GRAPHITE: CLEARING CONFUSION

by RALPH MALTBY

A lot of confusion over graphite shafts still exists with consumers, golf professionals and even the golf club manufacturers. The confusion begins with a constant changing of shaft specifications and design characteristics by many of the graphite shaft manufacturers who are trying to improve their product and thus obtain the competitive edge in performance and also in advertising claims.

Confusion over graphite shafts is similar to the uproar over golf ball performance claims. The exception being golf professionals have had much more experience with golf balls and in most cases have weeded out the non-performers from the performers and basically understand golf balls better simply because they have been around longer.

Graphite will continue to improve and golf heads used for graphite shafts will someday be specifically designed to compliment and improve the performance of graphite shafts. This more complete marriage of working relationships between graphite shaft manufacturers and club manufacturers through increased testing and research should certainly occur with greater frequency in the future. The scientific evolution of golf club advancements is just beginning and increased distance should not be the goal. The ultimate goal should be increased pleasure in playing the game through greater consistency, accuracy and a more solid, easier to hit feeling when striking the ball. So much for solving the future of golf club design. The real facts to be concerned about now are there is still a graphite shaft market boom occurring and you should have all of the information required to capitalize on it, get your share of the profits, and most importantly . . . satisfy the customers.

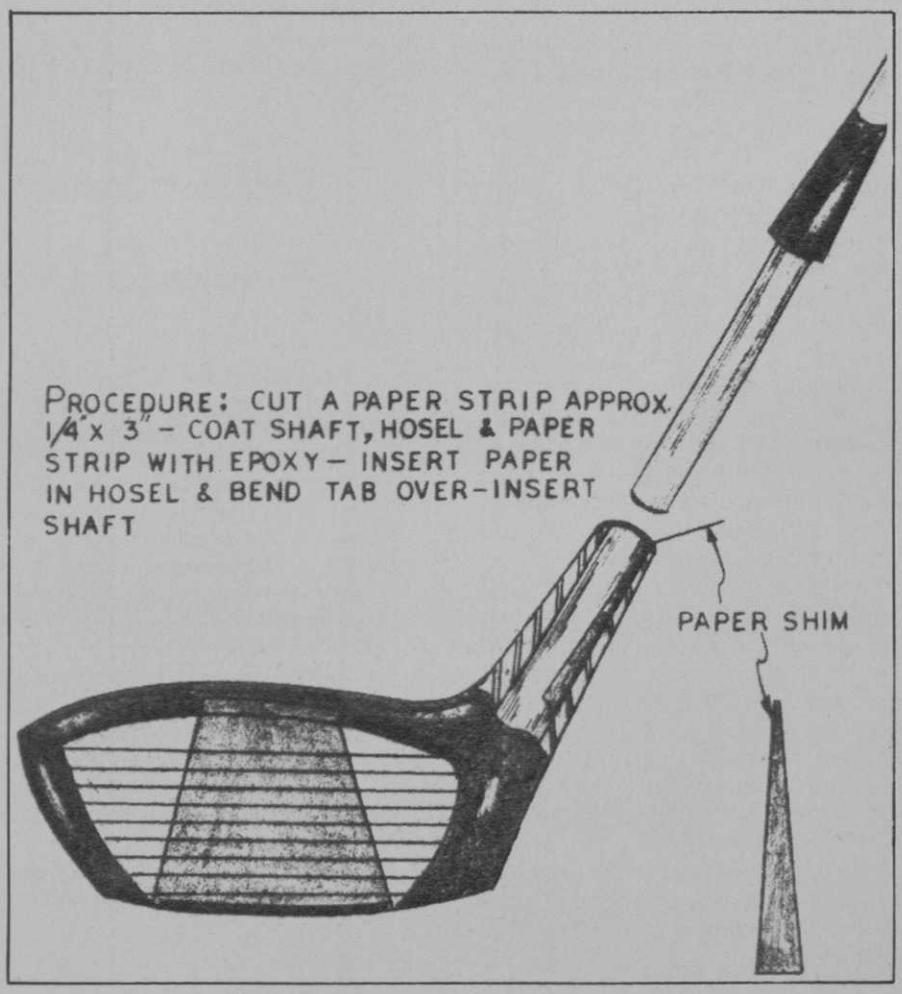
BUYING THE RIGHT GRAPHITE SHAFT

To mention three of four graphite shaft makers that have a good playable shaft would be like standing in the middle of East Side Highway at rush hour in New York City . . . suicide. Besides, this would still be a personal opinion even though it would be based on many rounds of use with different brands and a whole file full of static and dynamic test data. While this sounds like an answer, there isn't one. You can talk with golf pros and amateurs almost daily who will ask an opinion and then tell you the graphite shaft brand they have found is entirely different from personal recommendations. This probably points up the fact that a number of graphite shafted clubs were never set-up properly, resulting in some cases where a poorer shaft properly set-up for a certain golfer performs better than a good shaft not properly set-up.

