TECHNOLOGY DEVELOPMENT

Towards Self Reliance

By

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Director (M&C)

BEML Limited
BEML - Largest manufacturer of Mining Equipment in India
BEML Limited - Largest manufacturer of Mining Equipment in India
MINING MACHINERY VERTICAL

EQPT SUPPLY & MAINTENANCE

MARC, GPCC
COST CAP
SERVICE CENTRES
REGIONAL / DISTRICT OFFICES
PARTS DEPOTS

BEML - Largest manufacturer of Mining Equipment in India
R & D CENTRE - KGF

POWERLINE LABORATORY

STRUCTURAL ENGINEERING LABORATORY

FLUID POWER LABORATORY

MATERIAL SCIENCE LABORATORY

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TRANSMISSION – NEW DEVELOPMENTS

**DUMPER TRANSMISSIONS**

- 1200 HP - 7F / 2R
- 630 HP - 6F / 1R
- 430 HP - 7F / 1R

**DOZER TRANSMISSIONS**

- 320 HP - 3F / 3R
- 410 HP - 4F / 4R

**AT-GEMS - Powershift Transmission**
(Automatic Transmission with Generic Electronic clutch Modulation System)

**Benefits**
- Better operator comforts due to low inter gear ratio and smooth gear shifting.
- Inbuilt self diagnostics system along with safety interlocks
- Enhanced Transmission life.

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AXLES – NEW DEVELOPMENTS

100 TON DUMPER – MODULAR REAR AXLE

150 TON DUMPER – FRONT AXLE

205 TON DUMPER – FRONT AXLE

SALIENT FEATURES:

- BOLT ON TYPE DESIGN
- INTEGRAL SERVICE CUM PARKING BRAKE
- ANTI-LOCK BRAKING SYSTEM / ANTI-SPIN REGULATION

- HYDRAULICALLY ACTUATED CALIPER DISC BRAKE
- ANTI-LOCK BRAKING SYSTEM

BEML - Largest manufacturer of Mining Equipment in India
Technology Developed

High Capacity Eqpt Ready for Deployment in Coal Mines
FACE SHOVEL
Gross HP: 2 x 300 kw@1500 rpm
Operating Mass: 175000 kg
Bucket Capacity: 7.5 – 12.0 m³

BACKHOE
Gross HP: 2 x 300 kw@1500 rpm
Operating Mass: 170000 kg
Bucket Capacity: 8.0 – 12.0 m³
<table>
<thead>
<tr>
<th>PROTECTIVE DEVICE</th>
<th>PROTECTION</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EARTH LEAKAGE RELAY</td>
<td>PROVIDES PROTECTION TO HUMAN AND MACHINE AGAINST EARTH LEAKAGE</td>
<td></td>
</tr>
<tr>
<td>NEGATIVE SEQUENCE RELAY</td>
<td>PREVENTS MOTOR FROM ROTATING IN OPPOSITE DIRECTION.</td>
<td></td>
</tr>
<tr>
<td>MOTOR PROTECTION RELAY</td>
<td>PROTECTION FROM OVER LOAD, ROTOR STALL, PROLONGED START, TOO MANY STARTS PER HOUR, PHASE UNBALANCE</td>
<td></td>
</tr>
<tr>
<td>HT HRC FUSE FOR MOTOR</td>
<td>PROTECTS SYSTEM FROM SHORT CIRCUIT AND OVER LOAD</td>
<td></td>
</tr>
<tr>
<td>PLC (PROGRAMMABLE LOGICAL CONTROLLER)</td>
<td>PROVIDES PROTECTION AGAINST i) MOTOR WINDING OVER TEMPERATURE ii) MOTOR BEARINGS OVER TEMPERATURE iii) PTO OIL OVER TEMPERATURE iv) HYDRAULIC OIL OVER TEMPERATURE v) LOW HYDRAULIC OIL LEVEL vi) HYDRAULIC OIL STOP VALVE CLOSE MOTOR TRIPS FOR ALL THE ABOVE ABNORMALITIES</td>
<td></td>
</tr>
<tr>
<td>EMERGENCY TRIP BUTTON</td>
<td>AN EMERGENCY PUSH BUTTON PROVIDED IN OPERATOR CABIN ENABLES THE TRIPPING OF FIELD SWITCH VCB IN CASE OF EMERGENCY</td>
<td></td>
</tr>
<tr>
<td>ELCB (EARTH LEAKAGE CIRCUIT BREAKER)</td>
<td>PROTECTS LIGHTING CIRCUIT FROM EARTH LEAKAGE</td>
<td></td>
</tr>
</tbody>
</table>
BE1800E IN OPERATION AT M/s SCCL
35 Ton ~ 205 Ton DUMP TRUCKS for MINING SECTOR

