

Stage 2 should be isolated by an appropriate material/construction assuring the isolation until installation of penstocks proposed for Stage 2.

#### **3.3.4.12 Activated Sludge Tanks**

The aeration tanks shall be designed, constructed and equipped regarding the requirements set in Table 2-1.

In the aeration tanks, biological decomposition of organic matter takes place by means of microorganisms (activated sludge) suspended in the wastewater. The biological processes for decomposition of the organic matter require the supply of considerable quantities of oxygen and mixing. In order to obtain the maximum operational stability and to keep power consumption low, the mixing and the aeration shall be separated. The biological processes continuously create new microorganisms (activated sludge). An equivalent amount of sludge shall be removed from the process tank as biological surplus sludge.

The activated sludge tanks shall be designed to allow efficient removal of COD and nitrogen by biological process. Biological treatment units shall be designed on the modular bases and shall be reinforced concrete tanks.

The Contractor shall clearly define the type of denitrification process in his tender he proposes and provide with all the necessary equipment and arrangements in terms of layout, PID, process control devices.

Since BOD5/Total N ratio is low, addition of external carbon source to supply energy for the nitrifying organisms seems necessary. The external carbon source shall be methanol. The Contractor shall design, supply and install all necessary methanol storage and dosing facilities including the safety systems.

The sludge loss through effluent should not be taken account for the calculation of the excess sludge amount.

The aeration system shall be based on floor-mounted fine bubble aeration diffusers. The diffuser system shall be divided into separate grid sets in order to allow servicing of separate units. Each grid set shall have maximum 5% of the total diffuser number of each aeration tank. The anoxic zones, which are required for denitrification, shall be created by the manipulation of aeration within the reactor by dissolved oxygen set point and additional ORP control and NO<sub>3</sub> analyzers by the SCADA system.

An adequate amount of the compensators and sliding supports and/or brackets shall be supplied to meet the enlargement of the aeration pipes.

Each of the aeration tanks shall be equipped with submerged energy efficient mixers in order to ensure the efficient mixing of sludge and water and to avoid settling of sludge in the tanks. Each mixer shall have has a separate lifting equipment compliant with Section 7.8.1 for the hoisting of the mixers. The proposed mixers by the Contractor shall be in accordance with the specifications given in Section 7.8.30. The mixers shall be designed for minimum horizontal velocity of the water of 0.3 m/s. Computational Fluid Dynamic (CFD) analyses for the mixers shall be submitted during the design stage and the mixers will be subject to the approval of the Engineer.