Why Bill Has Water System Troubles

By JOHN BUCKNER GILL

BILL HAS BEEN HAVING plenty of trouble with the water system on his golf course this season. The pipes were new when installed a little less than ten years ago, but within the past year leaks have started to show up all over the system, and the cost of repairs has knocked Bill's budget for a loop.

To make matters worse, many of the present greens were built after the water system was installed—and on top of some of the most important mains in the system. There is no need to say that it is under these greens that most of the leaks have occurred—it wouldn't be true to life to have it otherwise. Bill is slowly going nuts.

Corrosion is a natural thing to expect of a pipe, especially in a watering system on a golf course where the application of water leaches acid from the fertilizer and percolates it through the soil to the pipe line. Bill's board of supervisors (it's a municipal system) have made plans to replace the entire pipe layout with asbestos-cement pipe, but that can be done only after present restrictions are lifted and labor becomes more generally available. Bill's immediate problem is to reduce the number of leaks now—and fast!

We went out to the course the other day to look over the situation, and got there while the watering crew were operating the sprinklers. The system uses 60 sprinklers with ⅜" main nozzles that are rated by the manufacturer to discharge 36.6 gallons per minute at a working pressure of 60 pounds. With the exception of one area, the operating pressure on this system is usually higher than 60 pounds with all sprinklers working. There are approximately 500 quick-coupling valves installed on triangular centers of 100 feet in two rows down each fairway, with as many as 50 on the longest. The system is the hoseless type and sprinklers are attached directly to the quick-coupling valves when in operation. When irrigating, the sprinklers are concentrated, that is, they are attached to 60 successive valves rather than spread out over a wider area on the course.

In one sense this course is fortunate. Although they pay for the water used, they have no pumping expense. The water pressure is created by a natural fall of the supply line that sets up a static head of 250 feet, or 108 pounds per square inch. The supply line is 14 inches in diameter; large enough to supply all the water the course can use without loss of pressure due to friction in the supply line itself. From the point where the supply line enters the golf course the land falls away to a lower elevation on the opposite side of the course where the added head adds up to 190 pounds per square inch static pressure.

When all 60 sprinklers are in operation on the lower end of the course, this 190 pounds of pressure is reduced to a working pressure of about 50 pounds, representing a net loss of 140 pounds due to friction within the piping system on the course. Many a greenkeeper would give a lot to have a supply of water at such pressure, but before we become too envious of Bill, let's see what these conditions and his method of operation is doing for him.

In the first place, a sprinkler rated to discharge about 36 gallons per minute at a pressure of 60 pounds will discharge many times that amount if the pressure is increased sufficiently. Except for the lower end of the course which is the farthest from the supply line, the working pressure on this watering system is usually far in excess of 60 pounds, depending on where the sprinklers are placed. This higher pressure has for the most part resulted in poor sprinkler coverage because of "fogging" caused by excessive pressure together with a wind condition that carries most of the mist away rather than allow it to settle as rain-drops on the grass.

Whenever possible, sprinklers should not be allowed to operate at pressures in excess of that recommended by the manufacturer. As much as 50 percent of the water discharged by the sprinkler can be lost back to the element by "fogging" or "misting," and a slight wind might even help to increase that percentage. When you consider that as much as 50 percent of the club's water bill, not to mention the cost of power, can go up in mist and never benefit the turf, it is something to ponder and do something about.

While enjoying the sight of Bill's "smoking sprinklers" we saw a geyser shoot up at the far end of a fairway where one of the watering crew had just changed the location of a sprinkler. Bill

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called out that another pipe had broken, and away he went with the valve key to shut off that section of the system.

When we arrived at the scene of the break the men were already digging away to uncover the pipe. The break had occured in a 1½" line that led to one outlet a distance of 60 feet from the 6 inch main. The operating pressure at this point was about 100 pounds we later found by test, and the operating pressure in the 6-inch main was 118 pounds. Under these conditions the sprinkler was discharging a little better than 50 gallons per minute according to the manufacturer's table. But we are interested in what was going on under the ground while this sprinkler was operating.

With an operating pressure of 118 pounds in the 6-inch main, and an operating pressure of 100 pounds at the sprinkler, it indicates that the 1½" pipe was setting up a friction loss of 18 pounds. But that is not the only fact to be considered. The cross sectional area of a 1½" pipe is 1.767 square inches. A gallon of water is 231 cubic inches. With these figures it is not hard to figure that 50 gallons per minute through a 1½" pipe has to travel at a velocity of 109 feet per second to keep the sprinkler going. That is going at the rate of almost a mile and a quarter a minute.

Hydraulic engineers consider velocities of greater than 8 feet per second bad practice in pipe sizes of 4" and larger, and although they allow greater velocities than that in smaller pipe, a speed of over 100 feet per minute is far in excess of good practice where the valve is of the quick-closing type. A water system on a golf course is no different than a water system anywhere else when it comes to a matter of pipe sizes and pressures. If anything, the operating conditions imposed on a golf course irrigation system by the type of valves used as well as the layout of the course make it necessary to guard against water hammer and surge, by adequate design. Thus we can take one lesson from Bill's experience: See to it that pipe sizes are sufficient not only from the standpoint of volume and pressure-loss, but that we also keep within the limits of allowable velocities.

When a quick-coupling valve closes, it closes. There is no fussing around about it. One minute the water is rushing out at full capacity, and in the next instant the valve is shut smack in its face. There is no preliminary ceremony, no "excuse it, please"; the water is stopped dead in its tracks. Try driving your car at 75 miles an hour against a brick wall, and you will get some idea of what we are talking about. That's the kind of punishment the pipe has been taking on Bill's golf course for the past 10 years, and it is small wonder that the pipe finally gave way at its weakest point.

If Bill could eliminate or even reduce the water hammer on his sprinkler system his weakened pipe could be made to hold out a while longer, at least until the time comes when he can make replacements. And it wouldn't be a bad idea to keep the hammer and surges as low as possible when he gets the new pipe, too. A check-over of his repairs for the past year leads us to believe that the majority of his leaks have been brought on much ahead of their normal time due to the punishment the pipe lines have been taking from improper closing of the valves, and the use of pipe too small in the first place just because there was sufficient pressure to overcome the friction loss. This conclusion is supported by the fact that in the same system there are other pipes with just as much corrosion and with walls just as thin as those that have broken, but today are still intact. These pipes are located at points in the system where there is not so much surge or variation of pressure.

Bill can help himself to some extent by more careful supervision of his watering crew. Their habit of kicking the handles of the couplers to shut off the sprinklers is doing the system no particular good. We realize that the watering crew cannot make up for the inherent design of a valve that snaps shut, but with a little care such a valve can be closed slowly if the men will only take the time to do it.

A hint to the wise should be sufficient. Manufacturers of irrigation valves would do well by themselves as well as by the greenkeepers if they would manufacture a slow-closing valve. There is one type of so-called flow-control valve on the market that is intended to dampen the shock of closing to some extent but there is still much room for improvement. In fact, it would not be impossible for all existing quick-coupling valves to be easily converted to a slow-closing type if manufacturers would recognize the need and manufacture the simple little gadget necessary to do it. In no time at all a greenkeeper could convert his system without removing a thing from the ground and save himself many headaches for a long time ahead.

WOOD LEAVES WINGED FOOT—Craig Wood, duration National Open champion, resigned July 24 from Winged Foot CC to go with MacGregor Golf, Inc. in promotion work. MacGregor has extensive sales development work already under way for postwar golf. Wood's new job calls for vigorous campaigning to put these plans in operation to strengthen the pro shop sales position.