



**SPROTT**  
SCHOOL OF BUSINESS

**BUSI 2505e - Business Finance**

**Monday, January 11, 2010**

**§10 Capital Investment Decisions (cont.)**

- §10.1-10.3 - Examples
- §10.5 - Alternative Definitions of Operating Cash Flow
- §10.6 - Applying the Tax Shield Approach to the Majestic Mulch and Compost Company Project
- §10.7 - Some Special Cases of Cash Flow Analysis

**opportunity cost** - most valuable alternative that is given up if an investment is undertaken

Your firm purchased a warehouse for \$335,000 six years ago. Four years ago, repairs were made to the building, which cost \$60,000. The annual taxes on the property are \$20,000. The warehouse has a current book value of \$268,000 and a market value of \$295,000. The warehouse is totally paid for and solely owned by your firm. If the company decides to assign this warehouse to a new project, what value, if any, should be included in the initial cash flow of the project for this building?

**answer:** \$295,000

**erosion** - portion of cash flows of a new project that comes at the expense of a firm's existing operations

TreeTop Ltd. currently sells \$189,000 of trees, \$286,400 of evergreen shrubbery, and \$62,800 of flowers. It is considering adding flowering shrubs to their product line. Given this change only, sales are estimated at \$168,000 for trees, \$239,700 for evergreen shrubbery, \$59,900 for flowers, and \$136,800 for the flowering shrubs. What is the amount of the erosion?

**answer:** \$70,600

basic

$$OCF = EBIT + Depreciation - Taxes$$

bottom-up approach

*works only when there is no interest expense*

$$OCF = NetIncome + Depreciation$$

top-down approach

*don't subtract non-cash deductions*

$$OCF = Sales - Costs - Taxes$$

### tax shield approach

$$OCF = \underbrace{(Sales - Costs)(1 - TaxRate)}$$

project cash flow if there were  
no depreciation expense

$$+ \underbrace{Depreciation * TaxRate}$$

**depreciation (CCA) tax shield**  
*only cash flow effect from deducting  
depreciation is to reduce taxes*

The Market Place Grill has annual sales of \$1.9 million, depreciation of \$238,000, and net working capital of \$196,000. The firm has a tax rate of 35 percent and a profit margin of 8.2 percent. The firm has no long-term debt. What is the amount of the operating cash flow?

**answer:** \$393,800

Jacob's Jewelers is considering carrying a new product line which is expected to produce annual sales of \$450,000 and increase cash expenses by \$305,000. If the product line is added, taxes will increase by \$38,000. The additional depreciation expense will be \$36,000. An initial cash outlay of \$65,000 is required for net working capital. What is the amount of the operating cash flow using the top-down approach?

**answer:** \$107,000

Benson Industries is adding a new assembly line which will increase annual sales by \$980,000 and cash expenses by \$535,000. The project will require an initial investment in equipment of \$1.2 million. This equipment belongs in a 40% CCA class. The company has a marginal tax rate of 35 percent. What is the operating cash flow in the first year of the project using the tax shield approach?

**answer:** \$373,250

- power mulcher example from §10.4
- applying tax shield approach instead
- Salvage Value versus UCC
  - Using the methods described in §10.5 will give incorrect answers when the salvage value differs from its UCC
  - If the asset is depreciated using a declining balance method, then the CCA tax shield formula is the most accurate approach, since it takes into account the future CCA impact

### Present Value of CCA Tax Shield Formula

$PV(\text{Tax Shield CCA}) =$

$$\frac{I \cdot d \cdot T_c}{d + k} \times \frac{1 + 0.5k}{1 + k} - \frac{S_n \cdot d \cdot T_c}{d + k} \times \frac{1}{(1 + k)^n}$$

where:

$I$  = total capital investment

$d$  = CCA rate

$T_c$  = corporate tax rate

$k$  = discount rate

$S_n$  = salvage value in year  $n$

$n$  = number of periods in the project

You purchase a machine for \$22,000 which belongs in a 30% CCA class. What is the present value of the CCA tax shield on the machine if it is sold at the end of the third year for \$6,000, your tax rate is 34%, and the appropriate discount rate is 15%?

