**Econ Homework #03**

**7-2**

Original cost: $50,000 (10 yrs of life)

Interest rate of 6%

With salvage value, we will need $45,000 saved to replace.

**7-5**

1. Costs $20,000 with 6 years of life. No salvage at the end
2. Costs $34,000 with 10 years of life. $4000 salvage value at the end.

Interest rate of 6%.

To figure out which is worth more, we need to annualize the loan and annualize the salvage value.

Option A.)

Option B.)

Option A is the preferred option

**7-9**

FCI = $20 million.

Property taxes are 1% of FCI

State taxes are 5% of gross earnings

The net income is $2 million and federal income taxes are 35% of the gross earnings.

What if we had the same plant but the following conditions:

Property taxes of 4% FCI  
State income of 2% of gross earnings

What is the net income per year?

Thus,

Plant #2:

**7-17**

There are three methods to calculate depreciation:

1. Straight line (linear)
2. MACRS
3. Sum of the digits

Equipment costs amount to $35,000 with 5 years of use. There is a $5000 salvage value at the end.

*Straight Line –*

The total change in value is $30,000 over 5 years.

That’s each year.

|  |  |  |
| --- | --- | --- |
| **Straight Line** | | |
| *Year* | *Depreciation Allowance* | *Year-End value* |
| 1 | 6000 | 29000 |
| 2 | 12000 | 23000 |
| 3 | 18000 | 17000 |
| 4 | 24000 | 11000 |
| 5 | 30000 | 5000 |

*MACRS –*

MACRS is a special formula/depreciation schedule used by the IRS to calculate the value of depreciation of various investments and equipment purchases.

Each new depreciation allowance is equal to the original price minus the most recent depreciation allowance, divided by the service life.

|  |  |  |
| --- | --- | --- |
| **MACRS** | | |
| *Year* | *Depreication Allowance* | *Year-End value* |
| 1 | 7000 | 28000 |
| 2 | 5600 | 22400 |
| 3 | 5880 | 16520 |
| 4 | 5824 | 10696 |
| 5 | 5835.2 | 4860.8 |

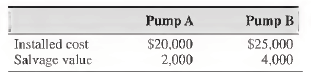
*Sum of the digits –*

We can calculate each depreciation allowance with the following formula:

% depreciation = where SYD = n(n+1)/2

|  |  |  |
| --- | --- | --- |
| **Sum of the Digits** | | |
| *Year* | *Depreication Allowance* | *Year-End value* |
| 1 | 10000 | 25000 |
| 2 | 8000 | 17000 |
| 3 | 6000 | 11000 |
| 4 | 4000 | 7000 |
| 5 | 2000 | 5000 |

**8-4**



We need to annualize the cost and the salvage value:

*Pump A –*

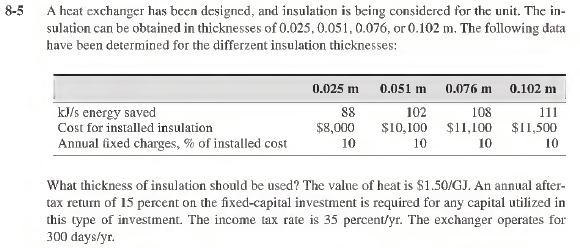
*Pump B –*

The sum of the annualized cost and salvage value for pump B must be equal to the sum of the annualized cost and salvage value for pump A. Use excel solver to get the value of n.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Pump A** | **Pump B** |  |
| *Cost* | 20000 | 25000 |  |
| *Salvage* | 2000 | 4000 |  |
| *i* | 0.15 | 0.15 |  |
| *n* | 4 | 5.320202 |  |
| Ac | 7005.307 | 7148.543 |  |
| As | 400.5307 | 543.7669 | **Error Sq** |
| Atot | 6604.776 | 6604.776 | 0 |

This equates to about 5-6 years.

