A TATA Enterprise

Hydro Power Dams Barrages Tunnels

Engineering

a better tomorrow

TCE Consulting Engineers Limited

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TCE Consulting Engineers Limited (TCE), a wholly owned subsidiary of Tata Sons Limited, is a leading engineering consultant with over 3000 prestigious projects engineered to its credit covering diverse realms of the industry.With four decades of rich experience,TCE provides competent and comprehensive engineering consultancy solutions with global perspective. TCE's **ISO 9001** certified multi-disciplinary services have earned enormous goodwill from clients in India and overseas.

▲ Penstocks, Khopoli

■ 6 x 25 MW Hydro & 1 x 150 MW Pumped Storage Power Project, Bhira

▲ Power Houses, Khopoli

TCE Consulting Engineers Limited

Hydro Power Plants

TCE has rich experience in executing hydro power projects. Over the years, TCE has made significant contribution in this sector with expertise in planning, designing and implementation of various facets of hydro power projects involving • dams • tunnels • low / high pressure steel penstocks • power houses and • tailrace systems. TCE's expertise embraces • hydrology • geology • geo-technical engineering • electro-mechanical engineering • engineering of hydraulic structures • power evacuation.

TCE has renovated and upgraded hydro power stations and provided engineering services for hydraulic design, water hammer studies, penstock designs, flood analysis and spillway designs. TCE also undertakes finite element analysis of gravity dams and dam safety reviews.

TCE has engineered hydro power projects with an aggregate generating capacity of 870 MW. Of these, 700 MW are of major hydro power plants, 22 MW are of small / mini / micro hydro plants and 150 MW is of pumped storage scheme. TCE has also prepared feasibility reports for about 3000 MW of major hydro power plants and 630 MW of pumped storage schemes.

▲ 3 x 83 MW Derbendikhan Hydro Power Project, Iraq

Hydro Power Stations

TCE's technical competence in hydro power sector has been recognised internationally. TCE was consultant to Mitsubishi for pre-bid and post-bid detailed engineering and construction management for the 3 x 83 MW power station at Derbendikan in Iraq.

Besides hands on experience in engineering new hydro power projects, TCE also has considerable experience in renovation and uprating of existing hydro power stations. A typical example is the extension and renovation of the Shanan hydro power station in Himachal Pradesh from 4 x 12 MW units to 4 x 15 MW units besides the addition of a new 50 MW unit. This power station located at a high altitude with snowfall for 3 months in a year, posed many engineering challenges, which TCE overcame successfully.

▲ 6 x 25 MW Turbine Hall, Bhira

▲ 24 MW Spiral Casing, Bhivpuri

▲ 9 MW Spiral Casing, Chunchanakatte

▲ Tailrace Power House, Bhivpuri

▲ 2 x 6.75 MW Hydro Turbines, Tawa

▲ 2 x 9 MW Hydro Turbine, Chunchanakatte

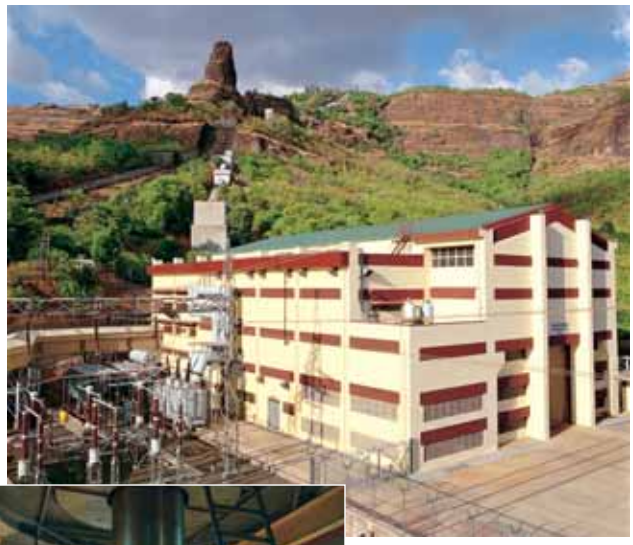
▲ Upstream Intake Dam, Tawa

■ 2 x 6.75 MW Hydro Power Station, Tawa

Pumped Storage Schemes

The shortfall in peak load in the Mumbai region power grid is met by The Tata Power Company Limited's 150 MW pumped storage scheme at Bhira. TCE was the detailed engineering and construction management consultant for this project.

