

Product Profile



Bharat Heavy Electricals Limited, Bhopal



INDIAN ENGINEERING - GLOBAL ENTERPRISE
ENGINEERING SUSTAINABLE SOLUTIONS



M E S S A G E



It is heartening to know that BHEL, Bhopal is publishing a Catalogue of its “Products at a Glance” to have a consolidated brief of the products manufactured in Bhopal Unit. This Product Catalogue also highlights the major developments on various products of the Unit.

With the state-of-art technology and ultra-modern manufacturing facilities, BHEL, Bhopal manufactures and supplies wide range of equipment for Power plants, Transmission, Industry, Transportation (Railway), Renewable Energy, Oil & Gas and Defense. Further, we are continuously upgrading our product specifications, ratings and manufacturing processes for continuous improvement in performance and efficiency in view of changing market requirements. These efforts will enable us to have a strong customer orientation and thus strengthen their confidence in our products.

I am sure that this Product Catalogue will be very useful for all associated with BHEL and will serve as knowledge pool for BHEL employees.

Bhopal
04-12-2019


(C. Ananda)
Executive Director

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ELECTRICAL MACHINES

Product

Application

AC Machines for Safe Area Application

(Voltage: AC 3 Ph, 415 V to 13800 V, Frequency: 50 / 60 Hz, Enclosure: SPDP / CACW / TEFC / TETV CACA / Duct ventilated) 2 to 30 poles

- **Squirrel Cage Induction Motors**
(150 kW to 22000 kW)
For industries (cement, paper, sugar, rubber, Steel, irrigation, Thermal Power Projects, Mines, Refineries etc.)
- **Slip Ring Induction Motors**
(150 kW to 10000 kW)
For Industries (cement, rubber), Irrigation, Mines etc.
- **Synchronous Motors**
(1000 kW to 25000 kW)
For Industries (paper, steel, Refinery, Irrigation etc.)
- **Variable Speed Motors**
Squirrel cage induction motors
(150 kW to 22000 kW)
Synchronous motors (1000 kW to 25000 kW)
For industries and power plant

Fans / compressors / pumps / crusher / mills / conveyors

Fans / crusher / mills / blowers / banbury mixture / conveyors

Fans / compressors / pump

Fans / kiln

ID Fan.



2800 kW, 6.6 kV, 4 P Vertical Sq. Cage Induction Motor for NPCIL



6000 kW, 11 kV, 6 P, 60 Hz Slip Ring Induction Motor for City Cement, UAE



2150 kW, 6.6 kV, 4 P Constant Torque Motor for Essar Construction India Ltd.

AC Machines for Hazardous Area Application (Fixed speed or with VFD)

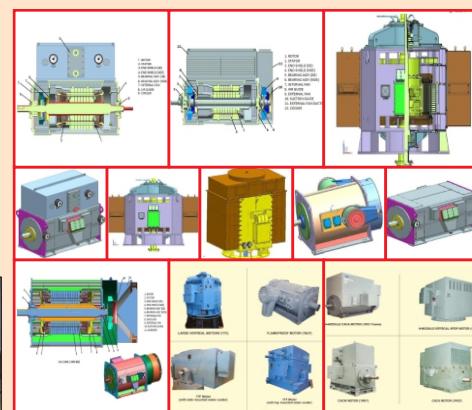
(Voltage: AC 3 Ph, 415 V to 13800 V, Frequency : 50 / 60 Hz, Enclosure: SPDP / TETV/CACW/TEFC/ CACA/Duct ventilated),

For Industries (chemical, fertilizer, gas & Petroleum, refinery, pumping station etc.)

- **Flame-Proof Squirrel Cage Induction Motors (Ex 'd')**
(150 kW to 1500 kW)



Fans / compressors / pumps



ELECTRICAL MACHINES

Product

- Non-sparking Squirrel Cage Induction Motors (Ex 'n')
(150kW to 4000kW) (higher rating on request)
- Increased Safety Squirrel Cage Induction
Motors (Ex 'e')
(150kW to 4000kW) (higher rating on request)
- Pressurized Squirrel Cage induction Motors (Ex 'p')
(150 kW to 22000 kW)
- Pressurized Synchronous Motors (Ex 'p')
(1000 kW to 25000 kW)

Application

**Industrial Application/
Oil Refinery/
For Circulation Water Pumps
in Thermal Power Plant**

Mill Duty Motors

(150 kW to 5000 kW with base speed > 150 rpm)
For steel mills

Fans

Industrial Alternators

(3000 kVA to 25000 kVA)
For Industries (sugar / cement / steel / paper / chemicals), Captive power plants

Steam turbine / Gas turbine / Diesel engine

Induction Generators

(300 kVA to 6000 kVA) For Mini / Micro HEP

Hydro turbine

Wind Generators

(300 kVA to 3000 kVA) For wind farm

Wind turbine



275 kW, 6.6 kV, 2 P Increased safely
H-Compact Motor for KSB Pumps Ltd.



Large Size Wound Rotor Alternator
(17.5 Mw, 11 Kv/4p For Khanna Paper)



Slow Speed Pressurised Sy. Motor
(1.2 MW, 6.6 KV, 18P For IOCL, Mathura)

MAJOR DEVELOPMENTS

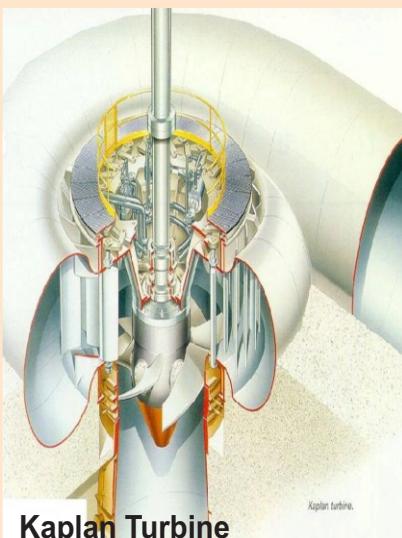
- Largest Rated 22 Pole, 5200 kW, 11 kV Vertical Sq. Cage Induction Motor for 5 x 800 MW Ultra Mega Power Plant of Coastal Gujrat Power Ltd., Mundra
- Largest Rated 18 Pole, 3400 kW, 11 kV Vertical Sq. Cage Induction Motor for Circulating Water Pump application for LANCO Anapara Project
- Largest Rated 16 Pole, 3350 kW, 11 kV Vertical Sq. Cage Induction Motor for Circulating Water Pump application for NTPC, Simhadri.
- Largest Rated 6000 kW, 11 kV 6 Pole, 60 Hz Slip Ring Induction Motor for Mill application for export to City Cement, UAE
- Largest Rated 5500 kW, 6.6 kV, 4 Pole, CACA Pressurized Sq. Case Induction Motor for operation in Zone-II Hazardous Area with gas group-IIA, IIB, IIC and temp. class T3 for BPCL for Kochi Project.
- Largest Rated 2150 kW, 6.6 kV, 4 Pole, Sq. cage Induction Motor delivering constant torque in the speed range of 160 RPM for Slurry Pump application for ESSAR Construction India Ltd
- Largest Rated 4150 kW, 2 x 4 kV, 10 Pole, VFD Synchronous Motor for ID Fan application for TNEB, North Chennai
- Largest Rated 17500 kW, 11 kV, 4 Pole, Brushless Alternator for Khanna Paper Mills, Amritsar.
- 3000 kW, 420 V, Pole Brushless Alternator for Captive Power Generation
- Largest Rated 13 MW/11 kV/4p, CACA, pressurized, Synchronous Motors for centrifugal compressors for operation in zone-II, Hazardous Area for gas well in Oman.
- Smallest 150 kW 415 JV 12 Pole, flame proof motor for raw reciprocating compressor and exported to Laksel, Singapore.
- Largest constant motor newly rated 1150 kW 6.6kV 4 pole VFD Driven KILN, duty motor.

