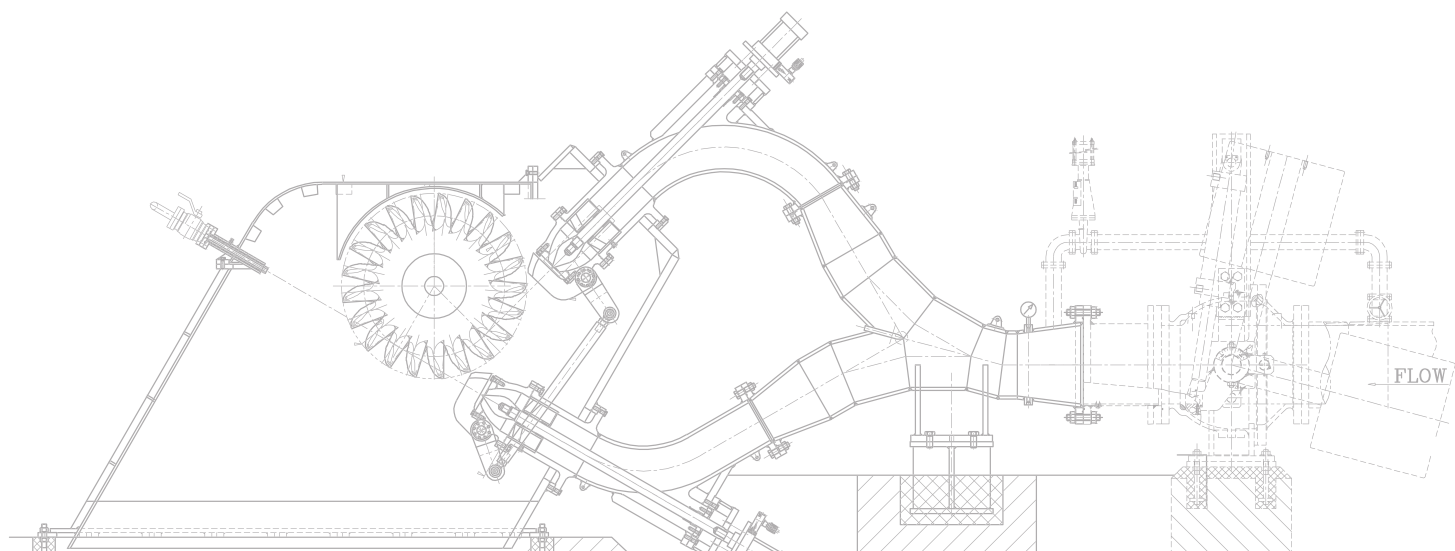


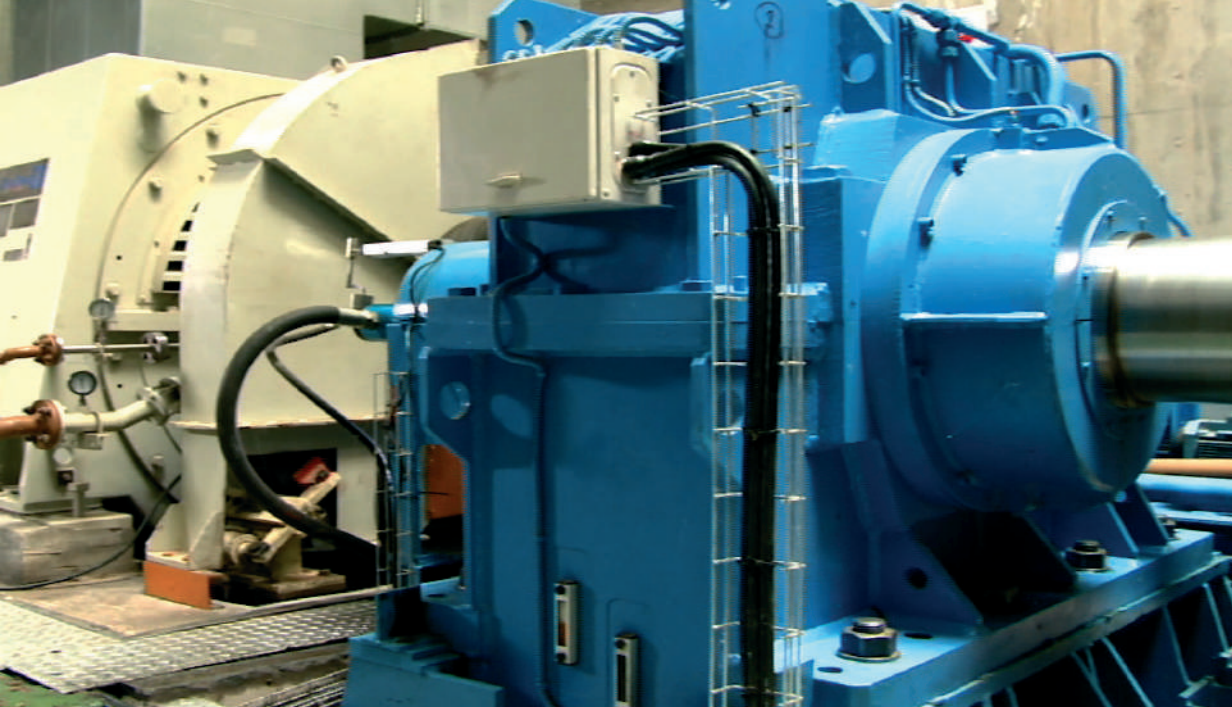
Maintenance and Improvement Solutions

bfl

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BFL Turnkey Upgrades

BFL can provide turnkey upgrades and refurbishments of hydroelectric plants across the world.

Our Service Division restores aging turbines and balance of plant equipment to perform at their original levels and giving them a second life.

BFL can take up upgrades and refurbishments with proper reverse / re - engineering not only of BFL supplied turbines but any other make or brand.

Our Engineers are trained and experienced in designing, manufacturing and retro-fitting new custom designed runners and other components of hydro turbine. We also undertake complete overhauling of Hydropower plants. From new bearing materials to improved wicket gate linkage to modernizing electrical equipment, instrumentation and control systems, our renovation and rehabilitation programs will extend the life of the turbines and increase the performance level within the layout of existing Hydropower plants.



Refurbishment

A hydropower plant has an expected life cycle of more than 30 years. BFL supports its customers in keeping their plants running for a maximum period of time. BFL thereby focuses on customer-oriented optimisation including new construction, repairs and the preservation of used plant elements as spare parts.

BFL specialists create concepts, focussing not only on the replacement of the entire plant but also on repairs and the optimisation of the existing plant. Hence, most often, we don't want to replace the entire turbine. BFL uses state of the art replacement runners and automation system, to upgrade the existing plant to the latest state of technology.

In order to refurbish the existing plant, BFL creates overall concepts to refurbish the machines with a cost-optimised and customer-oriented approach.