BH35-2
BH60M
BH100
BH150E
BH205E

BEML - Largest manufacturer of Mining Equipment in India
35 Ton ~ 205 Ton DUMP TRUCKS
for MINING SECTOR

BEML - Largest manufacturer of Mining Equipment in India
BH150E AC DRIVE REAR DUMP TRUCK

Salient Features:

- High power Cummins QSK 50 C diesel engine (1398 kW) in combination with proven AC Drive system of GE.
- Maximum payload: 136 MT (150 US Ton), Capacity: 82 cu.m. (SAE 2:1 heaped)
- High power-to-weight ratio gives ample reserve power for increased engine life.
- Diesel electric power module (AC drive system) with few wear parts guarantees high reliability.
- Built in safety features like ROPS Cabin, Emergency power steering, Electrical dynamic retarding and all hydraulic brake system.

Electrical drive dump truck designed & developed First time in INDIA
BH205E (205 US TON) WITH AC ELECTRIC DRIVE

Salient Features:

- High power MTU/ CUMMINS diesel engine (1716 kW) in combination with proven AC Drive system of GE.
- Maximum payload: 186 MT (205 US Ton), Capacity: 111 cu.m. (SAE 2:1 heaped)
- High power-to-weight ratio gives ample reserve power for increased engine life.
- Diesel electric power module (AC drive system) with few wear parts guarantees high reliability.
- Built in safety features like ROPS Cabin, Emergency power steering, Electrical dynamic retarding and all hydraulic brake system.
- Specifications and features ensure best safety and maximum operator comfort.
BH205E Roll out

A PROUD moment for an Indian OEM

BEML - Largest manufacturer of Mining Equipment in India
LEARNINGS FROM BH150E & BH205E ELECTRIC DUMPER PROJECTS

- DESIGN METHODOLOGY
  - POWER TRAIN OPTIMISATION – POWER, SIZE AND WEIGHT
  - SPACE CLAIM
  - KINEMATIC ANALYSIS
  - DESIGN ANALYSIS OF STRUCTURES (MAIN FRAME, FRONT AXLE, REAR AXLE, LINKS, BODY & SUB FRAME) AT ALL OPERATING CONDITIONS
  - HYDRAULIC CIRCUIT DESIGN AND OPTIMISATION
  - CFD ANALYSIS FOR FLOW PATH OPTIMISATION IN COOLING DUCTS
  - CFD ANALYSIS AND OPTIMISATION OF EXHAUST GAS FLOW THRU DUMPER BODY
  - ROPS AND FOPS ANALYSIS OF CABIN IN LINE WITH ISO STANDARDS

- LEVERAGED FOR
  - UPGRADATION & OPTIMISATION OF DESIGNS OF CURRENT DUMPER MODELS

BEML - Largest manufacturer of Mining Equipment in India
FORAY INTO UNDERGROUND MINING EQUIPMENT
LOW HEIGHT SIDE DISCHARGE LOADER

Bucket Capacity : 1.1 cu m (SAE RATED) with side discharge mechanism
Operating Mass : 10,300 kg
Prime Mover : 3 Phase FLP Induction Motor 48kW / 55 kW
BUCKET CAPACITY : 1.5 cu m (SAE RATED) Push Plate Bucket
OPERATING MASS : 8,600 kg
RATED POWER : 37 kW, 3 Phase FLP Induction Motor
FORAY INTO UNDERGROUND MINING EQUIPMENT
DIESEL OPERATED MINE CRUISER

16 MEN MINE CRUISER

- Used for transportation of Men and Material in underground coal Mines
- Flame Proof Certification as per SANS 868 PART – 1 & PART 1 - 1,2,3
- PRIME MOVER: 63 kW Flame Proof / Explosion protected Diesel Engine
- DRIVE: Hydrostatic
- STEERING: 4x4 with Emergency Steering
- BRAKING SYSTEM: Wet Multiple Disc Brakes on both axles as Service Brake
- CANOPY: FOPS