HYDRO TURBINES

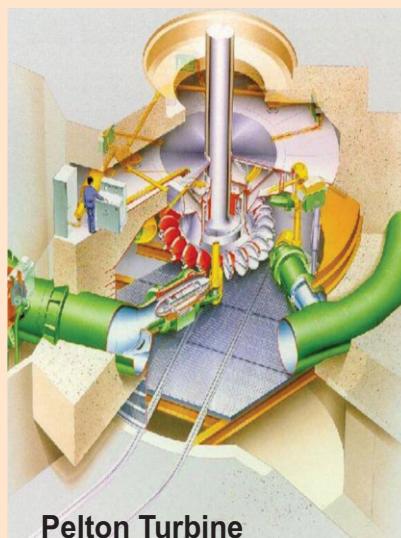
GENERAL

BHEL offers total service for Hydro-Electric Power stations, covering the development, engineering, manufacture, erection and commissioning of equipment, after sales-services and spares .BHEL has successfully supplied more than **500 sets totaling 25,000 MW** of Hydro Power equipment in India & abroad. BHEL-Hydro sets account for more than 50% of the total Hydro Power sets in the country.

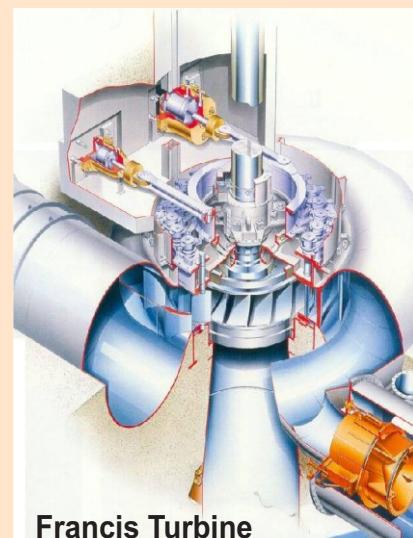
- A leading engineering enterprise which supplies all types of equipment for hydro power generation.
- In the market for about five decades.
- Ultramodern model development and testing facilities.
- State-of-the-art FEM & CFD Analysis capability
- Special design features for Reliability, Longer life, Easy maintenance, Silt resistance, Cost reduction.
- NABL Accredited Development Laboratory recognized by DSIR
- Sophisticated CAD/CAM/CAE facilities and ISO 9001 Certification.
- Manufacturing facility with latest CNC machine tools.



Kaplan Turbine



Pelton Turbine



Francis Turbine

HYDRO TURBINES

BHEL HYDRO POWER PLANT CAPABILITY

- * Hydro Turbines : Custom-built conventional Hydro Turbines of Kaplan, Francis and Pelton types with matching Generators, Pump Turbines with matching Motor-Generators up to 300 MW
- * Bulb Turbines with matching Generators up to 10MW
- * High capacity pumps along with matching motors for Lift Irrigation Schemes (upto 150 MW)
- * Electro Hydraulic Microprocessor-based Digital Governor for Conventional Turbines
- * Microprocessor-based Digital Controller for lift irrigation schemes
- * Mini/micro Hydro sets with PLC-based compact Digital Governor up to 15 MW
- * Static Excitation Systems for Hydro Generators & Motors
- * Brushless exciter for Hydro Generators & motors
- * Special purpose Motor Generator sets.
- * Spherical (rotary) Valves, Butterfly Valves and auxiliaries for hydro stations
- * Upgradation of Hydro Machines
- * EPC & Turnkey Contract including Civil works
- * Balance of Plant Facility package



Pelton Runner



Kaplan Runner



Reversible Francis Runner



Francis Runner

HYDRO TURBINES

MAJOR HYDRO EQUIPMENT TYPE & CAPABILITY

A. TYPES OF TURBINES

Francis : Unit Rating 5-300MW, Head 30-600M, Runner Diameter 1000-7500mm

Kaplan : Unit Rating 2-150MW, Head 10-80M, Runner Diameter 1200-8500mm

Pelton : Unit Rating 1.5-300MW, Head 200-1500M, Runner Diameter 1000-5000mm

Reversible Francis : Unit Rating 20-250MW, Head 50-4000M, Runner Diameter 1500-7000mm

Bulb Turbine : Unit Rating 1.5-40MW, Head 3.0-15M, Runner Diameter 3000-7500mm

Mini & Micro Turbine : Unit Rating 0.1-5.0MW, Head 1.0-15M, Runner Diameter 1500-2500mm

Small Hydro Turbine : Unit Rating 2-5MW, Head 20-48.2M, Runner Diameter 1600-2800mm

B. TYPES OF VALVES

1. BUTTERFLY VALVE Size 1500-7000mm, Head 20-300m

- Conventional
- Single Seal Lattice door
- Double Seal Lattice door
- Biplane Lattice door

2. SPHERICAL VALVE Size 500-4000mm, Head 200-1200m

- Piston Type Seal
- Disc Type Seal

3. PRESSURE RELIEF VALVES

C. GOVERNOR

1.G 25 M Mechanical Governor

2.G 25 E Electro Hydraulic Governor

3.G 40 F Electro Hydraulic Governor Francis & Pelton

4.G 40 K Electro Hydraulic Governor Kaplan

5.Micro Processor based Electro Hydraulic Governor
(digital type)

6.Compact Electronic Governor

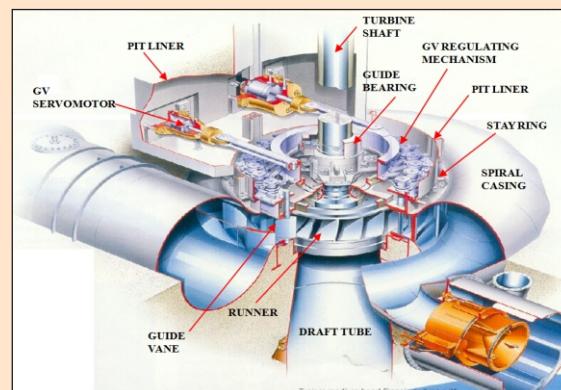
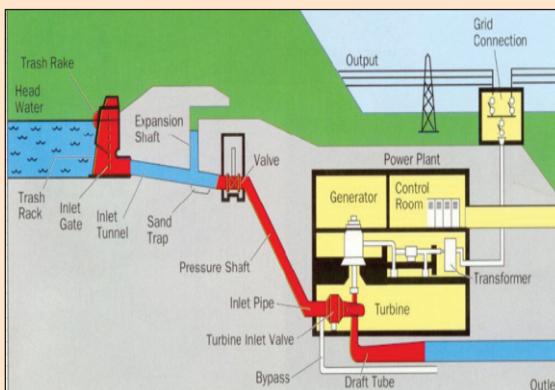
D. HYDRO TURBINE AUXILIARIES

ENGINEERING CAPABILITIES

- Hydraulic design of all types of turbines.
- Strength calculations for nearly all components
- Use of F.E.M for critical components and problems as a regular design tool-
 - Francis and Kaplan Runners
 - Stay Ring and Top Cover
 - Dynamic Analysis of Pelton Runners
- All type of Kinematic, Mechanisms and Linkages
- 3-D Visualization of different assemblies by Solid Modeller
 - Guide Apparatus Turning Mechanism
 - Kaplan Runner Blade Turning Mechanism
- Large Capacity Francis Turbine (300 MW) design developed
- Special design techniques developed for silt protection
- Design Automation processes
- Technology for forged Pelton runner and cast fabricated Francis runner developed
- Designs developed for longer life, easy maintenance and cost reduction