BFL also undertakes refurbishment of Generators, Gear Boxes, Transformers, Control Panels, all unit and plant auxiliaries (mechanical and electrical).

BFL guarantees satisfactory performance of refurbished or upgraded turbines and associated equipment.



Why upgrade and rehabilitate

Life Extension

The life cycle of a hydro turbine typically lasts for 30-40 years, but industry experience has shown that with an appropriate upgrade and rehabilitation program, life of a turbine can be extended considerably.

Increased Energy

With suitable modifications/replacements the efficiency can be enhanced depending on the current condition of the operating hydro power stations and by taking advantage of the latest technology.

Elimination of Cavitation and any other unexpected deterioration

BFL has the necessary design and analysis tools to eliminate cavitation damage and any other unexpected wear and tear due to unforeseen site conditions.



Introduction of BFL spares and service wing

BFL works diligently to develop and execute a customised plan that covers all aspects of each outage, from pre-disassembly to commissioning, including site machining of embedded components while ensuring that critical alignments and tolerances are achieved.

The field machining equipment reduces project costs and outage times. BFL field service teams are fully trained to secure complete success for each project and does so in accordance with the most critical health, safety and environmental requirements in the hydroelectric industry.

BFL Hydro's Field Service Division has decades of experience working on all types of hydro equipment. This experience is backed by our team of engineers in our main manufacturing facility in Hoskote, Bengaluru, India.

The BFL hydro team is ready to support all customer needs through every phase of the project, from mobilization to commissioning.

