

B.Tech. II YearII Semester

Sub :-Sprinkler and Micro Irrigation Systems

Topic:-Operation and Maintenance of Sprinkler System

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Purpose of irrigation system is said to be achieved when its performance is satisfactory and proper. Proper operation of any irrigation system includes matching the irrigation duration with the rate of application and the intake rate of soil to maximize the fraction of water stored in the root zone. To obtain full benefit of sprinkler system, it must be operated according to the design. To achieve uniform application, the sprinkler spacing or move distance need to be adjusted to compensate for variations due to wind or exceptionally hot summer days.

The system should be operated in keeping with good irrigation practices. It should be ensured that the prime mover and the pump are in alignment. For these the drive shaft as well as the pump shaft should lie at nearly the same height to prevent too great an angle on the universal shaft.

While laying the main and lateral pipes, always begin laying at the pump. This necessarily gives the correct connection of all quick coupling pipes. While joining couplings, it is ensured that both the couplings and the rubber seal rings are clean. In starting the sprinkler system, the motor or engine is started with the valves closed. The pump must attain the pressure stated on manufacturer's plate or otherwise there is a fault in the suction line. After the pump reaches the regulation pressure, the delivery valve is opened slowly. Similarly, the delivery valve is closed

after stopping the power unit. The pipes and sprinkler-lines are shifted as required after stopping. Dismantling of the installation takes place in the reverse order to the assembly described above.

The principle of operation of the portable sprinkler system is based on the movement of the laterals from one position to the next after a predetermined irrigation event. Each irrigation event has a set time that depends on the amount of water required by the crop at that stage of growth. For the semi portable irrigation system, the lateral is coupled directly to the valve control, elbow or to a header, which is then coupled directly to the valve control elbow. After irrigating in one position, the lateral is uncoupled and moved to the next position. Pipes should not be dragged along the ground as this results in damage and besides that soil would enter the pipes. Care should also be taken that when the pipes are moved is an area with electricity lines, there is no contact with the lines. For drag-hose sprinkler systems, the hose is lateral. The hose is connected with garden tap or turf hydrant at one end and the riser on the other end. Hose clips and adapters are used to secure the hose. After irrigating one position, all sprinklers, risers and tripod are moved to the next position. Of particular importance to this system is that users should clearly mark on the hose all positions of the sprinkler, so as to ensure that they place the sprinkler at the same position each time that position is irrigated and also to ensure that the overlap envisaged in the design is maintained.

Maintenance of Sprinkler System

Irrigation system maintenance is necessary to ensure most efficient use of water that is being applied. The best design cannot compensate for inadequate system maintenance.

Maintenance actually deals with system installation. Improper installation will cause trouble throughout the life of the system. A sprinkler system like any other farm equipment needs maintenance to keep it operating at peak efficiency. Parts of the system subject to wear are the rotating sprinkler heads, the pumping set, the couplers and the pipeline. General principle regarding the maintenance of the pipes and fittings and sprinkler heads are given below:

i) Pipes and fittings:

The pipes and fittings normally do not need much maintenance. The following precautions can be observed for pipes and fittings:

Any dirt or sand accumulated on the groove of the coupler in which the rubber sealing ring fits be occasionally cleaned. The pipes made up of Aluminum or HDPE should not be dumped on the damp concrete or fertilizer sacks. The pipes are automatically emptied and ready to be moved. When the pump is first started and before the pressure has built up in the system the seals may give a little leakage. With full pressure in the system the couplers and fittings will be effectively leak free.

ii) Sprinkler heads:

The sprinkler heads should be given the following attention.

(a) When moving the sprinkler lines make sure that the sprinklers are not damaged or pushed into the soil.

(b) Do not apply oil, grease or any lubricant to the sprinklers. They are water lubricated and using oil, grease or any other lubricant may stop them from working.

