THE TOKUYAMA DAM

Features of the Tokuyama Dam

Name of dam	Tokuyama Dam
Name of river	Ibi River, Kiso river system
Purpose of dam	Flood control, Maintenance flow for normal function of river, Water supply and Hydropower generation
Type of dam	Rockfill dam with clay core（ECRD）
Height of dam	161 m
Length of dam crest	427.1 m
Volume of dam	13,700,000 m^3 *
Catchment area	254.5 km^2
Reservoir area	13 km^2
Total storage volume	660,000,000 m^3 *
Year of completion	2008
Owner of dam	Japan Water Agency

*Largest in Japan

Water supports wealthy society

Incorporated Administrative Agency
Japan Water Agency

Outline of the Tokuyama Dam Project

The Tokuyama Dam, the largest multi-purpose rockfill dam in Japan, was constructed on upstream of the Ibi River, which is part of the Kiso River system. It was constructed by the Japan Water Agency (JWA) for the purposes of flood control, maintaining normal function of river water, new water supply and power generation. The dam has a height of 161 m, and a reservoir area of 13 km^2 with total reservoir capacity of about 660 million m^3 and embankment volume of about 13.7 million m^3.

Various active approaches such as **"Compiling existing technologies and installing new technologies for the rockfill dam"**, **"Coexisting with nature"** and **"Securing accountability"** were undertaken during the construction. In addition, such efforts as shortening the term of construction and reducing the construction cost were also made. As a result of these efforts, the project successfully completed in 2008.

Japan Water Agency received the "Outstanding Civil Engineering Achievement Award" by Japan Society of Civil Engineers in 2009 for constructing the Tokuyama Dam.

Under construction at peak

Placing core material was speeded up by increasing layor thickness up to 30 cm, which was enabled by installation of 12 m^3 of wheel loader and 46 ton dump truck. Rock material was also placed rapidly and massively with 90 ton ripper bulldozers, 12 m^3 backhoes, 10.3 m^3 tractor shovels and 90 ton dump trucks.

Just before first filling

Excavation in the surrounding of reservoir was minimized by such means as utilizing sedimentation in the existing reservoir for filter material and concrete aggregate, and changing road plan from open works to tunnel, and so on. More than 24 ha of forests was conserved from excavation.

After completed first filling

As a result of many efforts to mitigate environmental impacts, only few facilities such as bridges and slope of the quarry site can be seen around the reservoir.

The bridge crossing over the reservoir named "Tokunoyama Hattoku Bridge", has a long span of 503 m (three continued spans of PC extradozed box-girder bridge).

Innovative Progress in the Tokuyama Dam Project

1. Integration of technology in rockfill dam and state-of-the-art technology

⇒ see ref. 1) and 2)

(1) Rapid and Mass Construction of Placement

・Rapid placement with a lot of heavy machinery resulted in construction of 13.7 million m^3 of dam volume in 26 months. It set recorded 6.2 million m^3/year of placement, which enabled to shorten construction term and reduce project cost.

(2) Utilization of Reservoir Sediment in the Existing Dam

・Filter material and concrete aggregate for construction of the Tokuyama Dam were produced by effectively using the reservoir sediment gravel (about 840,000 m^3 in total) from the existing Yokoyama Dam which was suffering from serious sedimentation.

・This utilization allowed the Tokuyama Dam construction project to reduce the material procurement cost by eliminating rock crushing facility and avoiding excavation of the quarry site (about 17 ha in total).

・This utilization allowed the Yokoyama Dam to recycle deposited gravel, reduce the cost of sediment disposal, and restore the designed reservoir capacity.

(3) Introduction of New Technology and Method

・New technologies, including CSG, water immersion weighing system for fine aggregate, automatic scanning RI densimeter, and GPS construction management system, were used to lead to the next-generation dam technology in construction management, quality control, and so on.

・Seismic design and testing, taking into consideration of Neodani fault, enhanced safety.

2. Environmentally Sound Dam by Coexisting with Nature

⇒ see ref. 3), 4) and 5)

(1) Conservation of Diversified Ecosystem by Conserving the Largest Watershed with Broadleaf Forest in Japan and Creating Beautiful Reservoir

・By purchasing the all forest in the catchment area (245 km^2), its watershed environment has been conserved from land use change.

・By arranging temporary facilities in the future reservoir and introducing tunnels to 70% of shifting roads along the river, the aquatic and terrestrial flora and fauna in the watershed was conserved.
・By controlling deforestation within the reservoir, effects were produced in water side conservation, bank landscape conservation, control of turbid water release.

(2) Coexistence with raptors

・A large scale investigation on home range of raptors across the reservoir was carried out for the first time in Japan. Existence of five mated pairs of golden eagles and seventeen mated pairs of mountain hawk eagles were confirmed. Subsequent observation with CCD cameras installed in nesting trees brought lots of findings, such as clarification of unidentified behavior of them.
・Taking the above ecological information into account, the construction schedule was revised and construction method was changed in order to alleviate noise and vibration.

(3) Restoration of Natural Environment (Respect for Native Species) and Environment Conservation Activity

・For conserving native flora and fauna, development of artificial marsh, restoration and transplant of precious vegetation, immigration of endangered animals and other many kinds of challenges were carried out.
・A subsequent monitoring clarified increased wildfowls, rooted plants, and maintained or increased density of fishes. In addition, environmental monitoring and public awareness activities were performed continuously.

3. Social Contribution and Proactive Disclosure

(1) Proactive Information Release

・Public consultations on interim project assessment or environmental conservation approach were held 66 times.
・Thorough project cost management led to significant shortening of construction term and 149 million USD of cost reduction.

(2) Dam Going forward with Local Communities

・Guidance on site for the general public including site tours and one day bus

tour by a private tour company was implemented (participated by about 27,000 persons/year). On the other hand, holding a marathon, in which improved roads for construction were utilized, contributed to revitalization and stimulation of local communities.

References

1) T. Sato et al.; Utilization of Reservoir sediment of the existing dam (Yokoyama Dam) for Tokuyama Dam construction materials; 4th EADC Symposium, 2007.
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3) Y. Takahashi et al.; Environmental conservation activities at Tokuyama Dam in Japan, ICOLD 72nd Annual Meeting, 2004.
4) S. Jikan et al.; Project to convert mountain forests to public ownership throughout the entire upper catchment area of Tokuyama Dam reservoir, 3rd EADC Symposium, 2006.
5) T. Suyama et al.; Environmental conservation at the Tokuyama Dam, 4th EADC Symposium, 2007.