COSTS, INCOME AND BREAK-EVEN POINT IN MINING OPERATIONS

Costs

Costs in mining operations are basically divided into two as **investment cost** and **operating cost**. ***Investment cost*** is the total of cost items incurred during the investment period. These are all expenses before starting production such as mineral exploration activities, reserve development, production plan, preparation work, vehicle fleet provision, and the initial investment cost. Expenses incurred during the production period are operating costs.

Operating cost

Operating period costs are generally divided into fixed and variable. The division of operating cost into fixed and variable is a very important factor in financial and technical decision making.

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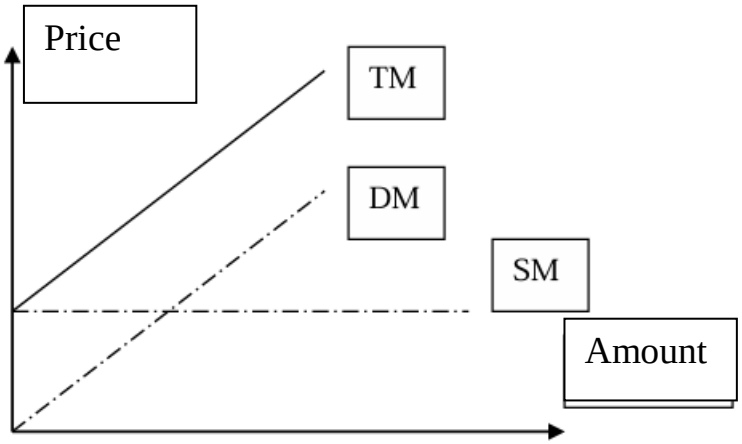
Variable cost

The total of costs that change depending on the production volume is called variable cost. Variable costs increase or decrease in parallel with the production volume.

Fixed costs

These are expenses that do not change depending on the amount of production. They are costs that increase only with time, without being affected by changes in the amount of production.



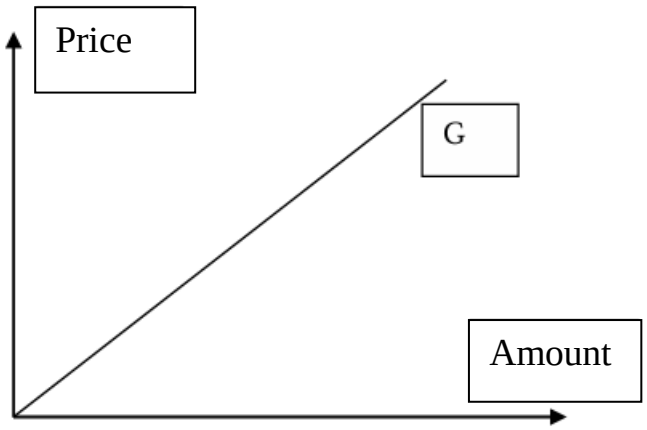
Graphical representation of expense

Income

Income is equal to the sales price times the quantity of goods sold. If the unit sales price is s and the quantity of goods sold is q, then income or total income is expressed as:

G = q*s

G: income



Graphical representation of income

Average income

The income per unit of goods is called average income. It is obtained by dividing the total income by the amount of goods sold.

OG = G/q

OG: average income.

Profit

The surplus value remaining after expenses are deducted from the income obtained by mining enterprises as a result of production is called profit. The profit formula is as follows:

K = G – TM
= G – (SM + DM)
= q * s - (SM + q * d)
K: profit

TM: total cost

SM: fixed cost

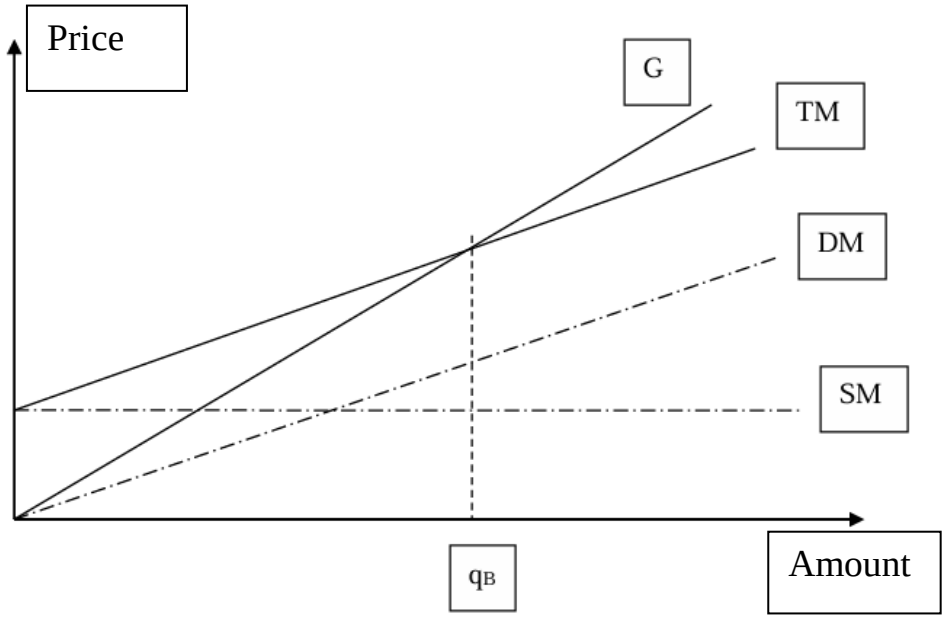
DM: variable cost

d: unit variable cost

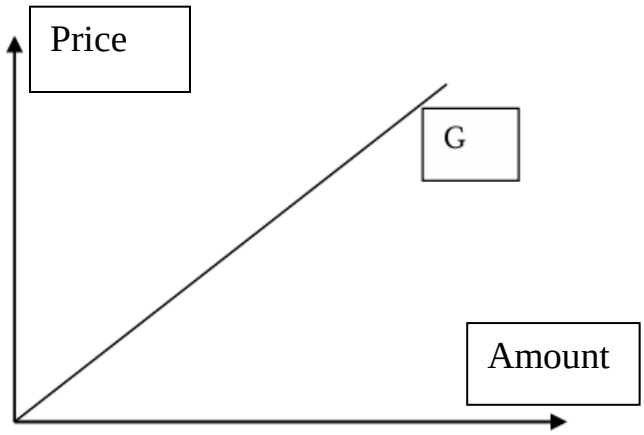
Break-Even Point

At the production level where income and expenses are equal, the company's profit is zero. This production level is called the break-even production level. It can be calculated graphically and mathematically.

Break-even point calculation with graphical method



Finding the break-even point using the graphical method



Break-even point calculation with mathematical method

$G = q*s$

$TM = q * d + SM$

$K = G – TM = q*s – (q * d + SM) =q * (s - d) – SM$

Since the production quantity at which the profit is "0" is the production quantity at the break-even point, finding the break-even point in terms of the quantity of goods to be produced is as follows:

$$q_B(s-d)-SM=0$$

$$q_B=\frac{SM}{s-d}$$

Example:

Production capacity : 1 000 000 tons/year

Electricity costs : 5 TL/ton

Fuel and oil costs : 10 TL/ton

Tire and spare parts costs : 5 TL/ton

Explosives costs : 5 TL/ton

Depreciation and interest costs : 1 000 000 TL/year

Labor - personnel costs : 500 000 TL/year

Other variable costs : 5 TL/ton

Other fixed costs : 500 000 TL/year

Unit sales price : 50 TL/ton

In a business with the above features;

a) Find the break-even point in terms of production quantity and show it graphically.

b) If the business is in a position to make a profit, find the break-even point as a percentage of its capacity.

c) Find the production quantity that needs to be made in order for the business to make a profit of 10,000,000 TL/year.

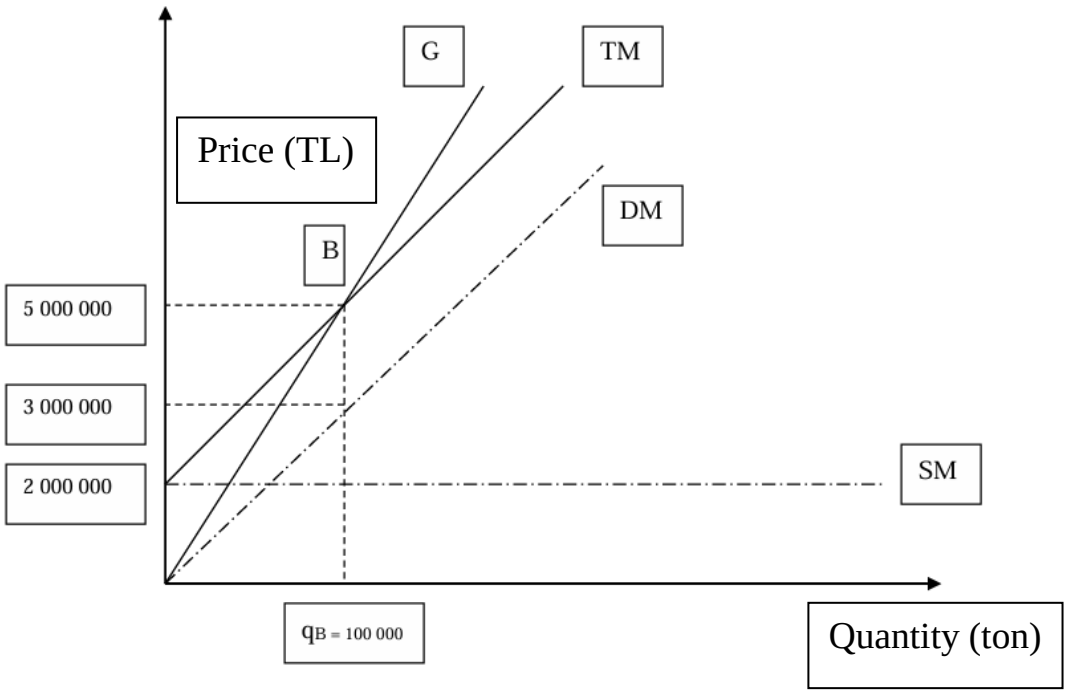
Solution:

a) SM = 1000000 TL/year + 500000 TL/year + 500000 TL/year = 2000000 TL/year

d = 5 TL/ton + 10 TL/ton + 5 TL/ton + 5 TL/ton + 5 TL/ton = 30 TL/ton

s = 50 TL/ton

$$q_B = \frac{2000000 TL/yıl}{50 TL/ton - 30 TL/ton} = 100000 ton/yıl$$



b) 100 000 tons/year < 1 000 000 tons/year → the company makes a profit.

$$\frac{100000 ton/\ yıl}{1000000 ton/\ yıl} = 0{,}1 = \%10$$

When production is done at capacity, the break-even point is reached.

The break-even point is 10% of production capacity. That is, the break-even point as a percentage of capacity will be 10%.

c) Production amount for the company to make a profit of 10,000,000 TL/year =

$$\frac{10000000 TL/\ yıl + 2000000 TL/\ yıl}{50 TL/ton - 30 TL/ton} = \frac{10000000 TL/\ yıl + 2000000 TL/\ yıl}{20 TL/ton} = 6000000 ton/\ yıl$$