IRRIGATION SYSTEM MEETS BROOKLINE'S WATER NEED

FOR some years prior to 1934, The Country Club, Brookline, Mass., had purchased from the municipality relatively small quantities of water, but by reason of the high price of such water no attempt was made to irrigate the fairways. When Brookline was selected for the 1934 national amateur championship, its Directors decided to install pumping equipment and pipe lines for thorough course irrigation.

It was found that water could be obtained from shallow driven wells at two points and, accordingly, three 2½ in. wells were driven in one place and two wells in another. Small brick pumping stations were built at each location and a motor driven De Laval centrifugal pump installed in each, the pumping equipment and appurtenances, together with the work of installation, being supplied by the Turbine Equipment Co. of New England. In each station the main from the wells lead into a sand chamber combined in one structure with a vacuum storage tank, and a motor-driven, water-sealed vacuum pump is used to lift the water initially from the wells into the sand chamber and at the same time to prime the centrifugal pump. A vacuum switch starts the vacuum pump when the vacuum in the reserve or vacuum storage chamber falls below 16 in. mercury column, and stops it when the vacuum exceeds 21 in. mercury column. The suction lift averages only about 10 to 12 in. mercury column, the water being held approximately 2 ft above the center line of the centrifugal pump at all times, but float-controlled automatic air release valves prevent drawing water into the high vacuum tank. The high reserve vacuum in the latter insures priming at all times with only infrequent operation of the vacuum pump.

Pond Is Reservoir

The two well stations have substantially the same construction and equipment, but one is designed to deliver at the rate of 100 gal per min, and the other at 150 gal per min. Both stations discharge through underground pipe lines into a large natural pond about one-quarter of a mile away, which serves as a reservoir, making it possible to operate the wells at a constant rate, although water is drawn from the reservoir at a high rate for the irrigation of greens, tees and fairways during the evening hours. The pond also receives drainage from some sections of the course and water from a number of relatively small natural springs.

View of main pump-house at the Country Club, Brookline.

The main, or irrigation, pumping station, which is located on the shore of the pond, houses two 500 gal per min centrifugal pumps, driven by 25 hp motors, a smaller pump driven by a 10 hp motor, a 1000 gal pneumatic storage tank built for 150 lb maximum working pressure, a motor driven air compressor and a 4-panel switchboard providing for full automatic operation of all pumps. The small pump and one of the larger centrifugal pumps deliver to the storage tank and the large pump also delivers to the discharge line.

The larger pump is operated through an automatic starter by a pressure switch to start the pump when the pressure in the tank falls to 35 lb gage and to stop the pump when the pressure rises to 72 lb gage. The smaller pump is controlled in response to the water level in the tank by a specially designed mercury switch, which starts the pump when the water is at a level in the tank corresponding to a pressure of 40 lb, and stops the pump when the water reaches a level corresponding to a pressure of 130 lb. The storage capacity of the tank between these levels is approximately 627 gallons.

The first of the larger pumps can deliver into the pneumatic tank, or, if desired, directly into the 6 in. discharge line, as stated above. The second larger pump is piped in series with the first, with check and gate valves, so that the two pumps can deliver 500 gal per min against approximately 130 lb pressure to reach the most distant and highest parts of the course. The smaller pump delivers approximately 120 gal per min. against 40 lb, which is reduced to approximately 100 gal per min. against 130 lb, and with the help of the pneumatic storage tank meets normal daytime demands, estimated at 100 gal per min., to supply line losses and three or four ¾-in. faucets, each requiring 25 gal per min. The small pump also saves running a 500 gallon pump, with its high cost for starting current and rapid wear of contactors, when the demand is small.

Waste Prevented by Electric Controls

When the water in the tank falls to a level corresponding to 40 lb per sq in, the smaller pump automatically begins delivering and if its delivery exceeds the outside demand for water, the level will gradually be restored to that corresponding to a pressure of 130 lb per sq in. However, if the demand continues to draw the pressure down, which would indicate the use of water in excess of the delivery of the small pump, the main pump will be started when the pressure reaches 35 lb. The latter pump will be stopped as soon as the level is restored to the point where the pressure is 72 lb, whereupon the small pump will again be started to take over the load, the electrical controls being so interlocked that both large and small pumps cannot run at the same time, thus preventing inefficient current consumption during the night when the large pump is carrying the heavy night load.

The air compressor, which is driven by a ¼ hp motor, is started by an automatic pressure switch whenever the pressure in the tank drops below 65 lb, and continues pumping so long as the pressure remains below that figure. When the pressure in the tank again reaches 65 lb however, the compressor is shut off and further increase in pressure and compression of the air is caused by rise of water level through the operation of the water pumps. The compressor thus delivers a small quantity of air into the system whenever the pressure in the tank falls below 65 lb, to replace air dissolved by the water or lost by leakage through safety valves and piping.

The basement of the pump house forms the suction chamber for all water pumps in the main pumping station and the suction lines are fitted with check valves below the water line, thus insuring continuous priming of the pumps after the initial start of the season.

From the main pumping station the water is led by approximately 6½ miles of underground piping to duplex sprinkler heads, each covering a circle of approximately 200 ft diameter. Special connections, each accommodating two hoses, are also provided for the use of the Brookline fire department. With this system, approximately 350,000 gallons of water were pumped each night and sprinkled over the three nine-hole courses during 1934, with very gratifying results, and this year the grounds are in even better condition because of the ample irrigation and proper treatment during the preceding season.

The total quantity of water pumped during the season of 1934 was approximately 13,000,000 gals, at a total cost for electrical energy to operate the pumps of approximately $1400, or around $108 per million gal. When the water was purchased from the town of Brookline, the cost was approximately 21c per 100 cu ft, or $280 per million gal, at which rate 13,000,000 gal would have cost $3,640. Assuming that the same amount of water would have been used, the saving in cost of pumping over the cost of purchased water is $2,240, less the fixed charges on the pumping equipment, which would be a small figure in comparison. Actually, had city water been used, 13,000,000 gal would not have been purchased, with the result that the course would have been in need of water and would not have attained its present excellent condition.