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Fixed Skimmer Wall Offshore Structure Built for a Thermal Power Station

Paroi séparatrice noyée pour eau réfrigérante d'une centrale

Unterwasser-Abscheidewand für Kraftwerkskühlwasser

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SUMMARY
This paper deals with the study of an offshore structure built in the lake near Satpura Thermal Power Station in Madhya Pradesh to provide cold water for the power station from the lake. The above system is based on the principle of availability of cold water at lower depths in a lake and the lake's capacity to cool the hot water delivered from the power station due to the wind effect on the large surface area of the lake.

RÉSUMÉ
L'article présente l'étude d'une structure noyée dans le lac situé à proximité de la centrale thermique de Satpura (Madhya Pradesh), et destinée à l'alimentation en eau de réfrigération. Le principe d'une paroi à effet séparateur repose sur l'existence d'eau froide à grande profondeur dans un lac disposant d'une capacité suffisante, en vue de pouvoir refroidir l'eau chaude provenant d'une centrale électrique par échange thermique sous l'effet des vents soufflant sur une surface de lac suffisamment grande.

ZUSAMMENFASSUNG
Für die Zuleitung von Kühlwasser für das thermische Satpura-Kraftwerk (Madhya Pradesh) wurde die Lösung einer Unterwasserkonstruktion im nahegelegenen See untersucht. Die Idee einer Abscheidewand beruht auf dem Vorhandensein kalten Wassers in grösserer Seetiefe und der ausreichenden Kapazität des Sees, das eingeleitete aufgeheitze Abwasser des Kraftwerks über Wärmeaustausch mit dem über die Grosse Seefläche streichenden Wind abzukühlen.

2.00 DETAILS OF THE STRUCTURE

2.10 The structure consists of a 480.00 meter long skimmer wall, suitably designed to draw cold water from a depth of about 6 meters below the surface of the lake.

It has two rows of 49 Nos. one meter diameter piles with steel casings driven to a depth of 27.00 meters maximum and 1.00 meter depth in rock. The piles are spaced at 10 meter centres in both directions. These rows are inter-connected by suitably designed RCC bracings provided at the top of piles stiffening them in both directions.

2.20 Precast RCC planks spanning net 9.00 meter distance between the piles are erected to cover a depth of 10.274 meters from the surface of lake.

2.30 This saucer shaped structure constructed in the lake, successfully provides the required quantity of cold water to the thermal power station from the down stream end.

The hot water coming out of the thermal power station is returned to the upstream side of lake by a return canal.

3.00 LAYOUT AND CONTROLS

3.10 Survey controls

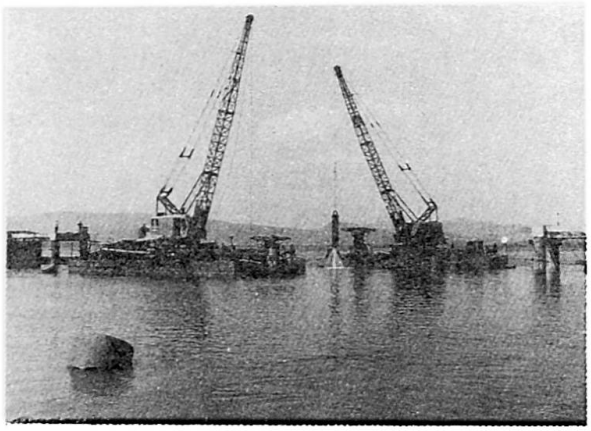
The entire structure was to be constructed in the lake and hence layout and control point establishment was important and difficult task.

3.11 As a first step two end points bench marks were established on either bank of the lake. Now the centre line of the structure was established by keeping the theodolite on the north bank and south bank base points and rotating the same by suitable angles. These new lines established the centre line of both end walls of skimmer wall. 70 meter point from North end pile and 60 meter point from South end pile established the centre line for main portion. All control points were now set to commence the work.

4.00 PROCEDURE OF CONSTRUCTION

4.10 The north side arm of the structure has 2 x 8 No. one meter diameter piles, the central section 2 x 34 Nos.piles and the southern arm had 2 x 7 Nos. of 1 meter diameter piles.

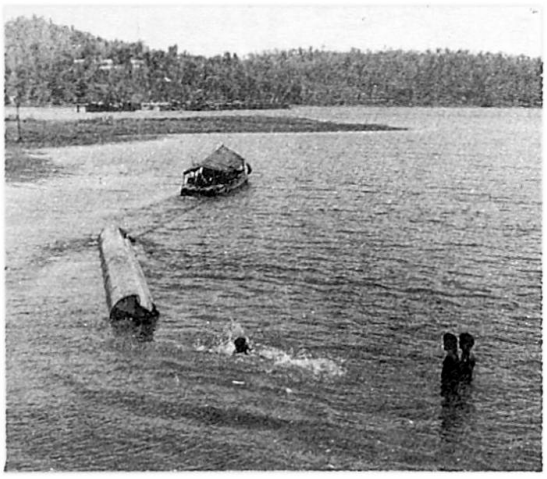
4.20



The Hochstrasser wisse piling rigs were mounted on a specially designed 200 MT buoyancy platforms. Each rig had one No. RB 38 or TATA P&H 955 ALC crane, bailers, chiesels, compressor, welding sets, generators, bailer stool and was totally self-sufficent. Suitable anchoring arrangements were made to maintain the rigs in any given location in the lake.