Reversible Francis Turbine



HYDRO TURBINES

MANUFACTURING FACILITIES : Important Machine Tools

- Lathes
- Vertical Borers
- Horizontal Borers
- Planning Machines
- Radial Drilling Machines
- Vertical Borer
- CNC Vertical Machining Centre
- CNC Vertical Borer
- CNC Horizontal Borer
- CNC Horizontal Borer (5 axis)
- CNC Lathe
- Radial Arm Drilling Machine



FABRICATION SHOP : Special Equipments & Facilities

- HVOF Coating Shop: The HVOF plant at BHEL Bhopal is the State of Art facility and one of the biggest in the world for HVOF coating. Being fully automatic, integrated and robotized plant the quality and consistency of coating is of the highest order
- Electro-Slag Welding
- TIG/MIG Welding
- Narrow Gap Welding
- 1,000 T Press
- 600 T Plate Bending Machine
- 3,000 T Shell Bending Press
- Electronic flame cutting Machine
- Stress relieving Furnace
- Shot blasting Chamber
- NDT facilities Dye -Penetrant test
- Magnetic Particle test& Ultrasonic test
- Radiographic
- Site fabrication facility developed.



RESEARCH & DEVELOPMENT FACILITY :

The R & D activities of Hydro Turbines in BHEL aim at developing innovative solutions and to meet Customer expectations in terms of ever improving performance, reliability, ease of maintenance and reduction in cost. It has been spearheading BHEL's quest to remain in the forefront of development of efficient Hydro turbine profiles since last two decades. A dedicated team of Engineers at HMDS, BHEL Bhopal make certain that the latest product features, processes, emerging techniques and technologies are adopted to ensure complete Customer satisfaction.



Hydro Machinery Development Centre
Bhopal



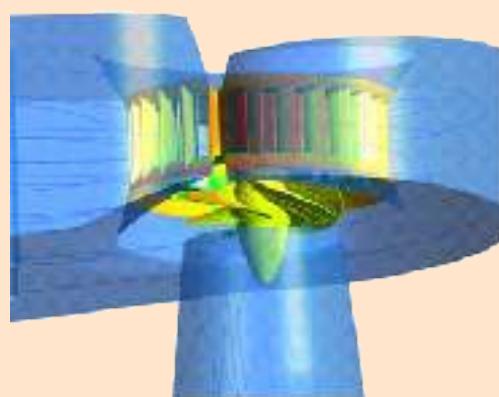
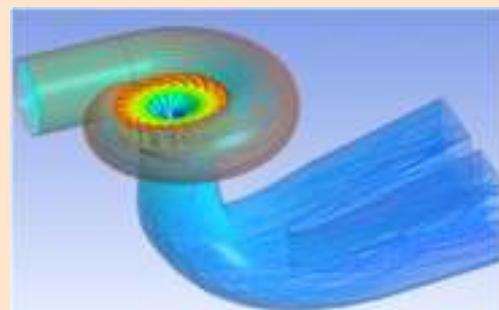
View of Model test-stands

HYDRO TURBINES

- Capability of Hydraulic design and optimization of full range of Francis, Kaplan, Pelton turbines & pumps exists.
- Equipped by a dedicated CFD laboratory which forms the basic back-bone of Hydraulic design and optimization of Hydraulic profiles.
- Ultramodern model development & testing laboratory accredited by NABL in accordance with ISO/IEC17025:2005 & recognized by DSTR as Research Centre.
- Three Universal test stands capable of testing entire range and all types of turbines/pumps (Francis, Kaplan, Pelton, Bulb, Reversible pump-turbines and pumps).
- The Laboratory is equipped with latest measuring instruments and Technical advancements and consistently complies with IEC 60193 standards.
- Over 160 developments, 41 model acceptance test & 13 field test conducted.
- Dedicated High Performance Cluster for CFD Analysis.
- Advance Research undertaken in the field of hydraulic machinery.
- Manufacturing facility with latest 5 Axis & 3 Axis CNC machining center.
- Dedicated group for Turbine Field Efficiency Testing at site in accordance to IEC 60041.

Major Highlights

- Credited with largest rating Kaplan turbines for Ukai (75 MW) in country.
- Associated with largest operational Hydro Power Plant of the country at Nathpa-Jhakri(1500 MW).
- Credited with largest rating pump-storage plant at Sardar Sarovar HEP (250 MW).
- Credited with supply of Largest Rating Pelton Turbine of 200MW for Parbati HEP.
- Credited with supply of Highest Head (504m) Francis Turbine for Kameng HEP (4x150MW)
- BHEL Hydro has set its foot prints in a number of countries like Malaysia, Vietnam, Bhutan, Taiwan, New Zealand, Nepal, Tajikistan, Kazakhstan etc.



HYDRO ELECTRIC GENERATORS/LIFT IRRIGATION SCHEME MOTORS

GENERAL

BHEL Bhopal, is an engineering and design development center for Hydro Generator. It has manufactured supplied and commissioned more than 500 Hydro Generators from 0.5 MW to 200 MW (+ 10 % continuous over load). It has over five decades of Heavy Hydro Electric Project equipment supply experience with a total solution approach from water to wire. Hydro Generator is a tailor-made product; it is designed each time to meet customer's specifications, requirements and expectations.



India

- About 500 Machines commissioned till date
- Combined Installed Capacity of more than 25 GW
- @46 % Market Share



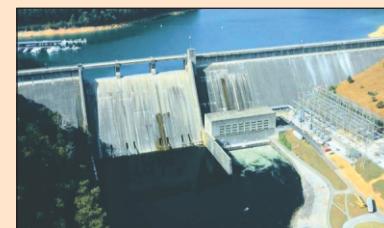
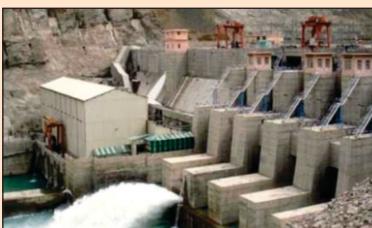
Export

- About 50 Machines commissioned till date
- Combined Installed Capacity of more than 2.5 GW
- Presence in
 - Afghanistan
 - Malaysia
 - Tajikistan
 - Azerbaijan
 - Nepal
 - Taiwan
 - Bhutan
 - New Zealand
 - Thailand
 - Rwanda
 - Vietnam

CAPABILITIES

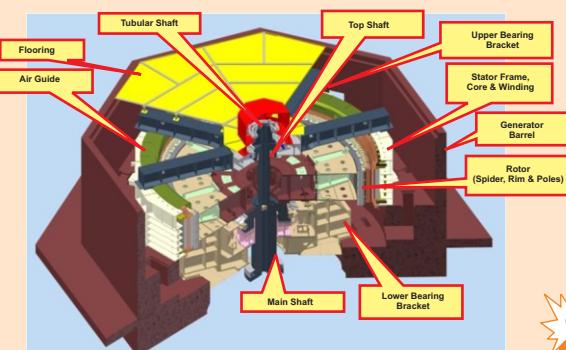
BHEL is capable to supply Hydro Generators from mini/micro to high range MW capacity with varying range of speeds, voltages complete with all type of components. Its various ranges of capabilities are as follows:

- Vertical Generators rating up to 200 MW
- Voltage rating up to 18 KV
- Horizontal Generators up to 20 MW.
- All type of bearing/mounting arrangements as per IEC can be offered.
- Underground or surface stations
- **Synchronous Motors for Lift Irrigation Schemes & reversible Motor-Generator for Pump Storage Projects**
- Full / Partial replacement for BHEL Machines
- Complete replacement of Non-BHEL Machines
- The excitation system employed can be any of the following types:
 - Fully Static digital exciter with thyristorised digital AVR
 - Brushless exciter with thyristorised digital AVR
- Stator winding with both resinrich (resiflex) or resipoor (VPI) can be offered.
- Thrust pad with babbitt metal or PTFE type.
- The generators are supplied complete with auxiliaries such as brake & jacks, oil and air coolers, lubricating oil, centrifuge filters, hydrostatic lubrication system, jacking pumps, neutral grounding transformer, LAVT, bus ducts, control panels, protection schemes, fire protection system, dynamic braking, SFC starters and all monitoring instruments etc.



