The Costs of Blowing Wind

A guide to the selection, installation, and operation of fans for better summer performance of bentgrass putting greens.

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Above left: A combination motor starter and disconnect switch is installed on the upper fan pole on this three-phase motor fan. Since three-phase motors don't have thermal protection, it is essential to install these devices to protect the fan motor. Above right: Concrete is used to secure the four-foot ground pole that attaches to the fan pole. The concrete provides a long-term stable foundation for the fan.

Limited air movement is one of the major contributing factors to summer bentgrass decline. More than 20 years of research and field observation has demonstrated that fans are a successful tool to improve air circulation and sustain turfgrass quality of creeping bentgrass putting greens in the summer months.

Although most golf courses in the Southeast with creeping bentgrass putting greens use one or more fans today, fan use is expanding into other parts of the country. The purpose of this article is to guide the reader through the process of fan selection, delivery of electrical power, installation, and annual operating costs. A thorough understanding will lead to more effective and efficient decision-making at golf courses throughout the country.

PRODUCT SELECTION AND SITE LOCATION

Many types of fans are available for putting greens today, but the most popular fans have 5- to 7.5-horsepower motors and the ability to oscillate for more coverage. These fans have the capability to produce a two to three mph wind over the turf canopy, up to 150 feet from the fan.

Usually one fan per green site is required to produce a wind vortex at approximately four feet above the turf canopy. This wind vortex replaces more humid air with less humid air in order to maintain leaf evapotranspiration. The top technical reps provided by most fan companies will assist with selection and placement of the fan to optimize agronomic benefits.

DELIVERY OF POWER

Once the fan has been chosen and the position determined at the putting green, the next step is to plan how to get electrical power to the site. It is advisable to hire a licensed electrician to assist with these plans, due to the complexity of the electrical issues.

First, the electrician must identify the power source closest to the putting green. If available, three-phase power is better, as it is the most efficient way of supplying the voltage to the fan motor and turning the fan impellor. Three-phase motors are less complicated as they lack mechanical start switches and capacitors, more dependable due to this simpler design, and less costly than single-phase motors. Also, since three-phase motors draw fewer amps than their single-phase counter-

A backhoe or front-end loader easily lifts the fan for assembly to the fan pole. A fork attachment on the loader is a plus to help lift and maneuver the fan. Remember, some type of device also will be needed to transport the fans on and off the golf course for off-season storage.

Table 1
Cost considerations for installing a fan

Trenching
Cement footing for pole, includes valve box, ground rod, and splice kit
Power supply setup (normally no cost) and circuit breaker
Fan hookup and disconnect (for three-phase, combination motor starter and disconnect)
Fan cover
Wire
Fan
Timers
Equipment rental

parts, due to their higher electrical efficiency, conductors needed are considerably smaller and thereby reduce wire costs. Due to the cost of copper, wire costs increase significantly as amperage needs increase.

Most golf courses do not have easy access to three-phase power, except at the pump station and the clubhouse area, but its availability is on the rise. Residential areas surrounding most golf courses are supplied, by and large, with single-phase power. Sometimes the power company may upgrade to three-phase power at no charge if requested. Typically, the power company doesn't charge to provide power unless they have to restructure their service, an unlikely event. Even if there is a charge to install three-phase power, the savings on usage would pay for itself in the first one or two years.

Single-phase motor fans still provide excellent performance, and although wire costs will be higher initially, the annual operational costs will be similar to fans using three-phase power.

INSTALLATION COSTS

Most golf courses install fans with their maintenance staff, but in some cases a contractor does a turnkey project. Typically, a licensed electrician will do the final hookup of the wire to the fan. Work performed includes digging the trenches for the wire; purchasing and laying the wire; installing the meters, breakers, ground wires, and disconnects; digging the hole for the fan base; pouring concrete at the fan base; and erecting the fan (Table 1).

Trenches for the wire are typically 24 to 36 inches in depth, depending on local regulations. Doing the trenching by the golf course maintenance staff will save some money versus a contractor, as normally the work is done during the winter or early spring when more time is available for these special projects.