BFL can supply all kinds of spares for mechanical and electrical equipment of hydro power plants of three variants like Francis, Kaplan and Pelton Turbines of both horizontal and vertical configurations to our supplied projects and as well to the non BFL supplied projects with strict adherence in meeting all international standards and project requirement in total.

Site services offered

but not limited to

- Site surveys of existing plants
- Complete disassembly and reassembly of hydro turbines, generators and ancillary equipment
- In-place machining of all embedded components
- Turning, milling, grinding on-site with portable precision machine tools
- High Precision alignment of rotating components
- Refurbishment or replacement of all types of Hydro Power Project Equipment
- Total Turbine modifications or replacements including Cavitation repairs
- Generator Repairs/ Modifications
- Installation of pressure oil, hydraulic control and rated for high pressures
- Installation of Lubricating oil and cooling systems
- Replacement of Old Governors with state of art dedicated/PLC Based Governors and modern fluid power devices for hydraulic control including any sensors & instrumentation upgrade
- Replacement of Analog Excitation panel with Digital AVR based panel
- All Pre and Post Commissioning testing of Hydro Power Plant E & M Equipment
- Introduction of Remote monitoring as required and any new statutory LDC communication



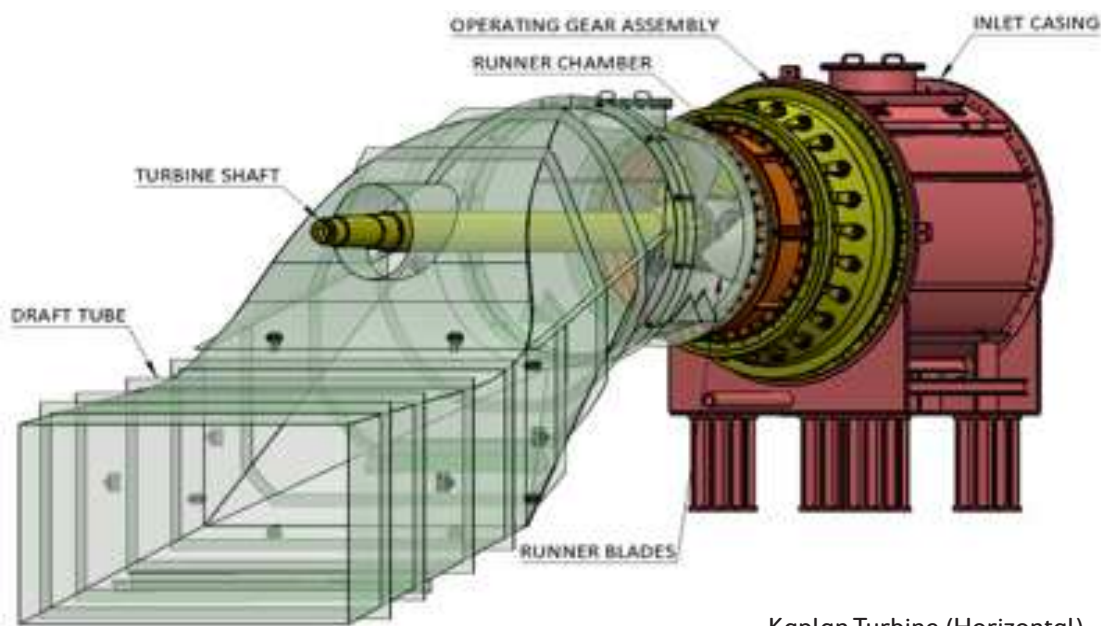
Specific BFL capabilities for upgrade solutions

