area has multiplied greatly and maintenance is needed anywhere from two weeks to three months."

The factors that will influence the frequency of application in a good maintenance program include: depth of the water (how much light is available for photosynthesis), water pH, how prolific is the variety of the weed and whether the water is stagnant or running. □

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## DOWNTOWN PRO SHOP from page 30

tion. In view of the lagging economic picture in the nation, Powell remains optimistic that the market will remain stable. "Even if there is a down period in the economy, I think golf and recreation won't be affected. Leisure time activities seem like the last thing that people will give up," Powell said. Although the game itself might not suffer, Powell would not offer any prediction on where his own business might end up with a money crunch upon us.

Treating people well is the key to the Powell operation. Hoping to lure the right customers into his shop, the 39-year-old businessman has established a store that doesn't try to be all things to all people.

Product availability is one of the industry's biggest headaches. But, Powell keeps well stocked to avoid catalog orders whenever possible.

According to Powell, product knowledge is essential. He works hard to keep abreast of new mer-

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chandise and its worth. "The worst thing that can happen to a pro is for someone to come into the shop and ask about a product and get a blank stare," the PGA pro commented.

Knowing the trade and forgetting marketing tricks are two bywords of Powell's shop. In three short years, Pro-Line has increased its profit from five to seven percent a year, proving that a little knowledge can pay off at the cash register.

Getting away from "word of mouth" advertising, Powell uses ads in the area's largest newspapers and cultivates customers with sale merchandise at various times of the year.

Being a golf pro is a very important thing in the life of Jim Powell, who is also head professional at Via Verde Country Club in nearby San Dimas. Although Powell's love of the game is great, he still sees his downtown shop as a key to his financial future.

"It's really sad to see some pros work at one club for 30 or 40 years and when they retire, walk away with nothing. If you stay at a club that long your future is really limited. Investing in this business has answered a lot of the money questions for me," Powell said.

Even before Powell sold his first set of clubs downtown, a plan was needed for the venture. There are several areas that Powell looked into before starting his charge into the downtown dollar fight:

1. A large amount of capital is essential. A store of this type can't open up on a shoelace. A full stock of merchandise must be on the shelves the day the doors open.

2. Experienced personnel is a must. An employer must hire people that know golf and are willing to find out more about the business side of it.

3. Establishing an area mailing list of prospective customers is important. Even though the shop is downtown the same atmosphere of a club can be accomplished. Make the customer feel like he is a "member" of the store.

4. Location is critical. Establishing a business on a main traffic artery is important, although a spot in a major shopping complex would also be preferable.

5. Vow to give service before and after the sale. This point is essential in the downtown venture.

Looking at the future, Powell sees the day soon when club pros may turn into mere clerks, no longer in charge of pro shops, carts and bag storage. Obviously, with the profits to be made by the wise pro, club management might be inclined to take over the pro shop and its related interests, turning the pro into a salaried employee.

For this reason, Powell is channeling a lot of his efforts into his downtown store, although he still is cost conscious in his responsibilities at Via Verde.

Since Powell purchases for both operations, his added buying power cuts costs at both locations. In fact, he often buys needed merchandise for Via Verde from his downtown store.

An additional advantage to the arrangement, is that Powell really has two market places to sell in. "There have been times when I've had items sell at the club and not the store and vice versa," Powell related.

Watching his buying closely, Powell realizes that mistakes will be made, but knows that staying with the pro lines keep his business relatively stable.

Although not discouraged, golf pros in general, have not accepted the Powell type of enterprise. Some of the thinking stems from the adage that a pro should keep his business where it is supposed to be, at the club. Many pros look down on compatriots moving to the business districts. Powell insists that this wasn't true in his case and the proof lies in the fact that the Southern California section of the PGA voted him to its Board of Directors.

There has been very little backlash from the pros in the surrounding Orange County area, although Powell did comment that the retail community was somewhat surprised to see his move to the city.

A more competitive retail market might force the pro into the city more. The benefits are obvious. Not only will his appearance in the business district enhance his financial picture, but a store downtown might get more people interested in the game.

Seeing the day soon when the pro might forfeit his shop, cart and bag storage concessions, Powell views the downtown shop as the savior for the merchandising pro. □



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