**8-5**



Heat is $1.50/GJ = $0.0000015/kJ

Income taxed at 35% Exchanger operatres at 300 days/yr

We can use the information to calculate the money saved, annual fixed cost,net savings, and net savings after tax:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Insulation** | | | | |
|  | **0.025 m** | **0.051 m** | **0.076 m** | **0.102 m** |
| *kJ/s saved* | 88 | 102 | 108 | 111 |
| *Installlation Cost* | 8000 | 10,100 | 11,100 | 11,500 |
| *Annual fixed cost, as % of install cost* | 10.00% | 10.00% | 10.00% | 10.00% |
| *Fixed Cost Annual* | 800 | 1010 | 1110 | 1150 |
| *Money saved* | 3421.44 | 3965.76 | 4199.04 | 4315.68 |
| *Net Savings* | 2621.44 | 2955.76 | 3089.04 | 3165.68 |
| *Net savings after tax* | 1703.936 | 1921.244 | 2007.876 | 2057.692 |
| *Investment return* | 21.30% | 19.02% | 18.09% | 17.89% |

We cab see that the greatest investment return is the first option. This is ncluding the fact that each investment is compared also to the previous.

**8-7**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **1** | **2** | **3** | **4** |
| *FCI* | 10,000 | 12,000 | 14,000 | 16,000 |
| *Post-tax total costs* | 3,000 | 2,800 | 2,350 | 2,100 |
| *Return on Investment* |  | 0.1 | 0.1625 | 0.125 |

We can see that design 3 is the most favorable option.

**8-10**

We can calculate the depreciation for each year based on the calculations and formulas from 7-17:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **year** | **annual revenue** | **Annual Operating Expenses (excluding depreciation)** | **Plant Value** | **MACRS** | **Depreciation** | **Cash Flow** | **Cash Flow Tax** |
| 1 | 7 | 4 | 50 | 0 | 10 | -7 | 0 |
| 2 | 10 | 5.6 | 40 | 0.2 | 16 | -11.6 | 0 |
| 3 | 15 | 6.8 | 24 | 0.32 | 9.6 | -1.4 | 0 |
| 4 | 20 | 7.8 | 14.4 | 0.192 | 5.76 | 6.44 | 2.254 |
| 5 | 22.5 | 8.8 | 8.64 | 0.1152 | 5.76 | 7.94 | 2.779 |
| 6 | 24 | 9.6 | 2.88 | 0.1152 | 2.88 | 11.52 | 4.032 |
| 7 | 25 | 10 | 0 | 0.0576 | 0 | 15 | 5.25 |

**8-18**

Our FCI is equal to $100 million spent over 3 years. The product has a 10-year life span.

We can calculate the net profit as such:

We can tabulate the data per year as such:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Year** | **FCI** | **Sales** | **Payoff annually** | **Depreciation** | **Capacity** | **Operating Expenses** | **Net Profit** | **Cash Flow** |
| *1* | 33.333 | 75 | 3.3333 | 3.3333 | 50.00% | 100 | -18.416645 | -15.083345 |
| *2* | 33.333 | 112.5 | 3.703666667 | 7.036966667 | 75.00% | 100 | 3.550971667 | 10.5879383 |
| *3* | 33.333 | 150 | 4.166625 | 11.20359167 | 100.00% | 100 | 25.21766542 | 36.4212571 |
| *4* | 0 | 150 | 0 | 11.20359167 | 100.00% | 100 | 25.21766542 | 36.4212571 |
| *5* | 0 | 150 | 0 | 11.20359167 | 100.00% | 100 | 25.21766542 | 36.4212571 |
| *6* | 0 | 150 | 0 | 11.20359167 | 100.00% | 100 | 25.21766542 | 36.4212571 |
| *7* | 0 | 150 | 0 | 11.20359167 | 100.00% | 100 | 25.21766542 | 36.4212571 |
| *8* | 0 | 150 | 0 | 11.20359167 | 100.00% | 100 | 25.21766542 | 36.4212571 |
| *9* | 0 | 150 | 0 | 11.20359167 | 100.00% | 100 | 25.21766542 | 36.4212571 |
| *10* | 0 | 150 | 0 | 11.20359167 | 100.00% | 100 | 25.21766542 | 36.4212571 |
|  |  |  |  |  |  | **Sum** | 186.87565 | 186.87565 |
|  |  |  |  |  |  | **Average** | 18.687565 | 28.687465 |
|  |  |  |  |  |  | **ROI** | 15.57% |  |
|  |  |  |  |  |  | **PBP** | 3.485843033 |  |