typical list

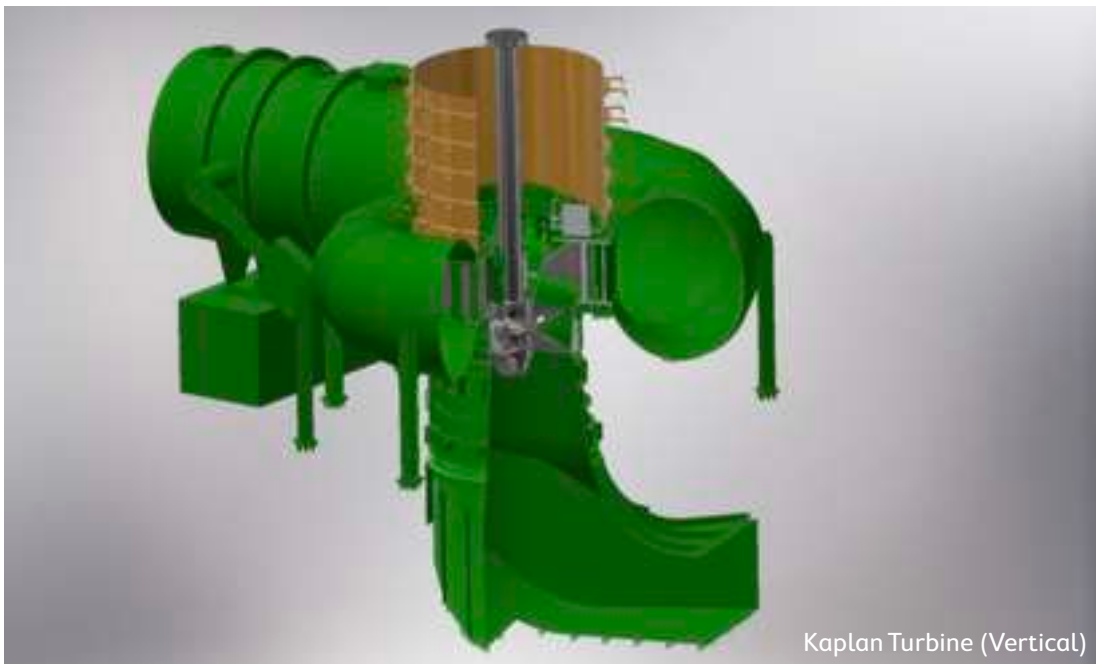
- Inlet Valves (Butterfly, Spherical), including hydraulic control and counter-weight closing, and hydraulic inter-locking
- Pressure Relief Valve for control of pressure rise
- Dual closing of guide vane servomotors, for control of speed rise and pressure rise
- Pelton Turbines – Spring closing of Deflectors
- Hydraulic control of Intake Gates
- Fast loading of Generating-sets, from 'Spin-generation' mode, if head race tunnel and/or penstock characteristics allow
- Total remote control of power plant, including start/stop, with power station locked
- Custom design of Power House auxiliary systems like Oil, Water, Lubrication, Jacking and fire fighting system
- Custom design of regulating valves for guide vane and runner control, for high flow capacities, and controlled by standard Servo Valves
- Penstock Protection Valves – Improved hydraulic control for automatic closing due to over-velocity
- Oil Handling System – Oil transfer pumps, oil purifier, filters, pipework to all locations and service bay

Types of turbines we specialise in upgrading and refurbishing

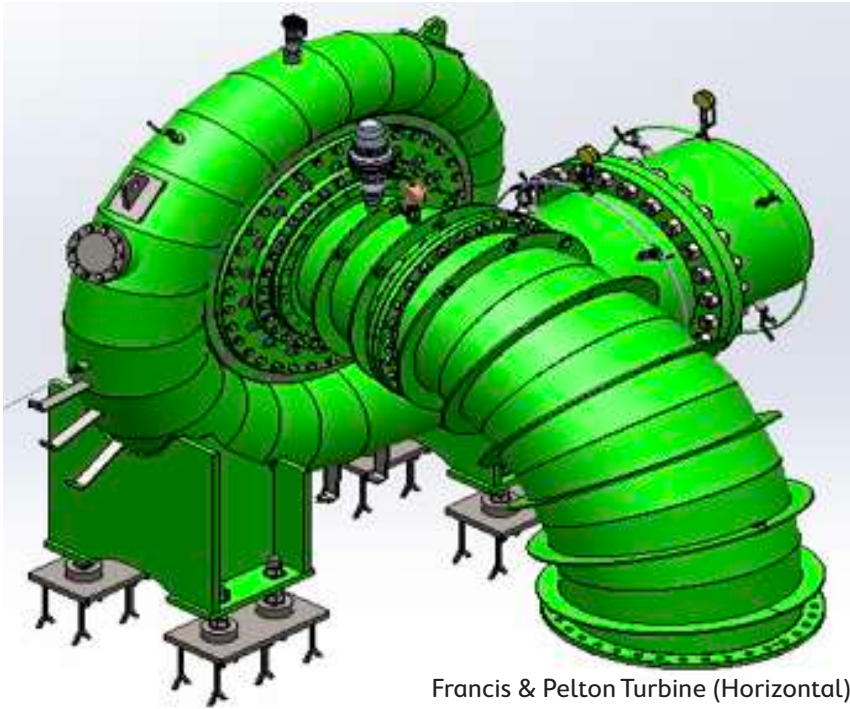
Each of our designs is customised to meet specific project requirements of both Horizontal and Vertical oriented turbines



