The Design Plan of Biomass Briquette Production Line with Annual Capacity of 30,000t

Keywords
biomass fuel, biomass fuel production line, biomass briquette, briquetting machine, how to make briquettes, charcoal briquette machine, briquette press, briquette plant design

Abstract
Biomass briquette, a new kind of clean and Eco-friendly fuel energy as substitute for fossil fuels, is favored by more and more people. It is feasible investment to start biomass fuel production line with annual capacity of 30,000t, which can bring you great profit. With years of experience and advanced technology, we are glad to offer customers detailed introduction for building and operating the production line.

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I. The design plan of biomass fuel production line
Biomass briquette fuel is modern clean fuel which is compressed by special equipments in new technology with raw materials like crop straw, peanut shells, sawdust, rice husk, straw, wood chips, tree branches and leaves, hay, organic household waste and so on. This biomass fuel can not only solve basic life energy problem in rural areas, but also replace coal to be used in the traditional coal-fired boiler equipments in urban areas.

Biomass fuel project with annual capacity of 200,000t can reduce 337,000t CO2 emission, 2,280t SO2 emission to protect the environment. Moreover, raw materials of biomass fuel are mainly agricultural wastes which are unlimited materials with wide distribution and low cost. So producing biomass fuel is the typical circular economy project.

1. The overview of overall production design
For biomass fuel with annual output of 30,000t, 9.5t biomass fuel per hour, 10 working hours per day and 330 working days in one year just can meet the production demand. The production efficiency of one biomass briquetting machine is 1.2-1.5t/h, and thus 5 biomass briquetting machines should be employed in this production line (note: 4 machines in operation and 1 machine in resting state). One machine is used as the stand-by machine. If other machines fail to work, it can be applied into the production to ensure the requested work in every day can be finished. The size and quantity of other equipments in the production line should be designed based on this kind of production.

2. Design Scale
The factory area is 4800㎡ including crushing shop of 1000㎡, workshop of 2800㎡, final product warehouse of 1000㎡.

3. Plan layout
The whole production line is arranged in the east-west direction, which mainly includes three parts: crushing shop, workshop and final product warehouse. In the case of meeting production requirements, the whole production line should be tidy and concentrated with compact equipment structure. Meanwhile, there should be safe space to ensure equipment maintenance and smooth secure channel.
4. Design principles and standards
a. Adopting reliable and mature processing technology and advanced technique to lower operation cost.
b. The whole production line should be easy to operate. Especially notice that drying machines you chose should be with less selection operation, high automation and reliable operation.
c. Briquetting machines and the bunker should be designed in stereo space to reduce floor space and the project investment.

II. The instruction of equipment selection

III. The biomass fuel production process with annual capacity of 30,000t
The automatic production line can concertedly finish the complete process from raw material collection & crushing to the final product package under the instruction of Central Control System.

1. Biomass gasification
Biomass gasification process is the conversion of solid biomass fuels into a high calorific product gas by the method of pyrolysis and thermal chemical oxidation. This gas also named biomass gas is the mixed gas including hydrogen (H₂), carbon monoxide (CO), methane (CH₄) and etc.

2. Material crushing
Collected materials first are crushed by crushing machine. Then the large particles are grinded into 30-50mm, which is beneficial to compress materials into briquettes. (This procedure can be operated based on customers' demands.)

3. Material drying and blending
Crushed materials are separately delivered by 4 screw conveyors into 4 drying machines. These dryers can lower material moisture content to 15%-20% to prepare for briquetting. 4 drying machines respectively get heat source from biomass gas provided by 2 gasifiers. The heat source can go into dryers through the hot stove. In dryers, once moisture content of materials meet the requirements, they will fall into the blender. After materials are evenly mixed, they will go into briquetting chamber through the screw conveyor. Fumes in dryers are purified through cyclone dust collector and then go into induced draft fan to be drained.

4. Briquetting
Every bunker can provide 6 briquetting machines enough materials by screw conveyors. 6 briquetting machines should be placed in east and west sides of electric motors.

