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Replacement of Sub Minors With Pressurized Irrigation Systems: In Canal Command Area

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ABSTRACT

There is no possibility to irrigate the entire command area of SSP through conventional flow irrigation. There is Strong need for efficient and cost effective use of limited delta to cover the entire command area where optimization of water use is the prime consideration. It has been recognized that use of modern irrigation methods like drip and sprinkler irrigation is the only alternative using Pressurized Irrigation Network System (PINS).Pressurized Irrigation Network System (PINS) is substitute arrangement for sub-minors and field channels in an open canal network. In present study, design of PINS is carried out considering 24 hours power supply at Rampur village.

KEYWORDS : PINS, Sub-minors, Power supply, Optimum use of water, conventional irrigation

INTRODUCTION

Water is one of the most critical inputs for agriculture which consumes more than 80% of the water resources of the country. It has been recognized that use of modern irrigation methods like drip and sprinkler irrigation is the only alternative using Pressurized Irrigation Network System (PINS). Pressurized Irrigation Network System (PINS) is substitute arrangement for sub-minors and field channels in an open canal network. In other words, it acts as a bridge between the source and Micro-Irrigation System (MIS) at the field level. This is primarily, a pipe network carrying required discharge at adequate pressure, finally delivering it to the attached MIS network. Design of this network is suitably framed incorporating features of water distribution under the Canal Command Area (CCA). Experience gained from many countries in arid and semi-arid zones has shown that pressure piped irrigation techniques are replacing successfully the traditional open canal surface methods at farm level. In present study, the design of PINS using Spreadsheet with multiple outlets at emitters with 24 hrs power supply is carried out.

NECESSITY OF PRESSURIZED IRRIGATION NETWORK SYSTEM (PINS)

- To make the Micro-Irrigation System (MIS) adoption technically viable in the canal command areas, a pressurized water conduiting system act as bridge by drawing water from the canal, storing in a place.
- To minimize the land acquisition problem.
- Not possible to irrigate the entire command area of SSP through conventional flow irrigation. Strong need for efficient and cost effective use of limited delta to cover the entire command area
- Limited availability of water - optimization of water use is the prime consideration
- Adverse soil characteristics in certain areas - low application of water is imperative
- Flood/ flow irrigation not desirable to problematic areas. To restrict unregulated water lifting from canals.
- Conjunctive management of pipe distribution with ground water.
- To improve overall farm efficiency

SSP COMMAND AREA

Sardar Sarovar (Narmada) Project Phase –IIA covers Culturable Command Area (C.C.A of 20,42,39 Ha) between Mahi and Surashtra Branch Canal off – taking from Narmada Main Canal.

The study area is selected in agro-climatic zone no.6 of SSP Command area which is situated at village Rampur. Rampur village is served by dholka direct minor canal. It is divided into two chak; chak 1 & chak 2 there area is 27.74 & 32.09 CCA respectively, which is further divided into 4 sub-chak area each. Analysis is carried out for both the alternatives using Darcy-Weisbach formula and dia of PINS pipe, connecting pipes, storage, pumping requirements and number of filters is computed using spreadsheet. Discharge has been computed using basic discharge coefficient taken as 0.65 for agro-climatic zone VI.

METHODOLOGY FOR DESIGN OF PINS

For pressurized pipe network, three types of pipes like Polyvinyl Chloride (PVC), High Density Polyethylene (HDPE) and Fiber Reinforced Pipe (FRP) can be used. FRP pipes are generally economical for larger diameter and hence in case of PINS it is not viable.

The design for PINS at Rampur village is carried out by following steps.

Connecting Pipes

In our case for non-pressurized gravity flow we prefer PVC pipe. For this, generally low pressure gravity mains of PE 80 class of PN 2.5 (2.5 kg/ cm^2) would be sufficient.

Design of PINS pipe

Here in study for pressurized flow HDPE pipe is preferred.

Design dischargess Q = BDC x CCA_1/ 2 (24hrs)

Computing Pumping Efforts

Pump HP = (Q x H) / (75 xh)
where Q = design discharge in lps
H = Pressure head in m; n = no. of sub-chaks

Filters

Capacity of media filter (m^3/ hr) = Design discharge of PINS pipe X 3.6(24 hrs) As per above steps design is carried out and result is obtained as below for 24 hrs power supply:

SR. NO			Chak No 1	Chak No 2
1	CCA (ha)		27.74	32.96
2	Q (lps) considerd		9.01	10.71
3	Head (m)		35	35
4	H.P	Designed	7.51	8.92
		Provided	10	10
5	Nos. of Pump		3	3
6	Filter Capacity (m3/hr)	Designed	32.43	50
		Provided	38.56	50

Table 1 Design of Number of Pumps and Filters (24 hrs Power Supply)

Chak No	CCA (ha)	Discharge (lps)	Sub chak No	Length of PINS (m)	Pipe OD (mm)
1	27.74	18.03	1	140	110
			2	485	140
			3	220	125
			4	355	125
TOTAL OF CHAK 1	27.74	18.03		1200	
2	32.96	21.42	1	160	90
			2	160	90
			3	435	110
			4	475	125
TOTAL CHAK 2	32.96	21.42		1230	
TOTAL FOR CCA	60.7	39.45		2430	

TABLE – 2 DESIGN OF PINS PIPE (24 HR POWER SUPPLY)

CONCLUSIONS

The country is likely to be water stressed in the coming years. Therefore hand in hand with technologies for water harvesting and storage, technologies for precision water application methods need to be adopted. For efficient performance and improvement in efficiencies of the irrigation systems, it is necessary to adopt a self-sustainable system and that is why modernization of canal command area is necessary through micro irrigation system. To bring more area under irrigation, it has become necessary to introduce new irrigation techniques like micro irrigation system for economizing the use of water and increase productivity per unit of water. Micro irrigation system need be promoted in a holistic manner involving appropriate methods thus micro irrigation system is done by using "PRESSURIZED IRRIGATION NETWORK SYSTEM" (PINS).

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