Fibreglass vs stainless steel screen

WEDC 12th Conference: Water and sanitation at mid-Decade: Calcutta 1986

S Huq, Md A Hossain

Fibreglass vs stainless steel screen

INTRODUCTION

In 1984 Associated Engineers and Drillers drilled and installed 55 deep tubewells in the Upazilla of Dhamrai in Dhaka district and Manikgonj Upazilla in Manikgonj district under a contract from the Bangladesh Agricultural Development Corporation (BADC). The project was funded by the International Development Association (IDA) of the World Bank. The area is part of an extensive flood plain of the river Ganges at an elevation from 6m to 100m above sea level. The alluvial plain contains a network of river channels, both active and passive. During the monsoon large areas are flooded but during the dry season the majority of the areas dry out and cultivation is limited to areas adjacent to surface water and where deep tubewells are available. The climate is tropical and humid with a wet south-west monsoon from June to November. During the remainder of the year a cool, dry north-east wind blows from central Asia, bringing the lowest temperatures and humidity around November/ December. The climate gives rise to three main seasons: (1) Winter (November to February), dry, cool (temperature 7 to 29°C), (2) Summer (March to May) dry, hot (30 to 40°C) humid (60-85%) stormy and (3) Monsoon (June to October) heavy rainfall, hot, humid. The aquifer consists mainly of sands and coarse sands between the depths of 200-300 feet overlain by a semi confining bed of finer grained mixed materials with generally low permeabilities. The aquifer deposits are considered to be in hydraulic continuity throughout the region and are sufficient for extracting required quantum of water by deep tubewells in practically all areas.

MATERIALS AND METHODS

The deep tubewells were drilled using reverse circulation, tractor mounted hydraulic drilling rigs. A bore hole of 22 inch diameter was made and the fixtures lowered to the appropriate depths. The tubewells were developed and tested at 3 cusecs and the pumping water level noted. The tubewell fixtures consisted of:

(1) 80-90 ft of 14 inch diameter upper well casing made of Mild steel (MS) Pipe,

(2) 50-150 ft of 6 inch diameter lower well casing made of Galvanized Iron (G.I.) Pipe

(3) 60-120 ft of 6 inch diameter Screen of either stainless steel or fibreglass.

The type of screen used in a particular tubewell depended on which type of screen was available with BADC at the time of installation. A bail plug of 6 inch diameter G.I. Pipe was also installed. The fixture design and type of screen used were noted and the actual draw down at 3 cusec test pumping was measured. The specific draw down was calculated.

The stainless steel screen used was continuous wire wound type with an area of opening of 20% to 30%. The fibreglass screen consisted of slotted fibreglass pipe with an area of opening of 12% and slot width of 1-1.5 mm. The stainless steel screen was imported from Japan, UK and Australia and fibreglass screen imported from India.

RESULTS

The data from the 35 tubewells using stainless steel screen are presented in Table 1. The results showed that the mean length of screen used was 80 ft while the length of lower well casing was 104 ft and the mean total depth of the tubewells was 272 ft. The mean draw down at 3 cusec test pumping was 31.11 ft and specific draw down 10.36. The data from the 20 tubewells using fibreglass screen are presented in Table 2. The results showed that the mean length of screen used was 108 ft while the length of lower well casing was 75 ft and the mean total depth of the tubewells was 270 ft. The mean draw down at 3 cusec test pumping was 20.5 ft and specific draw down 6.83.

DISCUSSION

It is clear from the results presented that there was no significant difference in the total depth of tubewells whether the screen used was fibreglass or stainless steel. Thus there was no difference in drilling costs.

The mean length of stainless steel screen used was 80 ft while fibreglass was 108 ft. Thus on average a tubewell will require 25% less screen if stainless steel material is used instead of fibreglass. However, the length of G.I. Pipe lower well casing in the case of the tubewells using stainless steel screen was almost 40% higher than in the tubewells using fibreglass screen. Thus any saving in cost of screen due to reduced length in the case of stainless steel is more than offset by the increased G.I. Pipe lower well casing required.