Another pumped storage scheme in Maharashtra is the 2 x 125 MW one at Ghatghar. TCE was appointed as the review consultant for detailed engineering of this scheme by Government of Maharashtra, Irrigation Department in association with Electric Power Development Company International Limited, Japan - a leading international consultant with vast experience in the design of pumped storages and RCC dams.



▲ 150 MW Pumped Storage Hydro Power Project, Bhira

▲ Francis Turbine Shaft & Governing System

▲ 2 x 9 MW Hydro Power Station, Shivapur

▲ 2 x 1.4 MW Mini Hydro Power Station, Dhupdal

Mini / Micro Hydel Stations

Advantages of quick project commissioning and lower capital investment have led to a spurt in mini and micro hydro power stations. TCE has engineered mini / micro hydro power stations at Gokak, Dhupdal, Shahpur, Madhavamantri and several other places in India. Having assisted government agencies in developing countries like Laos and Seychelles in engineering of such projects, TCE is well placed to offer its competent and comprehensive range of services in this sector.

▲ 1.3 MW Mini-Hydro Power Station, Shahapur

▲ Power House & Tailrace divide structures, Selabam Hydro Power station, Laos

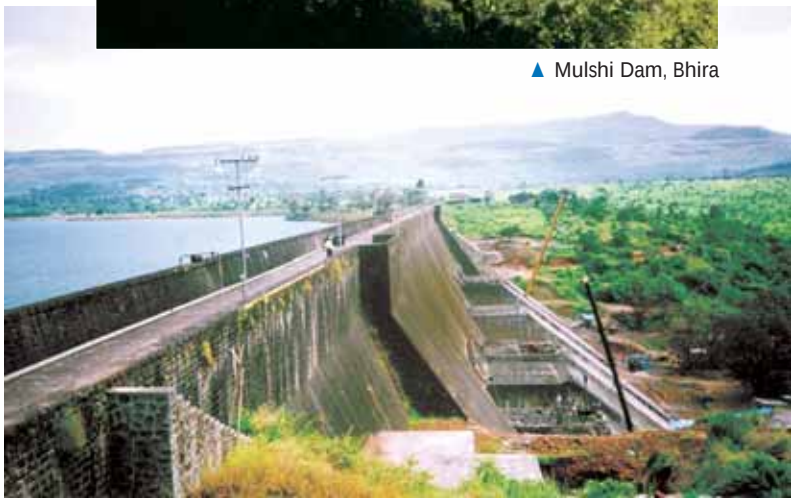
▲ 1 x 3 MW Power House, Selabam, Laos

Dams

As a part of hydro power projects, TCE has carried out design of new dams and also strengthening and rehabilitation of old dams. Further, new dams forming a part of water resources development projects or captive water supply projects for industries have often formed a part of TCE's scope of work.

TCE has developed an analytical tool for old dams to ensure their stability and conformance to modern safety requirements. The technique for strengthening of old dams involves post tensioned cables with masonry buttress backing.

▲ Mulshi Dam, Bhira



▲ Thokerwadi Dam, Bhivpuri

Diversion Structures

TCE has planned, designed and supervised the construction of a wide variety of diversion structures like barrages across rivers with semi-automatic and fully automatic gate control systems. TCE has executed projects involving hydraulic and structural design and complex hydraulic model studies to evaluate the performance of various functional elements of the system.

▲ Diurnal Reservoir,
Shanan Hydro Power Station

▲ Power Channel intake with control gates,
110 MW Shanan Hydro Power Station

▲ Intake Channel gate hoisting, Shivpur

▲ Kundli Pumping Scheme, Phase II

Model Studies

TCE has handled a variety of assignments in nuclear, hydro, thermal and water supply fields, where rigourous hydraulic model studies have resulted in economic solutions. TCE has developed mathematical models for mass oscillations in water conductors of hydro power stations and for pressure surges in pumping mains.

▲ Hydraulic model & Physical model studies for Selabam Hydro Power Station, Laos ▼

Tunnel Engineering

TCE has engineered several tunnel systems under varying geological conditions like tunnels in rock, tunnels under lake beds, tunnels in soft grounds apart from tunnels under the cities using tunnel boring machines. Tunnels were executed for • hydro power projects • cooling water system for thermal power stations • water supply projects • sewerage projects. TCE has also undertaken inspection of old tunnels and carried out rehabilitation of old unlined tunnels.

▲ Tunnel Lining, Mumbai Water Supply

▮ 150 MW Hydro Power Penstock, Bhira

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