The Maturing Of Graphite

Improved Production May Cut Prices, Making the Shaft More Salable

Finally shedding its fad image, graphite is becoming a stable of the shaft industry and predictably the product of tomorrow. Yesterday's uncertainty might become today's sure thing.

Observers of graphite think the product and its principle have shaped up. The merchandise is finding its market and it must have an ample one with 17 manufacturers in the field.

Shaft flexes are becoming more standardized. The buyer can relate to the traditional "R" and "S" labels, as the buggy whip flexes disappear. Many manufacturers, most notably Carbonite, Graftek and Graffalloy have made the clubmaker's job easier with simple instructions on how to vary shaft flex by trimming butt and tip ends.

Graffalloy's M-6 shaft has no variance in wall thickness from an "S" to an "R". A section of the tip and butt remain constant. Graftek's flexes in woods and irons have a constant wall thickness from tip to butt.

Along with the stabilization and perfection of graphite, its advertising claims are also becoming a bit more believable. One shaft maker modestly states: "Expect eight to 10 yards more carry with a square hit and about 10 yards more roll on the average fairway."

Helping the professional in his understanding of graphite, 3M, through its Carbonite acquisition, began an educational program recently. Using a booklet approach, Carbonite attempts to tell the graphite story in layman's language. Terms like "torsional rigidity", "dispersion factor" and "modulus of elasticity" are left to the engineer.

Barry Barman, marketing director of Fansteel, thinks his product is designed only for the golfer that realizes graphite can be an advantage to their game. Spelling out the value of graphite to the golfer must be in simple terms, though.

"For example, explaining 'recovery', is nothing more than the shaft straightening out as it enters the impact zone. Pointing out how quickly graphite releases stored up energy during recovery is also important. Explaining the importance of flush contact and how a good shaft helps the golfer to square the clubface at impact is another point worth stressing. Rather than using terms like 'torque factor', tell your prospect the story in everyday language," Barman commented.

Joel Fuerst, marketing director for Graftek, stresses accuracy and control in his firm's manufacture of the shaft. "Over 99 percent of the golfers in the world never break 80. These golfers therefore seldom hit the ball 'on the screws'. It is more important to most golfers to keep the ball in play than drive another 20 to 30 yards. The primary benefit of graphite is that 'mis-hits' are straighter, longer and 'in-bounds'."

Ed Carmichael, head of the Graffalloy operation, insists that the golfer should know that the firmness in the shaft means strength. "A graphite-epoxy shaft weighs about 35 to 40 percent less than steel. Yet, it can have much greater tensile strength. Graphite shafts can be made firm with a very minimal degree of twist and distortion at impact," Carmichael noted.

Other manufacturers such as Aldila, Graftek, Shakespeare and Exxon stress the importance of proper fitting. Shakespeare makes it easy by narrowing down the number of flexes. In the main, most producers agree that the starting point for fitting is to have the golfer try a flex and swingweight close to his present driver.

"When most players waggle a graphite driver for the first time, they think the shaft is too flexy. That's because a graphite driver has relatively more head weight than a steel club. In trying to get the same feel as his old clubs, the golfer often favors a shaft that is too stiff for him. The big key is to experiment with some test shots, adding or subtracting lead strips from the head as you go along," a West Coast clubmaker remarked on fitting the shaft.

Demonstration clubs from the

to page 32

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 manufacured 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 layed 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 ingerent 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? □