In Addition to supplier of Hydro Generators, BHEL has the capability to erect, test and commission Hydro-Generators either as a lumpsum turnkey contract or on a supervisory basis. BHEL offers its customers a comprehensive after-sales service in the following field:-

- Repair and rectification of large hydro-generators.
- Periodic overhauling/capital maintenance.
- Advisory service to the power stations on general maintenance to avoid outages or planned outages.
- Renovation, modernization and uprating of old hydro-generators.
- RLA studies, Diagnostic testing/studies.
- Procuring, stocking and distributing spares.



HYDRO ELECTRIC GENERATORS/LIFT IRRIGATION SCHEME MOTORS

FACILITIES

BHEL plants are well equipped in terms of production, testing and service facilities. Some of the main production facilities are:

- Hydro Generator machining, winding and assembly facilities like:
 - Horizontal ram Borer (Skoda) - (Max. travel Vertical-4.15 M, Horizontal-19)
 - Vertical Borer (Homma) - (Max. job dia.-9 M , Height-4M)
 - CNC Lathe – (Max. Job Dia-4 M, Length-10 M, Max Job Weight- 80 T)
 - 3-Axis CNC Vertical Turning (Mario) – (Max. job dia.-5 M , Height-3.5 M)
- A modern separate press shop block for all type of stampings.
- Separate central stamping unit at JagdisHPur with state of art manufacturing facilities.
- A modern fabrication block having all fabrication facilities including:
 - Automatic electro slag welding machine for welding of plates
 - 3-roll bending machine capable of bending plates
 - CNC oxy-acetylene cutting machine and CNC plasma cutting machine
 - Open hearth heat treatment furnace
- Tools Rooms equipped with some of the high precision machines like jig boring machine, copying machine, profile grinding and other special purpose machines.
- Coil and insulation manufacturing division having all manufacturing facilities of stator winding (single turn bars and diamond coils), excitation and DC leads etc This division also has:
 - VPI plant for hydro generator stator bars.
 - 6 axis robotic tapping machine for main insulation of hydro generator stator bars.



RESEARCH AND DEVELOPMENT

Product designs are continuously upgraded in line with latest state of art technology. BHEL also maintains close liaison with universities, research institutes, accredited labs and own R & D units. Extensive use of computer – aided techniques is made to optimize machine designs.

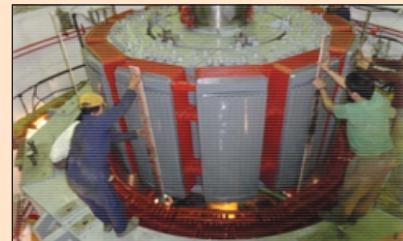
The current programme of development projects include evaluation of new insulating materials and systems, study of the performance of large thrust bearing, heat transfer, noise, ventilation studies, introduction of environmental friendly material etc.

QUALITY

BHEL can meet the most stringent demands for maintaining high quality standards comparable to International Organization, through an overall Quality Assurance programme consistent with the requirements of the customer.

Quality Assurance assumes overall responsibility for establishing, maintaining and monitoring all system and procedures necessary for quality relating to design, manufacture, testing, installation and commissioning.

The corporate quality control & unit quality control department ensures that component and assemblies comply with the drawings and meet the requisite standards of workmanship. Reputed Third party inspection agencies are employed to ensure the quality of bought out items from abroad and indigenously. BHEL also has well established NABL lab for carrying out physical / chemical/ mechanical/ electrical destructive/ nondestructive testing of materials.



STEAM TURBINES

Products

- 195 MW, 210 MW, 250MW, 270MW Steam Turbines with associated auxiliaries.
- Spares for all BHEL make steam turbines up to 600 MW
- Repair of turbine rotors upto 500 MW
- 700 MW Steam Turbines.
- 236MW Steam Turbines With associated auxiliaries.
- 15000 SHP Marine Turbines.

Application

Thermal Power Plant



Rotor of Steam Turbine

Nuclear power plant

Marine propulsion

THERMAL GROUP : CONDENSER & FEED WATER HEATERS

Surface Condenser

For Thermal plants upto 500 MW sets & Nuclear plants upto 700 MW sets

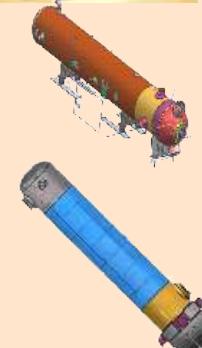
Condensation of Steam coming out from LP Turbine Exhaust



Feed Water Heaters - FWH

HP Heaters, LP Heaters, Drain coolers etc.
For Thermal- Sub-Critical upto 300 MW & Super Critical with Single Stream 300- 660MW and Nuclear plants upto 700 MW rating

Heating of Feed Water in the regenerative cycle to improve the plant heat rate.



Moisture Separator &Reheater-MSR

For 236 MW, 500 MW & 700 MW Nuclear Sets

Removal of Moisture Re-heating of Steam before feeding to LP Turbine



Live Steam Reheater- LSR

For 500 MW FBR Nuclear sets

Reheating of Steam



Auxiliary Heat Exchangers

Frame & Tube type Air Coolers, Oil Coolers (Shell & Tube type - single tube, Concentric Double tube type, Frame & Tube type and Plug-in type) / Frame & Tube type Hydrogen Coolers/ Shell & Tube type Water-Water Coolers

Extraction of Heat from Turbo Generator, Hydro Generator, Transformer & Motors



Gland Steam Condenser

Thermal Plants upto 500 MW Nuclear Plants upto 700 MW

Condensation of steam coming out from Turbines glands.



Duplex LP Heater

800 MW Supercritical sets

Heating of feed water in the regenerative cycle to improve the plant efficiency.



STEAM TURBINES

Products

Industrial Heat Exchangers

For Cement /Sugar / Fertiliser / Chemical / Petroleum Industries

Rubber Expansion Joints - RE Joints

Pressure Balance, Compensating & Conventional type For Thermal & Nuclear sets of all ratings

Butter Fly Valves - BF Valves

Construction – Fabricated / cast body & door

- Mode of operation
Hand operated – Manual, Electrical & Hydraulic
- Range

Cast construction

For Normal Water : 400 NB to 1200 NB

For Sea Water * : 1800, 2000, 2200 NB including complete small size range.

*Available with Rubber Lining also

Fabricated construction

For Normal water & Sea Water *

Application : 1400 NB & above (presently up to 2700 NB)

*Available with Rubber Lining

Flash Tanks

For thermal & nuclear sets of all ratings

Service Tanks, Storage Tanks & Pressure Vessels

For Thermal , Nuclear sets of all ratings & industrial Applications

Coolers for Naval Applications

CACW cooler, Water Coolers, etc.

Constructed using special high alloy materials.

Application

Extraction of heat for process applications



To absorb thermal & mechanical movements in CW/ACW piping



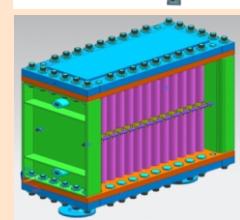
To Regulate/ Control flow in CW/ACW & other water system piping.