BEML - Largest manufacturer of Mining Equipment in India
AFTER-SALES-SERVICE
BEML - Largest manufacturer of Mining Equipment in India

Corporate Office, International Business Division

- Manufacturing Plants (4)
- Regional Offices (12)
- District Offices (18)
- Activity Centres (5)
- Service Centres (5)
- Global Service HQ

- Engineers at Pit Head
- Mother depots at KGF, Mysore
- Parts Depot at Regional and District Offices
- Service Centres at Bilaspur, Kolkata, Singrauli, Hyderabad & New Delhi
<table>
<thead>
<tr>
<th>SLNO</th>
<th>COAL CO</th>
<th>REGIONAL OFFICE</th>
<th>DISTRICT OFFICE</th>
<th>CONSIGNMENT STORE</th>
<th>SERVICE CENTRE</th>
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<tbody>
<tr>
<td>1</td>
<td>NCL</td>
<td>SINGRAULI with Parts Depot</td>
<td></td>
<td></td>
<td>SINGRAULI</td>
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<tr>
<td>2</td>
<td>SECL</td>
<td>BILASPUR with Parts Depot</td>
<td></td>
<td></td>
<td>BILASPUR</td>
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<tr>
<td>3</td>
<td>WCL</td>
<td>NAGPUR</td>
<td>CHANDRAPUR with Parts Depot</td>
<td>NAGPUR SER-HQ</td>
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<tr>
<td>4</td>
<td>MCL</td>
<td>SAMBALPUR with Parts Depot</td>
<td></td>
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<td>BILASPUR</td>
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<tr>
<td>5</td>
<td>CCL</td>
<td>RANCHI with Parts Depot</td>
<td></td>
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<tr>
<td>6</td>
<td>BCCL</td>
<td>Dhanbad with Parts Depot</td>
<td></td>
<td></td>
<td>KOLKATA</td>
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<tr>
<td>7</td>
<td>ECL</td>
<td>KOLKATA</td>
<td>ASANSOL with Parts Depot</td>
<td>RAJMAHAL</td>
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<tr>
<td>8</td>
<td>SCCL</td>
<td>HYDERABAD</td>
<td>Kothagudem Ramagundam</td>
<td>HYDERABAD</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>NLC</td>
<td>CHENNAI</td>
<td>NEYVELI</td>
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</table>
Total: 4740 equipment
Technology Development through Joint Working
## BH240E AC ELECTRIC DRIVE

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameter</th>
<th>AC Drive</th>
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<tbody>
<tr>
<td>1</td>
<td>Payload</td>
<td>240 US ST</td>
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<tr>
<td>2</td>
<td>Engine</td>
<td>QSK60 / 16V2000</td>
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<tr>
<td>3</td>
<td>Power kW (hp)</td>
<td>1865 (2500)</td>
</tr>
<tr>
<td>4</td>
<td>Wheel Base</td>
<td>6.1 meter</td>
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<tr>
<td>5</td>
<td>Front TRACK</td>
<td>5.77meter</td>
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<tr>
<td>6</td>
<td>GVW</td>
<td>382.2</td>
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<tr>
<td>7</td>
<td>FRONT AXLE / REAR AXLE</td>
<td>126.13 / 256.07</td>
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<tr>
<td>8</td>
<td>NVW</td>
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<tr>
<td>9</td>
<td>FRONT AXLE / REAR AXLE</td>
<td>73.9 / 90.3</td>
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<tr>
<td>10</td>
<td>Maximum Speed</td>
<td>64kmph</td>
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<tr>
<td></td>
<td>Drive line</td>
<td>GE/SIEMENS</td>
</tr>
<tr>
<td>11</td>
<td>BODY Volume</td>
<td>Struck (cum) / Heaped 2:1(cum)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>117 / 147</td>
</tr>
</tbody>
</table>

BEML - Largest manufacturer of Mining Equipment in India
10.5 cu m ELECTRIC ROPE SHOVEL

HOIST MACHINERY
SWING MACHINERY
CROWD MACHINERY
PROPEL MACHINERY
DRIVE MOTORS
MOTOR GENERATOR SET (FOR D.C ONLY)
MOTOR CONTROL CENTER
HT CABINET & DRIVE PANELS
TRANSFORMERS
ELECTRICALS (Reputed make)