Photo.2 Hochstrasser piling rigs in operation

4.30



A novel system was adopted to drive the u/s row of piles. Firstly a 1000mm diameter 12mm thick casing of approximately 10 meter length was manufactured on the bank. The ends of this casing were sealed with temperory seals and this was floated and towed to the required location near the piling rig. The casing was lifted, seal covers removed, cutting edge welded at the lower end. The upper end was connected to Hochstrasser pneumatic hammer head. The pile was now driven to final depth upto 27 meters maximum and one meter into rock.

Photo.3 1000mm diameter casing being towed to site

4.31 A 1200mm diameter 12mm thick casing was now driven outside above pile, to a depth of about 8 to 10 meters to penetrate about 2 meters into clay layer. The 1000mm diameter casing and annualar space between the same and 1200 diameter casing was now dewatered upto about 11 meters below water level. Excess 1000mm diameter casing upto 10.274 meters below water level was cut off.

4.32 A new 1000mm diameter casing, with 300 x 150 mm channels welded on either side, was lowered and placed exactly over above casing to locate above channels perfectly in longitudinal direction to enable fixing of RC planks. The lower end of this casing was now welded to the upper end of driven casing. The temporary 1200 diameter casing was now withdrawn.

4.33 The 1000 mm diameter pile was now dewatered and 10 Nos. 28 diameter anchors were fixed and grouted. Wherever it was not possible to dewater the pile casing for anchoring work, a M250 grade concrete bottom plug of suitable thickness (upto 2 meter thick) was laid. After allowing it to set for 21 days, the casing was dewatered and anchoring work carried out. The piles were now concreted.

5.00 The down stream piles were driven as in para 4.30.

6.00 The R.C. planks 9.20 m x 0.5 m x 0.2 m were precast in casting yard on the bank. These were floated and carried to the location with the help of two simple floats made out of 1000 mm diameter casings sealed at both ends.

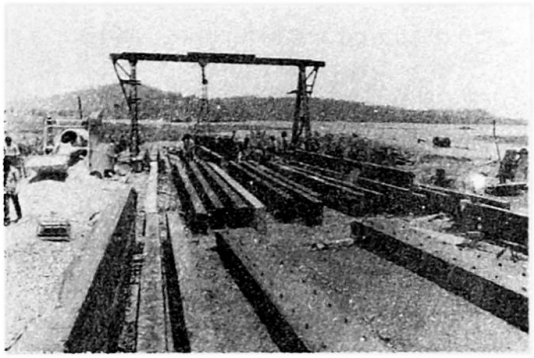


Photo.4 Casting yard for RC planks

6.10 These planks were lifted by a launching camel and placed between the grooved piles. All R.C. planks throughout the length of the skimmer wall were fixed as above.

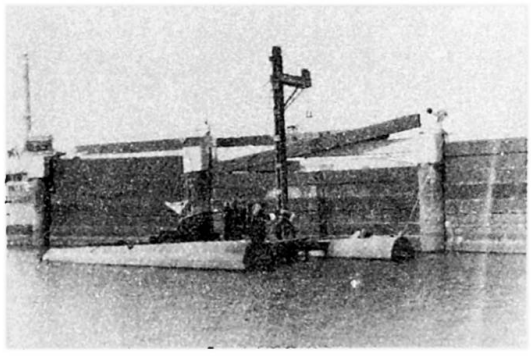


Photo.5 Launching camel placing RC planks

6.20 The longitudinal bracings for down stream piles and transverse bracing were cast in situ with suspended shutter forms.

Similarly, the top bracings above the R.C. planks were cast in situ after the R.C. planks were fixed in position

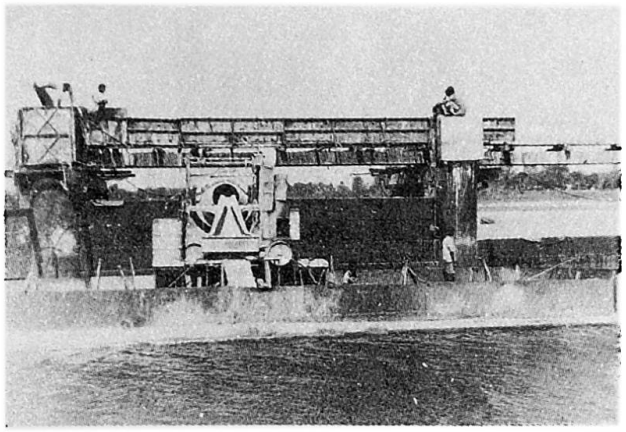


Photo 6 Concreting of cast in situ longitudingal bracings.

6.21 The ends of wall towards the edge of the lake have been closed with crated boulder fill at shallow depth. The entire structure was completed in 36 months.

7.00 CONCLUSION

Cooling efficiency of this structure compares favourably with induced or natural draught cooling towers. Operational cost of the system is almost ''nil".

8.00 ACKNOWLEDGEMENT

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