A GLIMPSE OF BHEL

Bharat Heavy Electricals Limited (BHEL) is today the largest engineering and manufacturing enterprise of its kind in India. BHEL has a wide range of products of Thermal, Hydro and Nuclear power stations, Transmission, Transportation, Oil & Gas and Non-Conventional Energy.

Ranked among the top 12 manufacturers of power generating equipment in the world, BHEL has spread its operations over a vast network of 14 manufacturing units, with ISO 9001 certification of BVQI, besides a number of service divisions across the country, each striving for excellence in products, performance and service.

To meet stakeholders’ expectations, BHEL lays great emphasis on the continuous up gradation of products and related technologies and development of new products so as to remain competitive & future ready. The company has upgraded its products to contemporary levels through continuous in—house efforts as well as through acquisition of new technologies from leading engineering organizations of the world.

FEATURES

BHEL manufactures a complete range of Bowl Mill (Pulveriser) for all supercritical & non supercritical thermal power plant applications. Pulverisers are one of the major auxiliaries in a coal fired thermal power station. They are used for grinding the raw coal, so that the pulverised product at desired fineness can fed to and directly fired in the furnace of the steam generator. Currently, BHEL has entered into a License & Technical Assistance Agreement with M/s Alstom – France for the supply of HP pulverisers being applied in supercritical applications in India. Bowl Mill has long been recognized as the most advantageous design of the coal pulverisers and include low initial cost, low maintenance cost, removal of tramp iron, low power consumption, easy maintenance, wide range output, quiet operation.

The basic features of Bowl Mill (Pulveriser) supplied by BHEL are:

- Medium speed range of 40 to 60 rpm.
- Motor speed range of 600 to 1000 rpm.
- Speed reduction by two method :
  1) single stage worm & worm wheel set
  2)Planetary Gear Box
• Input coal size is 25 mm while output is 65-75 micron.
• Crushing of coal by replaceable bull ring segment and grinding rolls.
• Externally adjustable classifier for segregation of fine coal practices.
• Removable planetary gearbox
• External journal design
• Horizontal pivot scrapers
• Aerodynamic vane wheel
• Extended life of all wearing parts
• Optimized static or Dynamic classifiers
• Simplified design
• Ease of maintenance and construction
• Low operating and maintenance cost

Applications

Bowl Mills are used in:

• Thermal power plants
• Cement Companies
• Steel Plants
PRINCIPLE OF OPERATION

Raw coal coming from feeder gets ground between the grinding rolls and bull ring segments installed on the revolving Bowl. Bowl is made to rotate at medium speed for proper pulverization of coal. Springs exert necessary pressure on rolls for grinding. Hot air through the mill besides removing coal moisture, picks up the lighter particles and takes them through the classifier and drop down the higher size particles for further grinding. Fine coal air mixture leaves the mill and enters the fuel piping system. Tramp iron pieces which are not required to grind, leave the Bowl due to centrifugal force and are removed through the reject removal system.

Bowl Mill Nomenclature / Designation

Suction type mills are designated as XRS whereas pressurized mills as XRP and HP.

The nomenclature of each letter is as follows:

X - Frequency of power supply (50 cycles/sec)

R - Raymond, the inventor of bowl mills.

S - Suction type with exhauster coming after the mill

P - Pressurized type, with primary air fan coming before the mill

H - High Performance mills
Present Manufacturing Range:

<table>
<thead>
<tr>
<th>Mill Type</th>
<th>Base Capacity (T/HR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>583 XRS</td>
<td>15</td>
</tr>
<tr>
<td>603 XRS/XRP</td>
<td>16.7</td>
</tr>
<tr>
<td>623 XRP</td>
<td>18.4</td>
</tr>
<tr>
<td>703 XRP/HP</td>
<td>26.4</td>
</tr>
<tr>
<td>763 XRP</td>
<td>33.8</td>
</tr>
<tr>
<td>783 XRP</td>
<td>36.5</td>
</tr>
<tr>
<td>803 XRP/HP</td>
<td>39.8</td>
</tr>
<tr>
<td>883 XRP</td>
<td>51.1</td>
</tr>
<tr>
<td>903 XRP</td>
<td>54.1</td>
</tr>
<tr>
<td>1003 XRP</td>
<td>68.1</td>
</tr>
<tr>
<td>1043 XRP</td>
<td>72.0</td>
</tr>
<tr>
<td>1103 HP – Static</td>
<td>Can be provided on request</td>
</tr>
<tr>
<td>1103 HP – Dynamic</td>
<td>Can be provided on request</td>
</tr>
<tr>
<td>1203 HP – Static</td>
<td>Can be provided on request</td>
</tr>
<tr>
<td>1203 HP – Dynamic</td>
<td>Can be provided on request</td>
</tr>
</tbody>
</table>

*Indicated base capacities (T/Hr) are for coal of 55 grindability index. 10% of total moisture and output fineness 70% thru 200 mesh.

*For HP models mills for static and dynamic, capacity will be decided based on specific customer request. All figures and sketches are as per our collaborator practices.
MAJOR ASSEMBLIES AND CRITICAL COMPONENTS
PGB Assembly is lightweight and independent design, easy removable unit in the bowl mill without disturbing the upper mill section. The Gear box unit is stronger the worm shaft gear drive unit. Planetary gear box Assembly is a tremendous advancement in Bowl mill to reduce the speed of mill motor. Internally, there is a spiral Bevel and a Planetary Gear Stage to reduce the mill motor speed. The planetary stage consists “Sun” and three revolving “Planet”.

Introduction of PGB unit enhances the Service Life and reduces maintenance time.
Static classifiers are double cone type with external, manually adjustable fineness control. Design optimization of the HP mill static classifier has focused on efficient separation with minimized wear and pressure loss. Classifier outlet configurations are designed to achieve acceptable product distribution with minimized wear rates to fit customer needs.

As a result of these improvements, minimal liners are required in the mill outlet section for typical coals. Liners are available for very abrasive coals. Static classifiers are typically used when firing conditions do not require high fineness levels.
Milling systems has optimized the application of Dynamic classification technology to bowl mills in the power generation industry.
The Ball Tube Mill is basically horizontal cylindrical tube rotating at low speed on its axis, whose length is slightly more to its diameter. The inside of the Cylinder shell is fitted with heavy cast liners and is filled with cast or forged balls for grinding, to approximately 1/3 of the diameter. Advantages of Ball tube mills include high availability, low maintenance, constant capacity and fineness, hard and abrasive fuels ground efficiently, large reserve capacity, increased fineness at low loads, fast response of over range, low air to coal ratio, ability to pulverise a wide range of coals, virtually unaffected by foreign material flexibility of available capacity.
Features

- Horizontal type slow speed in the range of 13-20 rpm.
- Pulverisation of coal by attrition and by impact of hard balls
- Speed reduction achieved by gear train consisting of reduction gear box and large spur gear.
- Coal can be fed and removed from both sides of the mill.
- Half mill operation for partial loads allowed.
- Input coal size 25 mm white output is 70 to 90 microns
- Very high coal fineness achievable.

Present Manufacture Range of Tube Mills

<table>
<thead>
<tr>
<th>Mill Type</th>
<th>Size(Metres)</th>
<th>Ball Range(Tons)</th>
<th>Charge Nominal * Capacity(T/HR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBD 3448</td>
<td>3.4X4.8L</td>
<td>30-40</td>
<td>30.5</td>
</tr>
<tr>
<td>BBD 4760</td>
<td>4.7X6.0L</td>
<td>70-90</td>
<td>79.0</td>
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<tr>
<td>BBD 4772</td>
<td>4.7X7.2L</td>
<td>80-110</td>
<td>99.0</td>
</tr>
</tbody>
</table>

*At following parameters:

1) Maximum ball charge
2) HGI : 50
3) Fineness : 70% through 200 mesh
4) Total Moisture : 10%

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