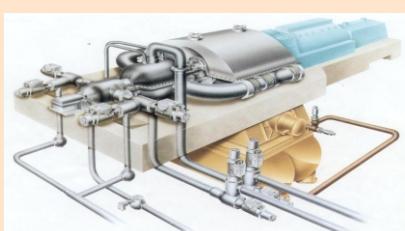
To stabilize the system drains before discharge to condenser.



For storage & supply of oil, DM water and other services as per system requirements



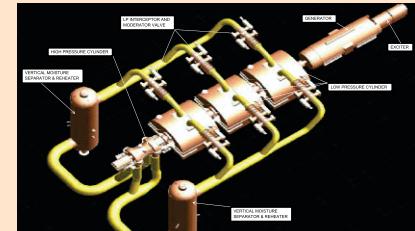
250 MW STEAM TURBINE GENERATOR IN THERMAL POWER PLANT



250 MW LOW PRESSURE ROTOR -STEAM TURBINE



PANOROMIC VIEW OF 700MW NUCLEAR POWER PLANT (TURBINE FLOOR)



SWITCHGEAR AND CONTROL EQUIPMENT

SWITCHGEAR

Product	Application
Medium Voltage Vacuum Switchgear of various types for Indoor and Outdoor applications for voltage ratings up to 36 kV and Gas Insulated Switchgears up to 420 kV	
• INDOOR SWITCHGEAR up to 12 kV, 50 kA, 3500 Amp	for thermal, nuclear, hydro and combined cycle power plant projects.
• INDOOR SWITCHGEAR up to 36 kV, 31.5 kA, 2500 Amp	for industries and refineries.
• INDOOR VACUUM CIRCUIT BREAKERS 12 kV, 25 kA, 1250 Amp.	for distribution systems
• OUTDOOR VACUUM CIRCUIT BREAKERS 36 kV, 25 kA, 2000 Amp.	for transmission and distribution segment
• OUTDOOR VACUUM CIRCUIT BREAKERS 12 kV, 25 kA, 1250 Amp.	for distribution segment.
• OUTDOOR POLE MOUNTED VACUUM CKT. BRKR 1 Ph, Vacuum Circuit Breaker 25 kV, 25 kA, 1600 Amp.	for Trakside railway application
• OUTDOOR POLE MOUNTED CAPACITOR SWITCH Autorecloser/Sectionaliser	for 12 kV rural segment
• GAS INSULATED SWITCHGEAR 36 kV, 40 kA, 1600 Amp. for Refineries, urban s/s.	for Refineries, urban s/s.
• GAS INSULATED SWITCHGEAR 145 kV, 31.5 kA, 2500 Amp. for transmission segment	for transmission segment
• GAS INSULATED SWITCHGEARS 420 kV, 40kA, 3150Amp.	for transmission segment



On Load Tap Changers (OLTC)

For Power Transformer, Furnace Transformer, Station Transformer, Rectifier Transformer etc.

- **On Load Tap Changer**
For up to 400 kV class Transformer
- **Off Circuit Tap Switch**
For up to 400 kV class Transformer

For Power Transformer

SWITCHGEAR AND CONTROL EQUIPMENT

CONTROL AND RELAY PANELS

- Control & Protection Panels
(up to 400 kV)
For EHV Transmission projects
- Synchronizing Trolley / Swing Panels
- Protection Panels
For large generators up to 800 MW for thermal / nuclear / hydro / combined cycle power projects
- Remote Control and Relay Boards for MV Switchgear
- Outdoor-type marshalling kiosks
- Remote transformer tap-changer control panels

Control & Protection for circuits in Substation (Transmission lines, Transformers , Bus bar , Bus coupler, Reactors, Capacitors)

Synchronization of switchyard Circuits

Protection of Generators, Gen. Transformer & Unit Auxiliary Transformer

Control & indication of MV Switchgear from remote control room

Marshalling of cables in the switchyard

Tap changer control & indication from control room

CONTROL EQUIPMENT : MAJOR PRODUCT RANGE

SN	DESCRIPTION	TYPE	RATING	APPLICATION	
A	CONTROL EQUIPMENT FOR INDUSTRIES				
1.	LARGE CURRENT RECTIFIER				
	POWER RECTIFIER FOR INDUSTRIES	DIODE TYPE FORCED AIR COOLED DM WATER COOLED	100 - 1500 VDC, 2 KA - 120 KA, 60 - 500 MW	FOR USE IN THE PROCESS INDUSTRIES LIKE CAUSTIC SODA, ALUMINUM, GRAPHITE PLANT etc.	
	CONTROL CUBICLE ABOVE				
B	CONTROL GEAR EQUIPMENTS FOR POWER PLANTS				
1	EXCITATION CONTROLS FOR POWER PLANTS	DIGITAL AVR, WARSHIP AVR, DIGITAL STATIC EXCITATION EQUIPMENT, FIELD SUPPRESSION PANEL.		FOR VOLTAGE REGULATION OF SYNCHRONOUS GENERATORS & MOTORS BRUSHLESS EXCITATION OF SYNCHRONOUS GENERATORS & MOTORS	
2	ELECTRO HYDRAULIC GOVERNOR	DIGITAL		LOAD CONTROL OF HYDRO TURBINES	
3	MICROPROCESSOR BASED ELECTRONIC CONTROLLERS	THYRISTOR TYPE	70 KV TO 95 KV 400 mA to 1400 mA	FOR POWERING THE FIELDS OF THE ELECTROSTATIC PRECIPITATORS IN POWER PLANTS & INDUSTRIES	
4.	INTEGRATED GENERATOR CONTROL METERING, PROTECTION & EXCITATION		90 V - 200 V 3 A - 50 A	FOR MINI Diesel GENERATOR & CAPTIVE POWER PLANT	
5.	COMPOSITE MONITORING SYSTEM (CMS) FOR POWER TRANSFORMER (GENERATOR & INTERCONNECTING TRANSFORMER, SHUNT REACTOR)	MICRO CONTROLLER, FPGA BASED		FOR MONITORING OF PARAMETERS, LIFE ESTIMATION, OVERLOAD CAPABILITY ESTIMATION, COOLER CONTROL FOR POWER TRANSFORMER	