Buying the right graphite shaft is easier if you understand as much as possible about them and can draw some conclusions on your own. Talking with your fellow golf professionals and also trying as many different brands as you can will also be beneficial.

Following is an explanation from both a technical and theoretical viewpoint concerning a few basics of shaft dynamics in overall club design.

Currently, graphite shaft manufacturers are supporting two different theories regarding the amount of torque a graphite shaft should or should not have. A few manufacturers have elected to design their shafts with a low resistance to radial torque and other manufacturers have designed theirs with a high resistance to radial torque with a few manufacturers staying somewhere in between. The shafts with the higher resistance to radial torque more closely approximate the torque characteristics of the long accepted steel shaft. Torque in a golf shaft can be defined as the amount of rotational twist in the shaft that occurs during swing. Torque can be measured accurately in a golf shaft on a static test device which clamps one end of the shaft securely and applies a known force to twist the shaft at the other end. The amount of twisting is measured in degrees.



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Although this measurement is accurate, it should only be considered relative when compared with other shafts of like flex and length. The dynamic torque characteristics of golf shafts vary significantly when different weight heads are swung at different head speeds by different golfers.

Theory would suggest that a golf shaft should have enough built-in resistance to torque to minimize ball dispersion and maximize clubhead feel at impact. This would support that faction of graphite manufacturers who have designed their shafts with a higher resistance to torque or one which is closer to that of steel. Some of the basic parameters inherent in the design of a golf club and ultimately how it is used to hit a golf ball support this statement as follows: The axis of the shaft and the center of gravity of the clubhead are not in line with each other; therefore, when a golf club is swung, forces acting through the center of gravity of the clubhead tend to generate a twist in the shaft. The amount of twist in the shaft will vary according to acceleration, swing speed, head weight and distribution of that weight. In theory, a shaft with a low resistance to torque will not be very consistent regarding accuracy for the golfer who does not possess a smooth accelerating clubhead speed, shot after shot. The tour player or better golfer has a better chance to adjust to this type of shaft because of his consistency and smoothness.

REMOVING AND INSTALLING GRAPHITE SHAFTS (WOOD CLUBS)

Generally, four situations will occur in the shop regarding graphite shafts:

1. A customer wants his steel shafted club changed to a graphite shaft.
2. A customer breaks his graphite shafted driver and wants it reshafted.
3. A customer wants his graphite shaft removed from its present head and installed in another head.
4. A customer wants you to build him a custom wood with a graphite shaft.

Situation No. 1 and No. 4 above, we are only concerned with putting in the graphite shaft since time and space here do not allow for a lengthy explanation on how to remove steel shafts. However, if a steel shaft has been removed and the new graphite shaft is a loose or sloppy fit it will be necessary to use one or two thin paper strips to shim it to a proper fit.

In situation No. 2 above, the graphite shaft is broken and must be removed. The easiest method is to drill out the broken shaft taking care not to drill off center and ruin the head. The final cleanup in the hosel can be done using the proper size reamer. **Note:** Before drilling the hosel, wind a few turns of masking tape around the hosel to prevent it from possibly splitting.

Situation No. 3 is the toughest but it is not impossible. If by chance the head is broken, it can be cut away from the shaft using a sharp wood chisel, but if both the shaft and head are to be saved then proceed as follows: First, remove the hosel whipping. Usually, you will not have to contend with a shaft locking screw because graphite shaft manufacturers don't recommend them. They tend to weaken the shaft. So, epoxy is the most common means of securing the head to the shaft.

The main difference in removing graphite shafts is in the method used to heat and soften the epoxy holding the shaft in the head. A propane torch is used with most shafts, but that much heat would destroy a graphite shaft. The best method, currently in use, to soften the epoxy bond is to put a plastic food bag over the head, tie it shut at the top and immerse it in boiling water for 10 to 20 minutes.

