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TESTS OF CENTRIFUGAL PUMPS

The pumping of water for irrigation purposes, from both underground and surface sources, is destined to become of great economic importance in the not far distant future, especially in the western portions of North America. In certain sections, providing a water supply were available, lands now rated as of low productive properties could be transformed into profitable and highly productive localities, so that when a water supply is available, there is probably no better investment for a man with a small ready capital, than the building of a pumping plant with a capacity sufficient to irrigate from 20 to 40 acres of land where the depth of water does not exceed 50 feet. Such land is obtainable at low prices on the mesas bordering the river valleys and is particularly desirable where orchard fruits and garden produce are raised with success, where for such products there is a well established market and where finally, land irrigated by gravity irrigation systems can only be obtained upon payment of prices beyond the means of the average investor. In many localities of our West such conditions already exist to some extent and it is in such localities as well as in the more promising "dry-farming" districts that the development of the independent pumping plant is most likely to occur. The central station electrical pumping plant system is a phase of the matter requiring the most careful study of economic and engineering features by experts and will not be touched upon here. The private project should, however, not be entered upon by the person who does not possess some little experience in irrigation affairs so far as they relate to irrigation pumping at least. The fixed charges and operating expenses of a pumping plant are so high under usual conditions that only by the most careful attention to details of equipment and by the exercise of good management in the operation of the pumping plant as well as farm will the enterprise be made to pay or be found as profitable as the preliminary estimates might lead one to expect. In a recent bulletin of the New Mexico Experiment Station, Mr. B. P. Fleming and J. B. Stoneking give results of tests on a number of pumps, and their conclusions as taken up in this article are interesting.

In the matter of equipment it can scarcely be supposed that the person without special training will make a wise selection particularly as to the size and type of pump and motive power. As a matter of fact most pumping plants are put in under contract with some firm supplying or dealing in machinery and the owner beyond the most general specifications is given, and probably deserves, but little opportunity to decide the character of machinery which is put into his plant. Moreover after the plant is put into operation the owner usually takes it for granted that the amount of water guaranteed by the contractor has been obtained and rarely undertakes to determine if the facts support this assumption. In many instances tests have shown centrifugal pumps to be below specifications and guaranteed capacity. This condition of affairs is often a source of annoyance to contractors. This article is written with a view of enabling a prospective purchaser to form a definite idea of the capacity and other essential points from a source other than the manufacturer's pamphlet. The details given below will aid one in selecting a pump and will also give some information regarding the speed at which the pump must be operated to secure a given discharge at a given head. The engine horsepower may then be determined from the curve and the proper size of driving pulley ascertained when the diameter of the pump pulley is known.

These pump discrepancies at times assume large proportions, as may be seen from a glance at Tables No. 1 and No. 2, which are the results of recent investigations at the New Mexico Experiment Station.

Without exception these plants had been designed to secure the rated discharge and the pumps selected were those which according to manufacturers' catalogs would give these quantities, the engine power being based on figures secured from the same source. The method of testing these devices were carried out under careful supervision.

The suction and discharge heads were measured by mercury gauges, and the higher discharge heads by an accurate pressure gauge of the Bourdon type. The suction and dis-

Table 1.

Pump Serial No.	Size of Pump	Range of speed through which operated		Greatest discharge at		Corresponding total heads for greatest discharges		Highest Efficiency attained at any speed	Maker's Rating or "Economic Capacity"	Conditions at highest efficiency attained		
		Lowest	Highest	Lowest Speed	Highest Speed	Lowest Speed	Highest Speed			Discharge Gallons per Min.	Head Ft.	Speed R.P.M.
	Inches.	R.P.M.	R.P.M.	G.P.M.	G.P.M.	Ft.	Ft.	%	G.P.M.			
1	2½	590	1245	200	500	16	55	48	185	250	48	920
2	2	700	1415	135	200	22	100	55	95–125	115	40	860
3	4	675	1320	265	550	14	50	51	400	400	72	1320
4	6	320	370	1040	900	16	23	35	1200–1800	750	19	320
5	1½	940	2130	62	135	13	60	39	55–75	60	13	940
6	6	290	455	600	860	11	32	42	1050	590	11	290
7	6	560	855	510	600	16	35	33	880	600	35	855
8	6	570	750	880	760	17	52	56.5	1100	500	34	570
9	6	700	900	720	800	22	43	48	800	800	42	900
10	4	760	1235	450	600	14	45	56	400	350	44	960
11	4	300	550	300	550	11	17.5	50	450	250	24	400