(c) Sprinkler usually has a sealed bearing and the bottom of the bearing there are washers. Usually it is the washers that wear and not the more expensive metal parts. The washers be checked for wear once a season or every six months this is especially important where water is sandy. Replace the washers if worn.

(d) After several seasons operation the swing arm spring may need tightening. This is done by pulling out the spring end at the top and rebending it. This will increase the spring tension. In general check all equipment at the end of the season and make any repairs and adjustment and order the spare parts immediately so that the equipment is in perfect condition to start in the next season.

As a rule, the underground component of the system requires no maintenance. However, at times, because of careless errors during cultural practices, pipes have to be replaced in order for the system to operate at designated pressure. The above ground components of the sprinkler system, if carefully operated and maintained, are expected to last for about 15 years. This would require careful movement of aluminum/ HDPE pipe, after each riser and sprinklers have been disconnected from the pipe to facilitate ease of movement to the next position. Portable aluminum / HDPE pipes connected through coupling with rubber rings in order to ensure water tight connections. These rings have a life of 2 years and need to be replaced accordingly.

The hoses used for sprinkler systems are rated at 7 meters pressure and are reinforced. Their life expectancy is 8 years. However, at times perforations or cuts occur during cultivation. Line joiners can be used to repair the hoses.

With respect to sprinklers, it is necessary that all nozzles are replaced at least every two years (four seasons), in order to maintain the correct flow and distribution of water from the sprinkler. This is particularly important when surface water with high load of suspended solids is used for irrigation. The tension of the sprinkler spring and rear of some of the plastic seals also require attention. It is therefore necessary that every 4-5 years the sprinklers are taken to the supplier for an overall check up.

Trouble Shooting and Remedies

The following are the general guidelines to identify and remove the common troubles in the sprinkler systems:

- 1) Pump does not prime or deliver water
 - a) The pump suction lift should be checked, is it within the limits? If not lower the pump closer to the water surface.
 - b) Air leak from the suction pipeline and all connections should be checked. All connections and flanges should be made air tight.
 - c) The strainer of the foot valve should be checked for blockage.
 - d) Check that the flap in the foot valve is free to open fully.
 - e) Check the pump gland (s) for air leaks. If required repack the gland (s) using a thick grease to seal the gland satisfactorily.
 - f) Check that the gate valve on the delivery pipe is fully closed during priming and opens fully when the pump is running.
 - g) Check that the direction of rotation of the pump is correct.

2. Sprinklers do not turn

- a) The operation pressure of pump should be checked.
- b) Check that the nozzle is not blocked. Preferably unscrew the nozzle or use a small soft piece of wood to clear the blockage.
- c) Sprinkler bearing should be free and smooth. Sprinkler can usually be pushed down towards the riser pipes so that the water pressure flushes out the bearing. If the bearing is still stiff dismantle and then clean it. Oil, grease or any lubricant should not be used.
- d) The condition of washers at the bottom of the bearing should be checked and it should be replaced then, if found worn or damaged.
- e) The swing arm should be checked for free movement further the spoon which moves into the water stream is not bent by comparing it with a sprinkler which is operating correctly. If it is bent then very carefully bend it bring into position.
- f) Adjust the swing arm spring tension. Usually it should not be necessary to pull up the spring by more than about 6 mm.

3. Leakage from Coupler or Fittings

The sealing rings in the couplers and fittings are usually designed to drain the water from the pipes when the pressure is turned off. This ensures that the pipes are automatically emptied and ready to be moved. When the pump is first started and before the pressure has built up in the system the seals may give a little leakage. With full pressure in the system the couplers and

fittings will be effectively leak-free. If, however, there is a leakage, check the following:

a) There is no accumulation of dirt or sand in the groove in the coupler in which the sealing ring fits. Clean out any dirt or sand and refit the sealing ring.

b) The end of the pipe going inside the coupler is smooth, clean and not distorted.

c) In the case of fittings such as bends, tees and reducers ensure that the fitting has been properly connected into the coupler.