MACHINERY ASSEMBLIES (IN-HOUSE / OUTSOURCED)

BEML - Largest manufacturer of Mining Equipment in India
10.5 cu m ROPE SHOVEL DECK PLANS

DC System

AC System

BEML - Largest manufacturer of Mining Equipment in India
Benefits to Mining Industry:

- High productivity
- Low cost of operation and maintenance
- Easy availability of spare parts
- Lower cost per ton
- 24x7 After-Sales-Service support at Mines / pit heads

Benefits to Country:

- Self Reliance to meet Country’s needs
- Development of indigenous technology
- Savings in FE outgo
- Low product cost with higher reliability
BEML’s PLANS & PRIORITIES

SUPPORT COAL Cos TO ACHIEVE
1 BILLION TONNE COAL PRODUCTION

BY
2019-20
READINESS FOR EQUIPMENT SUPPLY

1. CONTINUE EQPT SUPPLY ORDERED ON BEML ON FAST TRACK BASIS.

2. OFFER INDIGENOUSLY DEVELOPED HIGH CAPACITY EQPT ON TRIAL CUM SALE BASIS FOR IMMEDIATE DEPLOYMENT AT COAL COs.
   - Elec DUMP TRUCK – MODEL BH150E.
   - Elec DUMP TRUCK – MODEL BH205E.
   - Elec Hyd EXCAVATOR – MODEL BE1800E.

3. TAKE UP TIME BOUND DEVELOPMENT OF EQPT THRU JOINT WORKING ROUTE
   - 240T ELECTRIC DUMP TRUCK
   - 10.2 ~ 10.5 cu m ELECTRIC ROPE SHOVEL.
READINESS FOR AFTER-SALES-SERVICE

1. ESTABLISHED SPARE PARTS DEPOS AT 9 REGIONAL OFFICES & 5 DISTRICT OFFICES SITUATED AT COAL COs. FOR AFTER-SALES-SERVICE.
   - WILL BE FURTHER STRENGTHENED DEPENDING ON EQPT POPULATION.

2. SIGNED “MODEL DEPOT AGREEMENT” WITH M/s. NCL, SINGRAULI (NODAL Co. FOR BEML) WITH ADVANCE ANNUAL PROJECTION BY COAL COs. FOR FASTER DELIVERY OF GENUINE SPARE PARTS FROM BEML DEPOTS.
   - ADVANCE PROJECTIONS HELP OEMs FOR IMPROVED SPARE PARTS MGMT.

3. STOCKED GENUINE SPARES WORTH Rs.558 Crs AT 2 MOTHER DEPOTS & 7 REGIONAL DEPOTS SPREAD ACROSS THE COUNTRY TO SUPPORT SPARES REQUIREMENT OF COAL Cos – COAL Cos DERIVE THE ADVANTAGES OFFERED BY DEPOTS.
READINESS – AFTER-SALES-SERVICE

4. BEML HAS 4 SERVICE CENTRES WITH SERVICE HQ AT NAGPUR

   a. UNIT / RE-CON EXCHANGE SCHEMES FOR ASSYS / SUB ASSYS FOR RELIABILITY ENHANCEMENT.
   b. MIDLIFE OVERHAUL / REHABILATATION PROGRAM FOR EQUIPMENT LIFE EXTENTION.
      - COAL Cos CAN GAINFULLY UTILISE THE SAME.

5. BEML OFFERING MARC / GPCC / COST CAP CONTRACTS FOR HIGHER OUTPUT – BEML IS GEARING ITSELF TO TAKE UP MORE EQPT UNDER THESE CONTRACTS.
      - COAL Cos CAN CONCENTRATE ON THEIR CORE STRENGTHS.

6. TRAINING CENTRES ESTABLISHED AT NAGPUR, K.G.F & MYSORE. DRAWN PLANS TO IMPART FOCUSED TRAINING TO O & M STAFF OF COAL COs. IN THEIR RESPECTIVE FIELDS
      - COMPETENCY BUILDING FOR FIELD STAFF INTURN HIGHER OUTPUT.
Mission 1 Billion Tons’’

Coal Production

1 BILLION TON

2019-20

462 MILLION TON

2013-14

BEML - Largest manufacturer of Mining Equipment in India
Thank You