SWITCHGEAR AND CONTROL EQUIPMENT

CONTROL EQUIPMENT : MAJOR PRODUCT RANGE

SN	DESCRIPTION	TYPE	RATING	APPLICATION	
C CONTROL GEAR EQUIPMENT FOR TRACTION					
1	IGBT BASED INVERTERS FOR AC LOCOS	a. FORCED AIR COOLED b. FORCED AIR COOLED	180 KVA 3X100 KVA	FOR POWERING THE AUXILIARIES OF THE LOCOMOTIVE	
2	POWER STATIC INVERTER FOR AC/DC EMU	GTO BASED OIL COOLED	1400V , 544 A	FOR POWERING THE 3 PHASE INDUCTION MOTORS OF AC/DC EMU AND CONTROLLING THE TORQUE OF THE SPEED OF THE EMU	
3	AUX STATIC INVERTER FOR AC/DC EMU a. 20 KVA b. 50 KVA	IGBT BASED FORCED AIR COOLED	415 V 3 PHASE	FOR POWERING THE AUXILIARIES OF THE MOTOR COACH OF THE EMU	
4	POWER RECTIFIERS FOR 1400 HP DEMU 700 HP DEMU 700 HP DETC 350 HP DETC	FORCED AIR COOLED UNDERSLUNG MOUNTING & ON BOARD MOUNTING	1600 A, 800 VDC FOR DETC 1800 A, 900 VDC FOR DEMU	FOR CONVERTING THE AC VOLTAGE GENERATED BY THE TRACTION ALTERNATORS IN TO DC VOLTAGE AND POWERING THE DC TRACTION MOTORS OF DEMU / DETC	
5	RECTIFIERS FOR AC/DC & AC/AC DIESEL LOCOS	FORCED AIR COOLED SELF COOLED RECTIFIER ALTERNATOR MOUNTED RECTIFIER	3800 A, 1200 V	FOR CONVERTING THE AC VOLTAGE GENERATED BY THE TRACTION ALTERNATORS IN TO DC VOLTAGE AND POWERING THE DC TRACTION MOTORS OF DIESEL LOCOS	
6	RECTIFIER FOR EMU'S	UNDERSLUNG MOUNTED FORCED AIR COOLED		FOR CONVERTING THE SINGLE PHASE AC VOLTAGE IN TO DC VOLTAGE AND POWERING THE DC TRACTION MOTORS OF DIESEL LOCOS	
7	CONTROLS FOR 350 HP MG DEMU 700 HP BG DEMU 1400 HP BG DEMU	DRIVERS CONTROL DESK CONTROL PANEL MOTOR SWITCH GROUP	POWER 900 V, 3000 A CONTROL 110 V DC	CONTROLS ARE USED FOR THE CONTROL & PROTECTION OF THE DEMU DPC	
8	CONTROLS FOR 350 HP DETC 2X350 HP DETC 700 HP DETC	DRIVERS CONTROL DESK CONTROL PANEL MOTOR SWITCH GROUP	POWER 900 V, 2400 A CONTROL 110 V DC	CONTROLS ARE USED FOR THE CONTROL & PROTECTION OF THE DETC.	
9	CONTROLS FOR 25 KV AC EMU 25 KV MEMU 1500 V DC EMU 1500 V DC/ 25 KV AC AC-DC EMU	MOTOR SWITCH GROUP TAP CHANGE SWITCH GROUP RESISTORS CONTACTORS RELAYS	25 KV AC 1500 V DC 1500 V DC / 25 KV AC	CONTROLS ARE USED FOR THE CONTROL & PROTECTION OF THE EMU	

SWITCHGEAR AND CONTROL EQUIPMENT

CONTROL EQUIPMENT : MAJOR PRODUCT RANGE

SN	DESCRIPTION	TYPE	RATING	APPLICATION	
10	CONTROLS FOR CALCUTTA METRO COACHES	SWITCH GROUP FRAMES RESISTORS CAM SHAFT CONTROLLERS CONTACTORS RELAYS	POWER 750 V DC CONTROL 110 V DC	CONTROLS ARE USED FOR THE CONTROL & PROTECTION OF THE METRO COACH	
11	CONTROLS FOR AC & DC ELECTRIC LOCOS	SWITCH GROUP FRAMES RESISTORS CAM SHAFT CONTROLLERS CONTACTORS RELAYS	POWER 25 KV AC CONTROL 110 V DC		
12	DBR FOR AC LOCOS	FORCED COOLED VERTICAL DC MOTOR BLOWER	2400 KW, 450 VDC, 5400 A.	THE DBR IS USED FOR ENABLING ELECTRICAL BRAKING OF A LOCOMOTIVE	
13	DIESEL LOCOS FOR DC/DC , AC/DC & AC/AC TRANSMISSION FOR MAIN LINE & SHUNTING APPLICATIONS	CONTROL CUBICLES MASTER CONTROLLERS CONTACTORS RELAYS METERS SWITCHES DBR	1500 HP / 3300 HP, 780 V - 1100 V	CONTROLS ARE USED FOR THE CONTROL & PROTECTION OF THE DIESEL LOCO	

D OIL RIG APPLICATION

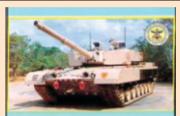
- AC/DC PCR FOR OIL RIG CONTROL FOR E760, E1400, E2000 & E3000 RIG - AC VFD CONTROLS FOR AC RIGS - POWER PACKS 1215/1430 KVA, 50 HZ, 3 PHASE, 600 VAC - DRILLER CONSOLE UPTO 3 MUD PUMPS, IRD & DRAW WORK CONTROL & MONITORING, LOAD RATING (0-1800 A, 0-1000V) - AC AND DC MODULE SUITABLE FOR UPTO E3000 RIG. - POWER FACTOR CORRECTOR FOR RIGS	THYRISTORISED DRIVES CONVENTIONAL CONTROLS PLC BASED CONTROLS AC VFD DRIVES & CONTROLS	UPTO 3000 HP RIGS	THE CONTROLS OF OIL RIGS ARE USED TO CONTROL THE POWER PACKS & TO CONTROL THE DIFFERENT DRIVES FOR CONTROLS IN THE DRILLING OF OIL WELLS	
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E GENERAL CONTROLGEAR APPARATUS

ELECTRO PNEUMATIC CONTACTORS	ELECTROMAGNETIC OVERCURRENT & AUXILIARY RELAYS
REVERSERS	STARTING / BREAKING & FIELD DIVERSION SWITCHES
VOLTAGE REGULATORS	MASTER CONTROLLER & CAM SHAFT CONTROLLERS
POWER BREAK SWITCHES	

SWITCHGEAR AND CONTROL EQUIPMENT

CONTROL EQUIPMENT : MAJOR PRODUCT RANGE

SN F	DESCRIPTION DEFENCE	TYPE	RATING	APPLICATION	
1.	CONTROLS FOR GUN CONTROL SYSTEM	EHG CONTROLS		THE CONTROLS ARE PROVIDED FOR THE MBT	
2	LOCAL CONTROL PANEL (LCP)		500 KW	MAIN MOTOR GENERATOR (MMG)	
3	LOCAL CONTROL PANEL (LCP)		350 KW	FOR REVERSE PROPULSION MOTOR (RPM) FOR SUBMARINE APPLICATION	
4	LOCAL CONTROL PANEL (LCP)		50KW DC-AC 50KW AC-DC	FOR PERMANENT MAGNET FREQUENCY CONVERTER FOR SUBMARINE APPLICATION	
5	LOCAL CONTROL PANEL (LCP)		1MW	FOR MAIN MOTOR GENERATOR FOR SUBMARINE	



36KV Gas Insulated Switch Gear



Acoustic Power Pack



145KV Gas Insulated Switch Gear



1430 kVA, 600 V, 50 Hz, 1000 RPM Power Pack

TRANSFORMERS, CAPACITORS, BUSHINGS

TRANSFORMERS

Product

Application

Power Transformers

For Power station

- Generator transformers
420 kV, 3 ph, 500 MVA &
765 kV, 1ph., 400 MVA
- Auto transformers
420 kV, 3 ph., 1000 MVA
420 KV, 1 ph , 600 MVA
765 kV, 1 ph., 1000 MVA
1200 kV, 1 ph, 1000 MVA



295MVA, +/-800kV, Converter Transformer
For PGCIL NEA HVDC Project



498MVA, 400kV Converter Transformer
For PGCIL Balia-Bhiwadi HVDC Project



80MVR, 765kV, Single Phase Shunt Reactor

Converter transformers / Smoothing reactors

Up to 600 MVA, \pm 500 kV HVDC/ \pm 800 KV HVDC

HVDC transmission

Up to 254 MVAr, 360 mH, 1568 Amps, \pm 500 kV HVDC

Smoothing Reactors

Shunt Reactors

Up to 150 MVAr, 420 kV, 3 Ph &
110 MVAr, 765 kV, 1 Ph

Controlling of reactive power

Controlled Shunt Reactors

Up to 200 MVAr, 420 kV, 3 Ph,
200 MVAr, 420 kV, 1 Ph &
200 MVAr, 765 kV, 1 Ph

Flexible AC Transmission System



500MVA, 765kV I-Phase Interconnecting Transformer



333MVA, 1200kV I-Phase Interconnecting Transformer



1200kV CVT

TRANSFORMERS, CAPACITORS, BUSHINGS

Product

Phase shifting transformers

Up to 400 MVA, 400 kV, 3 Ph &
400 MVA ,400 KV , 1 Ph

Instrument transformers

- Current transformers
(up to 400 kV, 3600 Amps.)
- Capacitor voltage transformers
(upto 1200 KV)