**answer:** \$5,623

## 10.6 power mulcher: projected revenues (table 10.6, p.278)

| Year | Unit Price | Unit Sales | Revenues  |
|------|------------|------------|-----------|
| 1    | \$120      | 3,000      | \$360,000 |
| 2    | 120        | 5,000      | 600,000   |
| 3    | 120        | 6,000      | 720,000   |
| 4    | 110        | 6,500      | 715,000   |
| 5    | 110        | 6,000      | 660,000   |
| 6    | 110        | 5,000      | 550,000   |
| 7    | 110        | 4,000      | 440,000   |
| 8    | 110        | 3,000      | 330,000   |

## 10.6 power mulcher: annual CCA - class 8, 20% (table 10.7, p.278)

| Year | Beginning UCC | CCA       | Ending UCC |
|------|---------------|-----------|------------|
| 1    | \$400,000     | \$ 80,000 | \$320,000  |
| 2    | 720,000       | 144,000   | 576,000    |
| 3    | 576,000       | 115,200   | 460,800    |
| 4    | 460,800       | 92,160    | 368,640    |
| 5    | 368,640       | 73,728    | 294,912    |
| 6    | 294,912       | 58,982    | 235,930    |
| 7    | 235,930       | 47,186    | 188,744    |
| 8    | 188,744       | 37,749    | 150,995    |

## 10.6 power mulcher: projected income statements (table 10.8, p.278)

|                | Year                    |                         |                         |                         |                         |                         |                         |                         |
|----------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
|                | 1                       | 2                       | 3                       | 4                       | 5                       | 6                       | 7                       | 8                       |
| Unit price     | \$ 120                  | \$ 120                  | \$ 120                  | \$ 110                  | \$ 110                  | \$ 110                  | \$ 110                  | \$ 110                  |
| Unit sales     | 3,000                   | 5,000                   | 6,000                   | 6,500                   | 6,000                   | 5,000                   | 4,000                   | 3,000                   |
| Revenues       | <u>\$360,000</u>        | <u>\$600,000</u>        | <u>\$720,000</u>        | <u>\$715,000</u>        | <u>\$660,000</u>        | <u>\$550,000</u>        | <u>\$440,000</u>        | <u>\$330,000</u>        |
| Variable costs | 180,000                 | 300,000                 | 360,000                 | 390,000                 | 360,000                 | 300,000                 | 240,000                 | 180,000                 |
| Fixed costs    | 25,000                  | 25,000                  | 25,000                  | 25,000                  | 25,000                  | 25,000                  | 25,000                  | 25,000                  |
| CCA            | 80,000                  | 144,000                 | 115,200                 | 92,160                  | 73,728                  | 58,982                  | 47,186                  | 37,749                  |
| EBIT           | <u>75,000</u>           | <u>131,000</u>          | <u>219,800</u>          | <u>207,840</u>          | <u>201,272</u>          | <u>166,018</u>          | <u>127,814</u>          | <u>87,251</u>           |
| Taxes          | 30,000                  | 52,400                  | 87,920                  | 83,136                  | 80,509                  | 66,407                  | 51,126                  | 34,901                  |
| Net income     | <u><u>\$ 45,000</u></u> | <u><u>\$ 78,600</u></u> | <u><u>\$131,880</u></u> | <u><u>\$124,704</u></u> | <u><u>\$120,763</u></u> | <u><u>\$ 99,611</u></u> | <u><u>\$ 76,688</u></u> | <u><u>\$ 52,350</u></u> |

