Table 25.3.1.5. Percentage of Product Passing a Square Opening Equal to Open-side Setting of Gyratory Crusher

Feed material	Run of mine	Scalped	Scalped and recombined with fines
Limestone	90	85	88
Granite	82	75	80
Trap rock	75	70	75
Ores	90	85	85

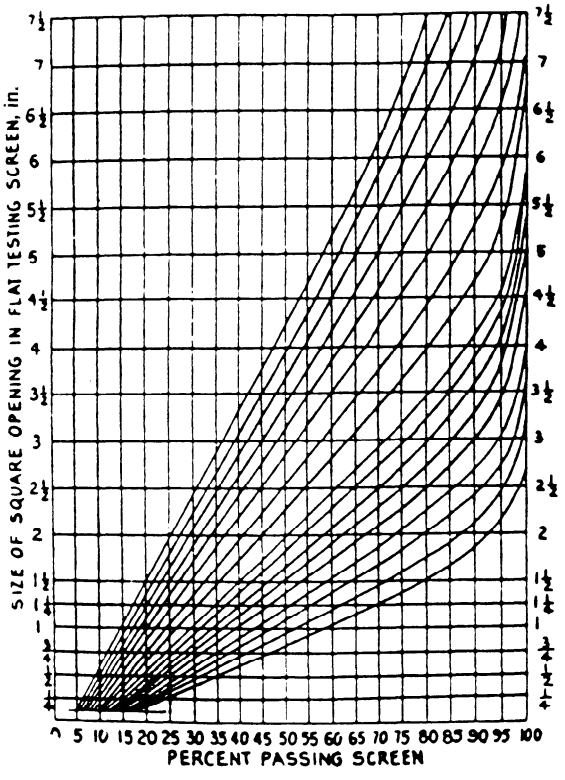

Fig. 25.3.1.4. Typical crusher size-distribution for under 7½ in. (190 mm) opening. Conversion factor: 1 in. = 25.4 mm.

DISCHARGE PRODUCT SIZE. Figs. 25.3.1.4 and 25.3.1.5 illustrate typical discharge product size distributions for gyratory crushers. These size distributions should only be considered as good approximations based on actual screen analyses. In practice, the distribution will vary depending on many factors, one of which is the rock type. To determine the expected product from a crusher set at a predetermined discharge opening, obtain from Table 25.3.1.2 the approximate percentage of feed that will pass an opening equivalent to the crusher setting. The intersection of two axes will provide the product curve for the specific application.

25.3.1.5 Power Calculation

The crusher motor size is determined using Bond's crusher work index. The relation used for calculating the approximate unit power consumption is

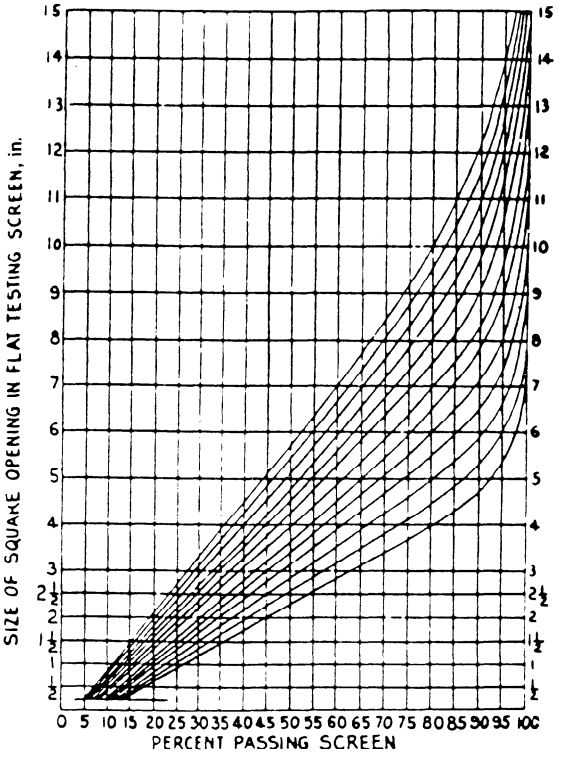

Fig. 25.3.1.5. Typical crusher-product size-distribution curves for open-side discharge over 7½ in. (190 mm). Conversion factor: 1 in. = 25.4 mm.

$$W = W_i \times 11.0 \times (\sqrt{F_{80}} - \sqrt{P_{80}}) / (\sqrt{F_{80}} \times \sqrt{P_{80}}) \qquad (25.3.1.1)$$

where W is specific power required in kWh/t, P_{80} is 80% passing size of the product in μm, and F_{80} is 80% passing size of the feed in μm or 2/3 of the crusher feed opening.

To find total power in kW, the calculated specific power is multiplied by a factor of 0.75 for primary crushing and 1.00 for secondary crushing:

$$\text{Total kW} = (\text{crusher capacity}) \times (W) \times (\text{factor}) \qquad (25.3.1.2)$$

This method of power calculation can be used for calculating the approximate power of primary jaw and gyratory crushers, secondary gyratory crushers, and cone crushers. For empirical values of work index for different materials, see Table 25.3.2.4.

An example of the use of the formula follows.

Example 25.3.1.1. Assume a copper ore with Bond crusher work index of 14.2. The design feed rate is 1800 t/h (2000 tph). An Allis Chalmers 5474 crusher is selected with an open-side setting of 165 mm (6-1/2 in.).

Solution. Feed size F_{80} = 914,400 (36 in.) (66% of crusher feed openings).

Product Size $P80$ = 139,700 mm (5.5 in.)

$$W = 14.2 \times 11.0 \times (\sqrt{914{,}400} - \sqrt{139{,}700}) / (\sqrt{914{,}400} \times \sqrt{139{,}700})$$

W = 0.255 kWh/t (0.310 hp/ton)

Total power = 0.255 × 1800 × 0.75 = 345 kW (465 hp)