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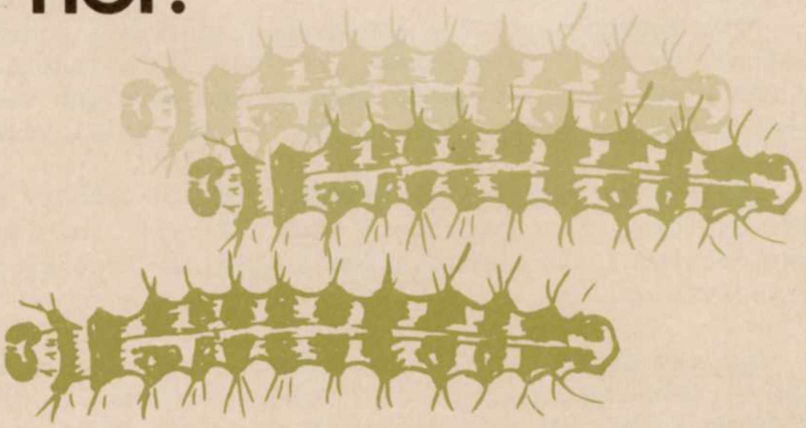

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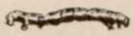
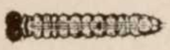


OAK MOTH LARVAE
Ca./trees & shrubs



CANKERWORM (Inchworm)
U.S./trees & shrubs

RED-HUMPED CATERPILLAR
Ca./trees & shrubs

FALL WEBWORM
U.S./trees & shrubs

TENT CATERPILLAR
U.S./trees & shrubs

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Government News / Business

Five Banvel herbicide pre-mixes constitute a new line of products from Velsicol Chemical Corporation. All have been Federally registered by EPA for use along utility, railroad, highway and pipeline rights-of-ways, according to Dick Fields, manager of the company's industrial vegetation control department.

Ciba-Geigy Corporation revealed in mid-January plans to construct a multi-level building near Greensboro, N.C. It will supplement the present five structures located in the corporation's complex, soon to be the home of the agricultural division.

William Erwin, an Indiana farmer who served on President Nixon's Task Force on Rural Development in 1970-71, has been named to the newly-created post of Assistant Secretary of Agriculture for Rural Development. The assignment comes when USDA chief Earl L. Butz reorganized the department's organizational chart. Erwin will have the agencies of the Farmers Home Administration, Rural Electrification Administration and Rural Development Service under his control.

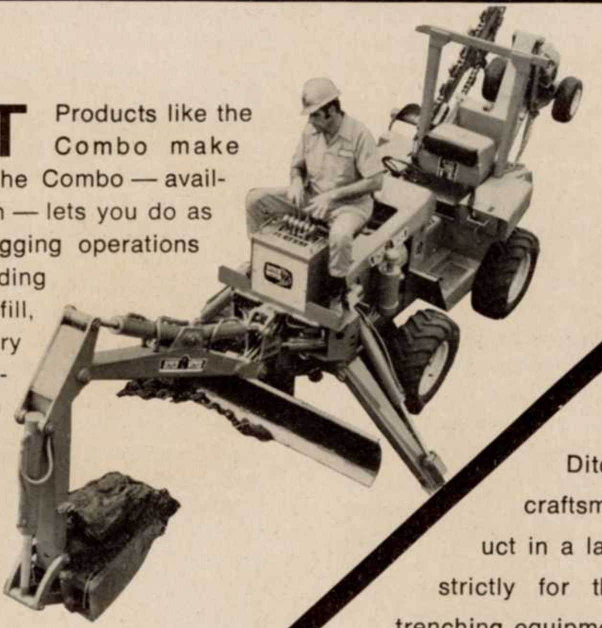
Check your First Aid facilities. It amounts to a black mark on an OSHA checklist if you haven't. The Occupational Safety and Health Administration says that if your place of business is not "in near proximity" to a hospital, clinic or infirmary, you are required to have a First-Aid kit approved by a consulting physician and an employee who is trained to render first aid. A member of your work force who has received special first aid instruction will qualify for the latter requirement.

