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TITLE : HAMMER - MILL

AIM & OBJECTIVE :

To study the operation of Hammer-Mill and determine the Power consumption for crushing a material of known W_i..

THEORY :

Hammer - Mills are operated at high-speeds for pulverizing and disintegration. The rotor shaft may be vertical or horizontal. The rotor runs in a housing containing grinding plates or liners.

The grinding - action results ~~sx~~ from impact and attrition between lumps or particles of the material being used. The fitness factors can be regulated by changing rotor-speed, feed rate, etc..

BOND CRUSHING & WORK-INDEX ..

A more realistic way of estimating the power required ~~for~~ for crushing and grinding is ..

$$\frac{P}{m} = \frac{K_b}{\sqrt{D_p}} \quad \text{-- (1)}$$

; where..

D_p in mm
P in KW
K_b is a cons..

W_i is defined as the gross-energy in kW/ton. This leads to a relation b/w K_b and W_i;

$$K_b = 0.3612\, W_i \qquad --- (2)$$

Now;

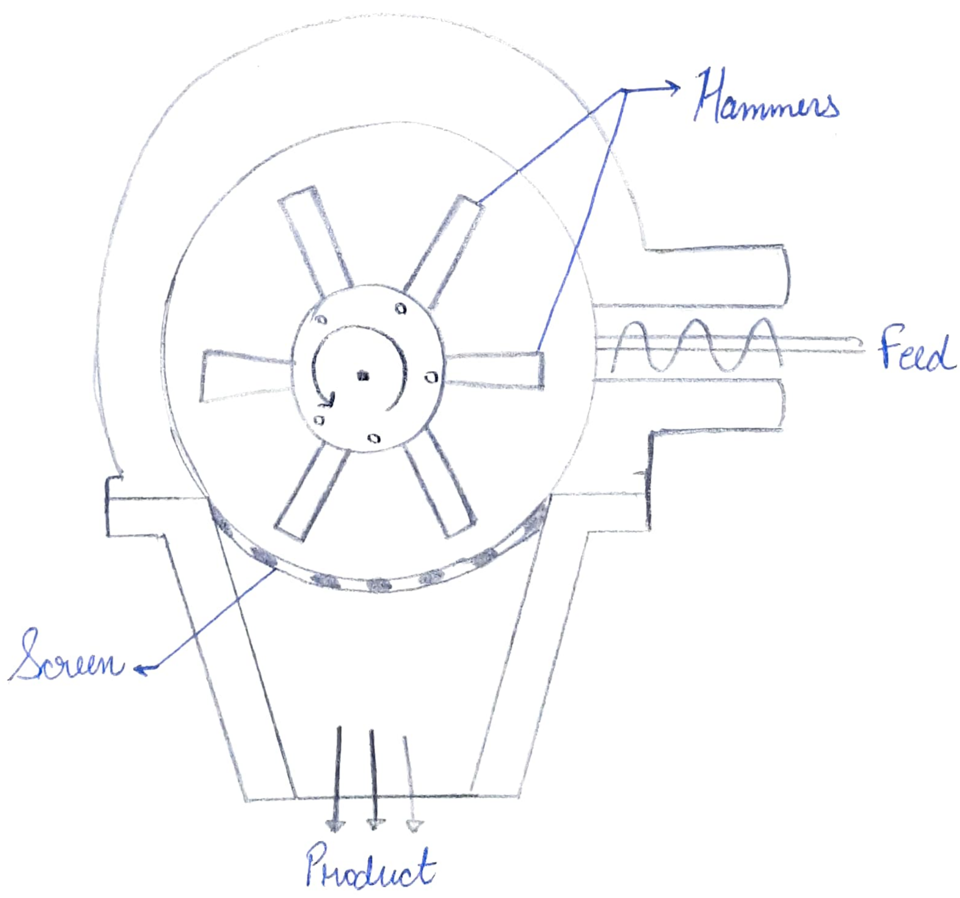
using (1) and (2);

we get;

$$\frac{P}{m} = 0.3162 \times W_i \left[\frac{1}{\sqrt{D_{pb}}} - \frac{1}{\sqrt{D_{pa}}} \right]$$

$$P = 0.3162 \times W_i \times m \times \left[\frac{1}{\sqrt{D_{pb}}} - \frac{1}{\sqrt{D_{pa}}} \right] \quad — (3)$$

SCHEMATIC DIGRAM:



OBSERVATION TABLE :

Without Load : Pulse - 9
time - 2 min

W_i = 12.74
Feed = Lime Stone
E_{mc} = 3200 Pulse/KWh

With Load :

S.no	Weight of Feed (g)	Size (F) (mm)	Weight of Product (g)	Size (P) (um)	t_c (s)	Pulse
1	200	4.75	132	250	125	11
2	200	5.00	128	250	120	10

SAMPLE CALCUTION :-

for S.no. 1 :-

$$P_L = \frac{Pulse_L \times 3600}{t_c \times E_{mc}} = \frac{11 \times 3600}{125 \times 3200} = 0.099 \text{ KW}$$

$$P_{NL} = \frac{Pulse_{NL} \times 3600}{t_b \times E_{mc}} = \frac{9 \times 3600}{120 \times 3200} = 0.084 \text{ KW}$$

so,

$$P_{act} = P_L - P_{NL} = \underline{\underline{0.0146}} \text{ KW}$$

$$P_{cal} = m \times K_b \times \left[\frac{1}{\sqrt{D_{Pb}}} - \frac{1}{\sqrt{D_{Pa}}}\right]$$

$$\dot{m} = \frac{W_f}{t_c} \times \frac{3600}{1000} = \frac{0.2 \times 3600}{125 \times 1000} = 0.00576 \text{ tons/h}$$

Now,

$D_{P_A} = 4.75$ mm

$D_{P_B} = 250\ \mu m = 0.25$ mm

$$P_{cal} = 0.00576 \times 0.3162 \times 12.74 \times \left[\frac{1}{\sqrt{0.25}} - \frac{1}{\sqrt{4.75}} \right]$$

$$= \underline{\underline{0.0357}} \text{ kw}$$

$$\eta = P_{act}/P_{cal} \times 100 = \frac{0.0146}{0.0357} \times 100 = 40.8\%$$

Similarly for ~~~~ S.no 2;
we get;

CALCULATION TABLE :

S.no.	P_{NL} (kw)	P_L (kw)	P_{act} (kw)	P_{cal} (kw)	η
1.	0.084	0.099	0.0146	0.0357	40.8%
2.	0.084	0.093	0.0097	0.0375	25.8%

RESULT :

For Set 1 , we got an efficiency of 40.8 % and Set 2 we got an efficiency of 25.8 %

PRECAUTIONS

1.) Never run the apparatus if power supply is less than 180 V ~~and~~ OR more than 230 V.

2.) Clean the hammers before operating.

3.) Make sure that all the nuts and bolts are properly fixed..