An Innovative Device for Tapping Potable Drinking Water
Uttaranchal Jal Sansthan for Uttaranchal Koop

ABSTRACT

Natural springs and Gadheras (source like Rivers & Streams) serve as major source of water in hilly areas of Uttaranchal State. Due to decrease in discharge of available springs and increasing demand, water was also tapped from surface sources (Gadheras) which was polluted and could not be used directly. Boulder Filled Galleries were constructed to divert water to supply mains against flow which required continuous supervision, and huge quantities of raw material. In addition to that, it also involved huge operation and maintenance costs.. To overcome these problems, Uttaranchal Koop was developed as an alternative to to tap the subsurface flow of

Uttaranchal is state of Natural Beauty, with a total geographic area of 51,125 SqKm. According to the 2001 census, the population was approximately 8.48 Million. The largest cities of state are Dehradun (530,263), Haridwar 9158,896) and Roorkee (115,278).

Status of Water Supply in Uttaranchal

	Rural Area	**Urban Area**
Gravity schemes	**9977**	**47**
Pumping Schemes	**280**	**16**
Total Schemes	**10257**	**63**

CONTEXT

Traditionally natural springs and gadheras (streams & rivers) serve as major source of water in hilly areas. Water from springs can be used for direct supply, Due to low discharge from springs, surface water from small streams was used for drinking water supply by diverting the supply main by constructing a cross wall across the stream against the flow called boulder filled gallery (BFG) However, construction of these BFGs required expert supervision, huge quantities of raw materials which are not easily available at the source

Bolder Filled Gallery

and enormous operation and maintenance costs. In view of this, appropriate, reliable and Cost effective Uttaranchal Koop was designed to replace BFGs.

SITUATION PRIOR TO THE INITIATIVE

There were several problems experienced by Uttaranchal Jal Sansthan with respect to the operation and maintenance of boulder filled galleries and the quality of water tapped from these galleries. There is no arrangement for turbidity removal in BFG, thus the quality of water supplied during monsoon is muddy and turbid.

At times during heavy floods , the cross wall of BFGs gets damaged and washed away completely & pipelines get choked resulting in silting inside the clear water reservoir (CWR). O&M of the BFG requires considerable amount of money and manpower for its restoration, repairs, desilting and removal of chokes after every monsoon. Due to these reasons, the water supply schemes remain non functional for several months ultimately resulting in interruption of water supply causing inconvenience to the public.

IMPLEMENTATION PROCESS

This innovation of 'Uttaranchal Koop' also named as 'French well' is based on river bank filtration technique which obtains water from aquifers, which are layers of sand and gravel near the banks of rivers that contain underground water.

Uttaranchal Koop is a hollow cylindrical steel pipe with radical perforated pipes, connected with welded outlet socket at the middle of a vertical cylinder for joining outlet pipe; a 1 to 1.5 m long pipe is placed vertically 3 to 4 m below the bed of stream with the open end at the bottom and close end at the top.

The device is placed over the impermeable strata of streams tapping the entire alluvial field. After placing the Koop, the space graded filter media envelops the Koop up to the natural bed level of the stream. The base flow of the stream rises inside the cylindrical pipe through its open end and perforated radial pipes due to hydrostatic pressure of the submerged surface and maintains a static level in the cylindrical pipe. The outlet socket, placed almost at the middle of the Koop is connected to the 'gravity-main' of the water supply scheme.

The gravity main starts drawing water from the Koop. The static level of the well is maintained through hydrostatic pressure, thus a continuous flow is obtained.

The scheme is designed in such a way that it works even during minimum discharge of the scheme during summers and winters. Uttaranchal Koops are being used successfully in 1019 rural water supply schemes and 58 urban water supply schemes in different districts of Uttaranchal.

COST OF THE PROJECT

Uttaranchal Koop	
Description of Work	**Amount in Rs.**
Excavation for foundation	
(i) In Soil mixed boulder 12.95 m^3 @ 54.05 m^3	**699.95**
ii) In medium rock 5.55 m3 @ 130.25/m^3	**722.89**
iii) Extra for lifting excavation earth below 1.5 mt. depth	**100**
Dewatering of water including cartage of pumps, oil lubricants, labour etc. complete or stream (gadhera) diversion work	**5000**
Fixing of shuttering including its cartage, rent and wastage.	**2500**
Supply and filling Filter media 18.5 cum @ 350/cum	**6475**
Cartage of filter media (Coarse sand)	**12210**
Cost of Uttaranchal Koop as per type design (250 mm dia)	**3360**
Carting and fixing of Uttaranchal Koop	**2000**
TOTAL	**33067.84**

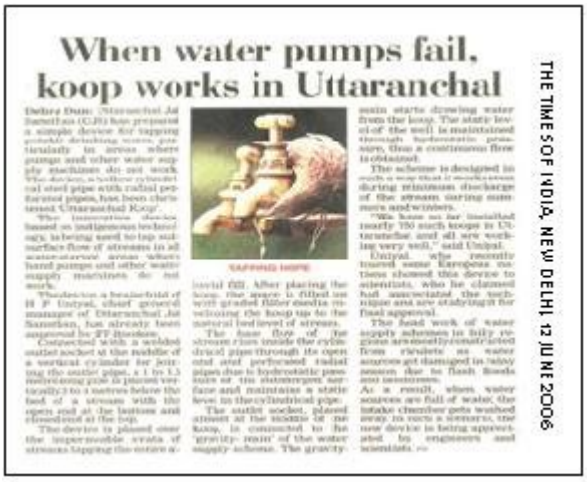
IMPACTS OF THE PROJECT

- Lower chances of water contamination, damage to the structure during monsoon period, and risk of tampering by miscreants
- Turbidity, suspended particles and coliform are removed to a great extent by the natural stream bed filtration process

  The total coliform and faecal coliform levels in the water drawn from Gadhera (total coliform is 315mpn/100ml, faecal coliform is 180 mpn/100ml) are on higher

side when compared to the water from Uttaranchal Koop (total coliform is 41mpn/100ml, faecal coliform is 25mpn/100ml).

- Installation cost of koop is around 15% of Boulder Filled Gallery and maintenance cost is 1% of that of the BFG.



When water pumps fail, koop works in Uttaranchal

THE TIMES OF INDIA, NEW DELHI, 12 JUNE 2006

'Koops' for water crisis

750 devices installed to tap water in dry places

HINDUSTAN TIMES, NEW DELHI, 19 JUNE, 2006

BENEFIT COST ANALYSIS

The estimated cost for the construction of BFG (approx. 4m wide) and roughening filter is around Rs. 1,75,395 per unit whereas

the total cost of fixing the Uttaranchal Koop below the river bed (2m to 3m depth) including all the excavations charges, supply and filling of filter media etc is only **Rs. 29,707.**

The capital cost of fixing Uttaranchal Koop is only around 15% the cost of BFG and the maintenance cost is around 1% compared to the cost of BFG. There is a cost saving of Rs. 1.34 lakhs by using Uttaranchal Koop in place of BFG and roughening filter.

SUSTAINABILITY

The Uttaranchal Koops are simple in installation and operation, almost maintenance free, economical and sustainable. They are easily replicable in hilly areaS

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