Johnson Hydraulic Equipment Company of Minneapolis has become Johnson Hydraulics Division of Arps Corporation. Duane Solem becomes General Manager of the Division. All present relationships will continue as in the past.

William D. Ruckelshaus, the Environmental Protection Agency's conductor, will continue to lead the band for four more years. A White House statement in late December said that Nixon considers EPA "one of the most important new agencies in government" and that Ruckelshaus will "continue to be a strong force in environmental protection."

Since its inception two years ago, EPA has been playing Tempest and Fugit in whipping together legislation surrounding environmental issues. The crescendo came with the passage of the Federal Noise Control and Abatement Act, the Federal Water Pollution Control Act Amendments and the Federal Environmental Pesticide Control Act -- all in 1972. Although cleaning up the environment is similar in scope to learning to breathe under water, the Administrator's score calls for action and his baton is the cudgel on environmental violators. Currently the orchestra is tooting and bowing in the areas of air and water pollution. But only a phrase or two away the tuba section will strengthen the underpinning on noise, pesticides and other targeted areas. You can bet that this ditty will continue until the last stanza.

WHAT MAKES DITCH WITCH THE LEADER?



PRODUCT

Products like the Combo make Ditch Witch the leader. The Combo — available only from Ditch Witch — lets you do as many as five different digging operations without changing or adding attachments. Trench, backfill, do backhoe and vibratory plowing operations or hydraulic boring — all with the same machine. The Combo is available in 30-HP, 37-HP and 65-HP models. All its components are tried and proven and each incorporates design superiority which enables Ditch Witch to outsell all its competition combined. The Combo lets you keep equipment costs down by doing more jobs with one machine. Let us show you what a Combo can do on your job site. There's no better way to see why Ditch Witch is the leader.

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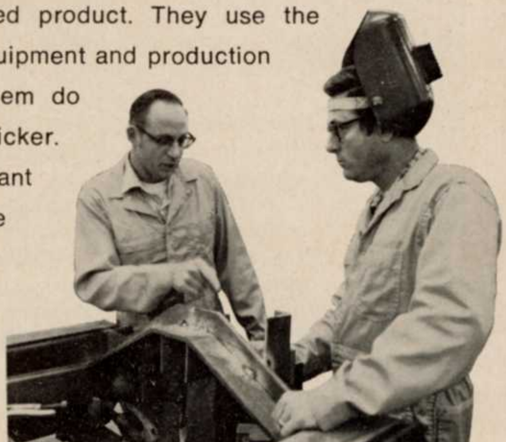

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How Much Must Be Spent For Turfgrass Irrigation?

By DR. WILLIAM W. WOOD
Economist, Agricultural Extension
And Associate, Giannini Foundation
University of California, Riverside

Editor's Note: As an economist, Dr. Wood views the commercial turfgrass industry in different terms than to what we are generally accustomed. Economics is a study of the factors affecting production, distribution and the return on investment for a given endeavor. Thus, in terms of irrigation, he attaches relative cost figures to determine the relationship between the golfer and better quality turf. By substituting your own figures it is possible to develop a better insight to irrigation on your course before the system goes in. *JAS.*

AS has been frequently noted, commercial turf managers do not have an easily identifiable product nor a market susceptible to traditional demand analysis. The superintendent produces a product that is measured in terms of satisfaction, a difficult standard to measure. The result, in terms of specifying appropriate costs levels, is either to do the "best" job with whatever funds are budgeted or to do the "best" job and see how much it costs.

The problem focuses on determining this range; to establish a reasonable budget level, determine how to allocate among cultural operations, and then produce the "best" job.

Basic to this problem is some viable definition of what the accumulated cultural operations are to produce. What turf condition is either optimal or at least minimum for the purpose of those with power to reject?

In this context, perhaps the first decision to be made is a specific identification of who must be satisfied. It may be a greens committee, a city council, a single individual who has the power to reject the turf condition, or it may be defined in terms of avoiding a certain number of complaints per time period.

