

At the time of commissioning of the 2nd 500 MW unit of Korba Super Thermal Power Station, serious problem of water ingress came up at the Ash Slurry Pump House.

Due to some constructional factor, the sump Pit of the Ash Slurry Pump House was heavily leaking. All general methods were attempted by **NTPC** authorities and the contractors to stop the leakage but none of the methods worked at all.

**CICO** took up the challenge and the problem was understood by our team. The site was inspected and our proposed technical solution to arrest the leakage was submitted to **NTPC** authorities and the same was accepted.

**CICO** executed the repair job successfully, without reconstruction of the structure resulting in enormous savings in time and cost over-runs. The **NTPC** authorities confidently commissioned the 2nd 500 MW Unit.

### **The problem**

The Korba Super Thermal Power Project of **NTPC** is situated on the banks of the Hasdeo river and the site is surrounded by several canals leading to high subsoil water level.

The Ashy Slurry Pump House facility is 13.5 metres below the ground level. The pit size is 20m x 12m - with a Sump pit of 3.2m x 2.2m x 1.9m.

**CICO** was briefed that during the excavation work, flowing water in the sub-soil was observed. The raft of the entire structure was constructed in parts by diverting the flow of water to overcome the problem of flowing water had washed out all the fines and cement, causing heavy leakage through the sump pit wall.

### **CICO's Observation**

After stripping off the shuttering, large voids/cavity in the northern wall of the sump pit was observed. The water was gushing out through this cavity with high pressure. The volume of leakage was observed about 550/600 litres per minute. Several pumps with an accumulated capacity of 120/150 HP were installed. The water which was being pumped out, by these pumps was sufficient to maintain a constant water level in the sump.

### **CICO's Recommendation**

Having inspected the site **CICO's** recommendation to **NTPC** authorities was to do curtain grouting on two sides (Northland East) of the sump with **CICO POLYGROUT** to form an impervious barrier to stop the water ingress.

Chemical curtain grouting with **CICO POLYGROUT** was to be done after reducing the volume of leakage by 'Cement Grouting' admixed with an 'accelerator' and plugging the entire leakage area by channelising the entire flow of water through fixing suitable nozzles.

The scope of "Cement Grouting" was given to a separate Agency. However, the accelerator used for grouting was supplied by **CICO**.

### **CICO Assigned the Chemical Curtain Grouting**

**NTPC** authorities being thoroughly convinced about **CICO's** recommendation to solve the problem of

water ingress, awarded the chemical curtain Grouting work using **CICO POLYGROUT** to **CICO** .

### **How CICO Went About**

Cement grouting operation conducted by another agency could not achieve the desired results. According to them due to streaming action, the cement grout was being washed out. The efforts to get high capacity pumps to dewater the sump pit was not successful. Addition of more small, capacity pumps was not a practical proposition in view of the size limitation of the sump pit and the problem of erection of Suction Pipes.

### **CICO Has to Face a Severe Handicap and Proceed**

It was not possible to reduce the flow of water or to empty the sump by dewatering for plugging the leakage and to channelise the flow of water through pipes to take up chemical grouting.

### **CICO's Proposed Action to Overcome the Constraint**

CICO discussed this constraint with **NTPC** engineers and proposed to start chemical curtain grouting by plugging the leakage points by means of stacking sand bags into the sump to a thickness of 600mm on both northern and eastern ends. **CICO** proposed to channelise the flow of water through PVC pipes fixed, while placing the sand bags and strutting steel plate barrier to retain the sand bags.

### **NTPC Engineers Accept CICO's Proposal**

The above make-shift arrangement was accepted by **NTPC** engineers. This preparatory work was completed and **CICO POLYGROUT** injection operation commenced. A total quantity of 285 litres of **CICO POLYGROUT** was injected. The pressure of the flowing water was so high that **CICO POLYGROUT** could not gel as even few seconds time required for gelling was not possible due to the high discharge of water.

Alternative Steps Taken Subsequently, another steel plate was fixed on the eastern wall of the sump pit 1.10 metre apart from the northern concrete wall. The gaps in between were kept in the sand bags to act as a passage for the leakage water to flow out., thereby making room for injection of **CICO POLYGROUT** on the raft after making through and through holes on its surface well apart from the edge of the sump pit. Seven such holes were drilled on the raft and nozzles fixed. 615 litres of **CICO POLYGROUT** was injected through these holes. The volume of the leakage was reduced to 40% . Since the plugging of the leakage point was not exactly on the source of the leakage point some quantity of **CICO POLYGROUT** came out. But **CICO** had succeeded in reducing the leakage.

### **CICO's R&D Team Gets Involved for the Solution**

The entire situation was reviewed by us and we came to the conclusion that a large quantity of **CICO POLYGROUT** would be required to stop the leakage of such a magnitude, so as to make the curtain grouting totally effective. However, this was going to be tremendously costly. Therefore we evaluated thoroughly the usage of different grout materials and approached our R&D Wing to suggest a right and economical grout to stop the leakages at the sump pit had to have the properties of being liquid, and flowable to be injected in, but also solidify on coming in contact with water and form a high density material to withstand streaming action and to avoid getting washed out.

## **CICO R&D Wing Evolves the Solution**

**CICO's** independent Research and Development wing studied the problem and gave a solution for use of an appropriate Grout material to be injected to fill up the huge void, and confine already injected **POLYGROUT** to form a barrier in water leakage path, alongwith the other quantities as outlined, and yet be economical.

**"CICO HOT MELT"** - Was the Answer **CICO's** R&D wing recommended the use of our of our own compound had to be made hot and melted. This molten grout material was to be grouted through the nozzles by pump.

**CICO** Hot Melt grout is Asphalt based and processed to perform the designed purpose.

## **SIMULATED Tests**

**CICO's** R&D Wing conducted several trials with **CICO HOT MELT** in simulated mini models of the site, before to do final grouting operation with **CICO HOT MELT**.

## **And Finally**

We carried out **CICO HOT MELT** operation at site, by making through and through holes in the raft, well apart from the edge of the sump pit Enabling '**CICO HOT MELT**' Grout to fill up the void of the water path and also press the **POLYGROUT** injected earlier, towards the leakage points. 18 through and through holes were made in the raft. Nozzles were fixed up. We started '**CICO HOT MELT**' Grouting operation within 8 weeks of assignment of this very complicated work to **CICO** by **NTPC**. On the first day itself 1120 kg of **CICO HOT MELT** was grouted.

With **CICO HOT MELT** grouting, 20% of the water leakage was stopped. We continued **CICO HOT MELT** grouting operation untill water leakage was reduced by 90 to 98% of the initial volume of leaking water, 6560 kg of **CICO HOT MELT** grout was injected through the nozzles.

From 550/600 litres per minute, the volume of leakage was reduced to 20/25 litres per minute. And this reduced volume of leaking water, also comprised of the leaking water coming from pumps running at the Ash Slurry Pump House. The **NTPC** executives inspected the satisfactory progress achieved by **CICO** at site.

**CICO** did not stop there itself. A thorough and minute checking of the sump pit was done **CICO POLYGROUT** injection operation. 71 litres of **CICO POLYGROUT** was injected through these 4 nozzles and that stopped even minor leakages also.

## **NTPC - A Thorough Satisfied Client Now**

**CICO** has earned the confidence of the **NTPC** authorities by executing the project work to their total satisfaction.