5. Final product collection, cooling and package
After briquetting, biomass briquettes through horizontal belt conveyors and then oblique belt conveyors are delivered into the cooling machine for cooling down to the temperature that meets packaging requirements. Then, by the bucket elevator final products go into the packing machine for package. At last, it is the palletizing machine to get packaged final products into the
IV. Electronic, instrument, automatic controlling system

1. Overview of the system

This system is a set of mature and economical equipments. The electronic control system is controlled by PLC. Based on the electric current of main motor in briquetting machines, you can adjust the feeding speed to make briquetting in the optimum production. The automatic control system includes drying moisture detection, bunker material level detection, molding temperature indicator and so on.

2. Design basis

- The instrument is the safe, reliable and economical product.
- Cables with casing are buried in the underground.
- The controlling form adopts centralized control and local operating.

3. Automatic control

According to the electric current of main motor in briquetting machines, you can adjust feeding speed to make briquetting in the optimum production.

V. Worker staffing

Due to the high mechanization, worker staffing can adopt three shifts. The detailed worker staffing is as follows.

<table>
<thead>
<tr>
<th>Work</th>
<th>Shift</th>
<th>Workers per shift</th>
<th>Worker number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulldozer</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Gasifier and Drying machine</td>
<td>3</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Blender</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Biomass briquetting machine</td>
<td>2</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Package</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Palletizer</td>
<td>2</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Mechanical worker</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Supervisor</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Fire fighting</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>38</td>
</tr>
</tbody>
</table>

Note: The worker staffing can be appropriately adjusted according to workers' ability and other requirements.
VI. Quality and after-sale service
1. Assurance measures for quality and safe
   1.1 Quality assurance for equipment processing and purchased parts
   a. For processing machine, production leader, designer and quality director are all responsible for supervision and inspection of the manufacturing. After finishing machine manufacturing, factory inspectors should do a comprehensive inspection of products. Qualified products allow ex-factory.
   b. Purchased parts are all from manufacturers with strict quality assurance system.
   1.2. Quality assurance for non-standard parts and installation quality
   a. Material control: for the purchase of applied materials, electrode and etc., there must be factory certification and material inspection sheet to ensure the quality of materials.
   b. Quality director and installation leader should be responsible for the quality and installation of non-standard parts, and also keep regular supervision and inspection.

2. Measures of security assurances
2.1. One professional and responsible safe inspector should specialize in the whole production line.
2.2 Equipped with right quantity of fire extinguishers. The safe inspector is also responsible for the distribution and check of fire extinguishers.
2.3. There should be 2 small fire fighting trucks: one for the material site and the other for the workshop.

3. Security assurance for equipment operation and coordination of ancillary device
3.1. Equipments that pass machine inspection and machine tests can leave the factory.
3.2. Equipments that need to be installed should pass field tests, then can be installed.

4. Service commitment
4.1. Properties of goods should be in accord with what introduced in the contract. Ensure that machines can work properly after installation and debugging.
4.2. Starting from the date of buyer's acceptance of products, "Three Guarantees" for product quality in one year (except for wearing part and human factors).
4.3 Provide customers with theoretical and practical training to master equipment operation and obtain ability on solving injury accidents.

VII. Fireproofing and fire-fighting measures in the production line
In order to ensure production & personal security and prevent fire accidents in crushing place, production line and bunker, there are effective fire prevention measures for different production places.
1. Fireproofing and fire-fighting measures for production line
   1.1. This production plant is inflammable place. For safe production, production design, installation and acceptance tests should follow there requirements:
   1.2. Each floor should be equipped with fire extinguishers.
   1.3. Strict regulations against fire.
   1.4. The grounding resistor≤4Ω

VIII Environment protection
1. The source of noise

<table>
<thead>
<tr>
<th>Machine</th>
<th>Noise(db)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomass briquetting machine</td>
<td>≤95</td>
</tr>
<tr>
<td>Induced draft Fan</td>
<td>≤90</td>
</tr>
<tr>
<td>Dry machine</td>
<td>≤70</td>
</tr>
</tbody>
</table>

2. Noise control
3. **Treat noise**
The induced draft fan is equipped with reducing noise device to reduce the noise to below 80 db.