Having decided who it is that must be satisfied, the very difficult task of specifying what will satisfy the individual or group must be accomplished. Unfortunately, many people react only in a negative manner. They can frequently state when quality or condition is not acceptable but cannot specify in a positive manner what the goal should be.

As a result, turf management seems to have been historically faced with trying to provide that quality turf which can be achieved with a minimum cost and yet provoke a minimum of complaint.

Three Approaches

In terms of irrigation, sufficient water must be applied to replace evapo-transpiration plus provide for inefficiencies in distribution with respect to both time and space. *This minimum relates to simply keeping the turf alive. Beyond this point, both quality preferences and intensity and/or frequency of use may necessitate additional cost.* To accomplish identification of additional costs, the turf industry must begin to quantify these variables and relate them to irrigation and other cultural operations.

For a starting point, one approach to this problem is to determine a turf management system that will have the capacity to provide the very best turf quality attainable.

Let us assume, for irrigation, this is a solid-set stationary sprinkler system that is fully automatic and of sufficient capacity to provide peak water demand in 28 hours a week or 4 hours per day. Note that by the above assumption, we also have identified certain characteristics of soil, terrain, and turf with respect to absorption capacity.

To specify numbers, assume an installation cost of $5,000 per acre for 120 acres (18 hole golf course) or total capital investment of $600,000. With an average life expectancy of 20 years, the annual fixed cost (depreciation and interest) would be

(continued on page 42)

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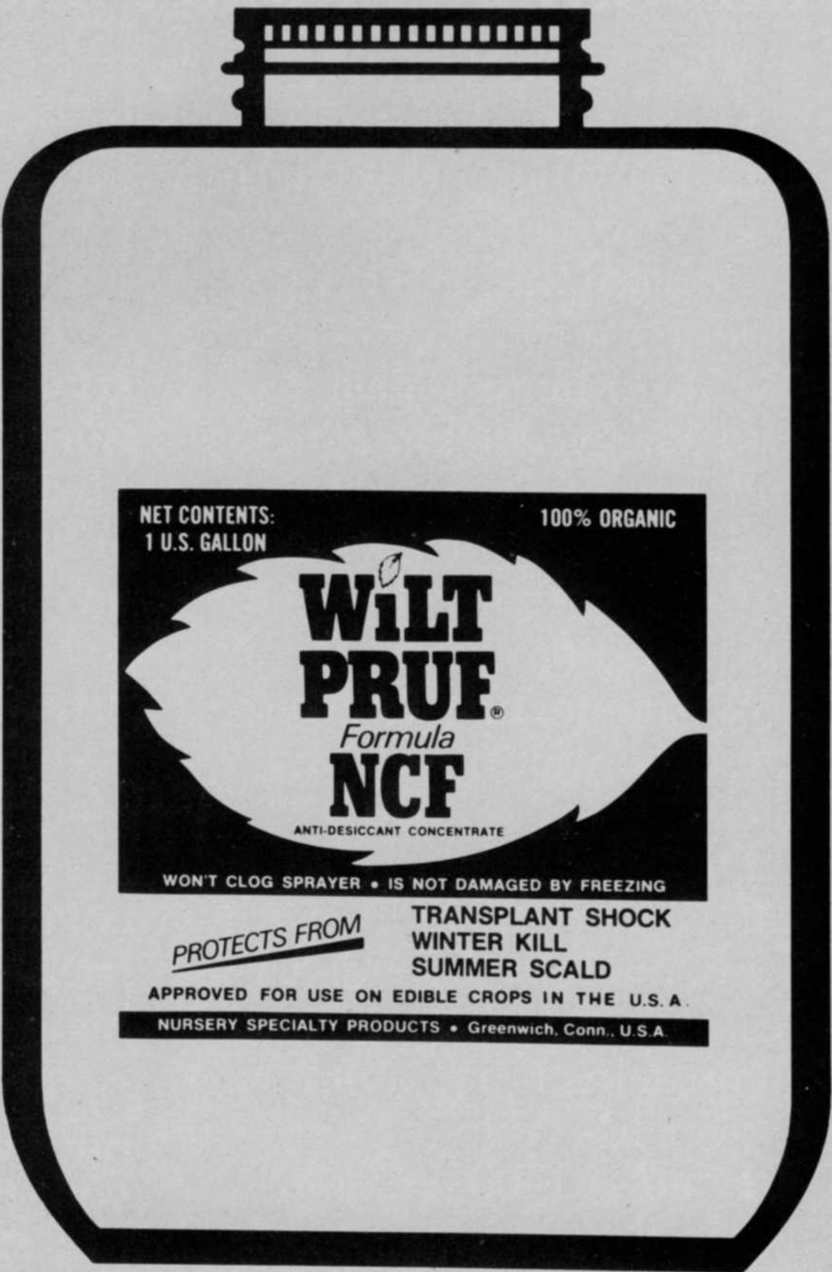