The mean actual draw down and specific draw down in the case of tubewells using stainless steel screen was over 50% higher than those using fibreglass screen. Thus the tubewells using stainless steel screen will require more energy to extract an equivalent amount of water. This will mean higher long term fuel and running costs to the farmers using tubewells with stainless steel screen.

CONCLUSION

The results of this study indicate that considering the aquifer condition in Bangladesh the use of stainless steel screen in deep tubewells does not result in any savings in drilling and material costs even though stainless screen with more area of opening is used per tubewell. Furthrmore the actual and specific draw down in the tubewells with stainless steel screen being higher, the long term running and maintenance costs will be higher for the tubewells with stainless steel screen compared with tubewells with fibreglass screen. It is therefore recommended to use greater length of low cost fibreglass screen where suitable aquifer is available and restrict the use of costly stainless steel screen to areas where the depth of the aquifer is limited to 60-80 ft only. From past experience such limited aquifer depth is found in only 3 to 5% of the areas.

Table 1 : Design and performance of thirty five deep tubewells in Dhamrai and Manikgonj upazillas using stainless steel screen

Tubewell No.	Length of Screen (ft)	Length of Lower well casing (ft)	Total depth of tubewell (ft)	Drawdown at 3 cusecs (ft)	Specific drawdown
1.	60	120	268	32.46	10.81
2.	60	110	258	36.83	12.27
3.	70	95	253	30.125	10.04
4.	60	120	268	35.71	11.90
5.	60	100	248	40.88	13.62
6.	70	105	263	24.92	8.30
7.	80	130	298	29.87	9.95
8.	80	85	253	26.62	8.87
9.	80	110	278	29.08	9.69
10.	80	58	226	23.79	7.93
11.	90	95	273	21.33	7.11
12.	90	120	298	22.75	7.58
13.	80	115	283	24.62	8.20
14.	80	120	288	35.00	11.66
15.	100	140	328	29.25	9.75
16.	80	80	248	32.25	10.75
17.	80	120	288	33.67	11.21
18.	80	80	258	26.04	8.68
19.	80	85	253	41.00	13.67
20.	80	80	248	37.33	12.42
21.	80	90	258	26.29	8.76
22.	80	115	283	38.58	12.86
23.	80	102	270	24.00	8.00
24.	80	90	258	33.67	11.22
25.	80	100	268	34.50	11.50
26.	80	90	258	35.87	11.96
27.	90	70	248	24.21	8.07
28.	80	90	258	29.37	9.79
29.	110	80	284	37.67	12.56
30.	90	117	295	23.75	7.92
31.	80	100	268	34.92	11.64
32.	80	80	248	34.83	11.61
33.	80	172	340	48.67	16.22
34.	80	127	295	27.00	9.00
35.	90	142	320	21.92	7.29
Mean	80	104	272	31.11	10.36
Maximum	60	58	226	40.88	13.62
Minimum	110	172	340	21.33	7.11

Table 2 : Design and performance of twenty deep tubewells in Dhamrai and Manikgonj upazillas using fibreglass screen

Tubewell No.	Length of Screen (ft)	Length of lower well casing (ft)	Total Depth of tubewell (ft)	Drawdown at 3 Cusecs (ft)	Specific drawdown
1.	100	96	284	18.58	6.19
2.	120	50	263	19.62	6.54
3.	120	40	248	17.46	5.82
4.	100	95	283	19.58	6.52
5.	120	60	268	19.58	6.52
6.	120	40	248	18.37	6.12
7.	100	93	281	20.54	6.84
8.	100	40	228	17.67	5.89
9.	100	75	263	20.17	6.72
10.	90	105	283	25.71	8.57
11.	100	40	228	15.42	5.14
12.	120	105	313	23.25	7.75
13.	120	40	248	29.33	9.77
14.	90	153	331	24.25	8.03
15.	90	85	263	23.00	7.66
16.	100	95	283	22.42	7.47
17.	120	70	278	19.42	6.47
18.	120	40	248	18.46	6.15
19.	100	93	281	20.54	6.85
20.	120	65	273	16.50	5.50
Mean	108	75	270	20.50	6.83
Maximum	120	153	313	25.71	5.14
Minimum	90	40	228	15.42	9.77