



TRANSPORTATION BUSINESS





OUR STORY

BHEL is India's largest engineering and manufacturing enterprise in the energy and infrastructure sectors. Established in 1964, we are a leading power equipment manufacturer globally and one of the earliest and leading contributors towards building an Aatmanirbhar Bharat. We serve our customers with a comprehensive portfolio of products, systems and services to its customers in the areas of Power- Thermal, Hydro, Gas, Nuclear & Solar PV, Transmission, Transportation, Defence & Aerospace, Oil & Gas, and Water.



Right from developing country's power generation capacity to creating multiple capabilities in country's core industrial & strategic sectors, BHEL is deeply aligned to the vision of a self-reliant India.

BHEL is leveraging on its technological capabilities and committed workforce to transform itself. Asserting leadership in core business, diversifying the business mix, cost optimisation, efficiency optimisation & innovative technological solutions are the major enablers driving company's competitiveness in its businesses.

BHEL has a widespread network of:

- ◆ 16 manufacturing plants
- ◆ 2 repair units
- ◆ 4 regional offices
- ◆ 8 service centres
- ◆ 15 regional marketing centres
- ◆ 3 overseas offices and more than 150 project sites
- ◆ Footprints in 86 countries across 6 continents
- ◆ Installed more than 1000 utility sets in Thermal, Hydro, Nuclear & Gas based Power Plants
- ◆ Contributes to 53% of Total Installed Conventional Power Generation Capacity



EMU/MEMU

- ◆ Air-Conditioned AC EMU
- ◆ Non-Airconditioned AC EMU
- ◆ Urban Transportation Systems
 - ◆ Kolkata metro
 - ◆ Train-18
 - ◆ ACMEMU

LOCOMOTIVES

- ◆ Electric Locomotives
- ◆ Diesel-Electric Shunting Locomotives (Up to 3250 HP)
- ◆ Battery Powered Locomotive
- ◆ Regenerative kit

Track Equipments

- ◆ OHE recording-cum-test car
- ◆ Battery Powered Road Vehicles
- ◆ Dynamic Track Stabilizers
- ◆ Rail-cum-road vehicle
- ◆ Diesel Electric Tower Car
- ◆ Utility Vehicle

TRANSPORTATION SYSTEMS

BHOPAL

- ◆ AC Traction Motor
- ◆ DC Traction Motor
- ◆ Traction Alternator /Generator
- ◆ High Horse power motor for 9000HP loco
- ◆ Motor Generator set for auxiliary requirements
- ◆ Auxiliary generator and Exciter
- ◆ Traction Gear and Pinion

TRACTION EQUIPMENT

JHANSI

- ◆ Bogies
- ◆ Traction Transformer
- ◆ Wheel & Axle Assembly
- ◆ Specialised Wagon (Up to 28 Axle, 296 Tonne)

EDN

- ◆ Traction Converter
- ◆ Auxiliary Converter
- ◆ Hotel Load Converter
- ◆ 9000HP converter
- ◆ Composite converter
- ◆ Vehicle Control Electronics
- ◆ Rectifiers & Control Gear equipment for Rolling Stock

OTHER HIGHLIGHTS

- 1 Since 1962, BHEL has been supplying traction equipment to meet the requirements of Indian Railways
- 2 BHEL established dedicated facilities to manufacture Electric locomotives and Diesel Electric Shunters
- 3 BHEL is the lone Indian supplier (outside IR) that manufactures mainline locomotives. Electric Locos supplied to Indian Railways & Diesel Electric Locos supplied to industries
- 4 BHEL has been instrumental in introducing 3 phase technology for Locomotives and EMUs in India
- 5 India's First Air-conditioned IGBT based AC EMU train, equipped with BHEL supplied Electrics and Software, has covered more than 1 Lakh Km in passenger service.
- 6 AC MEMU: BHEL has developed and supplied AC-MEMU with 3-phase electrics to RCF.
- 7 India's first WAG7 Locomotive with Regenerative capability
- 8 9000 HP Electric locomotive developed and running successfully.
- 9 Other Indian Railways, BHEL is the only manufacturer of complete 6000 HP Locomotive (Type- WAG9H).
- 10 BHEL is venturing into underslung 3-phase equipments for Train-18 and Kolkata metro projects.