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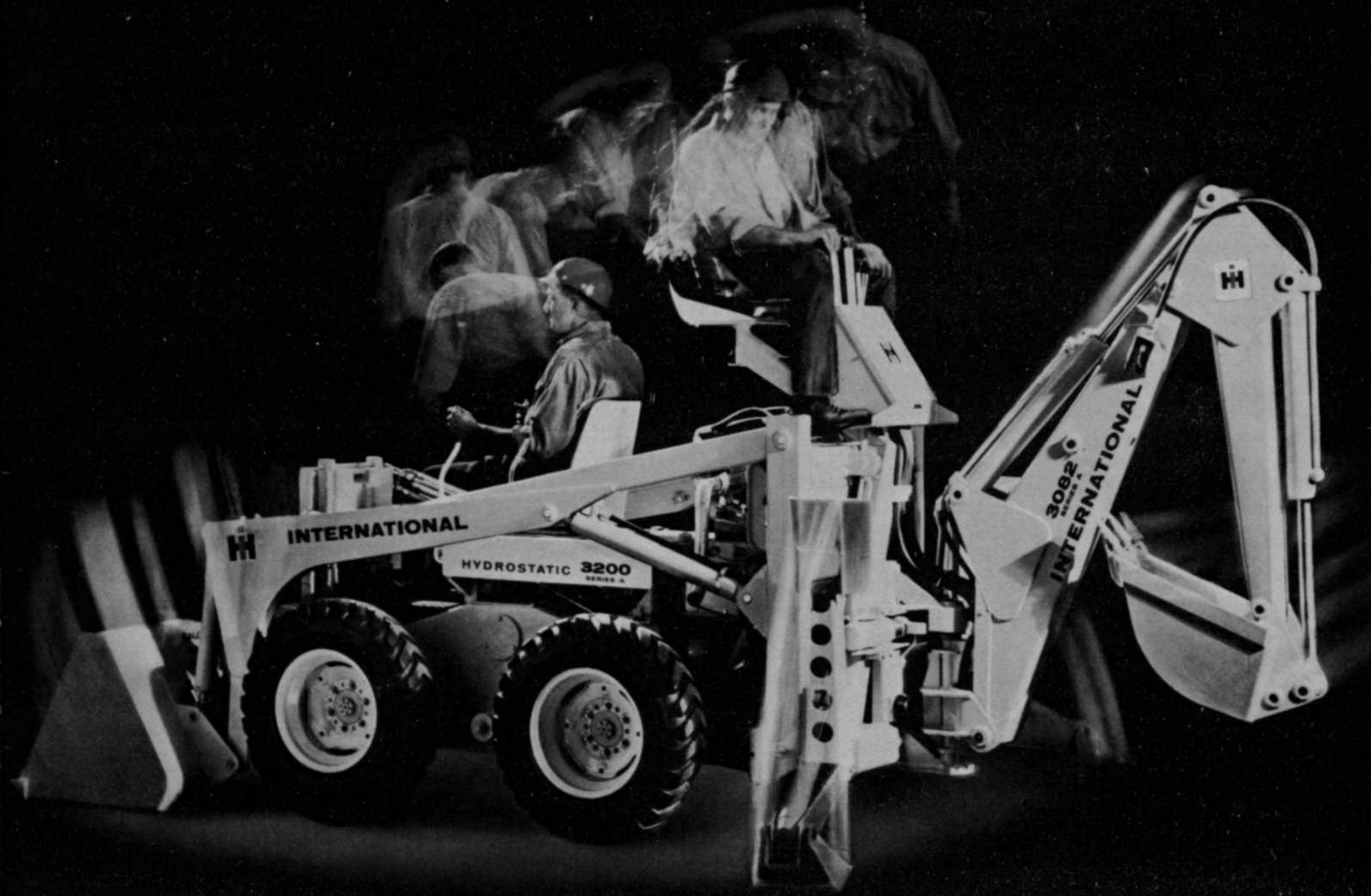

