STERN, V.M., SMITH, R.F., BOSCH, R.V. and HAGEN, K.S. (1959). The integrated control concept . **Hilgardia 29 :** 81-101.

THIRUMURTHI, S. and BHANUMATHI, C.P. (1991). Owls associated with paddy fields. **Newsl. Birdwatchers 31**(7,8) :10.

WODZICKI, K. (1973). Prospects for biological control rodent populations. **Bull. Wld. Hlth. Org., 48** :461-467.

(Received: December 1995 Revised: May 195;

Madras Agric. J., 83(2): 121-123 February 1996
https://doi.org/10.29321/MAJ.10.A00985

COEFFICIENT OF RESISTANCE (K) IN LOCALLY AVAILABLE FOOT VALVES IN COIMBATORE AREA

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ABSTRACT

It is revealed that in Coimbatore pumpset market, the coefficient of resistance(K) is more in the case of hemispherical foot valves and it ranges from 1.66 to 5.24 in the case of dominant foot valves like Gowri, Green, DPF and Mohan Kumar brands. In the case of cylindrical foot valves like Kirloskar, Sujala and Jothi brands the resistance is less and it varies from 0.94 to 2.30. Hence cylindrical shape foot valves are more desirable from the energy conservation point of view.

KEY WORDS: Foot valves, Coefficient of Resistance, Pressure loss, Strainer opening Ratio

In Tamil Nadu, there are about 9.5 lakhs of pumpsets that have been energised, out of which the diesel powered pumpsets being about 5 to 10 per cent and the remaining powered by electricity. A saving of atleast 10 per cent in the power consumption can be accomplished through the well designed foot valves of the pumpsets by reducing the pressure loss. Inorder to findout the efficiencies of foot valves in Coimbatore, a study on various commercially available foot valves was taken up at the Tamil Nadu Agricultural University during 84-85 and the results of the study are reported.

MATERIALS AND METHODS

The study was taken up to analyse the performance of locally available foot valves to identify areas of deficiency. With this view in mind, the locally available foot valves were tested in the hydraulic laboratory. The very commonly used foot valves of sizes 21/2" . 3" and 4" were tested in the laboratory. The locally available foot valves are predominantly hemispherical in shape, slots essentially rectangular in configuration, are oriented in radiyal direction, however there would be one or two rows of slots which are provided in the horizondal direction in the lower most portion. The top hemispherical portion is of solid wall enclosing the assembly of the leather flap. Thi: top portion ends in flange which can be coupled t the other flange fitted at the bottom of the suctio pipe. The details are given in Table (1).

In the course of experiments, water wa pumped from the sump with a five horse powe centrifugal pump and recirculated back. Th suction pipe line was 3" in diameter and delivery 21/2". A pressure tapping has been in the suction pipe line just above the foot valve and connected to the limb of monometer with the other end being open to atmospher. The discharge pumped out was metered by actually collecting in a tank. The pressure loss in the foot valves was observed on the manometer.

An equation was obtained to work out the pressure loss using the observed data. Considering two points for this purpose and applying Bernoullis theorem, we get

$$Ha + x = Hs + \frac{Vs^2}{2g} + hf \text{----------(1)}$$

But $Hs = Ha + H - 13.6\Delta H - (H - \Delta H) + W^1$
$[(H-\Delta H)+Y+x)]$----------(2)

That is $Hs = Ha - 13.6\,\Delta H + H$ ($\because W^1$ NO)------(3)

Eliminating Hs and rearranging for hf

Table 1. Details of foot values resistance coefficient and discharges

Name	Strainer opening ratio	Discharge (Q) m^3/sec	Coefficient of Resistance (K)	Shape of foot value
1	2	3	4	5
Gowri	0.34	0.017	1.68	Hemispherical
		0.015	1.97	
		0.013	2.26	
		0.010	3.03	
		0.008	3.50	
Green	0.31	0.018	1.66	Hemispherical
		0.015	2.15	
		0.014	2.25	
		0.012	2.77	
		0.009	3.80	
DPF	0.27	0.018	1.84	Hemispherical
		0.016	2.17	
		0.014	2.58	
		0.011	3.44	
		0.009	4.44	
Mohan Kumar	0.24	0.017	2.14	Hemispherical
		0.016	2.38	
		0.012	2.57	
		0.011	4.00	
		0.009	5.24	
Kirloskar	0.34	0.018	0.94	Cylindrical
		0.015	1.25	
		0.012	1.62	
		0.011	1.71	
		0.009	2.08	
Sujala	0.32	0.018	1.10	Cylindrical
		0.016	1.29	
		0.014	1.53	
		0.011	1.92	
Jothi	0.31	0.017	1.25	Cylindrical
		0.016	1.35	
		0.014	1.58	
		0.012	1.88	
		0.009	2.36	

$$h_f = x + 12.6\,\Delta H - \frac{VS^2}{2g} \text{-------- (4)}$$

Where

h_f = Head loss due to foot valve, m

x = Submergence of foot valve tapping, m

Hs = suction head, m

Vs = suction velocity, m/Sec

W^1 = Weight density of air

H = differential head in manometer , m

Ha = Head due to atmosphere

H= Height of air column in the manometer open side limb.

