

Sedimentation:- A critical problem of major irrigation projects:- A case study of Hatnur Dam in Jalgaon district, Maharashtra.

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Introduction of Tapi Valley

The Tapi river origin near Multai in Betul district of Madhya Pradesh state in the Satpuda ranges (R.L. 2500ft) of hills and flows west through the Madhya Pradesh, Maharashtra and Gujarat states meets the Arabian sea near Surat. Total length is 702km. In Madhya Pradesh catchments area in general is covered by dense forest.

The river enters Maharashtra, 51km up stream of Bhusawal in the Jalgaon district. The Hatnur dam constructed on Tapi river near Hatnur village

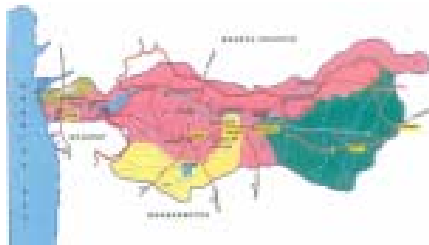


(Weir site). The major tributary Purna has her confluence with Tapi, just 8km away from weir site (near Changdev village). The Purna is the major left bank tributary of the Tapi river and higher than Tapi itself. The Purna also rises in Satpuda on southern slopes of the Gawailgarh hill near Bhainsdehi village of Bhainsdehi Tal of Betul district.

Objectives

1. To study the stage, capacity of Hatnur reservoir and finding the capacity lost due to sedimentation.
2. Calculate the actual siltation percentage from beginning to update (Hatnur dam).
3. Calculate the live storage capacity.

About the study Area



Salient features of Hatnur reservoir

- A. Name of the project : upper Tapi project
- B. Name of Dam: Hatnur
- C. River basin: Tapi

D. Location of dam: Near Hatnur village,
Tal: Bhusawal,
Dist: Jalgaon.
Maharashtra

E. Latitude: 21°04'N

F. Longitude : 75°05'E.

G. Date of start of construction : 1971

H. Date of Completion : 1982

I. Catchments area : 29430 Sq.Km.

J. Storage:

i. Gross : 388.00 M.cum

ii. Dead : 133.00 M.cum

iii. Live : 255.00 M.cum

K. Submergence : 4816 Ha

L. Elevation of Dam

i. M.D.D.L : 207.70 Mtrs

ii. F.R.L : 214.00 Mtrs

iii. M.W.L: 215.00 Mtrs

M. Scope of scheme: An irrigation projects with weir cum storage on river Tapi near Hatnur and Tapi right bank canal 95km in length to irrigate the 37,838 Ha. In the present stage.

Database and Methodology

- The data is collected from secondary sources. The main source is Meri Survey. In this Survey DGPS based hydrographic Survey uses advanced technique for positioning. Two or more satellite based GPS receivers are used in differential mode for positioning and Echo sounder is used for depth measurement.

From Table No. 1

- 1) Dead Storage Zone (R.L. 200 meter to 207.70 meter)

Sediment deposit in dead storage zone.

$$\begin{aligned} \text{Sediment deposit} &= [\text{water Quantity in M.cum, 1982}] - [\text{water Quantity in M.cum, 2007}] \\ &= 133.05 - 24.67 \\ &= 108.33 \text{ M.cum} \end{aligned}$$

\ Loss in 25 Year is 108.33 M.cum

\ Loss in 25 Year in % = 81.45

- 2) Live storage zone

original capacity (Between R.L. 207.7 to 212.5)

= water Quantity in M.cum, 1982 -

Water Quantity in M.cum, 2007

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Elevation meters	Year 1982 Area in M.sq.m	Year 2007 Quantity M.cum	Area in M.sq.m	Quantity M.cum	Remark
214.00	65.03	388.00			F.R.L
213.00	53.00	331.00			
212.00	47.20	307.75	25.81	133.05	Inter Polate
212.00	47.20	281.00	25.81	116.52	
211.00	41.00	235.00	23.01	85.75	
210.00	34.80	196.00	17.98	60.81	
209.00	30.00	167.00	13.96	42.17	
208.00	25.00	141.00	10.67	28.13	
207.00	20.80	133.05	9.74	24.67	M.D.D.L.
206.00	17.20	93.50	7.53	17.95	
205.00	14.40	77.00	5.01	11.16	
204.00	12.00	60.00	3.45	6.69	
203.00	10.00	45.00	2.44	3.67	
202.00	8.40	34.00	1.6	1.59	
201.00	6.80	25.00	0.65	0.43	
200.00	5.60	19.00	0.1	0.073	

$$=307.75 - 133.05$$

$$=174.70 \text{ M.cum.}$$

• Loss in 25 year of live water storage Capacity
 = 174.75 – 108.38
 = 66.37 Mcum

Loss in 25 year in % (percentage)= 37.97%
 As compared to original capacity this zone

3) Gross Storage Zone:
 (Between R.L. 200.00 Meter to 212.50 Meter)

Sediment deposit= Water quantity- water quantity in
 M.cum, 1982 in M.cum, 2007

$$=307.75-133.05$$

$$=174.70 \text{ M.cum.}$$

Loss in 25 year in % (percentage(2007-1982))
 =174.7
 =56.76%

Annual Loss in M.cum=174.7/25

$$= 6.9$$

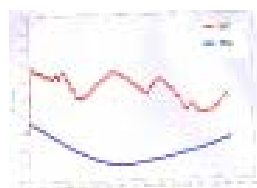
M.cum
 Rate of silation in Ha.M.(100 Sq.Km/year)

$$=(174.7*100*100)/(29430*25)$$

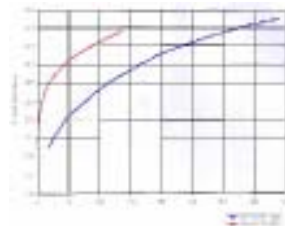
$$=2.374$$

$$=2.3$$

L-Section from Dam to Confluence



Elevation capacity curve of Hatnur reservoir



Conclusions

•The observed rate of sedimentation for Hatnur reservoir is found to be 2.3% Ha.M/100sq.km/year and it five times the rate adopted in the design which is 0.45 Ha.m/100Sq.Km/year. Total Silt accumulated up to 212.5m (174.70Mcm) which is 56.76% of original capacity. The essential implementation will effective operation of the reservoir to minimize silt deposition. For ex. Implementation in catchments area treatment for reduction of silt load may include forestations & constructions of check dams on the Tributaries & up stream of the river.

References

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