## 10.6 power mulcher: projected cash flows (table 10.9, p.278)

|                     | Year             |                  |                         |                  |                  |                  |                  |                  |                   |  |
|---------------------|------------------|------------------|-------------------------|------------------|------------------|------------------|------------------|------------------|-------------------|--|
|                     | 0                | 1                | 2                       | 3                | 4                | 5                | 6                | 7                | 8                 |  |
|                     |                  |                  | I. Operating Cash Flow  |                  |                  |                  |                  |                  |                   |  |
| EBIT                |                  | \$ 75,000        | \$131,000               | \$219,800        | \$207,840        | \$201,272        | \$166,018        | \$127,814        | \$ 87,251         |  |
| CCA                 |                  | 80,000           | 144,000                 | 115,200          | 92,160           | 73,728           | 58,982           | 47,186           | 37,749            |  |
| Taxes               |                  | 30,000           | 52,400                  | 87,920           | 83,136           | 80,509           | 66,407           | 51,126           | 34,901            |  |
| Operating cash flow |                  | <u>\$125,000</u> | <u>\$222,600</u>        | <u>\$247,080</u> | <u>\$216,864</u> | <u>\$194,491</u> | <u>\$158,593</u> | <u>\$123,874</u> | <u>\$ 90,099</u>  |  |
|                     |                  |                  | II. Net Working Capital |                  |                  |                  |                  |                  |                   |  |
| Initial NWC         |                  |                  |                         |                  |                  |                  |                  |                  |                   |  |
| NWC increases       | \$ 20,000        | \$ 34,000        | \$ 36,000               | \$ 18,000        | -\$ 750          | -\$ 8,250        | -\$16,500        | -\$16,500        | -\$ 16,500        |  |
| NWC recovery        |                  |                  |                         |                  |                  |                  |                  |                  | -\$ 49,500        |  |
| Additions to NWC    | <u>\$ 20,000</u> | <u>\$ 34,000</u> | <u>\$ 36,000</u>        | <u>\$ 18,000</u> | <u>-\$ 750</u>   | <u>-\$ 8,250</u> | <u>-\$16,500</u> | <u>-\$16,500</u> | <u>-\$ 66,000</u> |  |
|                     |                  |                  | III. Capital Spending   |                  |                  |                  |                  |                  |                   |  |
| Initial outlay      | \$800,000        |                  |                         |                  |                  |                  |                  |                  |                   |  |
| Aftertax salvage    |                  |                  |                         |                  |                  |                  |                  |                  | -\$150,000        |  |
| Capital spending    | \$800,000        |                  |                         |                  |                  |                  |                  |                  | -\$150,000        |  |

## 10.6 power mulcher: additions to net working capital (table 10.10, p.279)

| Year | Revenues  | Net Working Capital | Increase  |
|------|-----------|---------------------|-----------|
| 0    |           | \$ 20,000           |           |
| 1    | \$360,000 | 54,000              | \$ 34,000 |
| 2    | 600,000   | 90,000              | 36,000    |
| 3    | 720,000   | 108,000             | 18,000    |
| 4    | 715,000   | 107,250             | -750      |
| 5    | 660,000   | 99,000              | -8,250    |
| 6    | 550,000   | 82,500              | -16,500   |
| 7    | 440,000   | 66,000              | -16,500   |
| 8    | 330,000   | 49,500              | -16,500   |

## 10.6 power mulcher: projected total cash flows (table 10.11, p.280)

|                            | Year               |                  |                  |                  |                  |                  |                  |                  |                  |
|----------------------------|--------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
|                            | 0                  | 1                | 2                | 3                | 4                | 5                | 6                | 7                | 8                |
| Operating cash flow        |                    | \$125,000        | \$222,600        | \$247,080        | \$216,864        | \$194,491        | \$158,593        | \$123,874        | \$ 90,099        |
| Additions to NWC           | -\$ 20,000         | -34,000          | -36,000          | -18,000          | 750              | 8,250            | 16,500           | 16,500           | 66,000           |
| Capital spending           | -800,000           | 0                | 0                | 0                | 0                | 0                | 0                | 0                | 150,000          |
| Total project cash flow    | <u>-\$ 820,000</u> | <u>\$ 91,000</u> | <u>\$186,600</u> | <u>\$229,080</u> | <u>\$217,614</u> | <u>\$202,741</u> | <u>\$175,093</u> | <u>\$140,374</u> | <u>\$306,099</u> |
| Cumulative cash flow       | -\$ 820,000        | -\$729,000       | -\$542,400       | -\$313,320       | -\$ 95,706       | \$107,035        | \$282,128        | \$422,503        | \$728,602        |
| Discounted cash flow @ 15% | -\$ 820,000        | \$ 79,130        | \$141,096        | \$150,624        | \$124,422        | \$100,798        | \$ 75,698        | \$ 52,772        | \$100,064        |
| NPV                        | \$ 4,604           |                  |                  |                  |                  |                  |                  |                  |                  |
| IRR                        | 15.15%             |                  |                  |                  |                  |                  |                  |                  |                  |
| PB                         | 4.47               |                  |                  |                  |                  |                  |                  |                  |                  |

