

APPENDIX 1

Chapter 1

Calculations of estimated iron ore mine life (for section 1.1 and table 1.3):

For 2022 year, 266 Mt iron ore was required for 125 Mt crude steel production.

Condition – 1: Use of *Reserve of high-to-medium iron ore* = 14.42 Bt

$$\text{Mine life} = \frac{\text{reserve of iron ore}}{\text{iron ore required}} = \frac{14.42 \text{ Bt}}{266 \text{ Mt}} = \frac{14,420 \text{ Mt}}{266 \text{ Mt}} = 54.2 \text{ yrs}$$

Condition – 2: Use of *Total reserve of iron ore (high + medium + low grade)* = 22.48 Bt

$$\text{Mine life} = \frac{\text{reserve of iron ore}}{\text{iron ore required}} = \frac{22.48 \text{ Bt}}{266 \text{ Mt}} = \frac{22,480 \text{ Mt}}{266 \text{ Mt}} = 84.5 \text{ yrs}$$

Similarly, mine life for 2030 can be calculated.

APPENDIX 2

Chapter 5

Calculation of Iron yield (for section 5.5 and table 5.21):

For Heat 1 [AA (90-10)]:

$$\text{Iron yield(pct)} = \frac{(W_5 \times F_6) \times 100}{\{(W_1 - W_2) \times F_1\} + (W_3 \times F_2 \times F_3 \times F_4) + (W_4 \times F_5)} \dots (4.7)$$

where,

weight of TMT scrap, $W_1 = 2.92$ kg

weight of sample taken for chemical analysis before briquette addition, $W_2 = 0.188$ kg

weight diff. of scrap after sample taken for chemical analysis, $W_1 - W_2 = 0.732$ kg

fraction of Fe present in initial melt, $F_1 = 0.99265$

weight of composite briquette charged, $W_3 = 0.325$ kg

fraction of iron oxide present in composite briquette, $F_2 = 0.7512$

fraction of purity of iron oxide, $F_3 = 0.7018$

fraction of Fe present in iron oxide, $F_4 = 0.7$

weight of TMT rod dissolved during stirring the melt, $W_4 = 0.378$ kg

fraction of Fe present in TMT rod, $F_5 = 0.9831$

weight of product, $W_5 = 2.98$ kg

fraction of Fe present in product, $F_6 = 0.9853$

So,

$$\text{Iron yield(pct)} = \frac{(2.98 \times 0.9853) \times 100}{\{[2.732 \times 0.99265] + (0.325 \times 0.7512 \times 0.7018 \times 0.7) + (0.378 \times 0.9831)\}}$$

$$\text{Iron yield(pct)} = \frac{293.619}{\{2.712 + 0.1199 + 0.3716\}}$$

$$\text{Iron yield(pct)} = \frac{293.619}{3.2035}$$

$$\text{Iron yield(pct)} = 91.66$$