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The study of drainage and water pumping of spillway and hydropower plant foundation in Sangtuda 2 project, Tajikistan

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Abstract

Seepage of dam foundation area and reservoirs are considerable problems that most of these structures are involved with. Escape of water from reservoirs, the possibility to create high pressure (uplift pressure), underground water level control, increasing the volume of water pumping from project area and consequently increasing administrative costs and reducing efficiency are the most important problems. Sangtuda 2 Dam and Power plant Project is one of the ninth serial dams that are constructed over the Vakhsh River, one of the Amudarya branches. This dam is under construction, due to its location on the lime stone layers and due to the high karstification and Tectonics situation at run time encountered with lots of water leakage and overflow in spillway and power plant area. Water outflow increased up to 8 cubic meters per second at the time being. The water rate increase administrative costs (due to high costs of pumping water from the pit, sharp reduction in work efficiency an...). This article reviews the status of geology, hydrological, Tectonic and geotectonic in project area. Maximum water volume estimation in the possible ranges is established numerically by software to achieve perfect solutions. Solving methods and reviews the results indicates the need to pump about 10 cubic meters per second from the plant bed (level 450).

Keywords: Sangtuda2, Tajikistan, pumping, Karistification, leakage.

1. INTRODUCTION

Sangtuda 2 Dam and Hydroelectric Power plant project is located in 180 kilometers southwest of the Dushanbe, the capital city of Republic of Tajikistan on the Vakhsh River. Vakhsh River is one of the largest rivers in Tajikistan, with 20,500 million cubic meters annually discharge and electricity potential production about 8950 MW. Sangtuda2 dam is one of the ninth Serial hydro electrical dams that power station's producing share of this dam is equivalent to 220 MW [1].

2. SPECIFICATION AND ACCESS TO THE DAM BODY:

Sangtuda2 dam is earth fill type and has a height of 31.5 meters from the riverbed. The plant consists of two Kaplan turbines units with 220 MW power, layout is in the left side. Dam axis and power plant is a 2°Azimuth. Sangtuda 2 project site was selected in the coordinate 37/970° latitude north within 69/027° south longitudinal in the southwest part of Tajikistan, Dangarynsky region, Khtlan area over Vakhsh river one of the Amudarya branches near KhazanGozar village [1].

3. BACKGROUND STUDIES:

Previous Geology and geophysical Engineering studies in the site, including drilling exploratory boreholes are done as 17 vertical and canted boreholes for about 924 meters along the axis of dam and power plant structure axis about August 2006 to late July 2007.
Joint study range about dam and abutment structures respect to the structures axis conditions and location, joint geometrical characteristics and mechanical survey, tectonic data statistical analysis, Well tests about 924 meters, permeability tests (Lugeon and Lufrance tests) and the density tests (CPT, SPT) are done. In this article beside field tectonic surveys, site geology and hydrological studies during excavation phase to get better results is performed. Regional geological studies is performed by Mahab Qods Consulting Engineers co as well (2007), Sangtuda2 dam and power plant is in Tectonics subsidence region in Tajikistan. This