Al-Mustaqbal University College
Chem. Eng. Petroleum Industries Dept.

Chemical Engineering Economics

4th Stage

Prof. Dr. Nada Saadoon Ahmedzeki

2020-2021

Lecture 9

DEPRECIATION

“Depreciation is a decrease in value of a property over a period of time. Events that can cause a property to depreciate include wear and tear, age, deterioration, and normal obsolescence. The intent of depreciation is to allow a business to recover the cost of an asset over a period of time. In this chapter a very important aspect of accounting, namely, accounting for depreciable fixed assets like machinery, equipment, buildings, and structures, will be considered. Depreciation begins when a property is placed in service in a business or trade for the production of income. It ends when the cost of the asset has been fully recovered or when the asset is retired from service, whichever occurs first.

The causes of obsolescence may be categorized as follows:

- . Product obsolescence. This is caused by the development and marketing of either cheaper or better substitutes. An example might be milk containers: Glass was used for many years and was followed by waxed paper cartons until polyethylene was introduced.
- . Equipment obsolescence. Equipment designs are radically improved. Consider the replacement of shell-and-tube heat exchangers by plate type units in certain applications.

- . Process obsolescence. For many years phenol was made by a benzene sulfonic acid or chlorobenzene route. These processes involved large, expensive equipment subject to severe corrosion and erosion problems. The newer cumene–phenol process is less costly from a capital investment and operating expense standpoint for the same production rate. This is an example of technological improvement.

- . Capacity obsolescence. Batch processes are replaced by continuous processes for increased production, and for reducing overall operating expenses.

In order for a property to be depreciated, it must meet the following requirements:

- ❖ It must be used in a business or held to produce income.
- ❖ It must be expected to have a useful life of more than 1 year.
- ❖ It must be something that wears out, decays, gets used up, becomes obsolete, and loses its value from natural causes.

TERMINOLOGY

There are certain terms used in depreciation accounting that need to be defined:

Depreciation reserve is the accumulated depreciation at a specific time.
Book value is the original asset investment minus the accumulated depreciation.
Service life is the time period during which an equipment item or asset is in service and is economically feasible.

Economic or useful life as used in this text is synonymous with *service life*.

Salvage value is the net amount of money obtained from the sale of a used property over and above any charges involved in the removal and sale of the property. The term implies that the asset can give some type of service. Salvage value was regarded as a nondepreciable part of the first cost that is frozen in a project and then removed at the end of the useful life. Depending upon tax law revisions, salvage value has been allowed and then disallowed.

Scrap value implies that the asset has no further useful life and is sold for the value of scrap material in it.

Depreciation Calculation

1-Straight line
2-Declining balance
3-Unit of production
4-Modified Accelerated Cost Recovery System (MACRS)

Straight-Line Method

In the straight-line method, the property value is assumed to decrease linearly with time over the recovery period. No salvage or scrap value may be taken. Thus the amount of depreciation in each year of the recovery period is

$$d = \frac{V - V_s}{n}$$

where d is the annual depreciation in dollars per year, V the original investment in the property at the start of the recovery period, V_s is the salvage

value and n the length of the straight-line recovery period. For tax purposes, the recovery period for straight-line depreciation is 9.5 years for chemical plants, as shown in Table 7-8.

Table 7-8 Recovery periods for selected chemical-industry-related asset classes†

Type of assets	Recovery period, years	
	MACRS	Straight line
Heavy general-purpose trucks	5	5
Industrial steam and electric generation and/or distribution systems	15	22
Information systems (e.g., computers)	5	5
Manufacture of chemicals and allied products (including petrochemicals)	5	9.5
Manufacture of electronic components, products, and systems	5	5
Manufacture of finished plastic products	7	11
Manufacture of other (than grain, sugar, and vegetable oils) food and kindred products	7	12
Manufacture of pulp and paper	7	13
Manufacture of rubber products	7	14
Manufacture of semiconductors	5	5
Petroleum refining	10	16
Pipeline transportation	15	22
Gas utility synthetic natural gas (SNG)	7	14
SNG—coal gasification	10	18
Liquefied natural gas plant	15	22
Waste reduction and resource recovery plant	7	10
Alternative energy property	5	12

†Source: © 2002 CCH Incorporated. All Rights Reserved. Reprinted with permission from *1997 Depreciation Guide Featuring MACRS.*

Example

The primary cost of a certain equipment is 22000$ with its installation until it is on service. The salvage value at the end of 10 years as considered its service life is estimated 2000$. calculate the book value after 5 years using the straight line method.

Solution:

$$d = \frac{V - V_s}{n}$$

$$d = \frac{22000 - 2000}{10} = 2000\$$$

Its value after 5 years = V_a= V-ad
= 22000-5 (2000)= 12000$