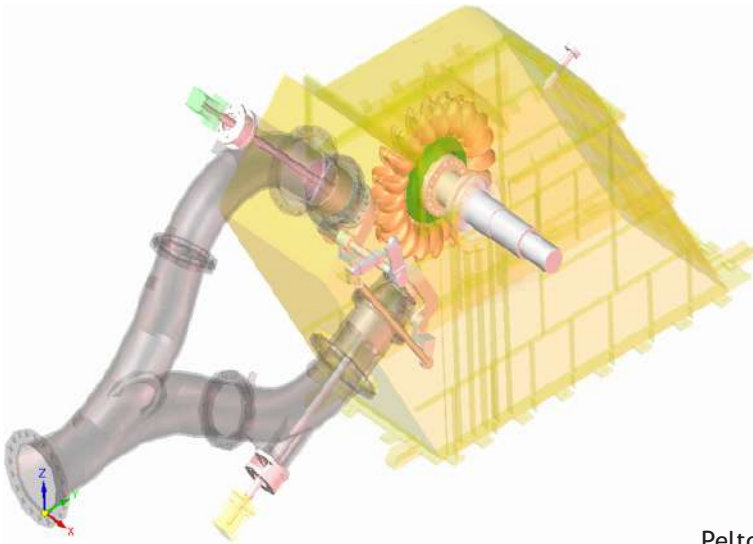
Kaplan Turbine (Horizontal)



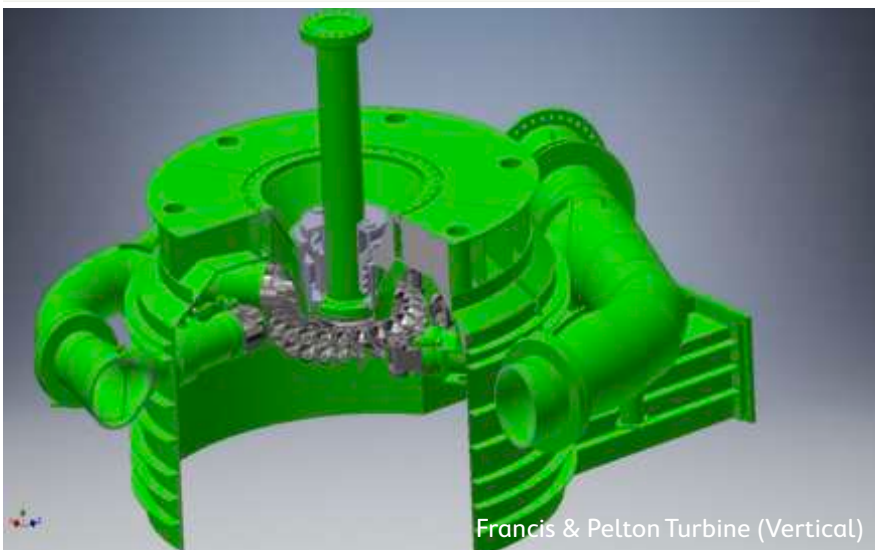
Kaplan Turbine (Vertical)



Francis & Pelton Turbine (Horizontal)



Pelton Turbine



Francis & Pelton Turbine (Vertical)

