

CONCRETE VOLUTE PUMPS – AN INNOVATIVE SOLUTION FOR LARGE CAPACITY SEA WATER PUMPING.

Coal fired thermal power plants generally require huge quantity of cooling water for the operation of plants. Sea water is normally used for the cooling for coastal plants. In one of the executed power plant cooling water requirement was in the order of 630,000 m³/hour for the total capacity of plant. In order to handle such huge quantity of water, Concrete Volute Pumps with 17.5m³/s flow rate were adopted to address issue of corrosion of the casing. TCE carried out the complete analysis, design, detailing including construction supervision of such concrete volute pumps.

Coal fired thermal power plants generally require huge quantity of cooling water for the operation of plants. Water requirement increases with number of units and unit capacity. For coastal power plants seawater is a normal source of such cooling water. In one of the executed power plant cooling water requirement was in the order of 630,000 m³/hour for the total capacity of plant. Sea water intakes with pumping arrangement generally convey the cooling water into the plant. Ten pumps of 63,000 m³/hour capacity each were used to pump such huge quantity of water with no stand by pumps. Considering the large flow rates required to be pumped, no stand by pumps and corrosive characteristics of sea water deteriorates the pump casing very fast calling for significant repair costs TCE proposed concrete volute casing pumps. Glass flake polyester vinyl acrylic polymer coating was used over the concrete surface to further protect the surface for damage due to the cavitations if any.

Concrete volute shape is developed in collaboration with the pump supplier considering the hydraulic design to handle the required flow rate and head (See Figure 1 & 2). TCE carried out the FEM analysis using 3-dimensional solid elements (Figure-3) using state of the art software ANSYS. Various load conditions were idealised and suitably incorporated in the model to truly represent the various scenarios. Adequacy of the concrete thicknesses at various critical locations was checked and reinforcement finalised using the analysis results.

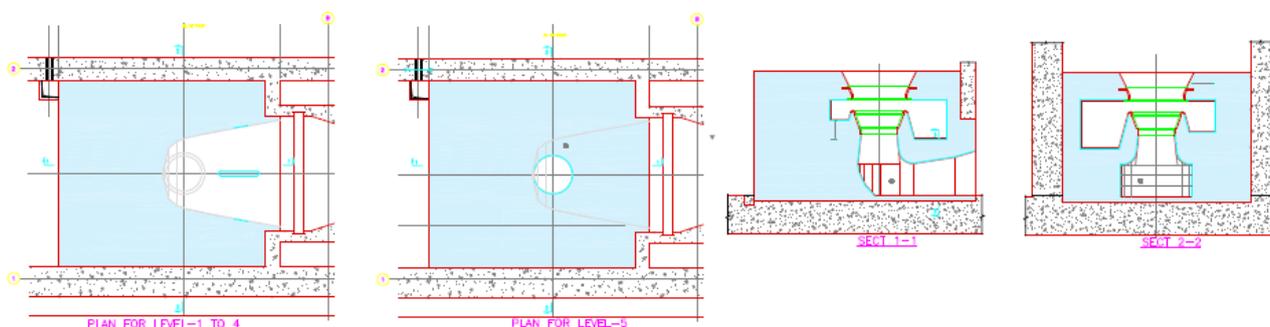


Figure-1 Concrete Volute details



Figure-2 Sectional View through pump

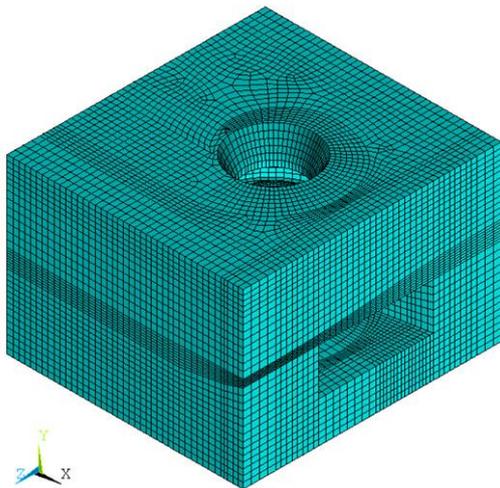


Figure-3 FEM Model of Concrete Volute

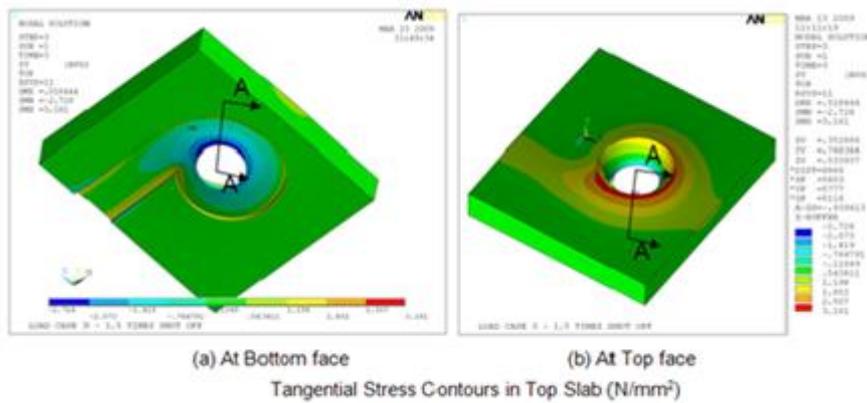


Figure-3 FEM Analysis Results

Construction of Volutes and draft tubes to the designed dimensions is very important and accuracy was very critical. Special formwork design was involved to achieve the profile. Strict quality supervision was followed during formwork position checking, reinforcement alignment and pouring of concrete. This is one more case for TCE for first of its kind design of concrete volute pumps.