W1.39

heat generated in grinding in ball mills and in vertical mills

1 Ball mills

Approximately 80% of the powwer drawn by a ball/ tube mill is converted into heat and is available for drying material passing through the mill. To that extent less heat is required to be brought in through hot gases from prehater.
Each kwh is equivalent to 860 kcalories.

Thus if a mill draws 2000 kws, heat generated in grinding would be
0.8*2000*860 = 1376000 kcals per hour.

Let capacity of mill be 100 tph and it is reqiured to dry raw materials from a moisture of 6 % in feed to a moisture of 0.5 % in product.
from rs 44, heat required to evaporate 1 kg water =1350 kcals
from rs 45, quantity of water evaporated = 100*(6-0.5)/(100-94) tph = 5.85 tph
Heat required for evaporation = 5850 *1350 = ~ 7.9 million kcal/hr
heat of grinding available as above, 1.4 million kcals/hr.
Therefore heat to be supplied by hot gases = 6.5 million kcal/hr

2 Vertical roller mills

In vertical roller mills it is assumed that 60 % of power drawn by the mill is converted into heat that is available for drying.
In vertical mill systems quantity of gases in circulation is high because they are air swept mills. Fan power is consequently quite high. Therefore about 20 % of fan power is considered as available for generating heat.

Thus if mill drew 2000 kws and mill fan drew 1000 kws then heat available for drying would be
860*(0.6*2000+0.2*1200) = 1238400 kcalories per hour.

Procedure for working out gas volumes would be the same for vertical mills and ball mills . See rs 47.