CENTRES OF EXCELLENCE

Centre of excellence at EDN Bengaluru

For testing of Traction Converter & Inverter.

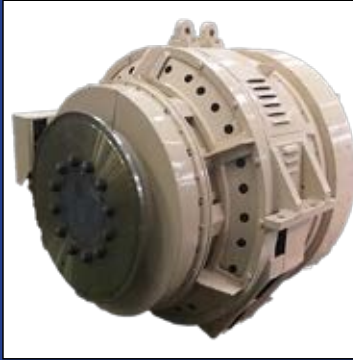
Centre of excellence at Bhopal

IGBT based

Centre for Electric Transportation (CET) at BHEL Bhopal has been set up under UNDP assistance for testing of complete Rolling Stock

Centre of excellence at R&D Hyderabad

For Simulators, Computational Fluid Dynamics, Permanent Magnet Machines, Surface Engineering, Intelligent Machines and Robotics, Machine Dynamics



INSPIRING INNOVATION

AC MEMU

BHEL manufactured 3-phase IGBT based electrics for MEMU with the state of art technology using Ethernet based complete Train Control Management System which provides advance control features.



9000 HP Loco

BHEL has indigenously developed the electric propulsion system for 9000HP locomotive with 9494KVA Transformer and High Horse power motor .



Regenerative kit

Indian Railways' "first" electric locomotive with a regenerative system. BHEL has developed the state-of-the-art regeneration system through in-house R&D efforts for the railway network's fleet of conventional electric locomotives.



WAG7 5000 HP Electric Locomotive

Various variants of BHEL manufactured 25 kV AC Electric Locomotives and 25 kV AC /1500 V DC Dual Voltage Electric Locomotives are in freight and passenger service with Indian Railways.



Air-conditioned ACEMU

India's first fully air-conditioned ACEMU Rake of 12 coaches with vestibule design is equipped with BHEL developed IGBT based propulsion system.



1400 HP diesel Electric Shunting Loco with Air-conditioned cab

BHEL manufactures Diesel Electric Shunting Locomotives in power range of 350-3250 HP for industrial applications such as Power, Steel, Cement, Fertiliser, etc. that are suitable for multiple unit operation.



Hotel Load Converter

BHEL has indigenously developed Hotel Load Converter at its Bengaluru works for passenger trains WAP5/WAP7 Electric Locomotives for CLW, Chittaranjan.



Traction Motors

6FRA6068: Three phase asynchronous motor for 25kV AC Loco 6000HP in WAP-7, WAG-9.

6FXA7059: 1166KW motor are used in 25kV AC 6000HP loco , WAP5

IM4506AZ: Three Phase Traction Motors for 25kV ELECTRIC LOCO 9000HP WAG9 & WAP7 based



TCN Based Vehicle Control Unit

BHEL was first to develop Train Communication Network (TCN) based Vehicle Control Unit for 6000 HP Electric Locomotives for CLW.



Traction Alternator

TA9902AZ Traction Alternator is 3860 kW AC synchronous machine developed by BHEL for application in 5500 HP WDG4/ WDG5 Diesel Electric Locomotives for BLW.

TA9906 and TA9904: BHEL manufactured and exported Traction Alternators of 3000HP and 2300HP respectively.



7775 kVA Traction Transformer

7775 kVA transformer has been indigenously developed with additional capacity for hotel load and inhouse developed aluminium tank application for WAP5/WAP7 locomotives.

6531 kVA transformer with indigenously developed Aluminium and Stainless steel Tank.



PREPARING FOR GROWTH

BHEL has been adept at transforming itself in line with the market requirements throughout its illustrious journey.

Electric Mobility:



BHEL is gearing up for electric vehicles market through in-house development of propulsion equipment and charging infrastructure in line with the Government of India's FAME (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles) Scheme.

Hydrogen fuel cell:



BHEL is gearing itself for providing environmentally friendly solution to Indian Railways through Hydrogen fuel cell technology.

Indigenous Development:



IGBT-based AC-traction control system for 4500 HP Diesel Electric Dual-cab Locomotive is being developed in-house. The 645 kW force cooled IM4508 traction motor for 5500 HP AC-AC WDG5 Locomotive has been developed at our Bhopal Works.

