

# Sample Replacement Project (Comprehensive)

You work for a corporation that manufactures bottled water. Due to current excess demand for the company's current products, the firm is considering purchasing a new production line capable of handling 1.5 times the firm's current production capacity.

## Proposed System:

The production line is expected to cost \$1,100,000 and has additional shipping and installation costs of \$25,000. The new production line has an estimated life of 10 years, with an annual maintenance cost of \$8,000. Due to the larger capacity expected to be produced, annual defects will amount to an additional \$3,000 over the current production system. The firm will depreciate the new production line using straight-line depreciation. Since the new production line will enable the company to produce products to meet current excess demand, sales are expected to increase by 175,000 units annually. The firm's product currently sells for \$1.99 a unit and variable costs of production amount to \$0.40 a unit. Additional inventory of \$10,000 will be purchased immediately to accommodate increased production; however, \$4,000 of that will be purchased on credit. Both the new Inventory and Accounts Payable accounts are expected to remain at the increased levels until the termination of the project. The production line has an estimated salvage value at the end of year 10 of \$100,000. Also, during the past year management spent \$3,000 researching various production lines and making on-site visits to view various production lines in action.

## Current System:

The old production line originally cost \$500,000 seven years ago and has a current salvage value of \$80,000. The old production line had an original estimated life of 15 years and was being depreciated using the straight-line method. The old production line has an estimated salvage value of \$50,000 at the end of its useful life. Maintenance costs on the old production line amount to \$10,000 annually.

## Additional Information:

The firm's current warehouse storage capacity is capable of handling the expected increase in production. However, additional line operators and other personnel must be hired to accommodate the additional production and shipping. The additional personnel will cost an estimated \$70,000 / year. The tax rate for the firm is 36%. Use a discount rate of 7%.

Based on the above information, answer the following questions:

- Calculate the Initial Investment for the project.
  - Calculate the operating cash flows for years 1 to 10.
  - Calculate the terminal cash flows for the project.
  - Calculate the NPV for the project.
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**a. Calculate the Initial Investment Outlay for the project.**

Purchase price of new machine	\$ (1,100,000)
Shipping/installation	\$ (25,000)
Increase in Inventory	\$ (10,000)
Increase in Accounts Payable	\$ 4,000
Salvage Value of old production line	\$ 80,000
Tax on sale of old production line*	\$ 67,200
Initial Outlay	\$ (983,800)

<b>*Tax on sale of old production line</b>	
Salvage Value of old production line	\$ 80,000
Book Value of old production line**	\$ 266,667
Loss on sale of old production line	\$ (186,667)
Tax savings	\$ (67,200)

<b>**Book Value of old production line</b>	
Purchase price of old production line	\$ 500,000
Accumulated depreciation	\$ 233,333
Book Value	\$ 266,667

**b. Calculate the operating cash flows for the project.**

	Years 1-8		Years 9-10	
Increase in unit sales	175,000		175,000	
Sales price per unit	\$ 1.99		\$ 1.99	
Increase in revenues		\$ 348,250		\$ 348,250
Increase in unit sales	175,000		175,000	
Variable cost per unit	\$ 0.40		\$ 0.40	
Increase in variable costs		\$ (70,000)		\$ (70,000)
Decrease in maintenance costs		\$ 2,000		\$ 2,000
Increase in defects		\$ (3,000)		\$ (3,000)
Additional personnel		\$ (70,000)		\$ (70,000)
Annual Depreciation--old production line	\$ 33,333		\$ -	
Annual Depreciation--new production line	\$ 112,500		\$ 112,500	
Increase in Depreciation		\$ (79,167)		\$ (112,500)
Increased (decreased) earnings before taxes		\$ 128,083		\$ 94,750
Taxes		\$ 46,110		\$ 34,110
Net Income		\$ 81,973		\$ 60,640
+ Increase in Depreciation		\$ 79,167		\$ 112,500
Operating Cash Flows		\$ 161,140		\$ 173,140

**c) Calculate the terminal cash flows for the project**

Reversal of Working Capital	\$	6,000
Salvage Value of new production line at year 10	\$	100,000
Tax on sale of new production line at year 10***	\$	(36,000)
Terminal Cash Flows at year 10	\$	70,000

<b>***Tax on sale of new production line</b>		
Salvage Value of new production line	\$	100,000
Book Value of old production line	\$	-
Gain on sale of new production line	\$	100,000
Taxes owed	\$	36,000

<b>Terminal Cash Flows (for old production line) at year 8</b>		
Salvage Value of old production line at year 8	\$	50,000
Tax on sale of old production line at year 8	\$	18,000
Net cash flow at year 8 due to sale of old p.l.	\$	32,000

**d) Calculate the NPV of the project**

Year	Cash Flows	Year	Cash Flows
0	\$ (983,800)	6	\$ 161,140
1	\$ 161,140	7	\$ 161,140
2	\$ 161,140	8	\$ 129,140
3	\$ 161,140	9	\$ 173,140
4	\$ 161,140	10	\$ 243,140
5	\$ 161,140		

**NPV= 177,567.49**

Notes:

The \$3,000 spent by management researching different production lines is a sunk cost and will be expensed this year as a normal operating expense. Whether or not management purchases the new production line, the \$3,000 cannot be recovered or allocated to the new production line.

The old production line could have been sold in year 8 (which is year 15 of the old production line) for \$50,000 as shown above. Because buying the new production line precludes selling the old production line at year 8, the Net Cash Flow due to sale of old production line of \$32,000 is an OPPORTUNITY COST and is subtracted from year 8's cash flows as shown to the left. Also, since the old production would have been sold in year 8, we would no longer have depreciation after that time.

At a NPV > 0, the firm should purchase the new line.