In this video, we will run through a problem for Straight Line Depreciation.

The topic of Straight Line Depreciation falls under the main category of Engineering Economics.

Equations, Symbols, Tables, and information on the various topics covered in Engineering Economics can be referenced on pages 114-120 of the NCEES Supplied Reference Handbook, 8th edition, 2nd revision.

Problem:

An elevator system installed in a high rise building is 12 years in to its 25 year useful lifespan. A new CFO takes over the books but is unable to find proper documentation detailing the specifics of the system. The CFO is able to determine that the annual straight line depreciation charge for the system is $25,000 and the Book Value last year was $450,000. With the limited details available, determine the salvage value of the system?

Solution:

The goal is to determine what the Salvage Value is for the specified piece of equipment at this facility. We are given limited information, but taking the details we do have, combined with the formulas we know for straight line depreciation, we can work our way backwards to determine the Salvage Value.

To determine the Book Value for any year within the useful lifespan, we can refer to the formula found on page 115 of the NCEES Supplied Reference Handbook, 8th edition, 2nd, which states:

$$\text{Book Value} = \text{Initial Cost} - \sum D_j$$

In this problem we are given:

$$\text{Book Value}_{11} = \$450{,}000$$
$$D_j = \$25{,}000$$

So

$$\sum D_{11} = \$275{,}000$$

Plugging these values in to the equation, we determine that the initial cost of the system was:

$$\$450{,}000 = \text{Initial Cost} - \$275{,}000$$
$$\text{Initial Cost} = \$725{,}000$$

We can now refer to the formula found on page 115 of the NCEES Supplied Reference Handbook, 8th edition, 2nd revision which states that the depreciation charge in any year is:

$$D_j = \frac{C - S_n}{n}$$

Where:

D_j = Depreciation in year j
C = Cost of the piece of equipment (referred to as 'basis' in the tax law)
S_n = Salvage Value in year n
n = The lifespan

We know now that:

$$D_j = \$25{,}000$$

$C = \$725{,}000$

$n = 25$

Plugging these values in to the equation we find that:

$$\$25{,}000 = \frac{\$725{,}000 - S_n}{25}$$

Rearranging and solving for the salvage value, we get:

$$S_n = \$725{,}000 - \$25{,}000(25) = \$100{,}000$$

The Salvage Value is $100,000

Wrong Answers:

1) The Salvage Value is $125,000

The goal is to determine what the Salvage Value is for the specified piece of equipment at this facility. We are given limited information, but taking the details we do have, combined with the formulas we know for straight line depreciation, we can work our way backwards to determine the Salvage Value.

To determine the Book Value for any year within the useful lifespan, we can refer to the formula found on page 115 of the NCEES Supplied Reference Handbook, 8th edition, 2nd, which states:

$$\text{Book Value} = \text{Initial Cost-}\sum D_j$$

There are many ways that you could have arrived at a salvage value of $125,000, but one common way is as follows. At the very beginning of the problem, you

made one critical mistake when determining the Initial Cost of the system. The problem states that the Book Value was $450,000 'last year', meaning in year 11. When you calculated the accumulative depreciation, you used 12 years of depreciation, which threw your initial cost off, affecting the remaining calculations made.

2) The Salvage Value is $0

The goal is to determine what the Salvage Value is for the specified piece of equipment at this facility. We are given limited information, but taking the details we do have, combined with the formulas we know for straight line depreciation, we can work our way backwards to determine the Salvage Value.

To determine the Book Value for any year within the useful lifespan, we can refer to the formula found on page 115 of the NCEES Supplied Reference Handbook, 8th edition, 2nd, which states:

$$\text{Book Value} = \text{Initial Cost} - \sum D_j$$

You took the correct procedure in solving for the salvage value, but made one critical mistake at the very beginning when you were determining the Initial Cost of the system. When you calculated this initial cost, you accounted for 1 year of depreciation, $25,000, not the 11 that you should have. This caused for you to have a significantly lower than actual initial cost that led to you concluding that the asset had no salvage value.

3) The Salvage Value is $425,000

You correctly solved for the initial cost, but followed it up by using the incorrect variables when solving for the salvage value.

You properly referenced the Straight Line Depreciation formula found on page 115 of the NCEES Supplied Reference Handbook, 8th edition, 2nd revision, which states that the depreciation charge in any year is:

$$D_j = \frac{C - S_n}{n}$$

However, when plugging in your values, you plugged in 12 for n, whereas, it should have been 25. The variable n represents the assets lifespan, not the current year in which you are analyzing.

Reference:

www.engineerintrainingexam.com/daily-carrot-engineering-economics-straight-line-depreciation