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Irrigation Pumps

The Heart Of The System

By JOHN P. DUNLAP
Irrigation Consultant
Lakeshore Equipment & Supply Co.
Cleveland, Ohio

THE HUMAN BODY and an irrigation system are somewhat alike in that they both depend upon a pump in order to function properly.

Fortunately for most people the human heart is a very good pump and supplies the body with the needed blood to maintain life.

Unfortunately, not all irrigation systems have good pumps and therefore many of these systems do not perform up to their capabilities.

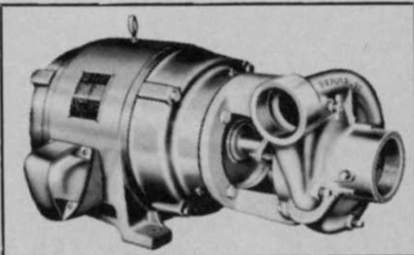
The pumping plant is one subject that is often times lightly passed over when discussing a new water system. A great deal has been written about automatic water systems. But seldom is the pumping plant mentioned, so let's look into the heart of the matter.

In order for a pumping plant to be designed properly we must know: (a) source of water, (b) type of power available, (c) the gallons and pressure required to operate the particular system, (d) pump location and total elevation (either gain or loss) from pump to outer extremities of the system.

Let's look at the several different items needed to make up a good pumping system.

Pumps: This is the most important part of the system since it does the work. Pumps come in all sizes, shapes, and types.

Centrifugal pumps are the most popular and the most economical pump used on irrigation systems today. They can be driven by gasoline engines, electric motors, or PTO drives. They are relatively cheap upon initial investment. They have few moving parts and are economical to maintain. Centrifugal pumps are available in a wide range of volumes and pressures. Studying data on pump performance will enable nearly anyone to select the pump to give maximum efficiency.



Centrifugal Pump

Their one disadvantage is they require an intake line which must be kept primed. But this can be easily solved if you keep your system under constant pressure. They also require a footvalve on the end of the intake line which should be inspected yearly and kept in top condition. If you have city water and are using the pumps as boosters only, then your priming problem is solved and a foot valve is not needed.

Vertical turbine pumps are the next most popular in use today. They are more costly to buy. And their design is more complex. Thus, these pumps are more costly to repair if anything goes wrong.

But there are instances where centrifugal pumps will not work and a turbine must be used. If your water source is a well or you must lift the water more than 15 feet to the pump, then a turbine is for you. They are also available in a variety of horsepowers, volumes, and pressures, so select the proper pump to do the job required.

Specialty valves: These are special application valves that are used to control flow—reduce pressure—sustain pressure—start and stop pumps and also act as check valves if the check feature is wanted. They are usually fully adjustable and can be set to precisely control pressure and flow on your system by sensing the amount of water required.

It is beyond the scope of this article to dwell into the workings of these valves but almost any flow or pressure problem can be solved by selecting the proper valve. It would be smart to contact someone knowledgeable in these valves before deciding which valve to buy.