Do not let the water get inside the bag. When the head is removed from the water, grasp it with one hand and the shaft with the other and twist gently to see if the epoxy bond has softened enough to allow the head to turn on the shaft. If no movement is felt, immerse the head back into the hot water for a few more minutes and then try to turn the head again.

When installing the graphite shaft, first check the fit of the shaft in the head. The shaft hole should be drilled or reamed so that the shaft is a sliding fit with the head, not too sloppy or too tight. A fit which is too tight will squeeze most of the epoxy out during assembly, whereas a fit with .003" to .005" clearance all around the shaft will provide a bond of much greater strength.

Lightly sand the entire shaft tip area to insure the best adhesion possible. Apply epoxy to both the shaft tip and inside the hosel hole and insert the shaft in the head. Allow the epoxy to cure overnight before proceeding. Do not install a shaft locking screw to pin the graphite shaft into the head as this will tend to weaken the shaft.

If the butt end of the shaft is to be cut to obtain the desired length, use a band saw or a hack saw to get the best results. As the shaft is being cut, rotate it so as not to pull the graphite fibers loose from the shaft. Lightly sand the cut end of the shaft to remove any rough edges.

Finally, remove the tape from around the hosel and apply the new whipping. Touch-up any areas with stain and finish, if necessary, and install the grip.

FITTING GRAPHITE SHAFTS

1. Length
2. Proper Shaft Flex
3. Proper Balancing (Swingweight and Total weight)

Of course, if we were to get highly technical there are many more factors in the proper fitting of golf clubs, but the aforementioned three areas seem to encompass the greatest amount of confusion and discussion.

Length — Generally speaking, you should not consider a change in the length of your club other than that to which you are accustomed. It seems that when graphite first came out, the promoters only made their test and sample clubs in 44" (1" longer than standard) lengths to obtain greater club head speeds and thus hopefully attempt to prove their absurd claims of 30 extra yards. This additional 1" over length has in some cases been assumed to be necessary if you switch from steel to graphite, but this is simply not so.

Shaft Flex — Here's where the author might be sticking his neck out and will be accused of making a hasty generalization, but here goes: If you use a "medium" flex shaft in steel you must use a "stiff" flex in graphite. In other words, always go one flex stiffer than you normally would go with steel regardless of

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whether or not you are playing regular steel or lightweight steel.

The reason for this is simple: If you reshaft with graphite, you will invariably add additional weight to the clubhead. This additional weight and slightly faster clubhead speed (because of a lighter overall weight golf club) will exert greater and different dynamic forces to the shaft during the swing and through impact, which can be somewhat normalized and made to feel as stiff as a steel shaft if the graphite shaft is actually stiffer than the steel shaft.

A number of comments from golf professionals, average players and data from actual test results seems to substantiate these statements.

Keep in mind however, the graphite shaft makers do change their specifications from time to time and also that some shaft brands are quite different from others.

Balancing — If a steel shafted club has been reshafted with a graphite shaft, it is important to understand what has happened to the original swingweight and total weight of the club and what to do. A graphite shaft is approximately 1 ½ to 2 ounces lighter in weight than a steel golf shaft, therefore, when a steel shaft is replaced in a clubhead with a graphite shaft, the club's static or total weight is decreased substantially. The exact amount of the decrease in total weight is the difference in shaft weights, or from 1 ½ to 2 ounces. This reduction in total club weight changes the club's weight distribution to the extent of reducing the swingweight by six to eight points.

The question now arises as to how much weight, if any, should be added to the clubhead. This is a very difficult question to answer because there are a number of different types of graphite shafts currently available and each has its own performance attributes. It is generally agreed that a good starting place would be to add ⅜ ounce to the clubhead, which is the equivalent of approximately five to six swingweights. This will still allow for a golf club with a much reduced total weight even though the swingweight is almost increased to where it was originally. A number of stronger players seem to prefer increasing the swingweight significantly higher than that of the original steel shaft. Some prefer one to two swingweights less than their steel shafted clubs. The point is, some weight should be added to the head and then begin experimenting by adding lead tape to the clubhead until the desired feel and performance is attained. Eventually, once the desired swingweight and total weight are acceptable the sole plate can be removed and the equivalent weight of the lead tape can be permanently installed.

One thing is clear about graphite. It is here to stay. This doesn't mean that just because a shaft has graphite in it that you will note improvements to your members' game and it doesn't mean that graphite is the ultimate answer to the quest for the perfect shaft, although it might be someday. The sure thing about graphite is there are a number of manufacturers that provide certain desirable performance characteristics for the golfer. □