Concrete-secured, four-foot ground poles are installed, to which the fan pole is attached. Concrete costs are only $10 to $15 per fan for materials. A valve box, in less than 10% of the projects, is installed for the ground pole. An electrical disconnect switch to turn the power supply on and off is surface mounted on the fan pole for single-phase power motors. Combination disconnects and starters are installed on the poles with three-phase motors for electrical overload protection, since single-phase motors have built-in thermal protection to automatically turn off the motors. Junction boxes located inside the disconnect box split the power for the fan and oscillator motor. Electrical disconnects in the ground or a valve box are not recommended due to potential water

Wire materials and installation are the most expensive costs for a fan project. Installing the wire to the proper depth and according to local electrical codes is essential to supply consistent power to fans.

issues. The only specialized equipment needed may be a trencher or a motorized posthole digger. A backhoe or front-end loader can lift the fan for assembly.

The greatest installation cost is the wire. Wire is sized by the electrical current it must carry over a specified distance from the voltage source. As the distance from the power source increases, so does the wire size necessary to provide current to the fan. Voltage drops in the wire occur over long distances, and the use of large wire helps maintain amperage. Fans drawing lower amperage lessen the wire conductor size and the amount of copper, reducing costs. Since three-phase motors draw fewer amps than single-phase motors, wire costs are significantly less, typically 50% lower. A popular cost estimate for wire for three-phase power is $3 per linear foot, as compared to $7 per linear foot for single-phase power. Be aware that the price of copper, and thus wire, fluctuates widely, and cost estimates should be sought before proposing a project. Electricians sometimes can save money by purchasing wire in bulk from a wholesaler.

Other ancillary costs could include easements and the extra expense to bore under hard surfaces. Timers are installed in a few instances, but most fans are operated 24 hours per day during the summer months.

ANNUAL ELECTRICAL COSTS

Annual electrical costs to operate fans will vary per power company. Most courses budget $60 per fan for every HP per month based on fan operation for 24 hours per day. As an example, this equates to $300 per month for a 5 HP fan. Be sure to include meter fees, even in months when the fans are not operational. These monthly fees average about $20 per green site. In the Southeast Region, fans generally operate from Memorial Day to Labor Day.

Above left: As the primary power for the fan, the power company's electric meter and breaker master switch are located on a pole close to the putting green. Wire from the power supply takes either single-phase or three-phase power to the fan. Top right: Timers are sometimes mounted in a box, either on the fan pole or near the fan to modulate fan operation times. Above right: Weatherproof covers are used to protect the fan motor and belts during the off-season when indoor storage facilities are not available.

PREVENTATIVE MAINTENANCE COSTS

Preventative maintenance on fans is not a huge undertaking. The factors and features of the design affect the overall time spent tending to fans. Belt-driven fans need a belt replacement every two years or so. Estimated cost is $40 per fan. Less popular direct-drive models do not have belts. However, the bearings inside every electric motor require periodic maintenance, although direct-drive fans have fewer loads on the bearings. Belt-driven fans have external (pillow block) bearings that need to be maintained along with the belt tension. Belts seldom need adjustment after the initial break-in.

Repainting of the fans should be done about every three to five years with a brush or spray gun. Aerosol touch-up paint provided by the manufacturer is available for yearly maintenance. Fan blades are metal and should last 10 to 20 years, and motors should last approximately 10 years or more.

FAN STORAGE

The storage of fans in the offseason is another consideration. Some courses spend labor hours taking down the fans and storing them off the golf course. Other golf courses prefer to keep the fans installed and place weather-protecting covers on them. The cost of covers ranges from $200 to $275.

CONCLUSION

Careful planning and the estimation of costs are essential after identifying a putting green site that will benefit from air movement. Following the guidance offered in this article will assist in understanding the components, steps, and costs involved in the installation of fans. When all is done, the air force delivered will be another step in maintaining healthy bentgrass putting greens in the summer.

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