y= Vertical distance between the water surface in the sump and the top mercury level in the closed limb of 'U' monometer

W_1 = Weight density of air column from the manometer to the outlet point of the valve. In this analysis the weight of the air column from the manometer to the outlet point of the valve is neglected. Hence headloss can be expressed as

$$\frac{K V^2}{2g} = h_f = x + 12.6\,H - \frac{Vs^2}{2g} \text{---------- (5)}$$

Where K is the coefficient of Resistance and 'V'is the velocity of liquid. The resistance coefficient can be determined with the computation of velocity head V^2 and the observed pressure head 'h'r.

RESULTS AND DISCUSSION

In hemispherical shaped foot valves the 'K' varies from 1.66 to 5.24 for discharge variation of 0.017 to 0.009 m^3/sec, whereas it varies from 0.94 to 2.36 for discharge variation of 0.18 to 0.009 m^3/sec. in the case of cylindrical shaped foot valves (Table 1). From the result it is clearly seen that that coefficient of resistance (K) is more in hemispherical shaped foot valves and less in cylindrical shaped foot valves for normal discharge rate. Among hemispherical foot valves the strainer opening ratio and discharge are inversely propotional to the coefficient of resistance. From the table it is imperative that within the cylindrical shape foot valves, the strainer opening Ratio and Discharge are inversely proportional to the resistance coefficient.

The head loss and corresponding coefficient of resistance varies with the entry velocity into the foot valve dome, smoothness of the material and shape of the valve and the strainer opening. Their values have been arrived at from experiments and reported by several agencies.

It was earlier observed that the coefficient of resistance for foot valve could be 0.8 for all sizes of suction pipes. Patel and Gupta (1979) reported the test results of 10 makes of foot valves in connection with a petrolleum conservation study and the values of coefficient of resistance ranged from 2.25 to 13.9. The Soil and Water Engineering Department,Punjab observed that the value of resistance coefficient for commercially available as 1.91 to 5.88. Seva Ram *et al.*, (1982) evaluated the value of the coefficient of friction ofhemispherical foot valves, ranged from 11.4 to 2.9. Patel (1982) observed the values of coefficient of Resistance ranging from 2.3 to 14.0 in Gujarat State. So, Cylindral shape foot valves are preferred for energy conservation.

REFERENCES

PATEL, B.L. and BHATTACHARYA, A.K. (1982) Headlosscharacteristics and power consumption in foot valves. **J.Agric. Eng., 30:** Vol

PATEL, S.M. and GUPTA, K.K. (1979). Study on conservation of LDO used in pumpsets for lift irrigation in Gujarat State. **Report of Institute of Cooperative Management Ahmedabad.**

SEVA RAM,H.C., SHARMA, H.S. and CHAUHAN, H.S. (1982) Patnagar foot valve. **Technical bulletin of G.B. pant University. of Agriculture & Technology, Pant nagar.**

Patel, S.M. (1982). Techno-economic/aspect of conservation of energy in the agricultural pump sets. **Report of Institute of Co- operative Management, Ahmedabad, Gujarat.**

(Received: August 1988 Revised: April 1996)

Madras Agric. J., 83(2): 123-125 February 1996

CUMBU-NAPIER HYBRID GRASS CO -3:A NEW HIGH YIELDING FODDER FOR IRRIGATED AREAS

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ABSTRACT

The presently available Cumbu-Napier hybrid grass varieties Co-1 and C0-2 are more suitable for black soil areas and cattle feeding. The new variety Co-3 was developed for red loamy soil areas and is highly suitable for sheept and goats in addition to cattle feeding. It is highly leafty, with long, broad,and softer leaves. In addition, the leaf-stem ratio is higher. It had recorded on an average, 393.6 t/ha/year of green fooder in the Station trials and a maximum yield of 514 t/ha under ART at Pudupalayam in Salem District. The dry matter yield was 65.12 t/ha/year and crude protein yield was 5.40 t/ha/year. The oxalic acid content is also less compared to Co-2

KEY WORDS : Cumbu-Napier Fodder

Among irrigated fodder grasses, Cumbu-Napier hybrids rank first in green fodder yield. At present, two varieties Co-1 and Co-2 are available for general cultivation (Sivasamy *et al.*, 1994) in Tamil Nadu. However, these two varieties have certain drawbacks like, thick stems and