APPENDIX H

DESIGN DETAILS OF SCREW FEEDER

The screw feeder used in the investigation was designed with reference to the Engineering Guide Sc-868 of Thomas Conveyor Company, Fortworth, Texas, U.S.A.

DATA

<table>
<thead>
<tr>
<th>Material</th>
<th>Bitumenous coal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particle size</td>
<td>1/4 inch to 0</td>
</tr>
<tr>
<td>Bulk density</td>
<td>50 pounds/cft</td>
</tr>
<tr>
<td>Capacity</td>
<td>400 pounds/hr</td>
</tr>
<tr>
<td>Length</td>
<td>3 feet</td>
</tr>
<tr>
<td>Service</td>
<td>24 hours/day</td>
</tr>
<tr>
<td></td>
<td>365 days/year</td>
</tr>
</tbody>
</table>

DESIGN

A. CONVEYOR SIZE SELECTION

1. From materials table, Page 7, recommended conveyor loading was 30% and material characteristics did not present any undue problem in this installation.

2. From capacity tables in Page 12, for a conveyor loaded at 30%, the following values are obtained.

   | Screw diameter     | 4 inches |
   | Maximum lump size  | 5/8 inch |
   | Capacity at 1 rpm  | 0.41 cft/hr |
   | Capacity at maximum rpm | 53 cft/hr |
   | Maximum economical speed | 130 rpm |
As the particle size conveyed is smaller, the selected conveyor would be adequate.

3. Speed of conveyor
   
   \[
   \text{Speed of conveyor} = \frac{\text{Volumetric capacity/hr}}{\text{Volumetric capacity/rpm}}
   \]

   Where,
   
   \[
   \text{Volumetric capacity} = \frac{\text{Capacity in lbs/hr}}{\text{Bulk density in lbs/cft}}
   \]

   \[
   = \frac{400}{50} = 8 \text{ cft/hr}
   \]

   So, speed of conveyor \( \frac{8}{0.41} = 19.1 \)

   ie. 20 rpm

4. As the capacity and speed tables were based on standard pitch conveyors, a single flight standard pitch conveyor was adopted.

   So, pitch = diameter = 4 inches

5. To prevent leakage of material, a tubular conveyor housing was adopted. The feed screw was of a ribbon type.

**B. COMPONENT DESIGN**

From Page 27, the following component specifications were selected.

- Hanger bearings: Bronze
- Coupling shafts: Standard steel
- Screw diameter: 4 inch.
C. HORSE POWER REQUIREMENT

The conveyor friction horse power,

\[ h.p_f = \frac{L_c S_c F_F F_b}{1,000,000} \]

Where

- \( L_c \) = Total length of conveyor in feet
- \( S_c \) = Speed of conveyor in rpm
- \( F_F \) = Conveyor diameter factor
- \( F_b \) = Hanger bearing type factor

From Page 17, for a 4" diameter conveyor, \( F_F = 12 \) and for bronze bearing, \( F_b = 1.7 \)

So,

\[ h.p_f = \frac{(3)(20)(12)(1.7)}{1,000,000} = 0.001224 \]

Conveyed material horse power

\[ h.p_m = \frac{C_w F_m F_m}{1,000,000} \]

Where

- \( C_w \) = Conveyor capacity in lbs/hr
- \( F_m \) = Material h.p. factor

From Page 7, \( F_m = 1 \)

So,

\[ h.p_m = \frac{400 \times 3 \times 1}{1,000,000} = 0.0012 \]

Conveyor total

\[ h.p. = h.p_f + h.p_m = 0.001224 + 0.0012 = 0.002424 \]
As the electric motor had to supply the frictional losses in the reduction gear unit also, a motor rated at 0.5 h.p. was used.