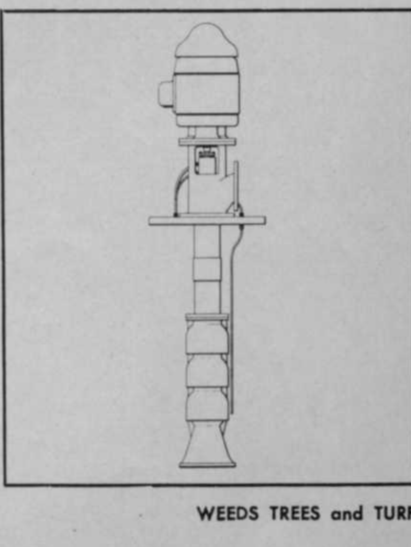
Check valves: Check valves are used to stop the back flow of water.

In every instance where system pressure is to be maintained you must have a check valve on each pump. Check valves are available in several different styles and for our purposes the no-slam or slow closing check valve should be used. Regular check valves close much too fast and can set up tremendous vibrations and noises when they close.

Pressure Tank: The pressure tank serves a couple of purposes in a water system but its main purpose is to provide an air cushion for more stable pressurization of the system. Since water cannot be compressed we use the air chamber to give us the expansion needed when water is demanded on the system.

Pressure tanks which have no membrane between the air and water tend to become waterlogged (loss of all air in tank) and cease to function a an expansion chamber. The last few years has seen

Vertical Turbine Pump



For more details on preceding page circle (147) on reply card

the development of the bladder type tank where a rubber diaphragm keeps the air chamber free of water. Once this type of tank is pressurized in the spring no further attention is needed until the fall draining. Even-though these tanks are higher priced the reliability will more than offset this added cost.

The above are some of the major components needed for a pumping plant.

Now let's set up a typical pumping plant that a golf course might need. The club which we are going to design a system for has just installed a new irrigation system with automatic green and tees and manual fairways. The total system demand is about 1000 G.P.M. and the water source is a lake.

Electrical power (440 volts) is available. We will choose 3 centrifugal pumps for our installation.

Our system is to be fully pressurized at all times so we can fill sprayers or hand syringe during the day. Thus, we will include a 5 Hp—90 gpm at 90 psi jockey pump for this purpose.

We also know, by adding up our sprinkler requirements, that for green and tee watering a second pump rated at 250 gpm at 110 psi with a 25 Hp motor will be needed.

In order to get our fairways watered manually, in a reasonable length of time, we will need the third pump, a 40 Hp unit rated at 600 gpm at 110 psi.

While we are at this point in our discussion lets look at a typical pump curve chart and see how we arrived at our Hp requirements for pump #2. (See Figure 1)

The gallons per minute (gpm) is across the bottom and total dynamic head (TDH) in feet is listed on the vertical left side. To convert total dynamic head to pressure per square inch (psi), multiply by the factor of .43. We need 250 gpm at 110 psi.