Urban Transportation:



BHEL is augmenting its facilities to cater to the demand for manufacture of High Speeded Trains, Stainless steel coaches for urban transportation, EMU train sets and Ultra High speed Maglev systems, Metro, Metro-neo, Metro-lite and Monorail.

DUAL MODE SHUNTING LOCOMOTIVE (DMSL):



BHEL have geared up for design and manufacture the Dual Mode Shunting Locomotive (DMSL) working both on battery and Electric power to cater the non powered areas also in a single type.



PRODUCT MANUFACTURE

BHEL - Bhopal



6 FRA Motor – 850 kW



3 – Phase AC EMU Motor – 285 kW

Traction Motors

- ◆ 3 Phase Motors for WAG 9 / WAP 5 & WAP 7 Electric Locomotives – 850 kW / 1150 kW
- ◆ 3 Phase Motor for 9000 HP Electric Locomotive – 1192 kW
- ◆ 3 Phase Motors for WDG 5 / WDG 4 / WDP 4 Diesel Electric Locomotives – 645 kW / 425 kW
- ◆ DC Motor for WDG 3 / WDP 3 Diesel Electric Locomotives – 280 kW
- ◆ 3 Phase & DC Motors for EMU's / DEMU's – 285 kW / 265 kW / 177 kW

Traction Alternators (TA)

- ◆ TA9906 and TA9904 Alternator for Diesel electrotors - 3000HP and 2300HP respectively.
- ◆ 3 Phase Alternators for WDG 5 / WDG 4 Diesel electric Locomotives – 3860 kW / 3588 kW
- ◆ Alternators for WDG 3 Diesel electric Locomotives – 4560 kW
- ◆ Alternators for DEMU's – 1320 HP
- ◆ Alternators for Diesel Electric Tower Car (DETC) with Underslung Transmission



TA for WDG 4 – 3860 kW



TA for DEMU – 1320 HP

Rectifiers & Controls

- ◆ Power Rectifiers for entire range of Diesel Rolling Stock
- ◆ Conventional Controls for DEMU's / DETC's / EMU's / MEMU's

Bhopal's Installed Capacity:

- ◆ 3 000 Traction Machines
- ◆ 250 Rectifiers & Controls

BHEL - Jhansi

Complete Locomotives

- WAG 7 (5000HP) 25 kV AC with Regenerative Capability
- Diesel Electric Shunting Locomotives – 350 / 700 & 3250 HP
- 6000 HP (WAG9H) - 25 kV AC

Installed Capacity:

- 75 locomotives & 15 Shunting Locos



WAG9H Locomotive

Transformers

- 3 – Phase Transformers -9035 kVA for 9000 HP
- 3 – Phase Transformers - 6531 kVA / 7775 kVA for Electric Locos
- 3 – Phase Transformers for EMU's – upto 1578 kVA

Installed Capacity:

- 500 Traction Transformers



7775 kVA Transformer

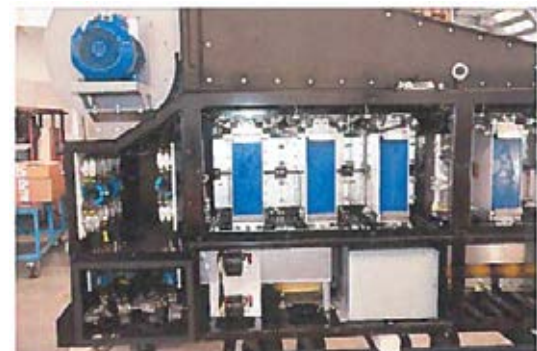
BHEL - Bangalore

Complete IGBT based Propulsion System comprising of

- Traction, Auxiliary Converters & VCU for 6000 HP WAG 9 / WAP 7 & WAP 5 Locomotives
- 9000HP propulsion equipments
- **Hotel Load Converter**
- Traction, Auxiliary Converters & VCU for ACEMU/MEMU

EDN Bangalore Installed capacity:

- 450 - 500 sets of Propulsion System
- 250 - 300 sets of Hotel Load Converters



IGBT Traction Converter



Vehicle Control Unit

IGBT Auxiliary Converter





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