Application

Flexible AC Transmission System

Metering, protection

Metering, protection & power line carrier communication at 30 kHz to 500 kHz



Pressurised Transformer
Assembly Bay



Bushing Manufacturing
Bay



Air Conditioned
Transformer Winding Mfg. Bay

TRANSFORMERS, CAPACITORS, BUSHINGS

CAPACITORS

H.T. Capacitors for Motors

(3.3 kV to 11 kV, delta connected capacitor banks)
For Industries (cement / fertilizer)

Power factor correction

H.T. Capacitors for Shunt, Series & SVC (Static VAr Compensation), Harmonic filter & HVDC application

(3.3 kV to 500 kV, 1Ph / 3 Ph capacitor banks)
For Distribution line / Transmission line /substn.

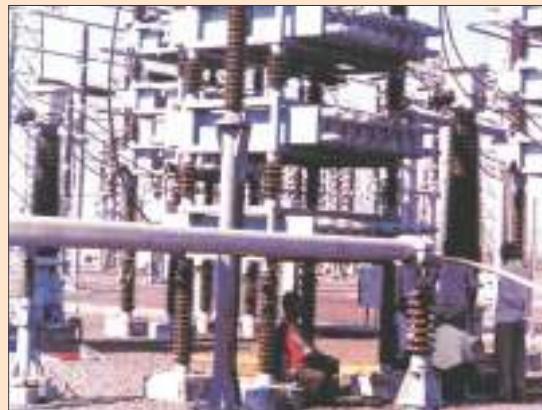
Voltage regulation, PF correction,
filtering of harmonics

Coupling Capacitor

(33 kV to 800 kV, 4400 pF to 13200 pF)
For Transmission line

Power line carrier communication at
30 kHz to 500 kHz

TRANSFORMERS, CAPACITORS, BUSHINGS



400 kV series Capacitor Bank for POWERGRID, FSC Wardha

Product

Surge Capacitor for Generator & Transformers
(11 kV to 40 kV, 0.125 µF to 0.25 µF)

Application

Protection of surges

Roof Capacitor
For Locomotive

PF correction

BUSHINGS

Oil impregnated paper (OIP) condenser bushings
(52 kV to 525 kV)

Transformer

Special application bushings like oil-oil
Wall bushings etc.

Cable box, Laboratories, Sub-stn

MAJOR HIGHLIGHTS

- 333 MVA, 1150/3 / 400/3/33kV, 1-ø, Auto Transformer for POWERGRID 1200 kV experimental line in 1200 kV UHVAC substation at Bina-India in 2011. (First Indian Manufacturer)
- 500 MVA, 765/ $\sqrt{3}$ /400/ $\sqrt{3}$ /33 kV, 1-ø, Auto Transformer for POWERGRID-India in 2011.
- 498 MVA, \pm 500 kV HVDC Convertor Transformer for POWERGRID Balia-Bhiwadi HVDC transmission line project in 2011.
- 80 MVAR, 765 kV, 1-ø, Shunt Reactor for POWERGRID-India in 2011.
- 50 MVAR, 420 kV, 3-ø, Controlled Shunt Reactor installed at Bina substation of POWERGRID-India in the year 2001.
- 275MVA I-Phase, 765KV, Generator Transformer for BIDCO 3x660MW STPP at Lalitpur in the Year 2015.
- 105MVA I-Phase, 765KV, Interconnecting Transformer for BIDCO 3x660MW STPP at Lalitpur in the Year 2015.
- 500MVA I-Phase, 765KV, Interconnecting Transformer for Megha Engg. against UPPTCL Tr. Project in Year 2016.
- 80MVAR I-Phase, 765KV, Shunt Reactor for Megha Engg. against UPPTCL Tr. Project in Year 2016.
- 110MVAR I-Phase, 765KV, Shunt Reactor for BIDCO 3x660MW STPP at Lalitpur in the Year 2016.
- 295.1MVA, +/- 800KV HVDC Converter Transfomer for Powergrid North East Agra 6000MW HVDC Interconnecting Transmission Line Project in the year 2017

TRANSPORTATION EQUIPMENTS

Product	Application
Traction Machines for Railways Applications	
● AC traction motors (upto 1150kW) (for passenger trains/ goods train)	AC Locomotives/DE Locomotives/ Electrical Multiple Units (EMUs)/ Diesel EMUs
● DC traction motors (upto 630kW) (for passenger trains/goods train/Metro Car)	AC Locomotives/DE Locomotives/ Electrical Multiple Units (EMUs)/ Diesel EMUs/ MEMUs
● AC Traction Alternators (upto 4000kW) (for passenger trains/ goods train)	DE Locomotives/ Diesel EMUs
● DC Traction Generator (upto 2000kW) (for passenger trains/ goods train)	DE Locomotives/ Diesel EMUs/ MG DEMUs
● Motor Generator Set (upto 25kW)	DE Locomotives/ Diesel EMUs/ MG DEMUs
● Auxiliary Generator With Exciter (upto 50kW)	DE Locomotives
● Eddy Current Clutch (Radiator fan cooling)	DE Locomotives
● DC Blower Motors (upto 50kW) (for passenger trains/ goods train)	DE Locomotives
● Traction Grade Gears & Pinion	
Traction Propulsion System	AC Locomotive/Diesel Electric Locomotive/DEMU/AC-EMU
● Traction Propulsion system comprising of Traction Converter, Auxilliary Converter & Vehicle Control Electronics for - • 6000HP GTO/IGBT Based AC Locomotives • 1600HP AC-AC Electrical Multiple Unit. • 1400HP AC-DC Diesel Eletric Multiple Unit	
Electric For Defense Application upto 1 MW	Defense Application
Alternator for Industrial Application with Single Bearing Arrangment upto 2MW	Industrial Application
Electrics for DETC (Diesel Electric Tower Car) for Rail Route Electrification.	Railway Route Electrification
Smoothing Reactors	
● Inductive shunt	AC Locomotives/Metro Cars (Kolkata Metro)
Machines for Oil Rig Applications	
● DC motor (for oil rig, mud pump etc.)	Off shore and on shore Oil Rig stations
● Alternators (for oil rig power pack)	Off shore and on shore Oil Rig stations
● 3 Phase AC Oil Rig Motor upto 1150HP (for Draw Works, Mud Pump, Drilling Operations)	Off Shor & On Shor Oil Rig Operations

TRANSPORTATION EQUIPMENTS



Traction Machine for AC Locomotive

- 3 Phase Traction motor up to **1200KW** for 9000HP Loco
- 3 Phase Traction motor up to **1150KW** for 6000HP Loco
- 3 Phase Traction motor up to **850KW** for 6000HP Loco
- DC Traction Motor up to **630KW** for 5000HP Loco