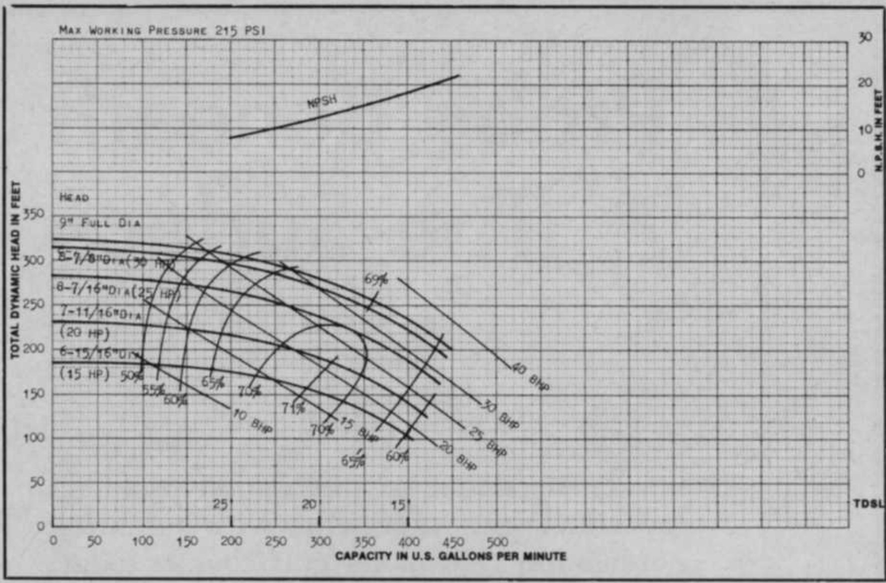


Figure 1. This is a typical pump curve chart. Capacity in gallons is plotted on one axis and dynamic head in feet on another axis.

We now convert 110 psi to TDH (divide 110 by .43 which equals 255 TDH). Then on the chart we find where the lines of 250 gpm and 250 TDH intersect.This indicates that a 25 Hp motor is needed to give us this performance. All pump manufacturers have pump curves available so you can choose the right pump for your own particular needs.

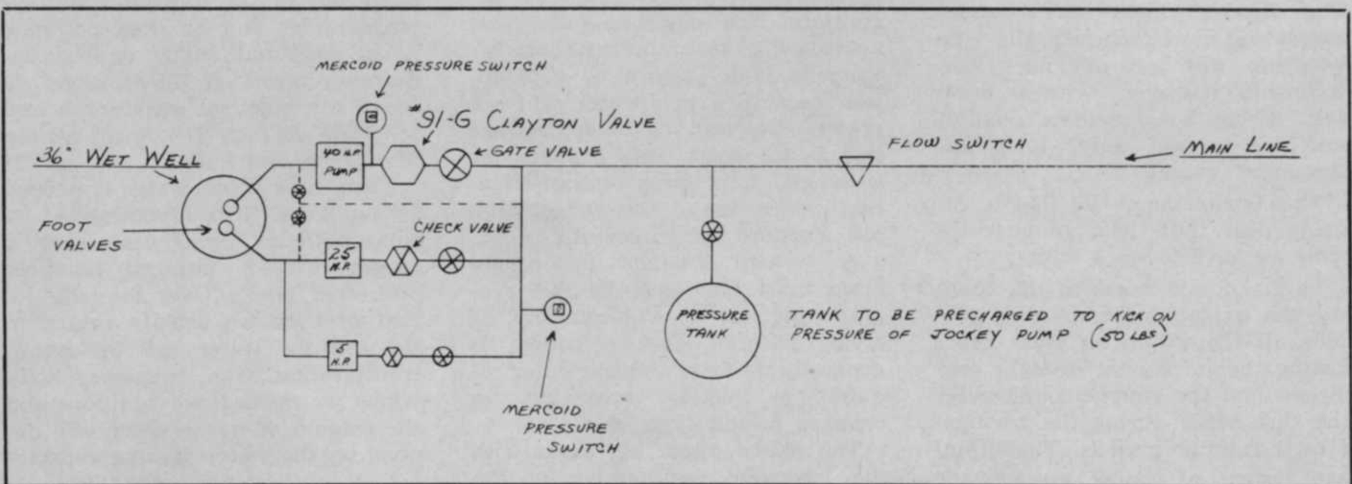
Now let's take a look at Figure 2. Here is a schematic of a typical 3-pump installation and how the components should be laid out. The concrete pad to which they are affixed should be about 12′ x 16′ so as to give ample working room. Whether a structure is erected around the pumps is up to the owner but it is highly recommended to reduce vandalism, and to keep the automatic pump controls clean and dry.

The piping in the pump house should be laid out so as to give maximum efficiency of flow. The use of flanged fittings or dresser couplings is recommended so any component can easily be removed without disturbing the rest of the piping system. Also, the use of long radius cast iron flanged fittings is highly recommended for the pump house piping—particularly on the larger pumps to reduce pressure loss.

