Whether your pumping plant runs by (1) gasoline, (2) electric or (3) Diesel power, it requires special attention to perform efficient service and avoid breakdowns during the wartime shortage of critical materials.

Your Pumping Plant in War Time

By CARL ROHWER
Irrigation Engineer, Division of Irrigation, Soil Conservation Service*

FOR long life and satisfactory operation of irrigation pumping plants it is essential that they be properly maintained and correctly operated. The materials required for building pumps and motors are critically needed everywhere, so every farmer should make a special effort to get the longest service possible from his pumping equipment. It will save him money and in addition will reduce the demand for strategic metals.

Lubrication

Proper lubrication is the most important factor in the successful operation of pumps, motors, and engines. Failure to lubricate at the right time may ruin expensive bearings and may cause a shutdown at a critical time.

Motors require very little attention, but the gauges for indicating the oil level in the bearings should be checked occasionally to see that oil is at proper level. If oil is low, dynamo oil should be added. The pump must be stopped when checking oil level or adding oil. Motor manufacturers recommend changing oil annually, or oftener if motor is operated continuously, and always at the beginning of the irrigation season. Flushing the bearings with kerosene after

* In cooperation with the Colorado Agricultural Experiment Station, Fort Collins, Colorado.
draining old oil is effective in removing accumulated sludge. The hood on the motor and the caps on the oil gauges are provided to keep dust and water out. They should not be removed except during inspections.

The thrust bearing, which carries the weight of the shaft and the column of water, is subjected to a heavy load in deep-well pumps, and the lubricating oil used must be cooled to keep the bearing from heating. Where this is done by piping water from the pump discharge to the bearing, the flow should be checked whenever the pump is visited. If flow should stop, the bearing might become overheated and permanently injured.

The foregoing instructions also apply to belt heads. For gear heads, because of the high bearing pressure, the special oil recommended by the manufacturer should be used. Automobile engine oil is not suitable for this purpose.

Oil used for lubricating all heavy-duty internal combustion engines must be of good quality and of the correct viscosity. The level of the oil in the reservoir should be checked frequently. Oil should be changed at the end of a specified number of hours of operation, usually 100 hours. This also is true of the oil filters. Bearings not supplied by the pressure system should be oiled or greased daily or as often as recommended by the manufacturer. If the engine is equipped with a water circulating pump this pump should be lubricated with hard oil made for this purpose. The fuel used in Diesel engines lubricates the plungers of the injectors. Because of high pressures developed, fuel must be absolutely clean or excessive wear will occur in these parts. Since most impurities sink in Diesel fuel the fuel intake pipe should not extend to the bottom of the tank. Oil reservoirs and fuel tanks must be kept closed to exclude dust and water. A drain plug in the bottom of the fuel tank is desirable for cleaning out sediment when necessary.

The drip oiler for the pump shaft on an oil-lubricated deep-well turbine should be kept filled with the proper lubricant. Dynamo oil, similar to that recommended for the motor may be used and light engine oil (S. A. E. 10 viscosity) is also satisfactory. Marine oil, which absorbs moisture, is recommended by some manufacturers. It prevents rusting of shaft and tube, but its high viscosity causes an increase in bearing friction. The recommended rate of drip for all types of oil is about 2 drops per minute for each 100 feet of shaft. Since the rate of drip varies with temperature it should be checked occasionally to see that sufficient oil is being supplied and also that rate is not too great, or the oil reservoir may be drained before pump is again visited. Drip oilers should be shut off after pump is stopped. If a solenoid controlled oiler is used, it should be inspected whenever the pump is started to see that oil is flowing. Pumps are usually visited at least daily, but inspection at more frequent intervals is a worthwhile safeguard.

Water should always be turned into the discharge pipe of a water-lubricated deep-well turbine before the pump is started. Rubber bearings are used and, if the pump is started while the bearings are dry, the friction may cause the rubber to stick to the shaft with the result that the bearings are ruined. This risk will be avoided if the reservoir is kept filled so that water will always be available when starting the pump.

Horizontal centrifugal pumps with sleeve bearings are usually equipped with ring oilers which carry oil to the shaft from a reservoir. Pumps with ball or roller bearings are frequently built so that the bearings run in a bath of oil. The oil reservoir for both types of bearings is a part of the bearing housing. A good grade of
light oil is recommended for lubricating this type of bearing. It should be changed at the beginning of the irrigation season, and before the reservoir is filled with new oil it should be flushed with kerosene. The packing glands on the shaft are lubricated by means of grease cups. A special hard grease is required. These glands give most satisfactory service if they are not screwed up too tight.

Special ball-bearing grease should be used for grease-lubricated ball bearings. Greases containing graphite or other fillers are not suitable because the clearance between the balls and races is extremely small. It is important also that the grease be free from grit or sand. Grease cups should be turned down a small amount at regular intervals. Too much grease causes heating of the bearing.

Pump Repairs and Adjustments

The position of the adjusting nut at the end of the shaft where it extends through the motor, belt pulley, or gear head determines the position of the impellers with reference to the bowls. If the impellers are too high or too low, excessive friction and wear may occur. Since the shaft stretches when it is carrying the weight of the column of water, the adjustment of the position of the impellers varies with the length of the shaft. Different makes of pumps and different types of impellers require special settings. For this reason the instructions for the particular pump must be followed in making the adjustment.

If a pump fails to deliver its rated discharge, several possibilities should be investigated. The water level may have dropped. When this occurs; the discharge can be increased, within limits, by speeding up the engine if the plant is engine driven. If it is motor driven, more bowls or larger bowls will have to be installed. In either case, if the drop in water level is sufficient to cause the pump to suck air, the whole bowl assembly will have to be lowered. A larger motor also may be required. Another possibility is that the pump is not operating at rated speed. If this is suspected the speed should be checked with speed indicator. In areas where the pumps are operated almost continuously, pump impellers wear out rapidly. In some areas the water is so active that it dissolves the impellers and bowls. The pump must be pulled to make repairs when this occurs. Waters that contain gas reduce the pump discharge. The effect is most pronounced when the suction lift is high. Pumps with semi-enclosed...