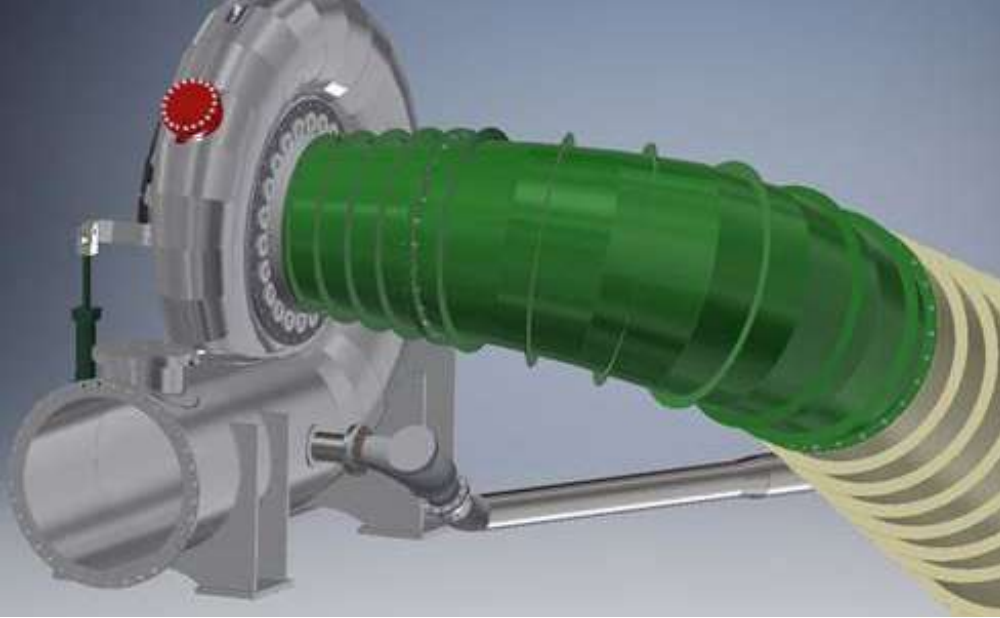


BFL Analytical tools

- Three-Dimensional Structural Analysis, static and dynamic
- Advanced Fatigue and Fracture Mechanics
- Computational Fluid Dynamics Analysis, fully viscous, steady and transient
- Non-linear Shafting Analysis
- Hydraulic Transient Analysis
- Interactive Turbine Design

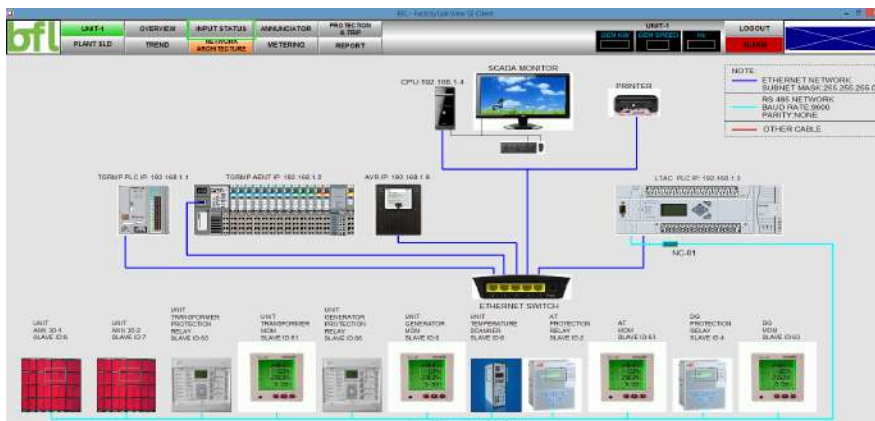
BFL Unique capabilities & technical adaptations

- 3D Scan for accurate measurement
- 3D Printing of Francis pattern for quicker and accurate profile
- Oxy and Air film coating for increasing life of Hydraulic passage components, such as Runner, Guide Vanes, Nozzle etc.
- Remote Assistance by an Expert for online solution to the problems of PLC & SCADA from our Headquarters



Control & automation

BFL Provides best PLC brands in the control system with programming suitable for maximisation of energy generation and automatic start/stop. Remote monitoring options provided to view the power plant SCADA from any location.





Indoor switchgear & outdoor switchyard

BFL can offer indoor switchgear from 0.415KV up to 40.5KV & outdoor switchyard from 10KV up to 400KV.

Transformers can be supplied ranging from 500KVA upto 365 MVA.

BFL can also offer suitable GIS solutions for the present/future conventional switch yards.

BFL has earned a reputation within the hydro industry for over 35 plus years in providing quality site services for our customers needs in locations spread over many continents. Our experienced Field Service Division works closely with our Design Engineering and Project Management teams, ensuring that the customers' projects are being carried out in accordance with highest industry standards.

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