HYDRAULIC STUDIES OF SEDIMENTATION AND ARTIFICIAL ACCELERATION SEDIMENT TRANSPORT IN A LARGE-SCALE RESERVOIR FOR POWER GENERATION

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The Sakuma dam is a large concrete gravity dam, length, height, and volume of which are s 293.5m, 155.5m and 1.12Mm^3 respectively, is located about 70km up from t he river mouth of the Tenryuu facing the Pacific Ocean, which has a trunk length of 213km and drains a catchment area of 5,090km^2 in the Mid-Japan. The water stored in its reservoir is used at the Sakuma Power Station to generate electric power more than any other hydropower plants in Japan. The Tenryu river basin is characterized by steep topography and the fragile geology along the Median Tectonic Line, where heavy rainfalls produce and flood flows transport extremely large quantities of sediment and frequent flood flows transporting them. Therefore, the Sakuma dam reservoir has the largest sedimentation volume in Japan, which has reduced its initial total storage capacity of 327 Mm^3 in 1957 to 213 Mm^3 in 2002. In order to mitigate flood damage in the upstream area caused by riverbed aggravation due to the sedimentation, countermeasures to degrade the riverbed has been attempted, such as dredging removal and conveying to the dead capacity areas and flushing by river water with lowering the storage level, the latter of which is called "artificial acceleration of sediment transport". However, riverbed has not been lowered sufficiently, hence improvement of efficiency of the present measures as well as more effectual measures are pursued. Searches for them require clarification of the sedimentation process and actual states of current countermeasures, and their effects are discussed by using existing data here.

The volumetric changes, sediment process and particle size distribution are mentioned in detail in REFERENCE.

In the Sakuma reservoir, dredging, transporting and artificial acceleration of sediment transport are carried out as countermeasures against sedimentation. The effect of artificial acceleration of sediment transport is examined by accumulation curves from the dam site of sedimentation volumes of individual particle size classes calculated by existing surveying data and particle size distributions of sediment in the reservoir.

The artificial acceleration of sediment transport is very effective to erode sediment in the middle part of the Sakuma reservoir. The dam water level and discharge inflow during artificial acceleration of sediment transport are seemed important factors to conduct

volume of erosion and deposition. But acceleration of sediment transport carried out now and the control rule of the Sakuma reservoir during flood can not lower the upstream riverbed in the Sakuma reservoir. More effective countermeasures to lower the upstream riverbed in the Sakuma reservoir is required.

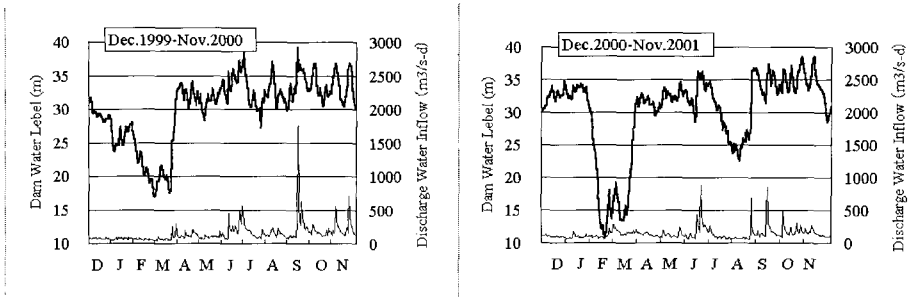

Fig. 1 Change of the Sakuma dam water level and discharge water inflow into the Sakuma Reservoir during Dec.1999-Nov.2000 and Dec.2000-Nov

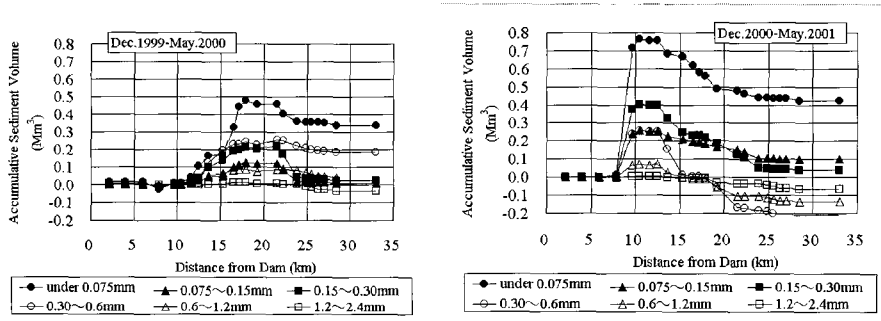

Fig. 2 Longitudinal accumulation curve of sedimentation volume of individual classes, expressing there transported volume during Dec.1999-May.2000 and Dec.2000-May

REFERENCES

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