The pumps are automatically controlled by a series of pressure and flow switches and the entire pumping plant is fully responsive to the demands of the irrigation system.

One final note. Each pumping plant is an individual system. Good pumping plants don't just happen; they are carefully designed and engineered to do a particular job and it is well worth your time to contact competent help when planning a new pumping plant. □

Each pumping plant is an individual system. The plant design below was developed after all the input factors were known. This typical design features three pumps for added flexibility in the system.



Probe Beneath The Surface

By AUSTIN J. MILLER, President
A. J. Miller, Inc., Royal Oak, Mich.

Overwatering is one of the biggest problems superintendents experience with automatic irrigation systems on golf courses today.

AFTER spending the day on the course, the golf course superintendent returns to his office, twists a few dials, sets several switches and leaves for the night knowing that his irrigation system will operate on schedule and without anyone in attendance.

This is a very common occurrence in the midwest and confidence in the automatic system is no longer difficult to establish.

This doesn't mean that problems are non-existent. What I would like to suggest is that we haven't recognized and addressed ourselves to the real problems. The superintendent with the new fully automatic system finds it is quite easy to get himself in deep trouble by *overwatering*.

This past season parts of the midwest and east were plagued by heavy rains. Many courses in these areas are built on relatively heavy soils. Overwatering in previous years left them with full soil reservoirs and no place for the water to go. The superintendent on a sandy course was more fortunate. His overwatering was less obvious. Overwatering, however, wastes water and leaches out nutrients, possibly into the ground water table and should be avoided.

This is the theme I'd like to develop. But first, let's go over the tools we have to work with.

In the humid areas of the country, the irrigation system must provide all the water turfgrass needs during the infrequent drought conditions and the supplemental water the turf needs during the frequent erratic rainfall periods. The drainage system, of course, services the course during periods of heavy rainfall.

Designing the irrigation system for drought conditions requires a good, even pattern of water distribution. Relative timing between the various areas is important but not critical. If a close watch is kept on the turf and an area shows signs of moisture stress, the interval of time can be increased for that night and the water deficiency made up. Economics (systems seldom have excess capacity) and the high and steady evapotranspiration rate during drought conditions keep superintendents from overwatering during these times. Evapotranspiration is the loss of water from the soil by evaporation and by transpiration from the plants growing in the soil.

Designing for humid conditions present a different set of problems. Generally, the grass has a low drought tolerance. The evapotranspiration rate varies to a greater degree and the amount and frequency of rainfall cannot be predicted accurately. The designer must now provide the operator with an extremely even pattern of distribution because excess water will not readily be lost by evapotranspiration. He must also provide for automatic shut down of the irrigation system due to rain and/or high soil moisture measurement.

A system designed for humid areas must also have flexible programming for a wide variety of areas. Rainfall over a course is generally uniform, but the water requirement varies according to changes in soil type, slope, etc.

The above discussion deals with the irrigation requirement of the grass plant for it's day to day water needs. A short range, but extremely important problem. is satisfying the plant's need for water when the evapotranspiration rate exceeds the uptake ability of the roots to supply water. A very short cycle of the sprinklers, 2-5 minutes, will raise the relative humidty in the micro-climate area and reduce the temperature of the plant and it's evapotranspiration rate. This is called syringing. It is valuable as a dew and frost removal tool.

Central programmers to provide steady irrigation during a drought, flexible irrigation during periods of rainfall, syringe cycles for influencing the micro climate and emergency shut down during rainfall or high soil moisture are being installed today and can be relied upon by the turf area superintendent.

So, doesn't that solve the problem? Not really, because the superintendent has to set the amount and frequency of the irrigation and syringe cycles and he does not now have measured input of the required information. His decisions are based too much on experience and too little on fact. The result all too often is overwatering.

Then, how much water is needed by turfgrass? This is determined by solar radiation, wind, grass species, length of day, cultural practices and other inputs. Over the long period of time we usually return to the soil the water lost by evapotranspiration. The frequency with which we make these additions and the amount of water added will depend on the water holding capacity

(continued on page 38)