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A Case Study on Pump Efficiency and Reduction of Energy Consumption *

Diesel and electricity are the commercial sources of energy in agriculture. Both these sources of energy are in short supply now-a-days. The cost of diesel is increasing day by day. India is facing energy-crisis particularly in rural areas. Irrigation can not be given to the crops due to unavailability of diesel or electricity. The electricity is supplied to agriculturists in Karnataka and Tamil Naidu at free of cost.

Karnataka and Tamil Nadu are some of the states which have largest subsidy on electricity. Eventhough the electricity is supplied at subsidesed rate to farmers its consumption can be reduced by operating it efficiently and reducing conveyance loss of irrigation water. The present study is takenup to estimate the efficiency of pumps under their natural operating conditions, study the management practices adopted by farmer to improve pump efficiency and suggest policy measures to reduce electricity consumption of pumpsets.

The study was conducted in Raichur and Coimbatore districts of Karnataka and Tamil Nadu state. The study was conducted on 86 pumpsets selected at random at actual site conditions without altering any component of the system. In every pumpset data on rate of discharge, static suction and delivery lift, consumption of energy(E) and other relevant information like diameter and length of suction and delivery pipe were measured. The pump discharge was measured with the help of 90^{o} V notch installed according to standard specification Michael and Ojha (1978). Discharge measurement was taken after half an hour of starting of the pumpset, when the pumping was observed to be in steady state condition. The consumption of energy was measured by three phase energy meter. Pump efficiency was computed using following relationship.

The package of practice for proper maintenance of pumpsets include gresing once in a week, check unpacking thread once in a month, bearing and washer once in six months, wear of shaft, lubricating the coil wiring and alignment of pump and motor once in a year. Application of low friction foot valve and placing wire mesh around the value are additional features for better management are also noted while discussion with the farmers.

The study revealed that 94.65 per cent of monoblock and 90 per cent of direct coupled pumps were operating in the efficiency range of 10-40 per cent. The mean efficiency of monoblock pumps (27.90) was slightly higher then mean efficiency of direct coumpled pump (27.22). In case of both monoblock and direct coupled pumps eventhough performance of pumps with respect to its rating is good. Still the pumps were giving less than 50 per cent efficiency because of their low rating as given by the manufacturer and hence, these were considered as inefficient pumps.

Eighty per cent of farmers used galvanized iron (GI) pipes for water lifting and rest PVC pipes study also indicated that for same length of pipe head loss in gelvanized iron pipe is more as compared to PVC pipes. This

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suggests that material of pipe plays an important role in influencing the head loss. The findings of present study are in agreement with the findings of Shashidhara (1984).

None of the farmers has used the improved foot value which has less friction and reduces power consumption by 10 per cent. Study indicated that coefficient of friction (K) for foot values with strainer varied from 2.18 to 5.5 34 foot values had K-values between 2-3. 42 between 3-4.0, 5 between 4-5 and 5 foot values above 5 had K values above 5.00. K values of foot valves less than one are commercially available now hence foot values having K values more than one considered to be in efficient. It is desirable to change all these in efficient foot values and savings can be achieved in energy requirement of pumps. Table 4 indicates managerial function influencing towards pump efficiency.

The ideal suction head is 20 feet, the increase in suction head reduces the pump efficiency. A linear regression was fitted with pump efficiency on suction head and adoption of managerial practices.

$$Y=a+b_1x_1+b_2x_2+\mu$$

Where x_1=suction head in feet, x_2=if managerial package of practice adopted otherwise=0 μ=eror term

The fitted function parameters are given table 5

The R^2 of fitted function is 0.3841 and significant at 1 per cent level. The variables included in the function explain 39 per cent variation in pump efficiency one foot increase in suction head over the ideal head of 20 ft. will reduce pump efficiency pump efficiency by 9.6 per cent study is an confirmation with study conducted by Lokanathan *et al.* (1993).

It is recommended that suction head should not exceed 20 feet. Further farmers should be advised the use PVC pipes and frictionless foot valves with K values less than one commercially available in the market to economise power consumption.

Department of Agricultural Engineering
College of Agriculture, Dharwad - 580 005

S.V. JAHAGIRDHAR
M. KOTEESWARAN

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