## 10.6 power mulcher: tax shield solution (tables 10.13 and 10.14, p.283)

|                          | Year       |                 |           |           |           |           |           |           |           |
|--------------------------|------------|-----------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                          | 0          | 1               | 2         | 3         | 4         | 5         | 6         | 7         | 8         |
| $(S - C)(1 - T_c)$       |            | \$93,000        | \$165,000 | \$201,000 | \$180,000 | \$165,000 | \$135,000 | \$105,000 | \$ 75,000 |
| Additions to NWC         | -\$ 20,000 | -34,000         | -36,000   | -18,000   | 750       | 8,250     | 16,500    | 16,500    | 66,000    |
| Capital spending         | -800,000   |                 |           |           |           |           |           |           | 150,000   |
| <b>Totals</b>            |            |                 |           |           |           |           |           |           |           |
| PV of $(S - C)(1 - T_c)$ |            | \$645,099       |           |           |           |           |           |           |           |
| PV of additions to NWC   |            | -49,179         |           |           |           |           |           |           |           |
| PV of capital spending   |            | -750,965        |           |           |           |           |           |           |           |
| PV of CCA tax shield     |            | 159,649         |           |           |           |           |           |           |           |
| NPV                      |            | <u>\$ 4,604</u> |           |           |           |           |           |           |           |

### Tax Shield

| Year | CCA       | $.40 \times \text{CCA}$ | PV at 15% |
|------|-----------|-------------------------|-----------|
| 1    | \$ 80,000 | \$32,000                | \$ 27,826 |
| 2    | 144,000   | 57,600                  | 43,554    |
| 3    | 115,200   | 46,080                  | 30,298    |
| 4    | 92,160    | 36,864                  | 21,077    |
| 5    | 73,728    | 29,491                  | 14,662    |
| 6    | 58,982    | 23,593                  | 10,200    |
| 7    | 47,186    | 18,874                  | 7,096     |
| 8    | 37,749    | 15,100                  | 4,936     |
|      |           | PV of tax shield on CCA | \$159,649 |

- cost-cutting proposal
  - whether cost savings large enough to justify capital expenditure
  - identify relevant **incremental** cash flows
  - no working capital consequences
- replacing an asset
  - analysis is more complex because replacing existing equipment
  - buy new machine, sell old machine
  - use salvage value, not UCC, for NPV analysis

- equipment with different lives
  - **equivalent annual cost** - PV of project cost on annual basis
- setting bid price
  - submitting a competitive bid to win a job
  - winner is whoever submits lowest bid
  - **winner's curse** - if you win, good chance you underbid
  - **goal is to determine lowest price we can profitably charge** - occurs when NPV is zero

Katie's Cafe is considering the addition of a new refrigeration system that will cut annual food costs by \$15,000. The system will cost \$36,000 to purchase and install. This system is expected to have a 3-year life and will be depreciated to zero using straight-line depreciation. What is the annual net income for this project if the tax rate is 34 percent?

**answer:** \$1,980

J&J Automotive is analyzing two machines to determine which one they should purchase. The company requires a 16 percent rate of return and the machinery belongs in a 30 percent CCA class. Machine A has a cost of \$427,000, annual operating costs of \$13,000, and a 4-year life. Machine B costs \$390,000, has annual operating costs of \$6,500, and has a 3-year life. Whichever machine is purchased will be replaced at the end of its useful life. Which machine should J&J purchase and why? Ignore taxes.

**answer:** A; because its EAC is \$14,551.41 less than that of Machine B

## 10.7 special cases: setting bid price - example

You are working on a bid to build five playgrounds a year for the next two years. This project requires the purchase of \$62,000 of equipment which will be depreciated using straight-line depreciation to a zero book value over two years. The equipment can be sold at the end of the project for \$39,000. You will also need \$12,000 in net working capital over the life of the project. The fixed costs will be \$18,000 a year and the variable costs will be \$49,000 per playground. Your required rate of return is 15% for this project and your tax rate is 34%. What is the minimum amount, rounded to the nearest \$100, you should bid per playground?

**answer:** \$57,900