Traction Machine for Diesel Electric Locomotives

5500HP DE Loco

- 3 Phase Traction motor up to 630KW
- Traction ALTERNATOR up to 3800KW

4500HP DE Loco

- DC Traction Motor up to 425KW
- Traction ALTERNATOR up to 2800KW

3300HP DE Loco

- DC Traction Motor up to 280KW
- Traction ALTERNATOR up to 1936KW



Traction Machine for DEMU & EMU/MEMU Application

1600HP DEMU

- 3 Phase Traction motor up to 230KW
- Traction ALTERNATOR up to 1095KW

1400HP DEMU

- DC Traction Motor up to 208KW
- Traction ALTERNATOR up to 925KW

AC EMU & Kolkata Metro

- 3 Phase Traction motor up to 285KW
- DC Traction Motor up to 167KW



Auxiliary Equipments for Traction Application

- Auxiliary Generators and excitors up to 20 kw
- DC blower motors up to 52 kw
- Eddy Current Clutch
- Traction grade gears and pinion



Electrics for Oil Rig Application

- 3 Phase oil rig motor up to 1150HP (Draw works, mud pump, drilling)
- Oil rig ALTERNATOR up to 1750KVA
- DC Oil motor up to 1000HP (Draw works, mud pump, drilling)

TRANSPORTATION EQUIPMENTS

TRANSPORTATION SYSTEM :

- Complete system design capabilities for main line and suburban railways with DC traction motors for Diesel & Electric fed system.
- System Performance calculation, verification & Validation
- Up gradation and addition of new feature in existing Locomotives/DEMUs/EMUs/ MEMUs
- Rehabilitation and up gradation of Old Locomotives/DEMUs/EMUs fitted with BHEL Electrics as well as other make for Railways as well as industry

SYSTEM LEVEL TEST FACILITIES

- Complete combined system test facility of Locomotives/DEMUs/EMUs/MEMUs in off the vehicle mode
- Type test facility for individual transportation equipments
- State of Art 3D-CMM facility for Quality Checks.



3-D CMM – Facility to ensure highly-accurate measurement



Station for type testing of DC electric traction motors up to 800 kW according to the national / International standards

CAPABILITY

1. Complete system design & performance calculation capabilities for DC motor drives.
2. Prototype Commissioning and performance validation in field.
3. Rehabilitation, up-gradation and addition of new feature in old Locomotives/ DEMUs/EMUs fitted with BHEL Electrics as well as other make for Indian Railways as well as non-Railways customers.

APPLICATION

- Mainline AC EMU
- Main line MEMU
- Diesel Electric locomotive upto 4000HP.
- Diesel Electric Multiple Unit upto 2000HP.
- Kolkata Metro and suburban railways

MAJOR PROJECTS COMPLETED BY TRANSPORTATION SYSTEM ENGINEERING:

- System Engineering of 1350-2600 HP Locomotives for Bangladesh Railway, 2300 HP locomotives for Sri Lanka, Mali, Malaysia, Angola and Senegal Railways.
- System Engineering for 1400 HHP DEMU for Sri Lankan Railways.
- System Engineering for 350 HP MG DEMU for Senegal Railways , 350 HP CG DEMU for Angolan Railways.
- System Integration and commissioning of 13 rakes of Kolkata Metro project successfully completed.
- System Engineering for conversion of DC EMU rakes into AC EMU using TM3701 traction motor.

TRANSPORTATION EQUIPMENTS

CENTRE FOR ELECTRIC TRANSPORTATION

FACILITY

1. **Loco Performance Evaluation facility** for testing of Powered Rail Vehicle using three axle dynamometer for all types of track gauges. Each of three drive trains is on a skid having rollers for simulation of continuous rail track connected to 1000 HP DC machines and four quadrant thyristor drive to simulate various powering and braking conditions.
2. **Structural Analysis and testing facility** using servo hydraulic closed loop test system consisting of 250kN servo hydraulic actuator powered by 210 bar, 285 lpm hydraulic power supply. Actuator can provide maximum displacement of ± 75 mm over a range of frequencies.



Performance evaluation test facility

APPLICATION

- Loco performance evaluation.
- Combined system testing of DC / AC traction drives.
- Evaluation of traction motor performance up to 750 kW power and 6000 Nm torque.
- Characterization of performance of power conditioning units like converters, inverters etc.
- Measurement of efficiency, electrical power, power factor, harmonics etc.
- Vibration and Shock test for various traction equipment
- Fatigue test on components and sub-assemblies of traction and road vehicles.



Structural test facility

3. Various Power Sources :

- 0-750V DC, 3x800 Amp
- 0-1500V DC, 2x1200 Amp
- 25 kV AC, single phase, 50 Hz, 4 MVA transformer
- 750/1500 VAC, 3-phase, 50 Hz 4 MV
- 600 VAC, 3-phase, 50 Hz 4 MVA

- For testing of 750V DC traction systems (Metro trains) and equipment.
- For testing of conventional DC EMU trains and equipment.
- For 25kV AC locos, EMUs, MEMUs, Metro trains and equipment.
- For testing of main / auxiliary traction equipment.
- For testing of main / auxiliary traction equipment.
- Temperature rise of DBR, Traction Motor, Alternator etc.

4. Regenerative loading facility

- 3x800 AMP-750 volts with & without DC generator

- For testing of Traction motor in back to back connection and regenerative loading of other traction equipment.

TRANSPORTATION EQUIPMENTS

5. IGBT based AC EMU/DEMU Test Facility

- Max voltage : 3-phase 1400 VAC.
- Max current : 400 Arms.

6. Test facility for Light run of Traction Motor with wheel axle assembly

7. Test Facility for Defense Electrics



Traction motor test facility
through IGBT AC EMU setup

- Type testing of 3-phase AC traction motors upto the available capacity of power converter.

- Backlash measurement of all type of traction motors manufactured by BHEL.

- Checking assembly of motor with wheel axle and run the motor at light load to prevent any assembly or noise related issues.



Traction motor wheeling test facility

MAJOR TESTS CONDUCTED

Major system level testing carried out at CET lab:

- Performance evaluation test on 5000 HP Thyristor Locomotive.
- Combined System Testing on GTO based 3-phase Traction Drive for AC EMU.
- Combined System Testing on GTO based 3-phase Traction Drive for AC/DC EMUs & specialized tests on its individual subsystems such as Traction Transformers, Inductors, Brake Resistors, Cooling systems, Aux inverter, LCD Module, LCD Cubicle, Heat Exchanger Modules, Heat Exchanger Cubicles, etc.
- Combined System Testing on MG DEMU, Specialized tests on Diesel Engine such as cooling proving, Power Pack tests, etc.
- Combined System Testing on CG DEMU Angola with LCC Control.
- Integrated test on IGBT based AC EMU 3-phase traction drive with coach mock-up including driver desk, HT Room etc. Also integrated Type tests on TCMS system & network which include MVB, TCN networks besides other network systems such as CAN 2.0, Ethernet, Wireless network, etc. and integrated type tests on Battery Charger, Auxiliary Inverter, etc.
- Integrated type tests on Traction Power Converters and asynchronous AC traction Motors TM3402BZ.

Major testing of individual equipment carried out at CET labn:

- Design verification and validation testing of 180 KVA auxiliary inverter of WAG-7 locomotive.
- Design verification and validation testing of Dynamic Brake Resister (DBR) of WAG-7 Locomotive including water test and witness by RDSO.
- Design verification and validation testing of Hotel load inverter of 3300 HP DE Locomotive.
- Design verification and validation testing of Roof mounted DBR for WDG2, DE locomotive.
- Design verification testing of Alternator for WDG4 DE locomotive.
- Design verification testing of Alternator for DEMU and Oil rig applications.
- Vibration testing of control equipment of Kolkata Metro project.



Making in India

...Five Decades of Excellence



Bharat Heavy Electricals Limited
Piplani, Bhopal - 462022,
Madhya Pradesh, India
Visit us at : www.bhelbpl.co.in

Bharat Heavy Electricals Limited
BHEL House, Siri Fort,
New Delhi -110049 India
Visit us at : www.bhel.com